Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 1

7-31-2025

Analyzing High-Risk Fertility Behavior for Sustainable Maternal-Child Health: A 2017 Sociodemographic Study in Urban and Rural Indonesia

Asti Annisa Utami
Universitas Indonesia, Depok, astiannisaa@gmail.com

Fadhaa Aditya Kautsar Murti
Universitas Indonesia, Depok, kautsarditya@gmaill.com

Popy Yuniar
Universitas Indonesia, Depok, popyyuniar@gmail.com

Milla Herdayati
Universitas Indonesia, Depok, millaherdayati@gmail.com

Recommended Citation

Utami AA , Murti FK , Yuniar P , et al. Analyzing High-Risk Fertility Behavior for Sustainable Maternal-Child Health: A 2017 Sociodemographic Study in Urban and Rural Indonesia. *Kesmas*. 2025; 20(5): 1-9
DOI: 10.7454/kesmas.v20isp1.2120
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/1

Utami *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 1-9
DOI: 10.7454/kesmas.v20isp1.2120

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Analyzing High-Risk Fertility Behavior for Sustainable Maternal-Child Health: A 2017 Sociodemographic Study in Urban and Rural Indonesia

Asti Annisa Utami[1*], Fadhaa Aditya Kautsar Murti[2], Popy Yuniar[2], Milla Herdayati[2]

[1]Department of Health Policy and Administration, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia
[2]Department of Biostatistics and Population Studies, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

Abstract

Indonesia's goal of achieving *Indonesia Emas 2045* hinges on improving Maternal-Child Health (MCH), essential for building a healthy and competitive population. Despite some advancements, the Maternal Mortality Rate (MMR) and Under-five Mortality Rate (U5MR) remain high, particularly because of High-Risk Fertility Behavior (HRFB). The HRFB poses significant risks to MCH, affecting both urban and rural women. This study aimed to identify the factors associated with HRFB in these areas to enhance MCH outcomes and support Indonesia's sustainable health goals. This cross-sectional study used a secondary dataset from the 2017 Indonesian Demographic Health Survey. A total of 20,530 women of reproductive age were included in this analysis. The main dependent variable was the HRFB, and the independent variables were split into three factors: individuals, households, and community factors. The overall prevalence of HRFB was 37.0%, with a slightly higher prevalence in urban areas (37.6%) than in rural areas (36.1%). In rural areas, HRFB was significantly associated with the wealth quintile, while in urban areas, it was linked to women's autonomy and education level. Addressing these factors is critical for improving MCH outcomes and reducing HRFB use.

Keywords: High-Risk Fertility Behavior, Indonesian Demographic Health Survey, Maternal-Child Health, reproductive-age women, urban-rural

Introduction

Indonesia's ambition to achieve prosperity, inclusivity, and sustainability, as envisioned in *Indonesia Emas 2045,* is impossible without the support of healthy human resources. Human health status is influenced not only by present-day health-related behaviors but also by conditions established early in the life course, including Maternal-Child Health (MCH). Thus, MCH is imperative to achieve sustainable healthy human capital in the future. This concept is supported by SDGs Goal 3, which clearly portrays MCH's pivotal contributions to sustainable development.[1] By 2023, it is expected to reduce the maternal mortality ratio (MMR) to less than 70 per 100,000 live births globally and to reduce neonatal mortality (NMR) to at least 12 per 1,000 live births and under-five mortality (U5MR) to at least 25 per 1,000 live births nationally.[1]

Indonesia has shown a 51.15% NMR decrease from 19 per 1,000 live births in 2007 to 9.28 per 1,000 live births in 2020, which complies with the SDGs target.[2] The MMR has also diminished by 45%, from 356 deaths per 100,000 live births in 2010 to 189 deaths per 100,000 live births in 2020.[2] However, this achievement does not occur evenly, as the MMR in eastern parts of Indonesia, including East Nusa Tenggara, West Papua, and Papua, is still high, ranging from 316 deaths per 100,000 live births to 565 deaths per 100,000 live births in 2020.[2]

A similar trend occurred in the U5MR, where the national rate in 2020 was 19.83 per 1,000 live births, with the lowest rates coming from western Indonesia and the highest from eastern Indonesia. All provinces in Java and Bali Island had no U5MR higher than 16.15 deaths per 1,000 live births. In contrast, in Nusa Tenggara, Maluku, and Papua Provinces, the rates ranged from 29.7 deaths per 1,000 live births to 49.04 deaths per 1,000 live births.[2] This uneven progress suggests the existence of unequal MCH risk factors across Indonesia, underscoring the need for targeted interventions to

***Correspondence**:* *Asti Annisa Utami, Department of Health Policy and Administration, Faculty of Public Health, Universitas Indonesia, Email: astiannisaa@gmail.com*

Received : September 20, 2024
Accepted : December 13, 2024
Published: July 31, 2025

foster health equity by 2045. Adding targeted, context-specific measures to reduce these disparities is essential to achieving both the SDGs and *Indonesia Emas* 2045 goals.[2]

High-risk fertility behavior (HRFB) is known to influence MCH and mortality rates. The HRFB is defined by the women's age during pregnancy, birth interval, and parity.[3] Women are considered to have high-risk fertility if they experience any of these four conditions, including a) pregnancy started under the age of 18 years or b) pregnancy above 34 years; c) birth interval less than 24 months; and d) parity 4 and above.[3–7] The HRFB is known to cause detrimental effects for both women and children, including various pregnancy complications, which are a higher risk of developing anemia for female adolescents, preeclampsia, premature birth, low birth weight, congenital abnormalities, a higher risk for maternal death, and stillbirth.[4,7–13]

Additionally, HRFB places infants at a 30% higher risk of mortality when born to female adolescents, highlighting the urgency of addressing this factor.[14] The HRFB has an enormous influence over maternal and child mortality risk, so addressing the factors associated with HRFB is crucial to controlling MCH health further.[7] In Indonesia, addressing the HRFB concerning the distinct risk factors of urban and rural areas is a strategic approach to improve favorable trends in MCH-related indicators and diminish the achievement gap between regions, thereby facilitating the attainment of national and international sustainable development objectives.[15]

This study analyzed the 2017 Indonesian Demographic Health Survey (IDHS) dataset collected by the Demographic Health Survey (DHS) Program. The 2017 IDHS was selected because it was the latest dataset to provide an overview of the reproductive health scheme in Indonesia. Other similar studies concerning HRFB in Indonesia have discussed the determinants of HRFB among Indonesian adolescents[16] and proven HRFB as a risk factor for NMR.[17] However, none of these studies analyzed the socioeconomic aspects of HRFB characterized by urban and rural areas. This study sought to elucidate the sociodemographic characteristics associated with HRFB in urban and rural regions in 2017, serving as a reference for stakeholders and policymakers to enhance MCH status in pursuit of sustainable MCH in *Indonesia Emas* 2045.

Method

The population in this cross-sectional study included women of reproductive age (15–49 years), with a total population of 49,627 individuals. The inclusion criterion for this study was currently married women in 2017. Among these, approximately 34,086 individuals were married during survey collection in 2017. Married status was obtained by asking about union status, which resulted in three different answers: currently in a union, formerly in a union, and never in a union. Thus, all women who were formerly in union and never in union were excluded. However, 13,556 individuals had incomplete data (any covariates with missing values) and were thus excluded from this study. Therefore, the final sample in this study comprised 20,530 reproductive-age women, implying a Complete Case Analysis (CCA) analysis method for this study. The CCA was used because of its simplicity, as well as its use in many papers with any DHS dataset, and it yielded results similar to those of MI and other imputation methods.[18,19] The process of sample selection is explained in Figure 1.

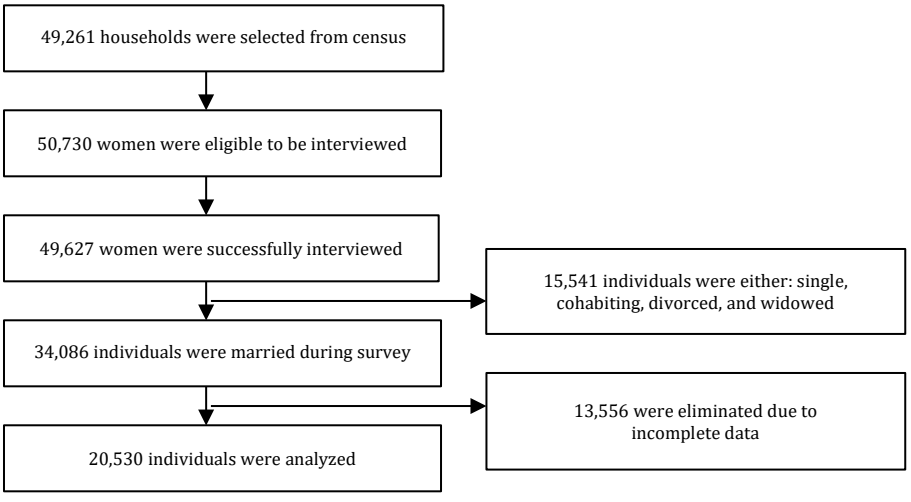

Figure 1. Sample Selection

This cross-sectional study utilized the 2017 IDHS dataset collected by the DHS Program, available at https://dhsprogram.com/. The 2017 IDHS asked about various health topics, including reproductive health status. The DHS Program is an open-source website. The DHS Program executed IDHS 2017 in compliance with the ethical directives established by Institutional Review Board number FWA00000845.

The dependent variable in this study was the HRFB. The HRFB is a risk factor for maternal health outcomes, which was determined by four different conditions: a) currently married women less than 18 years; b) currently married women over 34 years; c) currently married women with less than 24 months since preceding birth; and d) currently married women with more than three births. Meeting at least one of these four conditions categorized women into the HRFB. Various factors, including individual, household, and community levels, were selected as the independent variables. Individual factors consisted of the women's educational level (below senior high school [uneducated, primary, and junior high school], senior high school, and higher education [academy, diploma, and university degree]) and employment status (unemployed and employed).

Household factors consisted of the spouse's education status below senior high school [uneducated, primary, and junior high school], senior high school, and higher education [academy, diploma, and university degree]) and the spouse's occupation (white-collar workers [professional, clerical, and sales], blue-collar workers [agricultural and industrial workers], service workers, and unemployed). Community factors consisted of the wealth quintile (poorest, poor, middle, richer, and richest) as well as women's authority in deciding contraceptive use (the woman herself, other people [spouse/family], and joint decision [the woman and her spouse]). The choices of independent variables were similar to previous studies done in developing countries.[7,20]

Data analysis was performed using Stata version 17.0 (licensed under StataCorp). Univariate analysis was performed by examining the distribution of each variable using tables. For each table, the frequency and percentage distributions were specified for categorical variables, whereas the means and standard deviations were specified for continuous variables, if applicable. Bivariate analysis was performed using simple logistic regression to examine the association between the independent and dependent variables, producing an unadjusted odds ratio. Finally, multivariate analysis was conducted using multiple logistic regression to produce an adjusted odds ratio. The enter method was chosen for the adjusted logistic regression. Significant values were set to 0.05, and to allow for more predictors, variables with a p-value <0.250 were selected for multivariate analysis. The results were stratified by place of residence (rural and urban) for both bivariate and multivariate analyses to check for risk factor differences. For all analyses, normalized weights, stratum, and primary sampling units were considered to accommodate the complex survey design.

Results

Among 20,530 currently married women in this study, the prevalence of HRFB was 37.0 (95% CI: 36.1–37.9), with urban areas showing a slightly higher prevalence (37.6%) than their rural counterparts (36.1%). Decomposing each condition of the HRFB, it was found that giving birth at under the age of 18 years was more prevalent in rural areas than urban areas. In contrast, urban areas had a higher prevalence of women at risk of giving birth at age above 34 years. The incidence of elevated birth orders was greater in rural regions (4.5%) than in urban areas (3.2%) (Table 1).

In rural areas, it was found that the women's employment status and wealth quintile were independently associated with HRFB. However, after adjusting with other variables, a statistical association of a women's employment status could not be established. In contrast, the association between the wealth quintile and HRFB remained significant, even after adjusting for other variables. This study also found that the risk of HRFB increased with the increasing status of the wealth quintiles. Those in the richest quintile (aOR: 1.29; 95% CI:1.04, 1.61), richer quintile (aOR: 1.24; 95% CI:1.05, 1.46), and middle quintile (aOR: 1.21; 95% 1.04, 1.41) were more likely to have HRFB than those in the poorest quintile (Table 2).

In contrast to rural areas, women's education, spouses' education, women's employment status, wealth quintile, and women's autonomy showed significant unadjusted associations with the HRFB. However, the strength of the association between the spouse's education, wealth quintile, women's employment status, and HRFB was not strong enough to remain significant after adjusting for other variables.

Table 1. The Prevalence of High-Risk Fertility Behavior

Variable	% CI [ub, lb]	Rural (% CI)	Urban (% CI)
HRFB	37.0 [36.1, 37.9)	36.1 [35.1, 37.7]	37.6 [36.5, 38.8]
Women aged <18	0.1 [0.1, 0.2]	0.2 [0.1, 0.4]	0.03 [0.01, 0.09]
Women aged >34	25.4 [24.5, 26.3]	24.0 [22.6, 25.3]	26.9 [25.7, 28.2]
Interval <24 months	7.6 [7.2, 8.0}	7.7 [7.1, 8.4]	7.4 [6.9, 8.1]
Birth order >3	3.9 [3.6, 4.2]	4.5 [4.1, 5.0]	3.2 [2.9, 3.6]

Notes: CI = confidence interval, HRFB = high-risk fertility behavior

Table 2. Factors Associated with High-Risk Fertility Behavior in Rural Areas

Variable	Rural			
	p-value	Crude odds ratio	p-value	Adjusted odds ratio (Enter)
Women's education				
Below senior high school	Ref	Ref	Ref	Ref
Senior high school	0.654	1.02 (0.90, 1.16)	0.900	0.99 (0.87, 1.12)
Higher education	0.119	1.16 (0.96, 1.39)	0.623	1.05 (0.85, 1.29)
Spouse's education				
Below senior high school	Ref	Ref	-	-
Senior high school	0.309	0.93 (0.82, 1.06)	-	-
Higher education	0.870	1.01 (0.82, 1.25)	-	-
Women's employment status				
Unemployed	Ref	Ref	Ref	Ref
Employed	0.038	1.10 (1.00, 1.22)	0.052	1.10 (0.99, 1.21)
Spouse's job characteristics				
Unemployed	Ref	Ref	Ref	Ref
White-collar	0.962	0.98 (0.56, 1.73)	0.711	0.91 (0.52, 1.62)
Blue-collar	0.939	0.97 (0.56, 1.69)	0.955	0.98 (0.56, 1.70)
Service worker	0.967	1.01 (0.57, 1.77)	0.990	1.00 (0.56, 1.77)
Other	0.237	2.00 (0.63, 6.35)	0.348	1.73 (0.54, 5.45)
Wealth quintile				
Poorest	Ref	Ref	Ref	Ref
Poorer	0.365	1.06 (0.92, 1.23)	0.322	1.07 (0.93, 1.23)
Middle	0.015	1.20 (1.03, 1.40)	0.011	1.21 (1.04, 1.41)
Richer	0.012	1.23 (1.04, 1.44)	0.010	1.24 (1.05, 1.46)
Richest	0.015	1.29 (1.05, 1.59)	0.020	1.29 (1.04, 1.61)
Women's autonomy in deciding contraceptive use				
Women	Ref	Ref	-	-
Other people	0.718	0.96 (0.77, 1.18)	-	-
Joint decision	0.354	1.05 (0.94, 1.17)	-	-

This study found that individuals whose education level was senior high school (aOR: 1.17; 95% CI: 1.03, 1.32) and higher education (aOR: 1.45; 95% CI: 1.19, 1.78) had a higher risk of HRFB than those whose education level was below senior high school. Similarly, individuals whose autonomy to decide contraceptive use was in the control of their spouses (aOR: 0.75; 95% CI: 0.63, 0.90) had a lower likelihood of HRFB. Similarly, individuals with a joint decision to use contraceptives (aOR: 0.85; 95% CI: 0.77, 0.95) had a lower likelihood of HRFB.

Table 3. Factors Associated with High-Risk Fertility Behavior in Urban Areas

Variable	Urban			
	p-value	Crude odds ratio	p-value	Adjusted odds ratio (Enter)
Women's education				
Below senior high school	Ref	Ref	Ref	Ref
Senior high school	<0.001	1.22 (1.10, 1.36)	<0.001	1.17 (1.03, 1.32)
Higher education	<0.001	1.56 (1.35, 1.81)	<0.001	1.45 (1.18, 1.78)
Spouse's education				
Below senior high school	Ref	Ref	Ref	Ref
Senior high school	0.001	1.18 (1.07, 1.31)	0.368	1.05 (0.93, 1.18)
Higher education	<0.001	1.40 (1.21, 1.61)	0.638	1.04 (0.86, 1.25)
Women's employment status				
Unemployed	Ref	Ref	Ref	Ref
Employed	0.013	1.13 (1.02, 1.25)	0.088	1.09 (1.21)
Father's job characteristics				
Unemployed	Ref	Ref	Ref	Ref
White-collar	0.091	1.46 (0.93, 2.29)	0.125	1.41 (0.90, 2.20)
Blue-collar	0.132	1.41 (0.90, 2.22)	0.051	1.55 (0.99, 2.43)
Service worker	0.198	1.34 (0.85, 2.09)	0.124	1.41 (0.90, 2.20)
Other	0.653	1.16 (0.59, 2.26)	0.903	1.04 (0.53, 2.05)
Wealth quintile				
Poorest	Ref	Ref	Ref	Ref
Poorer	0.761	1.03 (0.82, 1.29)	0.903	1.01 (0.80, 1.27)
Middle	0.141	1.17 (0.94, 1.44)	0.303	1.11 (0.90, 1.38)
Richer	0.071	1.20 (0.98, 1.47)	0.337	1.11 (0.89, 1.37)
Richest	<0.001	1.46 (1.20, 1.79)	0.061	1.23 (0.99, 1.54)
Women's autonomy in deciding contraceptive use				
Women	Ref	Ref	Ref	Ref
Other people	0.009	0.79 (0.66, 0.94)	0.002	0.75 (0.63, 0.90)
Joint decision	0.038	0.89 (0.80, 0.99)	0.005	0.85 (0.77, 0.95)

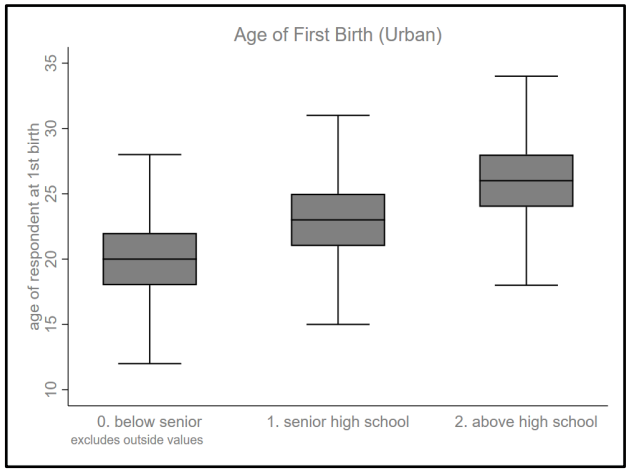

Figure 2. Median Age at First Birth by Education in Urban Areas

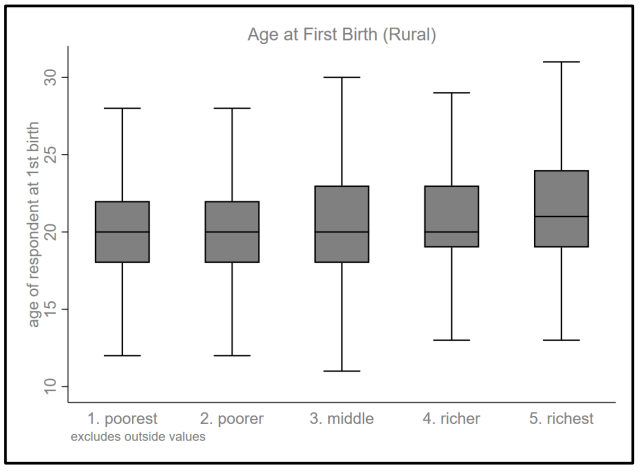

Figure 3. Median Age at First Birth by Wealth Quintile in Rural Areas

To confirm the results, this study also examined the median age at first birth. Boxplots in Figures 2 and 3 illustrate the trends in median age at first birth in urban and rural areas, stratified by women's educational level and wealth quintile, respectively, as significant factors in both settings.

Discussion

This study found the prevalence and risk factors associated with HRFB among reproductive-age women in Indonesia using the 2017 IDHS dataset. The overall prevalence of HRFB was slightly higher among women in urban areas than in rural areas, at 37.6% and 36.1%, respectively. Among the four indicators of HRFB, it was found that giving birth at age over 35 years constituted 25.4% of HRFB individuals (24.0% in rural areas and 25.9% in urban areas). The least common indicator of HRFB was giving birth at age less than 17 years, with an overall prevalence of 0.1% (0.2% in rural areas and 0.03% in urban areas).

These findings were in line with other studies stating that place of residence was one of the risk factors associated with HRFB.[7,21] This study also identified some differences in risk factors in rural and urban areas. This study discovered three main findings: 1) the wealth quintile remained the only significant predictor in rural areas; 2) education level and women's autonomy were significantly associated with HRFB in urban areas; and 3) there was a gradient of increasing risk along with the increasing status of wealth quintiles in rural areas and education status in urban areas.

One possible argument implied that a gradient of risk existed due to the intention to delay fertility among highly educated women in urban areas and upper-class women in rural areas. A narrative highlighted that the number of intentional delayed pregnancies among women was more prevalent among women with higher social status (often denoted by employment and career) of women,[22] and such factors were associated with delays in childbearing.[23,24] These findings were validated in Figures 2 and 3, where the median age of first birth increased with the increasing status of education in urban and wealth quintiles in rural areas.

Furthermore, it was also implied that women with higher education in urban areas were more likely to delay childbearing.[23] This is because higher education promotes career prospects and personal development, and it takes a prolonged period to establish a better career promotion.[22] Frequently, having a child is considered a barrier to pursuing a better education and a better career life in urban areas.[25,26] In contrast to its counterpart, education did not exhibit a significant association with HRFB, whereas the income quintile did. This result can be attributed to the unequal distribution of education levels in rural areas. The percentage disparity of women who finished high school and higher education was 14.50% in 2017, while women in urban areas had higher school participation rates than those in rural areas.[27] This might explain the educational significance of risk factor differences in rural and urban areas.

The wealth quintile correlated with the HRFB in rural but not urban areas. This study contended that this disparity resulted from variations in societal norms and the acceptance of childbirth at over 35 years. Social norms of having children at a later age were more acceptable in urban areas irrespective of wealth quintile.[28] Conversely, social norms of having children as early as possible are highly encouraged in rural areas, as shown by the high number of below 18 marriages.[29] This also explained why this study found that giving birth at age less than 17 years was more common in rural areas.

Additionally, women's autonomy in deciding on contraceptive use was associated with HRFB in urban areas, nevertheless not in rural areas. Women in urban areas have more autonomy than those in rural areas[30] and are not strictly bound to social norms compared to rural areas.[29] Thus, they can decide on their own or have equal voices as their partner regarding their reproductive health status,[31] including birth planning. Drawing back to Indonesia's sustainability plan in the *Indonesia Emas 2045*, family planning policies to increase people's quality of life are addressed in the social transformation agenda, which aims to control high-risk pregnancies supported by robust knowledge and behavioral changes in society.[32] The findings in this study are advantageous for policymakers in crafting evidence-based health policies to reduce HRFB risk according to the influencing sociodemographic factors in urban and rural areas.

The increase in education level and autonomy ownership among urban women and the higher wealth quintile among rural women are in line with a higher risk of HRFB, indicating that the good trends in sociodemographic factors among urban-rural communities have to be complemented by fertility education and access to family planning assistance from health facilities. This interpretation is supported by the IDHS 2017 findings, highlighting the insignificance of women's higher education level on HRFB protective behavior, such as contraception use.[33] The highest contraception use was found among women with basic education (64%) and decreased as the education level increased (46% among women with university degrees),[33] proving the relevance of improving fertility education in both urban and rural areas.

The fertility education content should be tailored specifically to address HRFB and be accessible to the whole population to influence the social norms that have been a significant incentive for HRFB practices. A previous study on

fertility education argue that improving it, regardless of its target population, can empower people to make informed decisions.[34] This underscores the importance of targeting both women and men in fertility education and sheds light on the role of fertility awareness in reducing HRFB through informed reproductive decisions, including childbearing age and number of children. Only targeting women in fertility education interventions could induce anxiety as if the burden of reproductive decisions were all on women.[34] Thus, addressing fertility education to a broader population is the key to creating a supportive society that prevents HRFB.

Improving HRFB knowledge among urban women is effective in influencing their behaviors and decisions in family planning, as they are already empowered by their high education level and autonomy in contraceptive use. However, the same intervention in rural areas should be accompanied by equitable access to formal education for women, as this study found that education level is not associated with HRFB in rural areas, unlike in urban settings, where education is a significant factor. This policy approach is aligned with *Indonesia Emas 2045's* strategy to strengthen family planning policy to achieve the social transformation agenda. According to Indonesia's current family planning program, the National Population and Family Planning Board manages the demand side, while the Ministry of Health manages the supply side.[35]

Enhancing the fertility education program, as proposed in this study, will assist the National Population and Family Planning Board in augmenting the program's demand side, primarily focused on community engagement. Simultaneously, the Ministry of Health, on the supply side, needs to balance this improvement through robust health systems development, including health facilities and health workers, to accommodate fertility education delivery through family planning consultation in the local primary healthcare.[35] Subsequently, future research needs to address the appropriate methods for fertility education in urban and rural areas and explore the strategy to reach a broader community.

The socioeconomic factors associated with the HRFB identified in this study served as a crucial input to Indonesia's decentralized government, emphasizing the urgency to strengthen MCH service coordination, particularly at the regional level. However, limitations persisted in this study. First, the cross-sectional design of this study was insufficient for establishing causality. Second, because this study utilized a secondary dataset, the choice of variables was limited. Third, the covariate residuals might persist.

Conclusion

Addressing HRFB risk factors in urban and rural areas is a strategic approach to improving MCH indicator performance to achieve Indonesia's sustainable health targets. High education levels, women's autonomous ownership in urban areas, and higher wealth quintiles in rural areas are sociodemographic factors that correlate with a higher risk of HRFB. This study also found that delaying pregnancy was the most prevalent HRFB in both areas, increasing the likelihood of high-risk pregnancies and contradicting the government's aim of reducing such risks. Therefore, this study suggests that enhancing fertility education in urban and rural populations influences social norms and promotes informed reproductive decisions. These efforts aim to reduce HRFB practices in both areas and contribute to achieving the social transformation agenda of the *Indonesia Emas* 2045.

Abbreviations

MCH: Maternal-Child Health; MMR: Maternal Mortality Rate; NMR: Neonatal Mortality Rate; U5MR: Under-five Mortality Rate; HRFB: High-Risk Fertility Behavior; IDHS: Indonesian Demographic Health Survey; DHS: Demographic Health Survey; CCA: Complete Case Analysis.

Ethics Approval and Consent to Participate

Not applicable.

Competing Interest

The authors declare no competing interest.

Availability of Data and Materials

The dataset is open publicly at https://dhsprogram.com/.

Authors' Contribution

Conceptualization – FAKM, AAU, PY, MH; Data Analysis – FAKM; Manuscript Writing – AAU, FAKM; Review – PY, MH.

Acknowledgment

The authors thank the DHS Program for providing this dataset.

References

1. United Nations. Goals 3 Ensure healthy lives and promote well-being for all at all ages: Targets and Indicators. New York; United Nations; 2015.
2. Badan Pusat Statistik, United Nations Population Fund. Mortalitas di Indonesia: Hasil *Long Form* Sensus Penduduk 2020. Jakarta: Badan Pusat Statistik; 2023.
3. Tsala Dimbuene Z, Tadesse Tessema Z, Wang Sonne SE. High-risk fertility behaviours among women of reproductive ages in the Democratic Republic of the Congo: Prevalence, correlates, and spatial distribution. PloS One. 2023; 18 (3): e0283236. DOI: 10.1371/journal.pone.0283236.
4. Amir-Ud-Din R, Naz L, Rubi A, et al. Impact of high-risk fertility behaviours on underfive mortality in Asia and Africa: Evidence from Demographic and Health Surveys. BMC Pregnancy Childbirth. 2021; 21: 344. DOI: 10.1186/s12884-021-03780-y.
5. Okyere J, Aboagye RG, Ahinkorah BO, et al. High-risk fertility behaviour and childhood anaemia in sub-Saharan Africa. BMJ Open. 2022; 12 (5): e051921. DOI: 10.1136/bmjopen-2021-051921.
6. Budu E, Ahinkorah BO, Okyere J, et al. High risk fertility behaviour and health facility delivery in West Africa. BMC Pregnancy Childbirth. 2023; 23: 842. DOI: 10.1186/s12884-023-06107-1.
7. Seifu BL, Tebeje TM, Asgedom YS, et al. Determinants of high-risk fertility behavior among women of reproductive age in Kenya: A multilevel analysis based on 2022 Kenyan demographic and health survey. BMC Public Health. 2023; 23: 2516. DOI: 10.1186/s12889-023-17459-w.
8. Croft TN, Allen CK, Zachary BW, et al. Guide to DHS Statistics. Rockville, Maryland, USA: ICF; 2023. Chapter 8, Infant and Child Mortality: High-Risk Fertility Behavior.
9. Habimana-Kabano I, Broekhuis A, Hooimeijer P. The Effect of Pregnancy Spacing on Fetal Survival and Neonatal Mortality in Rwanda: A Heckman Selection Analysis. J Biosoc Sci. 2016; 48 (3): 358–373. DOI: 10.1017/S0021932015000231.
10. Diabelková J, Rimárová K, Dorko E, et al. Adolescent Pregnancy Outcomes and Risk Factors. Int J Environ Res Public Health. 2023; 20 (5): 4113. DOI: 10.3390/ijerph20054113.
11. Heazell AEP, Newman L, Lean SC, et al. Pregnancy outcome in mothers over the age of 35. Curr Opin Obstet Gynecol . 2018; 30 (6): 337-343. DOI: 10.1097/GCO.0000000000000494.
12. Wakeyo MM, Kebira JY, Assefa N, et al. Short birth interval and its associated factors among multiparous women in Mieso agro-pastoralist district, Eastern Ethiopia: A community-based cross-sectional study. Front Glob Womens Health. 2022; 3: 801394. DOI: 10.3389/fgwh.2022.801394.
13. Bauserman M, Nowak K, Nolen TL, et al. The relationship between birth intervals and adverse maternal and neonatal outcomes in six low and lower-middle income countries. Reprod Health. 2020; 17 (Suppl 2): 157. DOI: 10.1186/s12978-020-01008-4.
14. Tessema ZT, Tamirat KS. Determinants of high-risk fertility behavior among reproductive-age women in Ethiopia using the recent Ethiopian Demographic Health Survey: A multilevel analysis. Trop Med Health. 2020; 48: 93. DOI: 10.1186/s41182-020-00280-1.
15. United Nations Children's Funds. Improving Maternal and Newborn Health Services in Eastern Indonesia: Findings from an External Review. Jakarta: United Nations Children's Funds; 2017.
16. Kosasih CE, Solehati T, Utomo W, et al. Determinants Factors of High-risk Sexual Behavior Pregnancy among Adolescent in Indonesia. Open Access Maced J Med Sci. 2021; 9 (T6): 69–79. DOI: 10.3889/oamjms.2021.7338.
17. Atriana D, Wahab A. Kematian Neonatal pada Ibu dengan Riwayat Kehamilan 4 Terlalu di Indonesia Analisis Data Survey Demografi dan Kesehatan Indonesia 2017 (SDKI 2017) [Thesis]. Yogyakarta: Universitas Gadjah Mada; 2023.
18. Bartlett JW, Carpenter JR, Tilling K, et al. Corrigendum: Improving upon the efficiency of complete case analysis when covariates are MNAR. Biostatistics. 2015; 16 (1): 205. DOI: 10.1093/biostatistics/kxu051
19. Sameen S, Lakhdir MPA, Azam SI, et al. Evaluating knowledge about HIV and discriminatory attitudes among Pakistani women of reproductive age using 2017–18 Demographic Health Survey data. Sci Rep. 2023; 13: 17849. DOI: 10.1038/s41598-023-45117-z.
20. Khan MN, Harris ML. Association between maternal high-risk fertility behaviour and perinatal mortality in Bangladesh: Evidence from the Demographic and Health Survey. PloS One. 2023; 18 (11): e0294464. DOI: 10.1371/journal.pone.0294464.
21. Singh P, Singh KK. Trends, patterns and predictors of high-risk fertility behaviour among Indian women: Evidence from National Family Health Survey. BMC Public Health. 2024; 24: 626. DOI: 10.1186/s12889-024-18046-3.
22. Safdari-Dehcheshmeh F, Noroozi M, Taleghani F, et al. Factors Influencing the Delay in Childbearing: A Narrative Review. Iran J Nurs Midwifery Res. 2023; 28 (1): 10–19. DOI: 10.4103/ijnmr.ijnmr_65_22.
23. Li H, Nawsherwan, Fan C, et al. The trend in delayed childbearing and its potential consequences on pregnancy outcomes: A single center 9-years retrospective cohort study in Hubei, China. BMC Pregnancy Childbirth. 2022; 22: 514. DOI: 10.1186/s12884-022-04807-8.
24. Pradhan E. Female Education and Childbearing: A Closer Look at the Data. Washington, DC: World Bank; 2015.
25. Behjati-Ardakani Z, Navabakhsh M, Hosseini SH. Sociological Study on the Transformation of Fertility and Childbearing Concept in Iran. J Reprod Infertil. 2017; 18: 153–161.
26. Florian SM. Motherhood and Employment Among Whites, Hispanics, and Blacks: A Life Course Approach. J Marriage Fam. 2018; 80 (1): 134–149. DOI: 10.1111/jomf.12448.
27. Badan Pusat Statistik. Percentage of Population Aged 15 Years and Over by Urban-Rural Classification, Sex, and Highest Education Level, 2009-2023. Jakarta: Badan Pusat Statistik; 2024.
28. Riederer B, Beaujouan É. Explaining the urban–rural gradient in later fertility in Europe. Popul Space Place. 2024; 30 (1): e2720. DOI: 10.1002/psp.2720.
29. United Nations Children's Fund, Badan Pusat Statistik. Achieving Gender Equality and Empowering All Women and Girls. Jakarta: United Nations Children's Fund.
30. Kusnali A, Rachmawati T, Puspasari HW, et al. Rural-Urban Women's Decision-Making Autonomy on Contraceptive Use in Indonesia. J Popul Soc Stud JPSS. 2024; 33: 361–379. DOI: 10.25133/JPSSv332025.019.
31. Nepal A, Dangol SK, Karki S, et al. Factors that determine women's autonomy to make decisions about sexual and reproductive health and rights in Nepal: A cross-sectional study. PLOS Glob Public Health. 2023; 3 (1): e0000832. DOI: 10.1371/journal.pgph.0000832.

32. Kementerian PPN/Bappenas Republik Indonesia. Rancangan Akhir Rencana Pembangunan Jangka Panjang Nasional 2025-2045. Jakarta: Kementerian PPN/Bappenas Republik Indonesia; 2024.
33. Badan Pusat Statistik. Laporan Survei Demografi dan Kesehatan Indonesia 2017. Jakarta: Badan Pusat Statistik; 2020.
34. Martins MV, Koert E, Sylvest R, et al. Fertility education: Recommendations for developing and implementing tools to improve fertility literacy. Hum Reprod. 2024; 39 (2): 293–302. DOI: 10.1093/humrep/dead253.
35. Kementerian Kesehatan Republik Indonesia. Pedoman Pelayanan Kontrasepsi dan Keluarga Berencana. Jakarta: Kementerian Kesehatan Republik Indonesia; 2020.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 2

7-31-2025

The Effectiveness of Remote Patient Monitoring in Reducing the Risk of Rehospitalizations in COVID-19 Patients: A Meta-Analysis

Dela Riadi
Universitas Pembangunan Nasional Veteran Jakarta, delariadi@upnvj.ac.id

Indang Trihandini
Universitas Indonesia, Depok, dini05@ui.ac.id

Dewi Nirmala Sari
Politeknik Kesehatan Kemenkes Jakarta III, Jakarta, denisakayladenis@gmail.com

Fikri Wijaya
Universitas Indonesia, Depok, fikri@ui.ac.id

Recommended Citation

Riadi D , Trihandini I , Sari DN , et al. The Effectiveness of Remote Patient Monitoring in Reducing the Risk of Rehospitalizations in COVID-19 Patients: A Meta-Analysis. *Kesmas*. 2025; 20(5): 10-20
DOI: 10.7454/kesmas.v20isp1.1715
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/2

Riadi *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 10-20
DOI: 10.7454/kesmas.v20isp1.1715

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

The Effectiveness of Remote Patient Monitoring in Reducing the Risk of Rehospitalizations in COVID-19 Patients: A Meta-Analysis

Dela Riadi[1], Indang Trihandini[2*], Dewi Nirmala Sari[3], Fikri Wijaya[4]

[1]Faculty of Medicine, Universitas Pembangunan Nasional Veteran Jakarta, Indonesia
[2]Department of Biostatistics and Population Studies, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia
[3]Department of Midwifery, Politeknik kesehatan Kemenkes Jakarta III, Jakarta, Indonesia
[4]Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

Abstract

An integrated analysis of various Remote Patient Monitoring (RPM) studies is needed to evaluate the reduction rate of the risk of rehospitalization in COVID-19 patients. This meta-analysis aimed to provide an overview of the effectiveness of RPM. A literature search through online databases (PubMed, Science Direct, Scopus, ProQuest, and Embase) was conducted from 2019 to 2022. After using the Cochrane Collaboration's risk of bias tool, five studies on COVID-19 were selected. Based on the data collected from 2,685 participants (intervention = 1,060, control = 1,625), the use of RPM was found to reduce rehospitalization by 0.56 times compared to not using RPM (I^2 = 9%; n = 2,685; OR 0.56 [95% CI 0.39-0.82]; p-value = 0.003). According to the characteristics analysis, sex, comorbidity of hypertension, heart failure, obesity, chronic lung, and chronic kidney disease had no significant effect on the risk being studied. It was only the comorbidity of diabetes that showed a significant impact. Both RPM intervention duration and long-term monitoring effectively reduced rehospitalization (>14 days). In brief, RPM may reduce hospitalizations in response to an impending epidemic. Future research should look into using RPM to treat chronic post-hospitalization conditions.

Keywords: COVID-19, meta-analysis, rehospitalization, remote patient monitoring, telemedicine

Introduction

The worldwide effects of the COVID-19 pandemic are devastating.[1] The reports from the World Health Organization (WHO) as of December 12, 2022, showed that the pandemic spread continues to spread, with a total of 645,084,824 confirmed cases globally and 6,633,118 deaths.[2] Any individuals who are severely affected by the disease require hospitalization. Generally, about 20% of affected individuals need to be hospitalized, especially the elderly or those with comorbidities.[3] The COVID-19 virus typically causes pneumonia, acute respiratory distress syndrome, septic shock, and cardiovascular complications.[4]

The advent of COVID-19 has increased the demand for advanced information technology solutions as well as basic medical supplies and medicines.[5] In order to meet the needs of the masses on COVID-19 screening, diagnosis, and monitoring at home, telemedicine has been ideally positioned to fulfill this role.[6] The use of electronic information and communication technologies for providers and patient contacts across geographic distances is known as telehealth, remote patient monitoring (RPM), and telemedicine.[7] An easy-to-use e-health platform is important as it enables COVID-19 patients to communicate and quickly find health-related information.[8]

Telemonitoring COVID-19 patients from their homes is a safe, practical, and widely recognized approach. When used in high-risk but non-terminally sick patients, the approach allows for proper clinical surveillance, early disease identification, proper arrangement of care during periods of high demand, and patient and family support. It also contributes to maintaining "social distancing" by reducing the number of visits patients need to make to emergency rooms and clinics.[9] Overall, RPM is the general name for any combination of medical devices, such as wearable devices

***Correspondence**:* *Indang Trihandini, Department of Biostatistics and Population Studies, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia*
Email: dini05@ui.ac.id, Phone: +62 812-1035-617

Received : April 29, 2024
Accepted : January 6, 2025
Published: July 31, 2025

or portable home health monitors, including information technology solutions that enable health data to be sent to healthcare practitioners without physical touch.[10]

The RPM collects health information about individuals in one location and securely transmits that data electronically to healthcare professionals in another location for evaluation and advice.[11] This type of service allows providers to continuously track healthcare data for patients after they are discharged to their homes or care facilities.[11] The procedure is important since it helps to improve patient safety and lower rehospitalization rates. Based on previous studies, patients who transition to the program and enroll on the first post-discharge day are associated with a significantly lower risk of combined emergency department outcomes or readmission to the hospital.[12]

The RPM activation programs are associated with lower hospitalizations, use of intensive care, and length of stay among COVID-19 patients.[13] In fact, it is argued that hospitalization was far more common in patients who did not get RPM than in those who did. For instance, a previous study determined that among the 187 patients (83%) initially treated in an outpatient setting, hospitalization rates were higher in those without RPM.[14] In another study, the rate of repeat visits to the emergency department did not significantly differ statistically between the RPM group (8%) and the control group (9.3%) (OR: 0.863; 95% CI: 0.413-1.803); p-value = 0.695)).[15]

To date, research on the application of RPM in COVID-19 patients has produced contradictory findings. Therefore, this study used a meta-analysis to assess the efficacy of the RPM program in lowering the risk of readmission in the COVID-19 patient population through a comprehensive statistical procedure. The specific aims were to compare the effects of RPM programs and explore potential covariates as effects of RPM programs, including gender, hypertension, diabetes, heart failure, obesity, chronic lung, and chronic kidney disease.

Method

In this meta-analysis, a comprehensive search using databases such as PubMed, Science Direct, Scopus, Proquest, and Embase was conducted from December 2019 to December 2022 and updated on March 20, 2023. Overall, the collected articles were found in English and Indonesian language. Additionally, this study included both free access and paid articles (limited to subscribers by institutions). The protocol review was registered in PROSPERO (register number CRD42022380056). The search was performed using the standard and related keywords, including "COVID-19," "COVID-19 patients," "Remote Patient Monitoring," "Remote Health Monitoring," "Telemonitoring," "Telemedicine," "Digital Health," "Mobile Health," "eHealth," "mHealth," "Telehealth," "Rehospitalization," "Rehospitalization," and "Readmission," as well as their equivalent MeSH terms. Furthermore, the corresponding compounds were also searched in the abovementioned databases using the (AND, OR) operators. The meta-analysis follows the steps of Preferred Reporting Items for Systemic Review and Meta-Analyses (PRISMA).[16]

It is vital to evaluate the data in each study closely and determine whether the studies that have been included satisfy internal validity standards. In this analysis, critical assessments were performed using the JBI Critical Appraisal Checklist for Randomized Controlled Trials.[17] The risk of bias assessment was conducted using the Cochrane Collaboration tool. The latest versions used were the Revised Cochrane Risk of Bias Tool for Randomized Trials (Rob 2) for randomized controlled trials (RCTs) and the Risk of Bias in Non-randomized Studies of Interventions (ROBINS-I) for non-RCT studies.[18,19] Both tools are licensed under Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. The Robvis tool can be used to present the risk assessment results.[20]

Article inclusion criteria were COVID-19 patients aged at least 18 years who participated in RPM programs. The study period was between December 1, 2019, and November 30, 2022, and was updated on March 20, 2023. Collected articles were in English and Indonesian language and included both free access and paid articles (limited to being subscribed by the institution). In contrast, the articles were excluded if the participant's age was below 18 years, grey literature, policy brief, commentary, review, or RPM Programs unrelated to COVID-19.

The heterogeneity of the collected articles was assessed by calculating the I^2 statistic. A high I^2 value indicated substantial heterogeneity, while a low I^2 value suggested homogeneity among the studies. Statistical analysis was performed using Revman 5.4. The x-axis of the plot was used to represent the research effect estimates, and the y-axis represented the study sample size or effect size variability (variance, standard deviation, or comparable measure). In order to evaluate publication bias in this study, the collected articles were assessed using a funnel plot.

Results

A thorough evaluation of the RPM in COVID-19 patients has been made in this study. From the PubMed electronic database (n = 103), Science Direct (n = 143), Scopus (n = 335), ProQuest (n = 130), Embase (n = 117), and contributions from other sources (n = 69), a total of 897 articles was found. The results of the literature search and the corresponding queries are shown in Table 1.

Table 1. Literature Search Results

Database	Query	Total
PubMed	("covid 19"[MeSH Terms] OR "sars cov 2"[MeSH Terms] OR ("covid 19"[Title/Abstract] OR "sars cov 2 coronavirus"[Title/Abstract] OR "severe acute respiratory syndrome coronavirus"[Title/Abstract] OR "novel coronavirus disease"[Title/Abstract] OR "novel coronavirus pneumonia"[Title/Abstract] OR "2019-novel CoV"[Title/Abstract] OR "2019 nCoV"[Title/Abstract])) AND ("Telemedicine"[MeSH Terms] OR ("Remote patient monitoring"[Title/Abstract] OR "remote health monitoring"[Title/Abstract] OR "telemonitoring"[Title/Abstract] OR "Telemedicine"[Title/Abstract] OR "digital health"[Title/Abstract] OR "mobile health"[Title/Abstract] OR "eHealth"[Title/Abstract] OR "mHealth"[Title/Abstract] OR "telehealth"[Title/Abstract])) AND ("Patient Readmission"[MeSH Terms] OR ("Re-hospitalization"[Title/Abstract] OR "Readmission"[Title/Abstract] OR "hospital discharge"[Title/Abstract] OR "continuity of patient care"[Title/Abstract] OR "patient discharge"[Title/Abstract]))	103
Science Direct	(Covid-19 OR Sars-cov-2) AND (“Remote patient monitoring” OR telemonitoring OR telemedicine OR "mobile health") AND (Rehospitalization OR Rehospitalization OR Readmission)	143
Scopus	(TITLE-ABS-KEY (covid-19) OR TITLE-ABS-KEY (sars-cov-2) OR TITLE-ABS-KEY (coronavirus) OR TITLE-ABS-KEY ("severe acute respiratory syndrome coronavirus") OR TITLE-ABS-KEY ("novel coronavirus disease") OR TITLE-ABS-KEY ("novel coronavirus pneumonia") OR TITLE-ABS-KEY ("2019-novel cov") OR TITLE-ABS-KEY ("2019 ncov")) AND (TITLE-ABS-KEY ("remote patient monitoring") OR TITLE-ABS-KEY ("remote health monitoring") OR TITLE-ABS-KEY (telemonitoring) OR TITLE-ABS-KEY (telemedicine) OR TITLE-ABS-KEY ("digital health") OR TITLE-ABS-KEY ("mobile health") OR TITLE-ABS-KEY (ehealth) OR TITLE-ABS-KEY (mhealth) OR TITLE-ABS-KEY (telehealth)) AND (TITLE-ABS-KEY (re-hospitalization) OR TITLE-ABS-KEY (readmission) OR TITLE-ABS-KEY ("hospital discharge") OR TITLE-ABS-KEY ("continuity of patient care") OR TITLE-ABS-KEY ("patient discharge"))	335
Proquest	(MAINSUBJECT.EXACT("COVID-19") OR abstract(Covid-19 OR Sars-cov-2 Coronavirus OR "severe acute respiratory syndrome coronavirus" OR "novel coronavirus disease" OR "novel coronavirus pneumonia" OR "2019-novel CoV" OR "2019 nCoV") OR title(Covid-19 OR Sars-cov-2 Coronavirus OR "severe acute respiratory syndrome coronavirus" OR "novel coronavirus disease" OR "novel coronavirus pneumonia" OR "2019-novel CoV" OR "2019 nCoV")) AND (MAINSUBJECT.EXACT("Telemedicine") OR abstract("Remote patient monitoring" OR "remote health monitoring" OR telemonitoring OR telemedicine OR "digital health" OR "mobile health" OR eHealth OR mHealth OR telehealth) OR title("Remote patient monitoring" OR "remote health monitoring" OR telemonitoring OR telemedicine OR "digital health" OR "mobile health" OR eHealth OR mHealth OR telehealth)) AND (MAINSUBJECT.EXACT("Outpatient care facilities") OR abstract(Rehospitalization OR Readmission OR "hospital discharge" OR "continuity of patient care" OR "patient discharge") OR title(Rehospitalization OR Readmission OR "hospital discharge" OR "continuity of patient care" OR "patient discharge"))	130
Embase	Covid-19 OR Sars-cov-2 Coronavirus OR “severe acute respiratory syndrome coronavirus” OR “novel coronavirus disease” OR “novel coronavirus pneumonia” OR “2019-novel CoV” OR “2019 nCoV” AND “Remote patient monitoring” OR “remote health monitoring” OR telemonitoring OR telemedicine OR “digital health” OR “mobile health” OR eHealth OR mHealth OR telehealth AND Rehospitalization OR Readmission OR “hospital discharge” OR “continuity of patient care” OR “patient discharge”	117
Other sources (manual)	"remote patient monitoring" AND "COVID-19 patient" AND "rehospitalization" OR "rehospitalization" OR "readmission"	69
	Grand Total	**897**

Out of 897 articles, 634 papers proceeded to title and abstract screening after removing duplicates (n = 263). The authors estimated that about 608 of these items were not suitable for inclusion in further screening. Overall, six articles were included in the study and proceeded to data extraction and qualitative synthesis. Only five studies were then included in the meta-analysis after 26 papers underwent full-text eligibility assessment. The final results of the article review are presented in the PRISMA flow diagram in Figure 1.

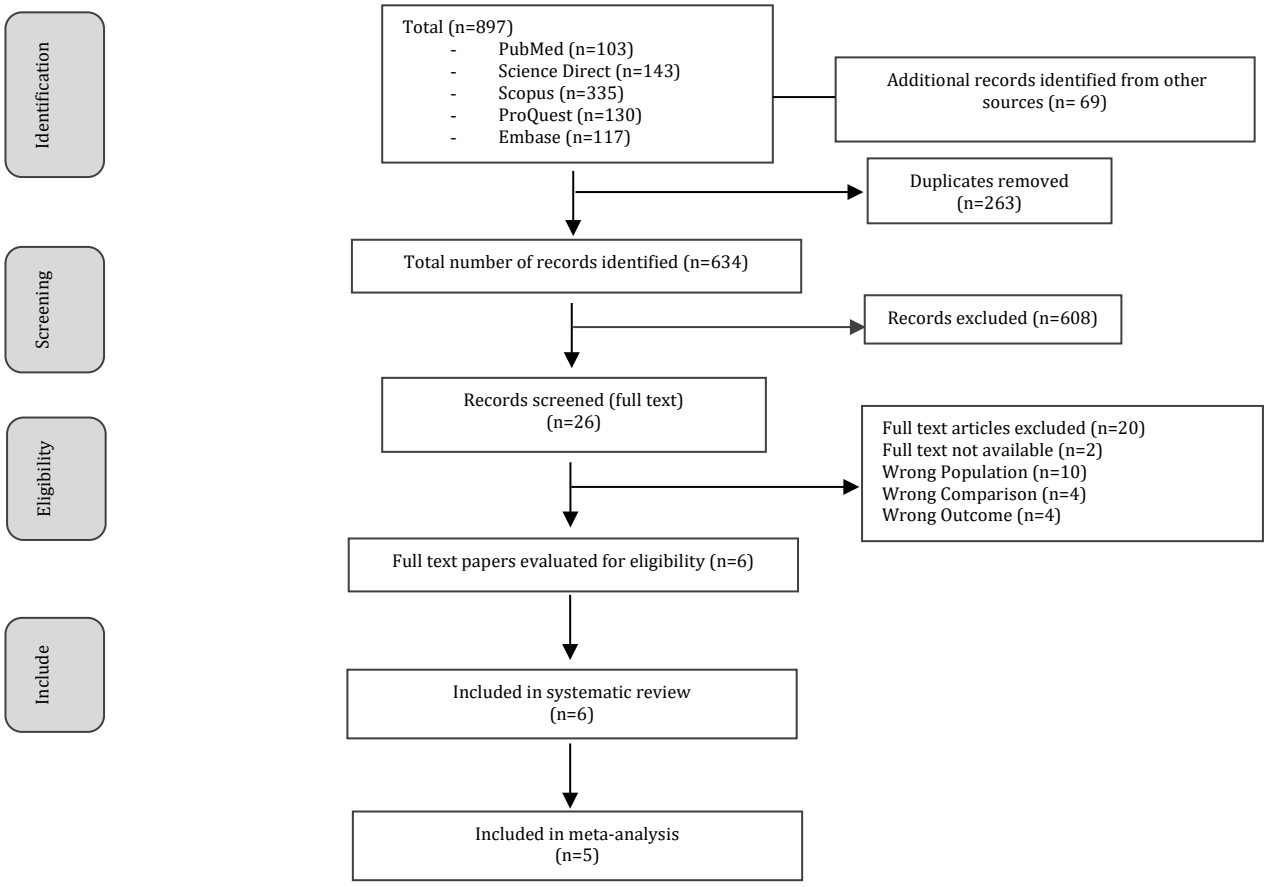

Figure 1. PRISMA Study Flow Diagram

Table 2 provides an overview of the articles included in the systematic review. Both non-random corrected and random corrected study designs were used in each analysis. A total of 2,683 participants from six studies included in the systematic intake were enrolled (intervention = 1,097, control = 1,586), with 1,471 (53.4%) male and 1,282 (46.6%) female. Three studies (50%) were conducted in the US, two (33%) in Spain, and one (16.7%) in the Netherlands. Across the six studies, participants' ages ranged from 53 to 70 years (n=2683). There were four long-term follow-up studies (>2 weeks; 66.7%) and two short-term follow-up studies (2 weeks; 33.3%), ranging in length from 14 days to 90 days.

All six studies included in the systematic review consisted of four non-RCTs and two RCTs. Using the ROBINS-I tool, all four non-RCTs (100%) were identified as having a moderate risk of bias.[19] The two RCTs were assessed with the RoB 2 tool. In one RCT, participants were aware of the intervention, resulting in contamination of assessment results and a high risk of bias.[18] The other RCT was identified as having a low risk of bias.[21]

Table 2. Summary of the Selected Articles

Authors, Country	Journal, Year of Publication	Study Design	Participant Characteristics	Measurement	Average and Mean Age (SD) of the Participants	Intervention (n=1,097) and Control (n=1,586)	Duration of Therapy	Results
Suárez-Gil *et al.*, Spain[3]	Journal of Personalized Medicine April 10, 2022	Retrospective Cohort	COVID-19 patients from ASLAM health services	• Temperature • Oxygen saturation • Respiratory symptoms	Average age: I: 66.5 (SD 16.1) C: 70.8 (SD 16.7) Sex: I: 247 (52%) male C: 39 (51.3%) male	Intervention (475) Control (76)	90 days	Although the telemedicin e-monitored group was older, no appreciable variations in the illness baseline were found.

Authors, Country	Journal, Year of Publication	Study Design	Participant Characteristics	Measurement	Average and Mean Age (SD) of the Participants	Intervention (n=1,097) and Control (n=1,586)	Duration of Therapy	Results
								On the other hand, the group that was not under telemedicine monitoring had more readmissions and a higher death rate ninety days following discharge.
Gordon *et al.*, USA[12]	Applied Clinical Informatics November 25, 2020	Retrospective Cohort	COVID-19 patient discharged from hospital	• Oxygen saturation • Temperature • Survey for symptoms of shortness of breath, cough, appetite, weakness, and vomiting	Average age of admission: 55 (17%) Sex: 63 (49%) male	Intervention (225) Control (1,061)	30 days	Participants in the RPM program who were enrolled successfully on the first post-discharge day were linked to a lower chance of the composite endpoint of readmission presentation; however, those who were not enrolled successfully were not linked to a lower chance of the composite endpoint.
Marquez-Algaba *et al.*, Spain[21]	Journal of Personalized Medicine January 1, 2022	RCT	COVID-19 patient after being discharged from hospital	• Temperature • Oxygen saturation • Heart frequency • Respiratory frequency • Patient-Reported Outcomes Measurement Information System (PROMIS) questionnaire Hospital Anxiety and Depression Scale (HADS)	Average age: I: 53.5 (46-59) C: 53.5 (43.2-63) Sex: I: 42 (56.8) male C: 43 (56.6) male	Intervention (n= 74) Control (n=76)	14 days	According to the protocol analysis, the control group experienced considerably more readmissions to the emergency department due to COVID-19.
Kuo *et al.*, USA[22]	JAMIA July 1, 2022	Retrospective Cohort	Post-acute care COVID-19 pneumonia patients	• Patient's clinical symptoms, vital signs, oxygen saturation	Average age: I: 56 (51–68) C: 59 (47–68)	Intervention (75) Control (150)	30 days	For the control and RPM groups, 30-day all-

Authors, Country	Journal, Year of Publication	Study Design	Participant Characteristics	Measurement	Average and Mean Age (SD) of the Participants	Intervention (n=1,097) and Control (n=1,586)	Duration of Therapy	Results
				• Health Index score • 9-question satisfaction survey	Sex: I: 50 (67%) male C: 96 (64%) male			cause readmission rates were 9.3% (7/75) and 14.7% (22/150), respectively .
Ye *et al.*, USA[23]	The Journal of General Internal Medicine January 14, 2021	Case series	Adult patients hospitalized with COVID-19 disease in an out-of-home setting	• New or worsening symptoms of cough, new or worsening shortness of breath with light activity, subjective or objective fever, oxygen saturation, and pulse (if the device is available) via Telehealth Guides. • Generalized Anxiety Disorder-2 (GAD-2) and the Patient Health Questionnaire-2 items (PHQ-2). • Loneliness was assessed using a single item ("not at all" to "almost every day"). • Patient satisfaction, they would recommend the program (0, not at all likely; 10, very likely).	Average age: I: 56.7 ± 15.2 C: 58.0 ± 18.0 Sex: I: 137 (63.1%) male C: 108 (56.3%) male	Intervention (217) Control (192)	14 days	Compared with non-referred patients, patients referred for remote monitoring had fewer ED visits and readmissions.
Goor *et al.*, Netherlands[24]	Journal of Clinical Medicine December 17, 2021	RCT	COVID-19 patient being treated in hospital are in the recovery stage of the disease	• Score for cough • Shortness of breath and general well-being scores • Temperature • Oxygen saturation	Average age: I: 55.1 (SD 7.5) C: 55.4 (SD 13.2) Sex: I: 14 (45.1%) female C: 13 (41.9%) female	Intervention (n= 31) Control (n=31)	30 days	A total of 62 patients were randomized (31 intervention, 31 control). The incidence of readmission due to COVID-19 was 2 for the intervention group (2/31) and 1 for the control group (1/31). The study showed no statistically significant differences.

Notes: SD = standard deviation, ASLAM = the Área Sanitaria de Lugo, A Mariña, y Monforte de Lemos healthcare, I = intervention, C = control, RPM = remote patient monitoring, ED = emergency department

A meta-analysis of the findings from the five studies on the effectiveness of RPM interventions in keeping COVID-19 patients out of hospital revealed statistically significant differences between the intervention group and the control group. The intervention group displayed a 0.56 times lower risk of rehospitalization (I^2 = 9%; n=2.685; OR 0.56 [95% CI 0.39-0.82]; p-value = 0.003) in low variation (homogeneous) studies. A technique that was used to identify potential publication bias in meta-analyses was funnel plots. Based on the duration of the intervention, a reduction in the incidence of hospitalization of 0.61 times was observed in the intervention group compared to the control group in two studies of short-term RPM duration (2 weeks), albeit with no statistically significant difference (I^2 = 60%; n = 553; OR 0.61 [95% CI 0.31-1.20]; p-value = 0.15). Three studies of long-term RPM training (over two weeks) found that the intervention group experienced 0.54 times fewer readmissions than the control group, and this difference was statistically significant (I^2 = 0%; n=2,132; OR 0.54 [95% CI 0.34-0.86]; p-value = 0.009), as shown in Figure 2. The visual funnel plot used to illustrate the likelihood that a COVID-19 patient will need to be readmitted to the hospital showed no publication bias. It was funnel-shaped and symmetrical, as shown in Figure 3.

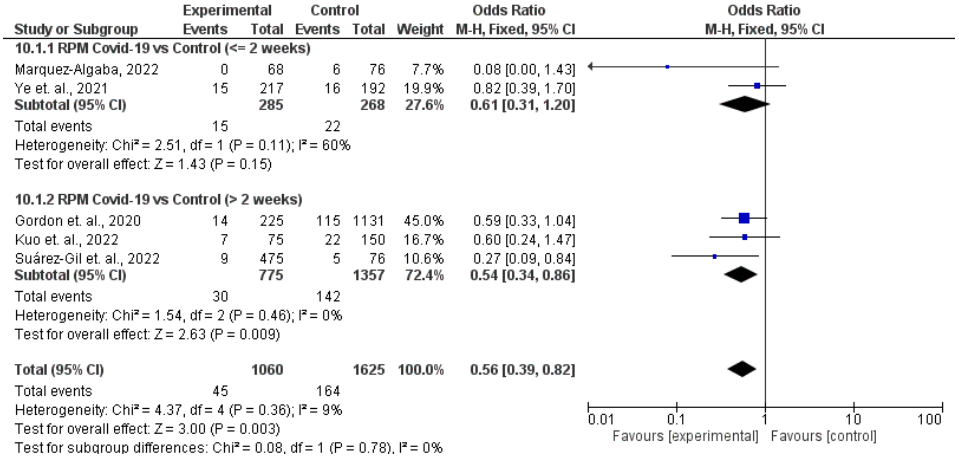

Figure 2. Forest Plot of Effectiveness of Remote Patient Monitoring Intervention to Reduce Readmission Compared to Control (Fixed Effect Model)

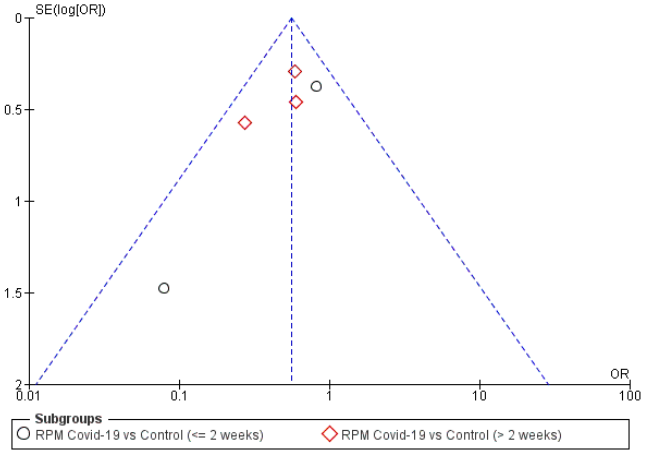

Figure 3. Funnel Plot of the Effectiveness of Remote Patient Monitoring Interventions to Lower Back Hospitalizations Compared to Controls

The authors then examined the data based on the pre-determined characteristics. It was found that males did not affect the reduction rate of the rehospitalization of COVID-19 patients, with a combined effect value of Z = 0.58. This value can be considered to be very small. Apart from that, there was no difference in overall OR, with an OR value of 1.06 and a 95% CI of 0.88-1.28. The p-value of 0.56 was greater than <0.05, showing no statistically significant difference. The degree of heterogeneity was low (p-value = 0.77), and the I^2 was 0%. Females also did not substantially reduce the rehospitalization rate of COVID-19 patients, with a combined effect value of Z = 0.77, an OR value of 0.93, and a 95% CI of 0.77–1.12. The p-value of 0.44 was greater than <0.05, meaning there was no statistically significant difference. Furthermore, the degree of heterogeneity was low (p-value = 0.81), and I^2 was 0%.

According to comorbidity of hypertension in three studies,[3,22,23] there were no significant differences in the effect of using RPM, with a combined effect value of Z = 0.67, an OR value of 1.82, a 95% CI of 0.31–10.61, and a p-value of 0.50, which is greater than <0.05. These results indicated no statistically significant difference. The degree of heterogeneity was high (p-value <0.001), and I^2 was 96%. For the COVID-19 patients with comorbidity of diabetes in these three studies,[3,22,23] a significantly different effect of using RPM was observed, with a combined effect value of Z = 2.67. The overall OR was 0.66 with a 95% CI of 0.49–0.90, a low degree of heterogeneity (p-value = 0.57), and an I^2 value of 0%.

Two studies[3,23] showed no significant effect in patients with comorbidity of heart failure, with a combined effect value of Z = 0.50 and an overall OR of 0.86 with a 95% CI of 0.48-1.54. The degree of heterogeneity (p-value = 0.77) was low, and an I^2 was 0%. In contrast, COVID-19 patients who had obesity in two studies[3,22] showed no significant effect, with a combined effect value of Z = 0.79. Overall, there was no difference in OR, where the value was 0.85, with a 95% CI of 0.56-1.28, a low degree of heterogeneity (p-value = 0.43), and I^2 of 0%.

Patients with chronic lung disease in three studies[3,22,23] displayed no significant effect, with a combined effect value of Z = 0.24 and an overall OR of 0.94 with a 95% CI of 0.60–1.50. There was a low degree of heterogeneity (p-value = 0.71) and an I^2 value of 0%. Similarly, a meta-analysis of chronic kidney disease from two studies[22,23] showed no effect, with an odds ratio of 0.67 and a 95% CI of 0.18–2.49. The test results for the overall effect were Z = 0.60, with a p-value of 0.55, which is greater than <0.05, indicating no statistically significant difference. The heterogeneity for chronic kidney disease was high, with an I^2 value of 75%.

Discussion

This meta-analysis used information from a global library of scientific literature to offer a thorough assessment of RPM concerning COVID-19. Along with demonstrating RPM's effectiveness in lowering rehospitalization rates for COVID-19 patients, the results also point to RPM's potential as a game-changing instrument in contemporary healthcare delivery. As part of the systematic review procedure, 897 entries from five major databases and other sources were thoroughly screened. Six articles were considered suitable for inclusion in the qualitative synthesis after duplicates and irrelevant studies were eliminated, and only five articles, totaling 2,691 participants, contributed to the meta-analysis. A concentrated evaluation of RPM's efficacy during the pandemic was ensured through this stringent selection procedure, which also enhanced the validity of the findings. This meta-analysis showed that RPM dramatically lowers rehospitalization rates among COVID-19 patients, with consistent findings across studies.

Three studies using a pulse oximeter, thermometer, and smartphone provide information on the RPM device used, respectively.[3,12,23] Another study stated smartphone and video consultations were combined with the use of portable oxygen.[22] This combination was made due to the characteristics of COVID-19 patients with pneumonia-related disorders.[22] Using smartphones, video consultations, and pulse oximeters, Marquez-Algaba *et al.*'s study[21] was in line with a systematic review of RPM from 272 studies showing that wireless devices or smartphone applications were the most popular strategies (75.7%) in RPM.[25] Two studies[12,23] provided once-daily data, whereas three studies reported data twice a day.[3,21,22] Three studies[3,12,21] reported daily data starting at 8 am, while two studies did not mention the start time of reporting daily data.[22,23]

It should be noted how simple RPM is to use. According to Delone & McLean's idea of the Information Success Model, which looks at how users behave in using information systems, system quality, information quality, service quality, and user happiness are aspects that influence a person's decision to use.[26] The users express satisfaction with the remote training experience, the ease of use of remote monitoring technology, the short learning curve for managing their health condition with a program, the lack of privacy concerns when using the technology, and the increased sense of security they receive from having a nurse that regularly checks on them.[22] However, Suarez-Gil *et al.*'s study makes no mention of language use in applications.[3] A study by Gordon *et al.* require participants to be released (with or without fellowship services), able to activate a patient portal account, and capable of completing an English or Spanish survey on their own or with a proxy.[12]

Being contactable by telephone was one of the inclusion criteria for Ye *et al.*'s study.[23] Referrals are made by emailing the contact information of the remote care coordinator who assigned the case to the Telehealth Guidance team to the patient. One of the barriers to inclusion criteria of Marquez-Algaba *et al.*'s study was the accessibility of mobile devices, such as smartphones or tablets with internet connectivity.[21] Regarding the application used in this study, it was run by a healthcare monitor (hcM) (a doctor or nurse certified in COVID-19), who was also responsible for servicing alarms and responding to inquiries.[21]

The department receives and evaluates data on vital signs (temperature and oxygen saturation) as well as responses to a breathing guide questionnaire every eight hours before deciding whether to refer the patient to hospitalization again.[22] The department team contacts the patient if any suspicious events occur, such as a change in the patient's biometrics or clinical status, as determined by the questionnaire.[13] The RPM maintenance team monitors the platform and contacts patients based on their Health Index score, the home absolute threshold for vitals measurements, or patient-initiated requests for assistance. In the study, patient response questionnaires and biometric information were used to construct Health Index scores.[22]

Messages will be sent to the Electronic Health Report (HER) inbox if one of three conditions occurs: first, the patient reports worsening symptoms in the questionnaire; second, O_2 saturation recorded alone is less than 92%; or third, the monitoring task assigned has not been completed within 24 hours.[12] When the patient is unresponsive or when the symptoms worsen, the EHR notifies the nursing staff, who then telephones the patient. The following criteria were used to identify if the patients are at increased risk during distance training: new or worsening mild activity-related shortness of breath; a new or intensifying cough; if a thermometer is not available; a new or intensifying fever.[12] Vital signs include a temperature of 100.4°F (if a thermometer is available), an oxygen saturation level of 95% (if a pulse oximeter is available), and a pulse rate of 110 beats per minute.[12] Patients in the control group trial received routine follow-ups in the primary care setting via telephone calls to track patients' symptoms.[21]

The length of intervention in patients at risk for COVID-19 is deemed successful after long-term (>2 weeks) RPM monitoring. The Health Resources and Services Administration (HRSA), a US Department of Health and Human Services division, established the RPM recommendation that data from remote physical monitoring should be collected for at least 16 to 30 days.[27] This recommendation fits these criteria and highlights the suitability of the approach. In addition, other research noted that the average gap between the discharge of the first and second COVID-19 patients ranged from 6 to 27 days.[28]

When discussing the issue of COVID-19, diabetes has always been associated with worse outcomes. In Wuhan City, a study of 161 COVID-19 patients revealed that diabetic patients had a longer time to get rid of the virus. In addition, diabetes predisposes to infection due to typical factors, such as impaired neutrophil chemotaxis and phagocytosis. In general, several variables, such as increased expression of ACE-2, increased furin, decreased T-cell activity, and increased interleukin-6 (IL-6), contribute to the increased likelihood and severity of SARS-CoV2 infection in patients with diabetes.[29]

This study revealed that RPM can be used more often by the government to manage, avoid, promote, and combat the negative impacts of COVID-19. For healthcare administrators to provide high-quality treatment, they must also keep up with current developments using personnel and equipment that track patient health. It is recommended that additional research be done on the use of RPM in the treatment of chronic post-hospitalization conditions such as diabetes, heart failure, hypertension, chronic kidney disease, and chronic obstructive pulmonary disease (COPD). This study's limitations include the following: a) the number of studies examined is small; b) research studies are only available in English and Indonesian; c) the results cannot be applied to the entire population because most COVID-19 patients are over 50; d) coronavirus mutations may impact the results; and e) access to paid articles is restricted.

Conclusion

The use of RPM during home treatment is effective in reducing the incidence of COVID-19 patient rehospitalization. Based on the characteristics, effect variation is seen for patients with comorbidity of diabetes. The duration of RPM intervention is more than two weeks, and patient compliance, as well as the expertise of doctors and nurses in monitoring, are very important for the effectiveness of RPM. The best RPM in this study is a combination of monitoring tools, smartphones, video consultations, and twice-daily monitoring. Implementing RPM can be useful in facing future pandemics or other chronic diseases to reduce rehospitalization.

Abbreviations

RPM: remote patient monitoring; Rob 2: Revised Cochrane Risk of Bias Tool for Randomized Trials; RCTs: randomized controlled trials; ROBINS-I: Risk of Bias in Non-randomized Studies of Interventions; CI: confidence interval; OR: odds ratio; EHR: electronic health report.

Ethics Approval and Consent to Participate

The ethical approval for this study is obtained from the Research Ethics and Public Health Services Commission, Faculty of Public Health, Universitas Indonesia (approval number: KET-646/UN2.F10.D11/PPM.00.02/2022).

Competing Interest

The authors have no conflicts of interest to declare.

Availability of Data and Materials

Data used in this study is available from the corresponding author upon reasonable request.

Authors' Contribution

DR and IT were responsible for conceptualization and methodology. DR and FW collected data. DR and DNS performed an investigation. DR wrote the original draft. IT supervised the study. All authors read and approved the final manuscript.

Acknowledgment

No funding.

References

1. Zorlu SA, Oz A. A Novel Combined Model to Predict the Prognosis of COVID-19: Radiologicalmetabolic Scoring. Curr Med Imaging. 2024; 20: e110523216780. DOI: 10.2174/1573405620666230511093259.
2. Carvalho ARB, Sousa Neto AR, Silva MDFD, et al. Global research trends related to coronavirus disease 2019 and the aged: A bibliometric analysis. Sao Paulo Med J. 2023; 142 (2): e2022662. DOI: 10.1590/1516-3180.2022.0662.R1.190523.
3. Suárez-Gil R, Casariego-Vales E, Blanco-López R, et al. Efficacy of telemedicine and telemonitoring in at-home monitoring of patients with COVID-19. J Clin Med. 2021; 10 (13): 2893. DOI: 10.3390/jcm10132893.
4. Mallah SI, Ghorab OK, Al-Salmi S, et al. COVID-19: Breaking down a global health crisis. Ann Clin Microbiol Antimicrob. 2021; 20 (1): 35. DOI: 10.1186/s12941-021-00438-7.
5. Javaid M, Haleem A, Vaishya R, et al. Industry 4.0 technologies and their applications in fighting COVID-19 pandemic. Diabetes Metab Syndr. 2020; 14, (4): 419-422. DOI: 10.1016/j.dsx.2020.04.032.
6. Lukas H, Xu C, Yu Y, et al. Emerging Telemedicine Tools for Remote COVID-19 Diagnosis, Monitoring, and Management. ACS Nano. 2020; 14 (12): 16180–16193. DOI: 10.1021/acsnano.0c08494.
7. Alwan M, Bravinder J, Burnstein P, et al. Telehealth and remote patient monitoring for long-term and post-acute care: A primer and provider selection guide. Washington DC: The LeadingAge Center for Aging Services Technologies (CAST); 2015.
8. Pappot N, Taarnhøj GA, Pappot H. Telemedicine and e-Health Solutions for COVID-19: Patients' Perspective. Telemed J E Health. 2020; 26 (7): 847–849. DOI: 10.1089/tmj.2020.0099.
9. Martínez-García M, Bal-Alvarado M, Santos Guerra F, et al. Monitoring of COVID-19 patients via telemedicine with telemonitoring. Rev Clín Esp (English Edition). 2020; 220 (8): 472–479. DOI: 10.1016/j.rceng.2020.07.001.
10. Roblyer D. Perspective on the increasing role of optical wearables and remote patient monitoring in the COVID-19 era and beyond. J Biomed Opt. 2020; 25 (10): 102703. DOI: 10.1117/1.JBO.25.10.102703.
11. Patel H, Hassell A, Cyriacks B, et al. Building a Real-Time Remote Patient Monitoring Patient Safety Program for COVID-19 Patients. Am J Med Qual. 2022; 37 (4): 342-347. DOI: 10.1097/JMQ.0000000000000046.
12. Gordon WJ, Henderson D, Desharone A, et al. Remote patient monitoring program for hospital discharged COVID-19 patients. Appl Clin Inform. 2020; 11 (5): 792–801. DOI: 10.1055/s-0040-1721039.
13. Crotty BH, Dong Y, Laud P, et al. Hospitalization Outcomes Among Patients with COVID-19 Undergoing Remote Monitoring. JAMA Netw Open. 2022; 5 (7): e2221050. DOI: 10.1001/jamanetworkopen.2022.21050.
14. Pritchett JC, Borah BJ, Desai AP, et al. Association of a Remote Patient Monitoring (RPM) Program With Reduced Hospitalizations in Cancer Patients with COVID-19. JCO Oncol Pract. 2021; 17 (9): e1293–e1302. DOI: 10.1200/OP.21.00307.
15. Oh SM, Nair S, Casler A, et al. A prospective observational study evaluating the use of remote patient monitoring in ED discharged COVID-19 patients in NYC. Am J Emerg Med. 2022; 55: 64-71. DOI: 10.1016/j.ajem.2022.02.035.
16. Siregar KN, Sari DN, Wathan FM, et al. Langkah Demi Langkah Systematic Literature Review dan Meta-Analysis di Bidang Kesehatan. Depok: Universitas Indonesia Publishing; 2021
17. Aromataris E, Lockwood C, Porritt K, et al. JBI Manual for Evidence Synthesis. JBI; 2024. DOI: 10.46658/JBIMES-24-01.
18. Higgins JP, Savović J, Page MJ, et al. Revised Cochrane risk-of-bias tool for randomized trials (RoB 2) SHORT VERSION (CRIBSHEET); 2019.
19. Sterne JA, Higgins JP, Elbers RG, et al. Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I): Detailed guidance; 2016.
20. Evidence Synthesis Hackathon. Robvis (visualization tool); 2022.
21. Marquez-Algaba E, Sanchez M, Baladas M, et al. COVID-19 follow-app. Mobile app-based monitoring of COVID-19 patients after hospital discharge: A single-center, open-label, randomized clinical trial. J Pers Med. 2022; 12 (1): 24. DOI: 10.3390/jpm12010024.
22. Kuo S, Aledia A, O'Connell R, et al. Implementation and impact on length of stay of a post-discharge remote patient monitoring program for acutely hospitalized COVID-19 pneumonia patients. JAMIA Open. 2022; 5 (3): ooac060. DOI: 10.1093/jamiaopen/ooac060.
23. Ye S, Hiura G, Fleck E, et al. Hospital readmissions after implementation of a discharge care program for patients with COVID-19 illness. J Gen Intern Med. 2021; 36 (3): 722–729. DOI: 10.1007/s11606-020-06340-w.
24. Goor HMR van, Breteler MJM, Loon K van, et al. Remote hospital care for recovering COVID-19 patients using telemedicine: A randomised controlled trial. 2021; 10 (24): 5940. DOI: 10.3390/jcm10245940.
25. Farias FAC, Dagostini CM, Bicca YA, et al. Remote Patient Monitoring: A Systematic Review. Telemed J E Health. 2020; 26 (5): 576-583. DOI: 10.1089/tmj.2019.0066.
26. Ghosh A, Gupta R, Misra A. Telemedicine for diabetes care in India during COVID19 pandemic and national lockdown period: Guidelines for physicians. Diabetes Metab Syndr. 2020; 14 (4): 273-276. DOI: 10.1016/j.dsx.2020.04.001.
27. Health Resources and Services Administration. Telehealth and remote patient monitoring. Washington, DC: U.S. Department of Health and Human Services; 2023.

28. Chen M, An W, Xia F, et al. Clinical characteristics of rehospitalized patients with COVID-19 in China. J Med Virol. 2020; 92 (10): 2146-2151. DOI: 10.1002/jmv.26002.
29. Singh AK, Gupta R, Ghosh A, et al. Diabetes in COVID-19: Prevalence, pathophysiology, prognosis and practical considerations. Diabetes Metab Syndr. 2020; 14 (4): 303-310. DOI: 10.1016/j.dsx.2020.04.004.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 3

7-31-2025

Direct Medical Costs of Diabetes Mellitus Treatment for Patients with Cardiovascular and Renal Complications

Rizki Fadila
Poltekkes Kemenkes Malang, Malang, rizkifadila@yahoo.com

Ayu Tyas Purnamasari
Poltekkes Kemenkes Malang, Malang, ayutyaspurnamasari@poltekkes-malang.ac.id

A.A. Istri Citra Dewiyani
Poltekkes Kemenkes Malang, Malang, citra_dewiyani@yahoo.com

Recommended Citation

Fadila R , Purnamasari A , Citra Dewiyani A , et al. Direct Medical Costs of Diabetes Mellitus Treatment for Patients with Cardiovascular and Renal Complications. *Kesmas*. 2025; 20(5): 21-27
DOI: 10.7454/kesmas.v20isp1.2124
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/3

Fadila *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 21-27
DOI: 10.7454/kesmas.v20isp1.2124

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Direct Medical Costs of Diabetes Mellitus Treatment for Patients with Cardiovascular and Renal Complications

Rizki Fadila*, Ayu Tyas Purnamasari, AAI Citra Dewiyani

Diploma III of Health Insurance Program, Department of Medical Records and Health Information, Poltekkes Kemenkes Malang, Malang, Indonesia

Abstract

Type 2 Diabetes Mellitus (T2DM) represents a growing global health challenge with significant clinical and economic implications, notably in Indonesia. The burden is intensified by renal and cardiovascular complications, especially among National Health Insurance beneficiaries. This retrospective study evaluated the direct medical costs of hospitalized T2DM patients with such complications at a type B hospital from 2019 to 2022. Costs were analyzed from both healthcare provider and payer perspectives, covering medical services, medical support services, pharmaceuticals, and other support services. Of the 192 patients reviewed, most were male (57.8%), aged 45–64 years (72.4%), with hospital stays of 1–5 days (90,1%) and severity level E-4-10-I (100%). Renal complications incur higher treatment costs than cardiovascular complications, with medical support services dominating renal costs and medical services such as doctor and nursing procedures, examinations, and visits contributing most to cardiovascular costs. These results highlight the urgent need for preventive measures, early diagnosis, and innovative treatments to optimize T2DM management and reduce associated economic burdens.

Keywords: cardiovascular complications, diabetes mellitus, direct medical costs, renal complications, type 2

Introduction

Indonesia has one of the highest rates of mortality from diabetes mellitus (DM). The escalating incidence rate among individuals diagnosed with diabetes constitutes a critical public health challenge and a primary area of concern. According to the International Diabetes Federation (IDF), the number of people living with diabetes in Indonesia will rise from 10.7 million in 2019 to a total of 16.6 million by 2045.[1] This projection is corroborated by findings from the 2018 Indonesian Basic Health Research, which indicated a rise in the prevalence of DM from 6.9% to 8.5%.[2] The DM requires relatively high costs if not properly managed.[3] Long-term management is essential to prevent complications from diseases such as heart disease, stroke, and retinopathy.[4] Additionally, DM can induce macrovascular complications, including coronary heart disease, stroke, and peripheral artery disease, alongside microvascular complications, such as diabetic nephropathy and retinopathy.[5] Heart failure frequently emerges as an initial indicator of cardiovascular disease among patients with Type 2 Diabetes Mellitus (T2DM), thereby heightening mortality risk.[6] Furthermore, diabetic foot ulcers are likely to occur in about 15% to 25% of individuals with diabetes during their lifetime. DM patients may also suffer from depression, anxiety, and other psychosocial disorders, which can lower their quality of life.[7]

The financial implications associated with DM management in Indonesia are projected to escalate to approximately USD 1.27 billion by 2020.[5] Furthermore, this financial strain is anticipated to rise significantly in the forthcoming decade, as the global prevalence of DM is expected to surge from 171 million individuals in 2000 to an estimated 366 million by 2030.[4] Complications lead to an increase in the cost burden associated with DM. The T2DM patients with heart complications incur the highest direct medical costs, followed by nephropathy, neuropathy, cerebrovascular disease, retinopathy, and peripheral vascular disease.[3] Treating T2DM with complications takes longer, increasing treatment costs, including direct medical expenses.[8] To surmise, complications of DM significantly impact the cost of managing the disease in Indonesia, create a significant financial burden, and affect the healthcare system as well as the individual and society as a whole, necessitating comprehensive strategies to reduce healthcare spending on DM management.[9]

***Correspondence**:* *Rizki Fadila, Health Insurance, Department of Medical Records and Health Information, Poltekkes Kemenkes Malang, Malang 65112, Indonesia, E-mail: rizkifadila@yahoo.com, Phone: +6287778305958.*

Received : September 22, 2024
Accepted : February 6, 2025
Published: July 31, 2025

The costs associated with DM have continued to rise, driven by the increasing prevalence of diabetes and the escalating expenses related to managing its complications. The cost of diabetes management, particularly in patients with severe complications such as renal and cardiovascular diseases, is approximately twice as high compared to patients without complications or comorbidities.[10] These complications not only deteriorate patients' quality of life but also significantly increase the financial burden on the healthcare system.[11]

The Indonesian Government, through its program called National Health Insurance (NHI), exhibits a substantial commitment to providing comprehensive healthcare coverage for its citizens. This program is specifically designed to address the healthcare needs of all Indonesians, including the ongoing management of patients with DM. However, there remain concerns regarding whether the financial resources allocated by the Social Security Administrative Body/*Badan Penyelenggara Jaminan Sosial* (BPJS) are sufficient to fully fund the medical needs of DM patients, particularly those with cardiovascular and renal complications. In light of the high burden of cardiovascular and renal complications among DM patients in Indonesia, a critical assessment of the adequacy of BPJS funding in ensuring the delivery of these healthcare services is imperative.

Healthcare providers received payment from BPJS through the prospective payment method known as the Indonesian Case-Based Groups (INA-CBGs) tariff, which provides a set price for a specific disease classification episode of care. The INA-CBGs tariff amount is predetermined based on agreed-upon package rates, regardless of the actual costs incurred while providing patient services. The tariff differs by the class of facilities, hospital ownership, class of care, and region. Implementing the prospective payment system in hospitals often leads to discrepancies between the hospital's actual tariff and the INA-CBGs' tariff.[12] The objective of this study was to estimate the direct medical cost of DM treatment for patients with cardiovascular and renal complications and analyze the differences between hospital rates and INA-CBGs rates based on the type of DM complications so it can offer a deeper understanding of cost disparities and assist in the development of policies within Indonesia's healthcare system.

Method

This study was observational research conducted from August until September 2023. This study collected data retrospectively from patient medical records and hospitalization costs for inpatients with DM at a type B hospital in Malang City, Indonesia. According to the Indonesian Minister of Health Regulation Number 03 of 2023, type B hospitals had a minimum of 200 beds.[13] The population only included patients from 2019 to 2022 who met the inclusion criteria: (i) diabetic patients treated without complications, with kidney complications, and with heart complications; (ii) participants of BPJS Healthcare Security; (iii) patients aged 18 years or older; and (iv) those with comprehensive medical record documentation. The three years of data gathered were to observe conditions both before and after COVID-19. Patients with T2DM were identified based on the diagnostic criteria outlined in the International Classification of Diseases Tenth Revision (ICD-10) code E-4-10.

The cost data in this study were sourced from patient billing records obtained through the Hospital Management Information System and the INA-CBGs tariff data collected from databases on computers that incorporated ICD-10. The INA-CBGs tariff was the total claim payments by BPJS Healthcare Security to Advanced Referral Health Facilities for service packages based on the grouping of disease diagnoses and procedures, covering all hospital resources used in both medical and non-medical services.[13] Inpatient data recorded in the medical records, including patient identity profiles, the quantifiable reduction of blood glucose levels during hospitalization, and length of stay (LoS), were also used. Patient data who met inclusion criteria were then analyzed: 1) patient characteristics (age, sex, LoS, disease severity level, type of hospital room); 2) direct medical cost; 3) difference of actual cost and INA-CBGs tariff.

The direct medical cost analysis was conducted by summing up the costs of administration, nutritional services, medical services, medical procedures, medical support, radiology, rehabilitation, and medications based on the perspective of healthcare providers. The costs were categorized into medical services, medical support services, pharmaceuticals, and other support services. After calculating the direct medical costs for DM patients with cardiovascular and renal complications based on the billing records that reflected the total charges, the values were then converted into the actual cost charged by the hospital to the patients.

The distribution of patient severity in DM with cardiovascular and renal complications was classified according to the INA-CBGs system, specifically into three codes: E-4-10-I, E-4-10-II, and E-4-10-III, representing Diabetes Mellitus & Nutritional or Metabolic Disorders. The Roman numerals in the codes indicate the severity level of the disease.[14] The direct medical cost data were then analyzed and compared to the INA-CBG rates based on the diagnosis of cardiovascular

and renal complications. If the direct medical cost was lower than the INA-CBGs tariff, the INA-CBGs rate was considered sufficient; conversely, if the direct medical cost exceeded the INA-CBGs rate, it was deemed insufficient. All costs were standardized to September 19, 2024 (USD 1 = approximately IDR 15,349.70). Further analysis will be conducted to examine cost analysis from healthcare provider and payer (BPJS Healthcare Security) perspectives. The Mann-Whitney test compared two groups with a 95% confidence level (α = 5%).

Results

The characteristics of T2DM patients are illustrated in Table 1. In this study's population, 31.8% had cardiovascular complications, and 68.2% had renal complications. Most were males (57.8%) aged between 45 and 64 years (72.4%). Most patients had a hospital LoS of 1 to 5 days (90.1%). All T2DM with cardiovascular and renal complications were performed at severity level I (100%). Most patients were admitted in 3rd class type of hospital room (46.9%). In this study, the cost components of T2DM cardiovascular and renal complications patients were divided into the actual cost components: medical costs, medical support costs, pharmaceutical costs, and support costs (nutrition and supplement). Table 2 shows the highest cost component during treatment for T2DM cardiovascular and renal complications, respectively.

Table 1. Characteristics of Patients with Type 2 Diabetes Mellitus Cardiovascular and Renal Complication (n=192)

Variable	All (n=192)	Cardiovascular Complication (n=61)		Renal Complication (n=131)	
		n	%	n	%
Sex					
Male	111	42	37.8	69	62.2
Female	81	19	23.5	62	76.5
Age					
18-44 years	20	7	35.0	13	65.0
45-64 years	139	42	30.2	97	69.8
≥65 years	33	12	36.4	21	63.6
Length of Stay					
1-5 days	173	53	30.6	120	69.4
6-10 days	18	7	38.9	11	61.1
>10 days	1	1	100.0	0	0.0
Disease severity level based on INA-CBG category					
E-4-10-I	192	61	31.8	131	68.2
E-4-10-II	0	0	0.0	0	0.0
E-4-10-III	0	0	0.0	0	0.0
Type of hospital room					
1st class	47	12	25.5	35	74.5
2nd class	55	16	29.1	39	70.9
3rd class	90	33	36.7	57	63.3

The total direct medical for treating T2DM with renal complications patients was higher than for treating T2DM with cardiovascular complications. The highest cost component for T2DM patients with cardiovascular complications in I, II, and III classes was medical costs, consisting of doctor and nursing procedures, examinations, visits, and medical service costs. Meanwhile, medical support cost was the highest cost component for T2DM patients with cardiovascular complications in 2nd class. The highest cost component for T2DM patients with renal complications in I, II, and III was medical support costs since the treatment for patients with renal complications contained medical procedures such as surgery and transfusion.

The different amounts of total T2DM with cardiovascular and renal complications based on the actual cost calculation and the INA-CBGs' tariff are shown in Table 3. The amounts were all negative, indicating that the actual costs were higher compared to the INA-CBGs' tariff rates or there was a deficit budget from the perspective of the hospital. For the period of 2019-2022, there was a total deficit of USD 3,293.92 and USD 12,412.61 for the treatment of T2DM with cardiovascular and renal complications, respectively.

Table 2. Average Actual Cost Per Treatment Grade for Type 2 Diabetes Mellitus with Cardiovascular and Renal Complication Patients

Type of Hospital Room	Complication	Average Actual Cost*				
		Medical Cost	Medical Support Cost	Pharmaceutical Cost	Support Cost	Total
1st Class	Cardiovascular	131.06	109.45	79.35	61.94	381.80
	Renal	89.90	184.07	92.12	57.68	423.77
2nd Class	Cardiovascular	96.23	116.90	71.48	28.34	312.94
	Renal	97.30	150.20	108.50	33.99	389.99
3rd Class	Cardiovascular	100.26	66.79	86.20	32.34	285.59
	Renal	97.17	157.20	99.04	35.89	389.30

*) The costs are in USD. USD 1 = approximately IDR 15,349.70.

Table 3. Difference of Total Cost for Type 2 Diabetes Mellitus with Cardiovascular and Renal Complications Patients Between the Actual Cost and the INA-CBG Tariff

Type of Hospital Room	Cardiovascular Complication		Renal Complication	
	Number of Cases	Difference of Costs*	Number of Cases	Difference of Costs*
1st Class	12	760.48	35	2,228.01
2nd Class	16	628.96	39	2,942.96
3rd Class	33	1,904.48	57	7,241.64
Total	61	3,293.92	131	12,412.61

*) The costs are in USD. USD 1 = approximately IDR 15,349.70.

Table 4 presents the results of statistical analyses comparing the actual healthcare costs with the INA-CBGs' tariffs on T2DM with cardiovascular and renal complications. No statistically significant differences were observed among T2DM patients with cardiovascular complications receiving treatment under the disease severity level of E-4-10-I in the 2nd class hospital room (p-value = 0.151) and 3rd class hospital room (p-value = 0.650), as both p-values exceeded the 0.05 significance threshold. Similarly, no significant difference was found among T2DM patients with renal complications treated under the disease severity level of E-4-10-I in the 3rd class hospital room (p-value = 0.145).

Table 4. Comparison of the Actual Cost and INA-CBGs' Tariff Rates for Type 2 Diabetes Mellitus with Cardiovascular and Renal Complication Patients

Type of Hospital Room	Method of Cost Measurement	Cardiovascular Complication		Renal Complication	
		Average Cost	Sig.	Average Cost	Sig.
1st Class	Actual Cost	381.80	<0.001*	423.77	<0.001*
	Ina CBG's Tariff	319.47		360.67	
2nd Class	Actual Cost	312.94	0.151	389.99	<0.001*
	Ina CBG's Tariff	273.84		314.78	
3rd Class	Actual Cost	285.59	0.650	389.30	0.145
	Ina CBG's Tariff	228.19		262.88	

**) significant value.* The costs are in USD. USD 1 = approximately IDR 15,349.70.

Discussion

This study focused on T2DM with complications, particularly cardiovascular and renal complications, in the NHI scheme. T2DM and its complications have reached epidemic proportions, especially in developing countries. The global diabetes epidemic is primarily driven by rapid socioeconomic changes, including urbanization and industrialization.[15] Most patients in this study were in the 3rd class of hospital room type since the proportion of patients covered by BPJS Healthcare Security in the 3rd class was the highest. All T2DM cases were in the severity level of E-4-10-I. In all groups of severity level and hospital room type of the T2DM with complication cases in the study, the different amounts of the actual cost expenditure and the INA-CBGs' tariff rates were negative, or in other words, the actual costs were higher as compared to the INA-CBGs' tariff rates.

For four years, the hospital experienced a substantial financial deficit resulting from the discrepancy between actual healthcare costs and the INA-CBGs' tariff rates, particularly for cases of T2DM with renal complications, which outnumbered cardiovascular complications. The average expenditures for T2DM with complications, based on the actual cost calculations and INA-CBGs' tariffs, showed significant differences, with actual costs consistently lower than the corresponding INA-CBGs' tariff rates across both types of complications. In terms of hospital room classification, both the actual costs and INA-CBGs' tariffs were highest in 1st class hospital rooms and progressively decreased in the 2nd and

3rd class hospital rooms. Additionally, treatment costs for patients categorized under severity level E-4-10-I were the lowest. Increased costs associated with severity levels E-4-10-II and E-4-10-III were attributed to comorbidities and disease complications, necessitating more intensive procedures, additional services, and longer LoS in the hospital.[16] These findings are consistent with a previous study, which reported that the average hospital inpatient costs exceeded the INA-CBGs' tariff rates.[17] This suggests that the unit costs calculated using activity-based costing methods were higher than both the actual costs and the INA-CBGs' tariffs.[18]

The main issue of this study was that the Indonesian Government's claim for T2DM with complications through the INA-CBGs was significantly lower than the total costs incurred by the hospital. The lower the type of hospital room, the higher the disparity since the hospital financing package decreased. No studies have been conducted to compare the costs of T2DM with cardiovascular and renal complications in Indonesia. However, this study showed low claims of funding from the Indonesian Government for T2DM with complications. Additionally, this study revealed that 68.22% of T2DM patients experienced renal complications. This result was consistent with a previous study, which reported a 32% prevalence of microalbuminuria among T2DM patients in Japan.[19] Similarly, studies in the United States have shown that approximately 36% of T2DM patients experience albuminuria, while 28% suffer from kidney-related complications.[20]

T2DM is a major risk factor for the development of chronic kidney disease, which can progress to end-stage renal disease and require costly treatments such as dialysis or kidney transplantation.[21] The significant increase in the prevalence of T2DM has led to an increased financial burden due to diabetic complications. Aggressive efforts to raise awareness, improve treatment adherence, ensure early diagnosis, and optimize monitoring are essential to achieve treatment goals and slow the progression of cardiovascular and renal complications associated with T2DM.[22] Furthermore, the treatment costs for T2DM with complications are often associated with pharmacological treatments, diagnostics, and therapeutic procedures.[23] These results aligned with a previous study on the impact of complications on direct treatment costs for T2DM in Indonesia, which showed that 84.35% of T2DM patients had at least one complication, with an average treatment cost of USD 774.37 per patient.[8]

Meanwhile, studies from the United States have estimated that the annual direct medical costs attributable to diabetes are approximately USD 12,022 per patient.[24] This means that the lowest price in the US area has a T2DM payment rate of up to 30 times the INA-CBGs claim for T2DM in Indonesia. The low price of T2DM claims needs to be a concerning issue. It is crucial to define a grouping algorithm as a Diagnosis-Related Group (DRG), which we refer to as INA-CBGs, to have a fair performance comparison and hospital reimbursement.[25] The optimal design of the DRG system for T2DM cases is critical to ensure adequate performance comparisons and appropriate reimbursement for these causes of frequent hospitalizations. The impact of low financing can certainly disrupt service quality and hospital cash flow, which needs further investigation. However, the World Health Organization has never recommended a specific rate for a country or hospital because each region has a different situation.

Moreover, hospitals must implement Clinical Pathways (CP) to assist the Responsible Medical Officer/*Dokter Penanggung Jawab Pelayanan* (DPJP) in making decisions regarding patient care. The CP in cost control serves as a guideline for medical staff to refer to when administering treatments and medications to patients. This is necessary to ensure that treatment is provided according to the medications and procedures that are truly required based on the patient's diagnosis and condition. In treating patients with DM and complications, CP can provide more detailed guidance on daily management and standardization of other medical disciplines, such as surgeons managing blood sugar levels during procedures with service standards deemed appropriate.[26] The CP also impacts hospital management in making decisions about patient care. Timely and optimal management of T2DM can offer potential cost-saving capacities in preventing complications, which can be achieved through ongoing monitoring and treatment at each level of care.[27]

This study had a limitation. The investigation was conducted in a single hospital, limiting the ability to compare hospital cost rates across multiple facilities. A broader analysis involving multiple hospitals is necessary for a more comprehensive understanding of cost variations. Generally, the INA-CBG claims from the Indonesian Government are significantly lower than those in other countries and addressing the rising costs of T2DM treatments is crucial to align with actuarial standards. Strengthening the financing scheme within the NHI system is essential to support providing high-quality T2DM care and improving the quality of life for patients in Indonesia.

Conclusion

This study provides valuable insights into the clinical and economic challenges of managing T2DM with complications in Indonesia. The total direct medical for treating T2DM with renal complications patients is higher than for treating T2DM with cardiovascular complications. The highest cost component for T2DM with cardiovascular consists of doctor and nursing procedures, examinations, visits, and medical service costs. Meanwhile, the highest cost component for T2DM with renal complications is medical support costs. This study highlights differences between T2DM with complication expenditures based on the actual cost and INA-CBGs' tariff rates, in which the INA-CBGs' tariff was lower than the actual cost. The study supports evaluating the INA-CBGs' tariff rates to accommodate actual healthcare expenditure. On the other hand, the hospital needs to evaluate the service quality of patient treatment by optimizing the budget allocated by the health insurance.

Abbreviations

DM: Diabetes Mellitus; T2DM: Type 2 Diabetes Mellitus; BPJS: *Badan Penyelenggara Jaminan Sosial*/Social Security Administrative Body; INA-CBGs: Indonesian Case-Based Groups; LoS: length of stay; NHI: National Health Insurance; DRG: Diagnosis-Related Group; CP: Clinal Pathways.

Ethics Approval and Consent to Participate

Ethical approval for this study was obtained from the Health Research Ethics Commission of Poltekkes Kemenkes Malang No.516/VI/KEPK POLKESMA/2023. Informed consent was obtained prior to data collection, and confidentiality was guaranteed.

Competing Interest

The authors declared no conflict of interest to be disclosed.

Availability of Data and Materials

Data and materials are available upon request.

Authors' Contribution

RF designed the study. RF, ATP, and AAICD conducted data collection. RF and ATP interpreted the data and wrote the manuscript.

Acknowledgment

This study was supported by The Ministry of Health Research Grants (Simlitabkes) under Poltekkes Kemenkes. A Type B Hospital in Malang has permitted to obtain research data.

References

1. International Diabetes Federation. IDF Diabetes Atlas. 9th ed. Brussels: International Diabetes Federation; 2019.
2. Badan Penelitian dan Pengembangan Kesehatan. Hasil Utama Riskesdas 2018. Jakarta: Kementerian Kesehatan Republik Indonesia; 2018.
3. Hidayat B, Ramadani RV, Rudijanto A, et al. Direct Medical Cost of Type 2 Diabetes Mellitus and Its Associated Complications in Indonesia. Value Heal Reg issues. 2022; 28: 82–89. DOI: 10.1016/j.vhri.2021.04.006.
4. Yulsam PY, Oenzil F, Efrida E. Insidens Riwayat Hipertensi dan Diabetes Melitus pada Pasien Penyakit Jantung Koroner di RS. Dr. M. Djamil Padang. J Kesehat Andalas. 2015; 4 (2): 535–539. DOI: 10.25077/jka.v4i2.295.
5. Tomic D, Shaw JE, Magliano DJ. The burden and risks of emerging complications of diabetes mellitus. Nat Rev Endocrinol. 2022; 18: 525–539. DOI: 10.1038/s41574-022-00690-7.
6. Jankauskas SS, Kansakar U, Varzideh F, et al. Heart failure in diabetes. Metabolism. 2021; 125: 154910. DOI: 10.1016/j.metabol.2021.154910.
7. Papazafiropoulou AK, Bakomitrou F, Trikallinou A, et al. Diabetes-dependent quality of life (ADDQOL) and affecting factors in patients with diabetes mellitus type 2 in Greece. BMC Res Notes. 2015; 8: 786. DOI: 10.1186/s13104-015-1782-8.
8. Einarson TR, Acs A, Ludwig C, et al. Economic Burden of Cardiovascular Disease in Type 2 Diabetes: A Systematic Review. Value Health. 2018; 21 (7): 881–890. DOI: 10.1016/j.jval.2017.12.019.
9. Patty YFPP, Mufarrihah, Nita Y. Cost of illness of diabetes mellitus in Indonesia: A systematic review. J Basic Clin Physiol Pharmacol. 2021; 32 (4): 285-295. DOI: 10.1515/jbcpp-2020-0502.
10. Tuan Kiet Pham H, Tuyet Mai Kieu T, Duc Duong T, et al. Direct medical costs of diabetes and its complications in Vietnam: A national health insurance database study. Diabetes Res Clin Pract. 2020; 162: 108051. DOI: 10.1016/j.diabres.2020.108051.
11. Fitri E, Andayani TM, Suparniati E. Cost Analysis of Diabetes Melitus. J Manag Pharm Pract. 2015; 5 (1): 61–66. DOI: 10.22146/jmpf.30.
12. Rahayuningrum IO, Tamtomo D, Suryono A. Comparison Between Hospital Inpatient Cost and INA-CBGs Tariff of Inpatient Care in the National Health Insurance Scheme in Solo, Boyolali and Karanganyar Districts, Central Java. J Health Pol Manag. 2016; 1 (2): 102-112. DOI: 10.26911/thejhpm.2016.01.02.05
13. Menteri Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonesia No. 3 Tahun 2023 Tentang Standar Tarif Pelayanan Kesehatan Dalam Penyelenggaraan Program Jaminan Kesehatan. Jakarta: Kementerian Kesehatan Republik Indonesia; 2023.
14. Yuliastuti F, Andayani TM, Endarti D, et al. Breast, cervical, and lung cancer: A comparison of real healthcare costs and INA-CBGs rates in the era of national health insurance. Pharm Pract (Granada). 2023; 21 (1): 2768. DOI: 10.18549/PharmPract.2023.1.2768.
15. Pradeepa R, Mohan V. Prevalence of type 2 diabetes and its complications in India and economic costs to the nation. Eur J Clin Nutr. 2017; 71 (7): 816-824. DOI: 10.1038/ejcn.2017.40.

16. Satibi S, Andayani TM, Endarti D, et al. Comparison of Real Cost Versus the Indonesian Case Base Groups (INA-CBGs) Tariff Rates Among Patients of High- Incidence Cancers Under the National Health Insurance Scheme. Asian Pac J Cancer Prev. 2019; 20 (1): 117–122. DOI: 10.31557/APJCP.2019.20.1.117.
17. Fajriyah N, Firmanti TA, Mufidah A, et al. A Diabetes Self-Management Education/Support (DSME/S) Program in Reference to the Biological, Psychological and Social Aspects of a Patient with Type 2 Diabetes Mellitus: A Systematic Review. J Ners. 2019; 14 (3): 55–64. DOI: 10.20473/jn.v14i3.16979.
18. Firman F, Lestari K. Analisis Pembiayaan Berdasarkan Lama Rawat Pasien BPJS Diabetes Melitus Tipe II Komplikasi Sirkulasi Perifer di RSU PKU Muhammadiyah Bantul. J Ekonom Kesehat Indonesia. 2024; 9 (1): 40-50. DOI: 10.7454/eki.v9i1.1119.
19. Friel KM, McCauley C, O'Kane M, et al. Can Clinical Outcomes Be Improved, and Inpatient Length of Stay Reduced for Adults With Diabetes? A Systematic Review. Front Clin Diabetes Healthc. 2022; 3: 883283. DOI: 10.3389/fcdhc.2022.883283.
20. Kumar R, Itumalla R, Perera B, et al. Patient knowledge about diabetes: Illness symptoms, complications and preventive personal lifestyle factors. Heal Psychol Res. 2022; 10 (3): 37520. DOI: 10.52965/001c.37520.
21. Liu L, Yu X, Deng J. Medical Expenses Analysis of Middle-Aged and Elderly Patients with Diabetes Mellitus in China. Int J Heal Econ Policy. 2021; 6 (1): 14-22. DOI: 10.11648/j.hep.20210601.12.
22. Soeatmadji DW, Rosandi R, Saraswati MR, et al. Clinicodemographic Profile and Outcomes of Type 2 Diabetes Mellitus in the Indonesian Cohort of DISCOVER: A 3-Year Prospective Cohort Study. J ASEAN Fed Endocr Soc. 2023; 38 (1): 68-74. DOI: 10.15605/jafes.038.01.10.
23. Garcia M, Mulvagh SL, Merz CNB, et al. Cardiovascular Disease in Women: Clinical Perspectives. Circ Res. 2016; 118 (8): 1273–1293. DOI: 10.1161/CIRCRESAHA.116.307547.
24. Parker ED, Lin J, Mahoney T, Ume N, Yang G, Gabbay RA, et al. Economic Costs of Diabetes in the U.S. in 2022. Diabetes Care [Internet]. 2023 Nov 1;47(1):26–43. Available from: https://doi.org/10.2337/dci23-0085
25. Wardhana MP, Gumilar KE, Rahmadhany P, et al. INA-CBGs claim versus total hospital cost: A vaginal delivery investigation at Airlangga University Academic Hospital, Indonesia. J Public health Res. 2020; 9 (4): 1999. DOI: 10.4081/jphr.2020.1999.
26. Herawati F, Irawati AD, Viani E, et al. Effective Clinical Pathway Improves Interprofessional Collaboration and Reduces Antibiotics Prophylaxis Use in Orthopedic Surgery in Hospitals in Indonesia. Antibiot (Basel). 2022; 11 (3): 399. DOI: 10.3390/antibiotics11030399.
27. Asmirajanti M, Syuhaimie Hamid AY, Hariyati TS. Clinical care pathway strenghens interprofessional collaboration and quality of health service: A literature review. Enfermería Clínica. 2018; 28 (Suppl. 1): 240–244. DOI: 10.1016/S1130-8621(18)30076-7.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 4

7-31-2025

Cross-Cultural Adaptation and Validation of RANAS-Based Instrument for Measuring Latrine Use Behavior in Indonesia

Vera Yulyani
Universitas Gadjah Mada, Yogyakarta, vera.yulyani@malahayati.ac.id

Fatwa Sari Tetra Dewi
Universitas Gadjah Mada, Yogyakarta, fatwasari@ugm.ac.id

Iswanto Iswanto
Poltekkes Kemenkes Yogyakarta, Yogyakarta, iswanto@poltekkesjogja.ac.id

Recommended Citation

Yulyani V , Dewi FS , Iswanto I , et al. Cross-Cultural Adaptation and Validation of RANAS-Based Instrument for Measuring Latrine Use Behavior in Indonesia. *Kesmas*. 2025; 20(5): 28-36
DOI: 10.7454/kesmas.v20isp1.2132
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/4

Yulyani *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 28-36
DOI: 10.7454/kesmas.v20isp1.2132

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Cross-Cultural Adaptation and Validation of RANAS-Based Instrument for Measuring Latrine Use Behavior in Indonesia

Vera Yulyani[1,2], Fatwa Sari Tetra Dewi[3]*, Iswanto[4]

[1]Doctoral Program in Medicine and Health Science, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia
[2]Department of Public Health, Faculty of Health Sciences, Universitas Malahayati, Bandar Lampung, Indonesia
[3]Department of Health Behavior, Environment and Social Medicine, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia
[4]Environmental Health Study Program, Politeknik Kesehatan Kementerian Kesehatan Yogyakarta, Yogyakarta, Indonesia

Abstract

Using toilets is a simple way to prevent diarrhea, yet no validated tool exists to measure this habit. This study aimed to develop and validate instruments for measuring latrine use consistency. This questionnaire was adapted from the risk, attitude, norm, ability, and self-regulation (RANAS) framework developed in India and modified for Indonesia. It was evaluated by three experts using the content validity index (CVI). The face validity index (FVI) was pilot-tested on 40 community respondents. Variables measured included behavior, habits, intentions to use toilets, knowledge, attitudes, norms, abilities, and self-regulation. Question items with relevance and clarity scores of item CVI above 0.80 were considered valid and appropriate. Item scoring 0.70–0.79 required revisions, while scores below 0.70 led to deletion. The relevance and clarity assessment results for behavioral, intention, knowledge, norm, and attitude to use toilet questions yielded a scale CVI of more than 0.80, indicating that all items were valid and reliable. However, the habits, abilities, and self-regulation variables had varying I-CVI scores, indicating a need to revise or remove certain items. A culturally adapted and validated RANAS-based instrument is reliable for measuring latrine use behavior in Indonesia.

Keywords: behavior, Content Validity, Face Validity, Instrument Development, latrine use

Introduction

Using toilets can reduce the incidence of diarrhea by protecting people from exposure to feces (excrement). It is estimated that using latrines is part of sanitation behavior and contributes to 31% of diarrheal diseases.[1] Several studies have shown that the use and access to toilet ownership significantly influence the incidence of diarrhea.[2,3] Poor sanitation practices also contribute to the incidence of cholera, worm infections, anemia, malnutrition, and long-term cognitive decline.[4–6] Improving access to better sanitation reduces diarrheal disease by 24.5% among children under the age of five.[7] Sanitation interventions can reduce diarrhea by around 15 to 26% across all age groups, with sanitation access interventions reducing diarrhea by 11 to 21% and behavior change interventions without infrastructure provision reducing diarrhea by 15 to 18%.[8]

In the sanitation ladder, toilet use behavior is associated with the existence of sanitation access: not having a toilet or open defecation (OD) behavior, having a toilet but not having a gooseneck and septic tank (unimproved), having a shared toilet with other households (improved) and having private toilet facilities (improved).[9] Several studies have also shown a correlation between ownership factors or access to toilets and their influence on toilet usage behavior.[10–12] Social norms also play a crucial role in predicting toilet use, as toilet access does not always guarantee utilization.[13] Social norms related to open defecation are still accepted in rural communities, thus hampering toilet use interventions, including efforts to increase toilet ownership that have been carried out so far.[14] Consequently, interventions involving social dynamics to change social norms are more sensitive than interventions prioritizing development or sanitation access.[15] Social norms (culture) and environmental and economic factors are also the causes of many Indonesians practicing open defecation.[16] Knowledge factors, attitudes, habits, availability of land and toilets, and social roles also contribute to open defecation in Indonesia.[17]

***Correspondence**:* *Fatwa Sari Tetra Dewi, Department of Health Behavior, Environment and Social Medicine, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia, Email: fatwasari@ugm.ac.id*

Received : September 25, 2024
Accepted : January 30, 2025
Published: July 31, 2025

Accurate measurement in identifying behavioral factors of toilet use can control open defecation levels; this measurement is better done at the individual than at the household level.[18] Accurate measurement standards to identify the causal factors of open defecation can encourage the design of appropriate interventions to reduce open defecation rates.[19] The instrument in this study was developed by adapting the questionnaire and framework from risk, attitude, norm, ability, and self-regulation (RANAS).[20–22] The RANAS questionnaire was used because it provides a comprehensive and easily adaptable framework for identifying and measuring psychosocial determinants of sanitation behavior. Based on various studies, the RANAS framework has also proven successful in encouraging changes in open defecation behavior.[20–22] Given that the adaptation of measurement instruments requires careful consideration of linguistic and cultural contexts, this study aimed to conduct cross-cultural adaptation and validate the RANAS-based instrument for measuring latrine use behavior in Indonesia.

Method

The RANAS questionnaire was previously used in India and was adjusted to the local Indonesian context and customs.[20] The RANAS questionnaire is usually used to evaluate interventions promoting toilet use behavior.[20,23] The instrument in this study was adapted from research conducted by the RANAS team with variables contained, including measurement of toilet use behavior, habits, intention to use a toilet, risk factors (knowledge of diarrhea, risk of vulnerability, and severity), norms, abilities to use a toilet, and self-regulation. RANAS was developed through collaboration between the Swiss Federal Institute of Aquatic Science and Technology (EAWAG) and the Federal Institute of Technology Zurich. This partnership has established itself as a leader in behavioral change research over the past two decades. This study adapted and adjusted the scale to Indonesia's local context. In developing this instrument, various stages were conducted, e.g., the English-Indonesian translation process to the content validity test using the Content Validity Index (CVI) format. This instrument was adapted from the RANAS questionnaire, and the stages are outlined in Figure 1.

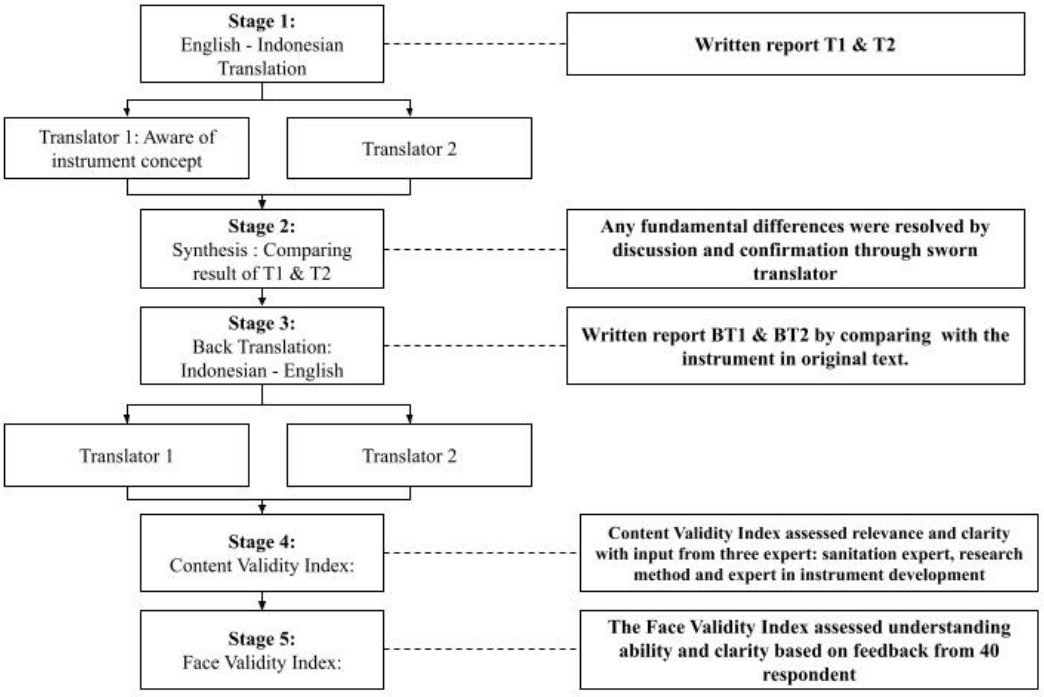

Figure 1. Stages of Cross-Cultural Adaptation and Validation Process

Notes: T1: First forward translation by a translator aware of the research concept; T2: Second forward translation by a translator without prior research knowledge; BT1 and BT2: Back translations by two independent translators who translated the synthesized Indonesian version into English.

As illustrated in Figure 1, the instrument adaptation process consisted of five stages. The first stage involved translating from English to Indonesian language by two in-house translators from a professional translation service agency. Both translators were bilingual professionals, with Indonesian as their native language, but they had different backgrounds regarding the research subject. One translator was informed about the study's purpose and latrine use concepts, while the other was not, allowing for both technical accuracy and natural language flow in the translation. In the second stage (synthesis), two independent translations were compared to the original text. This comparison ensured contextual appropriateness and terminology consistency. Any translation discrepancies were resolved through research team discussions and verified by a certified sworn translator.

The third stage involved back-translation, wherein the Indonesian version was translated back into English. This back-translated version was compared with the original English text to identify any significant discrepancies resolved through research team discussions. The fourth stage focused on content validation using the CVI to evaluate relevance and clarity. Three experts were selected based on their academic qualifications and institutional recognition: a sanitation expert, a research methodology expert, and an instrument development expert.

Content validity assessment is essential for ensuring the quality of adapted questionnaires, with the CVI providing a systematic approach to this evaluation.[24] This structured analysis method allowed experts to provide feedback for instrument refinement. Following recommendations from a previous study suggesting using between 3-10 experts,[25] three experts (one expert in epidemiology, one in sanitation, and one in instrument development) were selected for the CVI assessment. Each expert received the questionnaire via institutional email, along with a structured validation format that included the study's purpose, definitions of behavioral domains, and detailed instructions for completing the CVI assessment.[26]

The authors provided information on the synthesis results and back translation reports to be considered in the assessment and sent the CVI form. The final stage was the Face Validity Index (FVI), which assessed the ability to understand and clarify each question item with 40 respondents from the community. These respondents were selected based on specific characteristics that matched the target population: lived in areas where open defecation was still practiced, had limited or no access to proper sanitation facilities, and belonged to rural communities. Forty respondents were selected for the FVI pilot testing in Air Bakoman Village, Tanggamus District, Lampung Province, Indonesia, where open defecation practices remain prevalent. To ensure systematic sampling, respondents were chosen using an interval sampling method, starting from the house of the neighborhood head and then skipping one house before and after each selection within the neighborhood unit. Pilot testing was conducted in July 2024.

This instrument was adapted from previous research. Its variables included measurement of toilet use behavior, habits, intention to use a toilet, risk factors (knowledge of diarrhea, risk of vulnerability, and severity), norms, abilities to use a toilet, and self-regulation.[23] The behavior of using a toilet had 6 question items from RANAS that measured when and where they last defecated, including handling the feces of toddlers aged 0-5 years. The assessment score for this variable was 0, indicating that the respondent did not use a toilet; otherwise, it was 1 if the respondent used a toilet. The habit variable had 6 question items, with 3 in the context of open defecation habits and 3 in the context of toilet use habits.

This instrument also measured the intention to use a toilet with 3 question items. The risk factor variable was divided into 10 question items that measured the respondent's knowledge level about diarrhea, 3 question items that measured the respondent's perception of susceptibility to diarrhea, and 3 statement items that measured the risk of severity if exposed to diarrhea. The attitude variable had 17 question items that measured attitudes toward toilet use and defecating in the open. The norm variable comprised several sub-sections, such as 4 question items regarding other people's behavioral norms, 3 questions regarding personal interest norms, and 3 questions regarding other people's approval norms. The ability variable included 10 question items about processing the ability to use toilets adjusted to conditions in Indonesia and 7 question items about the ability to continue using toilets. Self-regulation variables consisted of 1 action plan question item, 3 action control question items, 3 question items on how to overcome problems using the toilet, 3 question items on remembering to use the toilet, and 3 question items on commitment to using the toilet. An overview of the variables and their assessment scales is presented in Table 1.

Table 1. Overview of Variables and Their Assessment Scales

Variable	Components	Number of Items	Scale Description
Behavior	Toilet Use	6	Binary (0 = non-use, 1 = use)
Habits	Open Defecation Habits	3	4-point scale
	Toilet Use Habits	3	4-point scale
Intention	Toilet Use Intention	3	4-point scale
Risk Factors	Knowledge about Diarrhea	10	4-point scale
	Perceived Susceptibility	3	4-point scale
	Perceived Severity	3	4-point scale
Attitude	Toilet Use and Open Defecation	17	4-point scale
Norms	Others' Behavioral Norms	4	4-point scale
	Personal Interest Norms	3	4-point scale
	Others' Approval Norms	3	4-point scale
Ability	Toilet Use Capability	10	4-point scale
	Continued Use Ability	7	4-point scale
Self-regulation	Action Planning	1	4-point scale
	Action Control	3	4-point scale
	Problem-Solving	3	4-point scale
	Memory Aids	3	4-point scale
	Commitment	3	4-point scale

These variables were assessed using the CVI format, and the CVI item-level value was calculated for each question and the overall scale of the variable level (S-CVI).[26] Each question item was evaluated for both relevance and clarity using a 4-point rating scale. In the CVI assessment, three experts independently rated each item with scores ranging from 1 to 4. For relevance, a score of 1 indicated "not relevant," while 4 indicated "very relevant." Similarly, for clarity, scores ranged from 1 (unclear) to 4 (very clear), with intermediate scores of 2 indicating "major revision" and 3 indicating "minor revision."

The item-content validity index (I-CVI) calculation process involved converting these ratings into binary scores, where ratings of 1 and 2 were converted to 0 (indicating disagreement), and ratings of 3 and 4 were converted to 1 (indicating agreement). The I-CVI for each item was calculated by dividing the number of experts who agreed (ratings of 3 or 4) by the total number of experts. For instance, if two out of three experts rated an item as either 3 or 4, the I-CVI was calculated as 2/3 = 0.67. The S-CVI was then determined by calculating the average of all the I-CVI values across the questionnaire items.

For the FVI, the same 4-point scale structure was maintained, but "relevance" was replaced with "understanding." In this case, a score of 1 indicated that the item was "very difficult to understand," while a score of 4 indicated it was "very easy to understand." The calculation method mirrored that of CVI, maintaining consistency in the validation process. These calculations are illustrated in Table 2, which provides concrete examples of how both I-CVI and S-CVI values were determined.

Table 2. Assessment Scales for Content Validity Index and Face Validity Index

Assessment Type	Dimension	Scale	Rating Description
Content Validity Index	Relevance	1	Not relevant
		2	Somewhat relevant
		3	Quiet relevant
		4	Very relevant
	Clarity	1	Unclear
		2	Major revision
		3	Minor revision
		4	Very clear
Face Validity Index	Understanding	1	Very difficult to understand
		2	Difficult to understand
		3	Easy to understand
		4	Very easy to understand

The calculation for each question item indicated the relevance value and category for each question item. Referring to previous literature, which showed that the relevance value and CVI are in the appropriate category if the value is above 0.80; however, if it is in the range of 0.70–0.79, then the question item needs to be revised, and if it is below 0.70, both in relevance and clarity then the question item is removed.[27]

Results

The results of the CVI and FVI for the behavioral variables are described in Table 3. The Table results showed that all question items achieved perfect CVI (1) and nearly perfect FVI (0.99) scores, indicating high agreement among experts on the relevance and clarity of the items, as well as solid understanding and clarity of the 40 respondents. The assessment of toilet use consistency is seen from the suitability of the answers from E2, E3, and E4. This questionnaire also examined the consistency of toilet use for children with the question items in E5. The CVI and FVI results indicated that the instrument is suitable for assessing the consistency of toilet use, which can help understand sanitation behavior across the population.

Table 3. Consistency Latrine Use: CVI and FVI

Consistency Latrine Use	CVI (3 expert)		FVI (40 respondents)		Decision
	Relevance	Clarity	Understanding	Clarity	
E1. When was the last time you defecated?	1	1	1	1	Appropriate
E2. The last time you defecated, did you defecate in an open space (open defecation) or latrine?	1	1	0.97	0.97	Appropriate
E3. In the last five days, how often did you use the latrine to defecate?	1	1	1	1	Appropriate
E4. During the last five days, how often did you defecate indiscriminately (OD)?	1	1	1	1	Appropriate
E5. For children (children under the age of five): The last time (child's name) defecated, where did (child's name) defecate?	1	1	1	1	Appropriate
E.5.1. If a child defecates in a place other than the latrine, what should be done to dispose of the feces?	1	1	1	1	Appropriate
S-CVI/FVI	1	1	0.99	0.99	Appropriate

The results of CVI and FVI for the variable forming behavior are depicted in Table 4. Table 4 shows the CVI and FVI scores for the behavioral factor variables assessed by three experts and 40 community respondents. Overall, most variables scored high on relevance, clarity, and understanding. Only six items were revised during the CVI stage. For each variable, relevance and clarity were measured at the CVI stage, and understanding and decision-making were measured at the FVI stage. For the habit variable, which included six question items, two items were revised based on CVI feedback. Intention and risk (subdivided into knowledge, vulnerability, and severability) variables scored high in both the CVI and FVI assessments, so no revisions were made.

For the attitude variable, all 16 items were deemed appropriate, with no revisions needed. The norms variable, which was subdivided into others' behavior, personal interest, and other's approval, also scored well, so no changes were made. One item in the ability variable was revised as it scored slightly lower at the CVI stage. Finally, the self-regulation variable, which was subcategorized into action planning, action control, problem-solving, remembering, and commitment, required revision for three items based on CVI feedback, particularly in the action control and commitment categories.

The revised question item is presented in Table 5. Since 4 question items have values below 0.90, both in the relevance and clarity categories, revisions have been made. In addition to the 4 question items to be revised based on recommendations from experts, the authors also revised the sentence in the practical knowledge ability subcategory by adding the word "I am able."

Table 4. CVI and FVI Scores of Behavioral Factor Variables

Variable	S-CVI (3 experts)		S-FVI (40 respondents)		Decision	Detailed Information
	Relevance	Clarity	Understanding	Clarity		
Habit: 6 question items	1	0.83	0.95	0.95	Appropriate	2 question items were revised during the CVI stages
Intention : 3 question items	1	1	0.98	0.99	Appropriate	no revised items
Risk:	**1**	**0.99**	**0.98**	**0.98**	Appropriate	no revised items
• knowledge (10 question items)	1	0.97	0.96	0.96		
• vulnerability (3 question items)						
• severability (3 question items)	1	1	0.97	0.97		
	1	1	1	1		
Attitude: 16 items question	1	1	0.98	0.98	Appropriate	no revised items
Norm:	**1**	**0.97**	**0.96**	**0.96**	Appropriate	no revised items
• other's behavior (4 question items)	1	0.91	0.93	0.92		
• personal interest (3 question items)						
• other's approval (3 question items)	1	1	1	1		
	1	1	0.96	0.97		
Ability:	**0.98**	**1**	**0.96**	**0.96**	Appropriate	1 question item was revised in the CVI stages
• practical knowledge (10 question items)	0.96	1	0.94	0.95		
• continuation of using the latrine	1	1	0.98	0.97		
Self-Regulation:	**0.97**	**0.89**	**1**	**1**	Appropriate	3 question items were revised in the CVI stages
• action planning (1 question item)	1	0.67	1	1		
• action control (3 question items)						
• problem-solving (3 question items)	1	0.89	1	1		
• remembering (3 question items)						
• commitment (3 question items)	1	1	1	1		
	0.89	0.89	1	1		
	1	1	1	1		

Table 5. List of Question Items That Need to be Revised

Questions Before Revision	Questions After Revision
F1. How automatically do you go for open defecation?	How spontaneous/automatic do you do open defecation? Such as in rivers/streams/gardens/seasides/using flying plastic
F2. How much effort do you have to make to remember to defecate in the open?	How much effort do you need to make to remember to practice open defecation? For example, in rivers, streams, gardens, or by the seaside.
O8. After 1 year of decomposing, the content of the pit can be used as fertilizer	I am able to process the contents of the septic tank after one year of decomposition to be used as fertilizer.
Q1. How do you get ready to use the latrine for defecation?	How do you prepare to use the toilet for defecation?*
R1. How much attention do you pay to yourself when using the latrine to defecate?	According to your observations, how often do you use the toilet for defecation?
T2. In the last five days, have you planned to use the latrine but then forgot?	In the past five days, have you ever planned to use the toilet for defecation but then forgot to do so?

*) The authors added an explanation about the response options ranging from "not ready" to "ready" in this survey item.

Discussion

The CVI and FVI were essential steps in evaluating the quality of an instrument because assessing how well the items represented the measured construct involved expert and respondent judgments about the clarity, relevance, and appropriateness of the language in the Indonesian context. All question items to measure the consistency of toilet use in CVI and FVI measurements showed almost perfect results, illustrating high expert agreement on the relevance and clarity of each question item as well as good respondent understanding, making the question items in this instrument suitable for describing the consistency of toilet use in all age groups. In this section, no revisions were made to the question items.

Consistent toilet use was usually measured by describing the frequency of toilet use during the past week, which was assessed by respondents's answers of "every day," "most days," "several days," and "never" in the toilet. Respondents who answered every day using the toilet were categorized as consistent, and the rest as inconsistent. The format of this question was similar to the questionnaire developed in a consistent study of latrine use in Ethiopia.[28] The results of the CVI and FVI tests for behavioral factors that form the consistency of toilet use showed good score indices for all behavioral variables measured, including habit, intention, risk, attitude, norm, ability, and self-regulation. Six question items need to be revised in the CVI phase: two for habit, one for attitude, and three for self-regulation question items.

A habit is defined as a routine that is performed repeatedly.[29] Sanitation habits in this instrument were assessed by evaluating open defecation practices and latrine use. This comprehensive approach was chosen to capture a complete picture of latrine habits and propensity to practice open defecation. By measuring both aspects, this study aimed to provide a more accurate understanding of how often and how much effort they put into continuing to use a latrine in their daily lives. There were 2 question items on the revised habit variable, which were those related to the revision of the term "automatic" to "spontaneous" since it is more relevant in the context of the habit of defecating in the open and more often heard in Indonesian society. The question item was also revised by adding the location of the intended open defecation, making it easier for respondents to understand the concept. In other revised habit question items, examples of the intended location of planned open defecation behavior were also added.

The results of the attitude index were good at the CVI stage. However, there was input from experts regarding revising all question items on the ability variable changed to the initial word "I am able." The revision of "I am able" was done to emphasize the ability and readiness of respondents to be involved and is more following the Indonesian cultural context, which tends to require direct and personal statements. This revision clarified subject (I) and described the specific actions respondents must take. In several studies conducted in Indonesia, affirmation of the subject in the questionnaire, like "I am able," is often used to measure the ability variable.[30,31] In the attitude variable, one question item with I-CVI attitude required revision related to the sentence "content of the pit" to "content of the septic tank." The term septic tank is a term that is familiar to Indonesians.

Three question items on the self-regulation variable were modified based on the CVI stage. The first modification related to respondents' readiness to use the toilet. An explanation was added for the options "not ready" to "ready." This revised item was intended to help respondents understand the scale of readiness to use the toilet in question. Second, the question items were revised to include more specific questions on the frequency of toilet use to enhance respondent comprehension. Finally, the question item in the self-regulation variable was modified by adding specifications regarding toilet use for defecation. Toilets in Indonesia are typically used for multiple purposes, such as bathing and washing clothes; thus, specifying the defecation function was deemed more appropriate for the Indonesian context.[32]

The FVI results indicated a good index with no question items requiring revision from the 40 respondents. However, based on notes and input from the questionnaire trial study, a modification was recommended regarding the terminology. The term "diarrhea" was supplemented with *"mencret"* (a colloquial Indonesian term commonly used in the study area to describe diarrhea) since this local term was more familiar and better understood by the Indonesians than the formal term "diarrhea." Subsequently, the term *"mencret"* was added alongside each question item containing the word diarrhea, particularly in the knowledge variable section.

This study had several limitations that should be considered. First, while the instrument demonstrated good content and face validity, other psychometric properties, such as construct validity and reliability, were not assessed. Second, face validity testing was limited to one rural village in the Tanggamus District, which may not fully represent the diverse cultural and linguistic variations across different regions of Indonesia. Third, the adaptation process focused primarily on linguistic and cultural aspects without extensive testing of the theoretical construct validity of the RANAS framework in the Indonesian context. Fourth, although adequate for initial validation, the sample size of 40 respondents for FVI may benefit from larger-scale testing across different geographical areas.

This study's findings have several important implications for research and practice. Regarding research implications, this validated instrument provides a foundation for future studies examining latrine use behavior in Indonesia, particularly in rural areas where open defecation remains prevalent. The successful adaptation of the RANAS framework demonstrates its potential applicability in Indonesia, although further psychometric testing is recommended. For practical implications, this instrument can be utilized by public health practitioners and policymakers to assess latrine use behavior and its determinants more accurately. Incorporating culturally appropriate terminology and context-specific

modifications enhances its utility in community-based assessments. The validated instrument can help design more targeted interventions by identifying specific behavioral factors influencing latrine use in Indonesian communities.

Conclusion

This study demonstrates the successful adaptation of a theoretically grounded instrument to measure latrine use behavior in Indonesia through systematic content and face validation processes. The adaptation process revealed the importance of incorporating cultural nuances and the local context when developing behavioral assessment tools, particularly in sanitation-related research. Beyond mere translation, the validation process highlighted the importance of cultural understanding, local terminology, and contextual modifications for creating effective measurement instruments for public health. This validated instrument represents a significant step forward in sanitation behavior research in Indonesia, providing researchers and practitioners with a reliable tool for understanding and addressing open defecation practices. The successful integration of the RANAS framework into the Indonesian context suggests that theoretical frameworks can be effectively adapted across cultures when proper validation procedures are followed, paving the way for evidence-based sanitation interventions that are both theoretically sound and culturally appropriate.

Abbreviations

RANAS: risk, attitude, norm, ability, and self-regulation; CVI: Content Validity Index; FVI: Face Validity Index; S-CVI: scale-content validity index; I-CVI: item-content validity index.

Ethics Approval and Consent to Participate

This study involved humans and has obtained ethical approval from the Medical and Health Research Ethics Committee (MHREC), Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, with number KE/FK/0383/EC/2024. All participants were explained the purpose of the study and informed consent to participate in the study before taking part.

Competing Interest

There are no conflicts of interest in this study.

Availability of Data and Materials

The data can be accessed upon a reasonable request.

Authors' Contribution

VY was the first author to conceptualize, collect data, and draft the manuscript. FSTD provided supervision, methodology, and manuscript revision. I assisted in conducting instrument assessments and revising the instruments.

Acknowledgment

The authors would like to thank the experts, Prof. Mohammad Hakimi, Lely Lusmilasari, Ph.D., and Dr. Heru Subekti, for their valuable time in assessing this instrument. The authors also thank the Head of Pulau Panggung Primary Health Care (PHC), all enumerators involved in data collection in the Pulau Panggung PHC working area, and all respondents willing to participate in providing valuable information. The authors also thank the Tanggamus District Development Planning Board, Universitas Gadjah Mada, and Malahayati University, who permitted this research. The researcher would also like to thank the Indonesian Education Scholarship (BPI), which provided the opportunity to continue studying and conducting research. This research is supported by funding from FKKMK UGM with the number 3030/UN1/FKKMK.1.3/PPKE/PT/2024.

References

1. World Health Organization. Safe water, better health. Geneva: World Health Organization; 2019.
2. Wolf J, Johnston RB, Ambelu A, et al. Burden of disease attributable to unsafe drinking water, sanitation, and hygiene in domestic settings: A global analysis for selected adverse health outcomes. Lancet. 2023; 401 (10393): 2060–2071. DOI: 10.1016/S0140-6736(23)00458-0.
3. Gozali SI, Astutik E, Ismail WI. Environmental sanitation and diarrhea in children ages 12 - 59 months in Pojok Village, Bojonegoro, Indonesia. J Berk Epidemiol. 2023; 11 (2): 120–127. DOI: 10.20473/jbe.V11I22023.120-127.
4. Musa SS, Ezie KN, Scott GY, et al. The challenges of addressing the cholera outbreak in Cameroon. Public Heal Pract (Oxf). 2022; 4: 100295. DOI: 10.1016/j.puhip.2022.100295.
5. Mara D. The elimination of open defecation and its adverse health effects: A moral imperative for governments and development professionals. J Water Sanit Hyg Dev. 2017; 7 (1): 1–12. DOI: 10.2166/washdev.2017.027.
6. Freeman MC, Garn JV, Sclar GD, et al. The impact of sanitation on infectious disease and nutritional status: A systematic review and meta-analysis. Int J Hyg Environ Health. 2017; 220 (6): 928–949. DOI: 10.1016/j.ijheh.2017.05.007.
7. Merid MW, Alem AZ, Chilot D, et al. Impact of access to improved water and sanitation on diarrhea reduction among rural under-five children in low and middle-income countries: A propensity score matched analysis. Trop Med Health. 2023; 51: 36 . DOI: 10.1186/s41182-023-00525-9.

8. Bauza V, Ye W, Liao J, et al. Interventions to improve sanitation for preventing diarrhoea. Cochrane Database Syst Rev. 2023; 1 (1): CD013328. DOI: 10.1002/14651858.CD013328.pub2.
9. World Health Organization and United Nations Children's Fund. Progress on household drinking water, sanitation and hygiene 2000-2022: Special focus on gender. World Health Organization, United Nations Children's Fund; 2023.
10. Yulyani V, Febriani CA, Shaharudin MS, et al. Patterns and determinants of open defecation among urban people. Kesmas. 2021; 16 (1): 45–50. DOI: 10.21109/kesmas.v16i1.3295.
11. Hirai M, Kelsey A, Mattson K, et al. Determinants of toilet ownership among rural households in six eastern districts of Indonesia. J Water Sanit Hyg Dev. 2018; 8 (3): 533–545. DOI: 10.2166/washdev.2018.010.
12. Paladiang R, Haryanto J, Has EMM. Determinan perilaku buang air besar sembarangan (BABS) di Desa Kiritana Kecamatan Kambera. Indones J Community Health Nurs. 2020; 5 (1): 33. DOI: 10.20473/ijchn.v5i1.17545.
13. Lopez VK, Berrocal VJ, Angulo BC, et al. Determinants of latrine use behavior: The psychosocial proxies of individual-level defecation practices in rural coastal Ecuador. Am J Trop Med Hyg. 2019; 100 (3): 733–741. DOI: 10.4269/ajtmh.18-0144.
14. Gauri V, Rahman T, Sen IK. Shifting social norms to reduce open defecation in rural India. Behav Public Policy. 2023; 7 (2): 266–290.
15. Jacob S, Natrajan B, Ajay TG. 'Why don't they use the toilet built for them?': Explaining toilet use in Chhattisgarh, Central India. Contrib Indian Sociol. 2021; 55 (1): 89–115. DOI: 10.1177/0069966720972565.
16. Sari AFK, Azizah R, Jalaludin J, et al. A review of open defecation (OD) in Indonesia and the control with logic model. Malaysian J Med Heal Sci. 2022; 18 (2): 157–165.
17. Yolanda K, Katmawanti S, Hapsari A, et al. Literature review: Predisposing, enabling and reinforcing factors that influence community open defecation behavior in Indonesia. In: Proceedings of the International Conference on Sports Science and Health (ICSSH 2022). Atlantis Press International; 2022. p. 88–120. DOI: 10.2991/978-94-6463-072-5_11.
18. Vyas S, Srivastav N, Mary D, et al. Measuring open defecation in India using survey questions: Evidence from a randomised survey experiment. BMJ Open. 2019; 9 (9): e030152. DOI: 10.1136/bmjopen-2019-030152.
19. Jain A, Wagner A, Snell-Rood C, et al. Understanding open defecation in the age of Swachh Bharat Abhiyan: Agency, accountability, and anger in rural Bihar. Int J Environ Res Public Health. 2020; 17 (4): 1384. DOI: 10.3390/ijerph17041384.
20. Friedrich M, Balasundaram T, Muralidharan A, et al. Increasing latrine use in rural Karnataka, India using the risks, attitudes, norms, abilities, and self-regulation approach: A cluster-randomized controlled trial. Sci Total Environ. 2020: 707: 135366. DOI: 10.1016/j.scitotenv.2019.135366.
21. Harter M, Mosch S, Mosler HJ. How does community-led total sanitation (CLTS) affect latrine ownership? A quantitative case study from Mozambique. BMC Public Health. 2018; 18 (1): 387. DOI: 10.1186/s12889-018-5287-y.
22. Tumwebaze IK, Mosler HJ. Effectiveness of group discussions and commitment in improving cleaning behaviour of shared sanitation users in Kampala, Uganda slums. Soc Sci Med. 2015; 147: 72–79. DOI: 10.1016/j.socscimed.2015.10.059.
23. Golla EB, Gelgelu TB, Adane MD, et al. Latrine utilization and associated factors among rural households in Southwest Ethiopia: Risk, attitude, norms, ability, and self-regulation behavioral model. Environ Health Insights. 2023; 17: 11786302231163956. DOI: 10.1177/11786302231163956.
24. Roebianto A, Savitri SI, Suciyana A, et al. Content validity: Definition and procedure of content validation in psychological research. Test Psychom Method Appl Psychol. 2023; 30: 5-18. DOI: 10.4473/TPM30.1.1.
25. Abdullah L, Jusoh Z. Validating content of sentence variety checklist for ESL writing. Int J Acad Res Progress Educ Dev. 2017; 6 (3): 81–91. DOI: 10.6007/IJARPED/v6-i3/3164.
26. Yusoff MSB. ABC of content validation and content validity index calculation. Educ Med J. 2019; 11 (2): 49–54. DOI: 10.21315/eimj2019.11.2.6.
27. Said NAM, Bujang SM, Buang NA, et al. Critical thinking transfer practice instrument: A content validity calculation steps based on expert panel evaluation. Educ Med J. 2022; 14 (3): 61–74. DOI: 10.21315/eimj2022.14.3.5.
28. Alemu F, Kumie A, Medhin G, et al. The role of psychological factors in predicting latrine ownership and consistent latrine use in rural Ethiopia: A cross-sectional study. BMC Public Health. 2018; 18: 229. DOI: 10.1186/s12889-018-5143-0.
29. Ersche KD, Lim TV, Ward LHE, et al. Creature of habit: A self-report measure of habitual routines and automatic tendencies in everyday life. Pers Individ Dif. 2017; 116: 73–85. DOI: 10.1016/j.paid.2017.04.024.
30. Persada SF, Miraja BA, Prasetya P, et al. Understanding Indonesian citizen's intentions to take personal protective measures and follow a stay-at-home order to limit the spread of COVID-19. Humanit Soc Sci Rev. 2020; 8 (5): 158–168. DOI: 10.18510/hssr.2020.8515.
31. Setyoadi S, Kartika AW, Hayati YS, et al. Community empowerment program to increase individual empowerment of cadres in stunting prevention. J Aisyah J Ilmu Kesehat. 2023; 8 (2): 1097–1104. DOI: 10.30604/jika.v8i3.2069.
32. Wagiono F, Shaddiq S, Junaidy J, et al. Community habits in floating houses (lanting) in utilizing the river as an shower, wash, and toilet (MCK) facility in the S. Parman down area neighborhood 01 Hamlet XVII Palangka Raya. JED J Etika Demokr. 2022; 7 (1): 109–121. DOI: 10.26618/jed.v7i1.6770.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 5

7-31-2025

Contribution of National Health Insurance Patient Revenue to Financial Performance of Private-Profit Hospitals from 2017 to 2022

Fadlul Imansyah
Universitas Indonesia, Depok, fadlul.imansyah81@ui.ac.id

Amal Chalik Sjaaf
Universitas Indonesia, Depok, amalc@ui.ac.id

Mardiati Nadjib
Universitas Indonesia, Depok, mardiatinadjib@gmail.com

Rina Hartini
Universitas Indonesia, Depok, rina.hartini@akuntansi.pnj.ac.id

Recommended Citation

Imansyah F , Sjaaf AC , Nadjib M , et al. Contribution of National Health Insurance Patient Revenue to Financial Performance of Private-Profit Hospitals from 2017 to 2022. *Kesmas*. 2025; 20(5): 37-46
DOI: 10.7454/kesmas.v20isp1.2078
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/5

Imansyah *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 37-46
DOI: 10.7454/kesmas.v20isp1.2078

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Contribution of National Health Insurance Patient Revenue to Financial Performance of Private-Profit Hospitals from 2017 to 2022

Fadlul Imansyah[1*], Amal Chalik Sjaaf[2], Mardiati Nadjib[2], Rina Hartini[2]

[1]Doctoral Program, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia
[2]Department of Health Administration and Policy, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

Abstract

This study investigated the relationship between National Health Insurance (NHI) patient revenue and profit-private hospital financial performance in Indonesia. As the NHI provider, *Badan Penyelenggara Jaminan Sosial* (BPJS) Healthcare Security's influence on hospital revenues has raised concerns about its impact on financial sustainability. This study used financial performance indicators to develop a financial performance index—Return on Assets (ROA), Return on Equity (ROE), Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) Margin, Current Ratio, and Net Profit Margin (NPM)—to assess the financial impact of BPJS Healthcare Security revenue. A partial model approach of multiple linear regression was employed using secondary data from seven private-profit hospitals listed on the Indonesian Stock Exchange from 2017 to 2022. The findings indicated a negative correlation between BPJS Healthcare Security patient revenue and the hospital financial performance index. Specifically, higher patient revenue correlated with lower performance across key financial indicators, including ROA, ROE, EBITDA Margin, Current Ratio, and NPM. It was essential for hospitals but not necessarily to improve their financial health performance. Hospitals need to optimize their revenue mix and explore alternative financial strategies to enhance performance.

Keywords: BPJS Healthcare Security, hospital financial performance, National Health Insurance, Private-Profit Hospital, Universal Health Coverage

Introduction

The impact of the coronavirus disease 2019 (COVID-19) pandemic, both nationally and internationally, demonstrates the importance of the country's strengthening of the health system by accelerating efforts for Universal Health Coverage (UHC).[1] According to the World Health Organization (WHO), UHC is a policy principle aimed at providing equal access to affordable and quality health services for the entire population of a country.[2] The goal of UHC is to provide all individuals with access to essential, adequate, and timely health services without causing financial difficulties.[3-5] The Indonesian Government established the Social Security Administrative Body/*Badan Penyelenggara Jaminan Sosial* (BPJS) under Law Number 24 of 2011 and BPJS Healthcare Security to specifically manage social security in health.[6] The National Health Insurance (NHI) program administered by BPJS Healthcare Security based on Presidential Regulation Number 12 of 2013 Article 6 Paragraph 1 requires all Indonesians to participate in the UHC target by 2019.[7]

BPJS Healthcare Security ensures that participants receive basic health benefits and protection.[8] A total of 95.75% of the Indonesian population has registered as BPJS Healthcare Security participants, with a total of 606.7 million patients visiting and using the healthcare facilities by the end of 2023.[9] The average daily usage of participants who benefited from BPJS Healthcare Security healthcare services provided by hospitals, clinics, and others during the year 2023 is 1.6 million people per day, indicating Indonesia's steady efforts in expanding the coverage of health insurance.[9] More than 2,300 hospitals in Indonesia (1,700 of them are private hospitals) receive patients funded by NHI.[7] Generally, NHI pays for primary health care through capitation. In contrast, hospital care is paid based on diagnostic codes.[10] The combination of low premiums and extensive coverage has resulted in annual deficits since the start of the program. The accumulated deficit reached IDR 51 trillion (USD 3.7 billion) by the end of 2019.[7]

***Correspondence**:* *Fadlul Imansyah, Doctoral Program, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia. Email: fadlul.imansyah81@ui.ac.id.*

Received : August 14, 2024
Accepted : December 13, 2024
Published: July 31, 2025

The implementation of NHI in hospitals greatly impacts the hospital's income, contributing to higher hospital revenue as more patients use these services.[11] For example, a public hospital in South Sulawesi has more than doubled its hospital income from 2014 to 2022.[11] Hospitals must continue to exist, develop, and be able to provide quality health services at affordable prices for the community.[12] The ability of hospitals to develop can be evaluated through their financial performance. Hospital financial performance can be measured by various indicators, such as profitability, liquidity, or combined size (combining several indicators).[13]

Several studies above examine the impact of health insurance on hospital financial performance, but there is no consensus on the relationship. Many empirical studies analyze the relationship between health insurance patients income and economic performance, resulting in valuable, reference-worthy research conclusions. However, regarding the content and perspective of the research, existing studies still show the following shortcomings.

First, although most of the literature shows the positive impact of health insurance on economic performance, researchers in various research contexts also highlighted a negative or unrelated relationship between the two. These contradictory relationships hinder the direct application of current research findings in the development of the health system. Therefore, further exploration is needed to better understand the impact of health insurance patients income on the financial performance of private hospitals.

With the rapid evolution of the health system, the relationship between health insurance and financial performance has become one of the trending topics in the field of public health. In particular, it has a significant impact on the sustainable progress of the health system of a country or region, the well-being of its people, and the economy as a whole. Therefore, exploring the relationship between health insurance patients income and financial performance has significant practical contributions to building and improving national social healthcare services.

The financial reports of several hospitals whose shares are listed on the Indonesia Stock Exchange[14] show that there has been a decline in cash flow throughout a certain period, along with the accumulation of deficits in NHI funds. Even this decline in cash flow in several hospitals has touched negative numbers. This condition indicates that the hospital does not have sufficient cash availability to finance its operational activities or is known as experiencing liquidity difficulties.

This study aimed to examine the contribution of NHI patient revenue to the financial performance of private hospitals. There are at least two main aspects that are rarely studied in the context of national social healthcare services in Indonesia. First, a comprehensive analysis of the financial condition of hospitals related to the NHI program. Second, the quality of hospital services and their relationship to financial performance should be evaluated, especially in the context of the implementation of the NHI program, which aims to improve access to and quality of health services in Indonesia. This study provided a deeper understanding of the factors influencing the financial performance of hospitals under the influence of the NHI program but also provided new insights into how financial performance was related to the quality of services provided to NHI program participants.

Method

The general objective of this study was to determine the impact of implementing the NHI program on the financial performance of private hospitals as measured by liquidity and profitability ratios. These financial ratios will be calculated throughout the implementation period of the NHI program by BPJS Healthcare Security for six years running from 2017 to 2022. This study also wanted to see whether each financial ratio was related to each other. Furthermore, this study also examined the implementation of the NHI program related to the financial performance of each type of hospital based on its characteristics, including business models that have sources of income from NHI and non-NHI patient participants. Based on these considerations, a research framework was made (Figure 1).

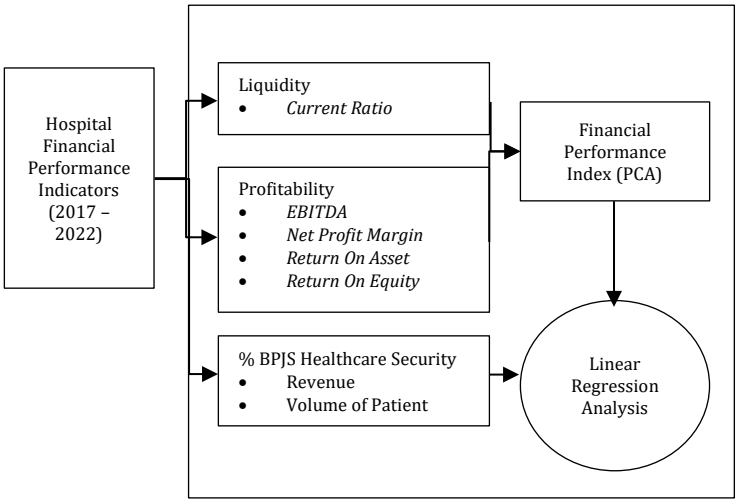

Figure 1. Research Framework

The formulation of the research model to see the relationship between the implementation of the NHI program and the financial performance of private hospitals can be explained as follows:

General Model

Y_1 = $a + b_1 X_1 + e$

Y_1 = Financial Performance

a = constant

b_1 = coefficient

X_1 = BPJS Healthcare Security Patients Contribution to Revenue

Partial Hospital Model

Y_{ij} = $a + b_1 X_1 + e$

Y_{ij} = Return On Asset; Return On Equity, EBITDA Margin; Current Ratio; Net Profit Margin, at: Hospital A, B, C

a = constant

b_3 = coefficient

X_1 = BPJS Healthcare Security Patients Contribution to Revenue

Partial Model

Y_{1t} = $a + b_{1t} X_{1t} + e$

Y_{1t} = Return On Asset; Return On Equity; EBITDA Margin; Net Profit Margin; Current Ratio

a = constant

b_{1t} = coefficient

X_{1t} = BPJS Healthcare Security Patients Contribution to Revenue

Y_{kl} = $a + b_2 X_2 + e$

Y_{kl} = Return On Asset; Return On Equity, EBITDA Margin; Current Ratio; Net Profit Margin, at: Hospital A, B, C

a = constant

b_2 = coefficient

X_2 = BPJS Healthcare Securtity Patients Contribution to Total Number of Patients

The use of Return on Assets (ROA), Return on Equity (ROE), Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) Margin, Current Ratio, and Net Profit Margin (NPM), and as representations of each liquidity ratio and profitability in modeling as an assessment of hospital financial performance was carried out, considering that these ratios were the most widely used in several previous studies.[13,15,16] It was expected that through modeling the four aspects of financial performance assessment, it could be seen how the relationship between the implementation of the NHI program was based on a combination of income sources for each type of hospital ownership.

Based on each financial annual report (including Balance Sheet and Income Statement), this study concentrated on seven publicly listed private-profit hospitals in the Indonesia Stock Exchange that were linked and had already become BPJS Healthcare Security providers for six years, from 2017 to the end of 2022. The observation period of six years was chosen not only to capture the period of COVID-19 and non-COVID-19 but also to gather more data on private-profit hospitals as before 2017, and fewer financial annual reports could be achieved.

The data were extracted from the Indonesia Stock Exchange's official website.[14] This study only selected private instead of public or government hospitals because of the need to purify the hospitals' self-financing capability apart from government or municipal budget support. These hospitals can be found in several Indonesian cities/districts, although the data used for this research only focused on their consolidated financial statements since most of them were not issued based on the hospital unit level. These publicly traded companies' reasonably accessible financial disclosures serve as the foundation for sampling hospitals (Hospital C, Hospital H, Hospital M, Hospital P, Hospital S, Hospital O, and Hospital J) within their purview.

Results

Impact of BPJS Healthcare Security Revenue Contribution on Financial Performance Index

The impact of BPJS Healthcare Security revenue contribution on the financial performance index of hospitals is highlighted in Table 1, presenting the results of a regression model analysis. The table shows a coefficient of -0.837, which indicates the significant negative relationship between BPJS Healthcare Security revenue contribution and hospital financial performance index, developed from the combination of ROA, ROE, EBITDA Margin, Current Ratio, and NPM ratios. Increased BPJS Healthcare Security revenue tended to lower these metrics, suggesting that heavy reliance on BPJS Healthcare Security may strain hospital finances. These results highlighted the need for hospitals to diversify revenue sources to ensure financial stability.

Table 1. Regression Model Revenue Contribution and Financial Performance Index

Variables	Coefficient	t-statistic	Prob.	Results
BPJS Healthcare Security	-0.837	-7.436	<0.001	Significant (p-value <0.001)
Constant (C)	0.752	10.504	<0.001	Significant (p-value <0.001)
R-squared	69.67%			
Adjusted R-squared	66.64%			
F-statistic	22.971			
Prob (F-statistic)	<0.001			

The regression test results of Model 1 showed a significant negative correlation between BPJS Healthcare Security's revenue contribution to the financial performance index, with a coefficient of -0.837 and a t-statistic of -7.436, as well as significant probability (p-value <0.001). These results suggested that increasing BPJS Healthcare Security revenue negatively affected hospital financial performance. Furthermore, the constant (C) was also significant, with a factor of 0.752 and a t-statistic of 10.504 (p-value <0.001). The R-squared rate of 69.67% and the adjusted R-squared of 66.64% indicated that this model effectively explained most variations in hospital financial performance. Significant F-statistic (p-value <0.001) also affirmed model compatibility in explaining the relationship between independent and dependent variables.

Financial Performance Index = 0.752 - 0.837 BPJS Healthcare Security Patients Revenue Contribution

The General Model by Separating High and Low Financial Performance Indicators

In Principal Component Analysis (PCA), hospital financial performance indicators were grouped by loading factor values. First, financial performance indicators with loading factors values above 0.50, including ROE, EBITDA Margin, and NPM. Second, financial performance indicators, such as ROA and Current Ratio, with loading factor values below 0.50. This distinction allowed for a more precise analysis of each indicator's impact on hospital financial performance, aiding in better decision-making and strategy development. Table 2 examines the impact of the income contribution of BPJS Healthcare Security on the three financial performance indicators of the company's ROE, EBITDA Margin, and NPM by separating the indicator of high financial performance, as well as companies that have lower financial performance indicators such as ROA and Current Ratio.

From the regression results in Table 2, the BPJS Healthcare Security variable has a coefficient of -0.771 with a t-statistic of -3.825 and a probability of 0.003, indicating a negative correlation between BPJS Healthcare Security patients income and high financial performance indicators like ROE, EBITDA Margin, and NPM. These results suggested that increased BPJS Healthcare Security patients revenue tended to reduce these performance metrics. The constant variable (C) in the model showed a coefficient of 0.407 with a t-statistic of 9.229 and a probability of <0.001, suggesting that this variable was statistically significant towards high financial performance.

In terms of goodness-of-fit, an Adjusted R-squared score of 55.3% indicated that the model could explain about 55.3% variation of the observed high financial performance indicators (ROE, EBITDA Margin, and NPM). An F-statistic of 14.634 with a probability of 0.003 indicated that the overall model was statistically significant. These results indicated that BPJS Healthcare Security patients income significantly impacted financial performance, suggesting that companies should manage BPJS Healthcare Security patients contributions to improve ROE, EBITDA Margin, and NPM.

Table 2. Regression Model of High and Low Loading Factors

Variable*	Coefficient	t-Statistic	Prob.	Results
BPJS Healthcare Security	-0.771	-3.825	0.003	Significant
Constant (C)	0.407	9.229	<0.001	Significant
R-squared	59.4%			
Adjusted R-squared	55.3%			
F-statistic	14.634			
Prob (F-statistic)	0.003			
Variable**	**Coefficient**	**t-Statistic**	**Prob.**	**Results**
BPJS Healthcare Security	-0.799	4.321	0.002	Significant
Constant (C)	1.164	9.431	<0.001	Significant
R-squared				
Adjusted R-squared	63.8%			
F-statistic	60.2%			
Prob (F-statistic)	17.645			

*ROE, EBITDA Margin, NPM
**ROA, Current Ratio

Table 2 also shows that BPJS Healthcare Security patients income significantly affects low-performance indicators ROA and Current Ratio. Regression analysis reveals that the greater the revenue contribution from BPJS Healthcare Security, the lower the ROA and Current Ratio values of the company. The BPJS Healthcare Security variable had a coefficient of -0.799 with a t-statistic of 4.321 and a probability of 0.002. The negative coefficient (-0.799) indicated a negative correlation between the contribution of BPJS Healthcare Security patients income and the two indicators of performance, meaning higher BPJS Healthcare Security patients revenue leads to lower ROA and Current Ratio values. The analysis results also showed that the constant variable coefficient (C) was 1.164 with a t-statistic of 9.431 and a probability of 0.000, indicating strong statistical significance to the three performance indicators.

An adjusted R-squared value of 63.8% suggested that the model can explain most of the variations of the two dependent variables (ROA and Current Ratio). An F-statistic of 60.2% with a probability of 17.645% confirms the model's statistical significance. Overall, the analysis suggested that BPJS Healthcare Security patients income significantly impacted financial performance, with a negative relationship to ROA and Current Ratio. The statistical significance of these results suggested that these negative impacts were not coincidental and had consistency throughout the sample analyzed. Thus, this model provides an understanding that the management of revenues from BPJS Healthcare Security is crucial. The findings highlighted the need for effective strategies in managing BPJS Healthcare Security patients revenue to improve or maintain corporate financial performance.

Partial Model Revenue Contribution and Financial Performance Indicators

The partial model examining the impact of BPJS Healthcare Security revenue contribution on financial performance indicators provided detailed insights into how BPJS Healthcare Security patients income affected various aspects of a hospital's financial health. The model used regression analysis to identify the relationship between BPJS Healthcare Security patients revenue contribution and each financial performance indicator (ROA, ROE, EBITDA Margin, Current Ratio, and NPM).

Table 3 presents the results of the partial model analyzing the impact of revenue contribution from BPJS Healthcare Security on various financial performance indicators: ROA, ROE, EBITDA Margin, Current Ratio, and NPM. Table 3 details the coefficients, t-statistics, and probability values for each indicator. For ROA, the constant term was 0.169 with a t-statistic of 6.899 and a probability of <0.001, indicating strong significance. The revenue contribution had a negative coefficient of -0.202 with a t-statistic of -3.253 and a probability of 0.008, showing a significant negative impact on ROA. For ROE, the constant term was 0.148 with a t-statistic of 7.643 and a probability of <0.001, indicating strong significance. The revenue contribution had a negative coefficient of -0.169 with a t-statistic of -3.433 and a probability of 0.006, indicating a significant negative impact on ROE. For the EBITDA Margin, the constant term was 0.337 with a t-statistic of 9.761 and a probability of <0.001, showing strong significance.

The revenue contribution had a negative coefficient of -0.345 with a t-statistic of -3.930 and a probability of 0.002, indicating a significant negative impact on the EBITDA Margin. For the Current Ratio, the constant term was 6.051 with

a t-statistic of 9.163 and a probability of <0.001, indicating strong significance. The revenue contribution had a negative coefficient of -6.844 with a t-statistic of -4.079 and a probability of 0.002, indicating a significant negative impact on the Current Ratio. For NPM, the constant term was 0.255 with a t-statistic of 9.188 and a probability of <0.001, indicating strong significance. The revenue contribution had a negative coefficient of -0.266 with a t-statistic of -3.773 and a probability of 0.003, indicating a significant negative impact on NPM. Overall, the results demonstrated that an increase in BPJS Healthcare Security patients revenue contribution significantly and negatively affected all the analyzed financial performance indicators, suggesting that higher BPJS Healthcare Security patients revenue can deteriorate the financial health of hospitals.

Table 3. Partial Model of Revenue Contribution and Return on Assets, Return On Equity, EBITDA Margin, Current Ratio, and Net Profit Margin

Dependent	Independent	Coeff.	t-stat	Prob.
ROA	(Constant)	0.169	6.899	<0.001
	BPJS Healthcare Security revenue contribution	-0.202	-3.253	0.008
ROE	(Constant)	0.148	7.643	<0.001
	BPJS Healthcare Security revenue contribution	-0.169	-3.433	0.006
EBITDA Margin	(Constant)	0.337	9.761	<0.001
	BPJS Healthcare Security revenue contribution	-0.345	-3.930	0.002
Current Ratio	(Constant)	6.051	9.163	<0.001
	BPJS Healthcare Security revenue contribution	-6.844	-4.079	0.002
NPM	(Constant)	0.255	9.188	<0.001
	BPJS Healthcare Security revenue contribution	-0.266	-3.773	0.003

Notes: ROA = Return on Assets, BPJS = *Badan Penyelenggara Jaminan Sosial*/Social Security Administrative Body,
ROE = Return on Equity, NPM = Net Profi Margin.

Development of Partial Regression Model 1 Contribution of Income and Financial Performance

Partial Regression Model 1 analyzed how revenue sources, including BPJS Healthcare Security contributions, affect financial metrics like ROA, ROE, EBITDA Margin, Current Ratio, and NPM. By measuring these effects through regression analysis, the model helps organizations understand the impact of different revenue streams on financial performance, aiding in optimizing revenue strategies and enhancing profitability and operational efficiency.

Table 4. Partial Regression Model 1 Contribution of Income and Financial Performance

Dependent	Independent	Hospital M		Hospital P	
		Coeff.	Prob.	Coeff.	Prob.
ROA	(Constant)	0.170	0.006	0.055	0.155
	BPJS Healthcare Security revenue contribution	0.065	0.824	-0.029	0.647
ROE	(Constant)	0.144	0.006	0.170	0.006
	BPJS Healthcare Security revenue contribution	0.087	0.725	-0.037	0.486
EBITDA MARGIN	(Constant)	0.346	0.001	0.174	0.025
	BPJS Healthcare Security revenue contribution	-0.030	0.924	-0.095	0.354
CURRENT RATIO	(Constant)	8.863	0.001	3.755	0.018
	BPJS Healthcare Security revenue contribution	**-28.710**	**0.032**	-3.105	0.155
NPM	(Constant)	**0.261**	**0.002**	0.132	0.035
	BPJS Healthcare Security revenue contribution	-0.017	0.962	-0.078	0.371

Notes: ROA = Return on Assets, BPJS = *Badan Penyelenggara Jaminan Sosial*/Social Security Administrative Body,
ROE = Return on Equity, NPM = Net Profit Margin.

Table 4 shows the results of Partial Regression Model 1, analyzing the impact of revenue contributions, including BPJS Healthcare Security, on financial performance metrics for Hospital P and Hospital M. These two hospitals had the most completed data in terms of BPJS Healthcare Security patients revenue contribution among the sample. The findings showed that the coefficients associated with revenue contribution generally showed non-significant p-values, indicating that revenue contributions generally did not significantly affect ROA, ROE, EBITDA Margin, Current Ratio, and NPM in either group. However, the current ratio in Hospital M exhibits a marginally significant negative association with revenue contribution, suggesting a potential challenge in maintaining liquidity. These results suggested that while BPJS Healthcare Security patients and other income sources influence financial metrics, other factors may have a more significant impact on financial performance. Further investigation is needed to better understand these dynamics and improve financial health and operational efficiency in healthcare organizations.

Development of Partial Regression Model 2 Contribution of Income and Total Patient Volume

Partial Regression Model 2 analyzed how BPJS Healthcare Security patients income and patient volume impact key financial metrics like ROA, ROE, EBITDA Margin, Current Ratio, and NPM. This analysis helped healthcare providers understand the effects of revenue and patient volume on financial performance, guiding strategies for better revenue management, patient care, and operational efficiency to improve financial sustainability and service effectiveness. Table 5 presents the results from Partial Regression Model 2, investigating the correlation of BPJS Healthcare Security contribution based on total patient volume on financial performance metrics across three hospitals: M, C, and H. These three hospitals had the most completed data in terms of BPJS Healthcare Security contribution based on total patient volume among the sample. In Hospital M, the constant coefficient for ROA was 0.494, with a p-value of 0.265, indicating non-significance. The combined coefficient for revenue contribution and total patient volume was -0.569, with a p-value of 0.428, which was also non-significant. Similar non-significant results were observed in Hospitals C and H. Across all hospitals, the constant coefficients were 0.176 (Hospital M), -0.165 (Hospital C), and 0.176 (Hospital H), all with non-significant p-values. The coefficients for revenue contribution and total patient volume were also non-significant, indicating no significant impact on ROE.

Table 5. Partial Regression Model 2 Revenue Contribution and Total Patient Volume

Dependent	Independent	Hospital M		Hospital C		Hospital H	
		Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
ROA	(Constant)	0.494	0.265	-1.035	0.777	0.494	0.265
	BPJS Healthcare Security contribution based on total patient volume	-0.569	0.428	1.565	0.778	-0.569	0.428
ROE	(Constant)	0.176	0.491	-0.165	0.134	0.176	0.491
	BPJS Healthcare Security contribution based on total patient volume	-0.155	0.713	0.223	0.170	-0.155	0.713
EBITDA MARGIN	(Constant)	0.330	0.000	-1.216	0.256	0.247	0.509
	BPJS Healthcare Security contribution based on total patient volume	0.045	0.653	1.567	0.322	0.030	0.961
CURRENT RATIO	(Constant)	8.745	0.000	-55.394	0.088	-0.005	0.998
	BPJS Healthcare Security contribution based on total patient volume	**-10.460**	**0.003***	**94.546**	**0.064***	2.073	0.578
NPM	(Constant)	**0.244**	**0.002**	-1.349	0.218	0.109	0.749
	BPJS Healthcare Security contribution based on total patient volume	0.055	0.620	1.756	0.277	0.004	0.995

Notes: ROA = Return on Assets, BPJS = *Badan Penyelenggara Jaminan Sosial*/Social Security Administrative Body,
ROE = Return on Equity, NPM = Net Profit Margin.

Hospital M showed a significant constant coefficient of 0.330 for the EBITDA Margin with a p-value of <0.001, suggesting a baseline level. The coefficient for revenue contribution and total patient volume was 0.045, with a non-significant p-value of 0.653. Similar non-significant results were found in Hospitals C and H. Hospitals M and C displayed significant constant coefficients (8.745 and -55.394, respectively), indicating varying baseline Current Ratios. Notably, Hospital M showed a significant negative coefficient of -10.460 for revenue contribution and total patient volume (p-value = 0.003), suggesting a negative impact on the Current Ratio. Hospitals C and H exhibited non-significant coefficients for this relationship. Hospital M and H demonstrated significant constant coefficients (0.244 and 0.109, respectively) for NPM. The coefficients for revenue contribution and total patient volume were non-significant across all groups, indicating no significant impact on NPM.

The findings suggested that revenue contribution and patient volume did not significantly affect ROA, ROE, EBITDA Margin, or NPM in the analyzed hospitals. However, increased revenue and patient volume negatively impacted the Current Ratio in MIKA, indicating potential liquidity issues. These results highlighted the complexity of financial performance in healthcare, suggesting a need for further investigation into operational efficiencies and financial management practices.

Discussion

Although NHI implementation in hospitals greatly impacts the hospital's income, the model analysis revealed a significant negative impact on the hospital financial performance index from BPJS Healthcare Security patients. This condition implied that the increase in revenue from BPJS Healthcare Security patients did not positively correlate to hospital financial performance. The coefficient of determination indicated that BPJS Healthcare Security patients' revenue accounted for a substantial portion of the variability in hospital financial performance. However, residual variables suggested that other factors beyond the model's scope influence hospital financial performance.

Utilizing a model that identified high and low loading factors also yielded results consistent with a negative and significant impact on the contribution of BPJS Healthcare Security earnings to the hospital financial performance index. Even if the contribution of BPJS Healthcare Security patients was largely a significant factor in explaining variations, there were a significant number of variables that the aforementioned factor cannot explain. Further analysis is needed to fully understand other factors affecting hospital financial performance.

The partial model delineated the impact of BPJS Healthcare Security patients' revenue contribution on various financial performance indicators. The overall model probability indicated a significant influence, with a probability value of less than 5%. In general, the contribution from BPJS Healthcare Security patients showed a significant negative effect on several hospital financial performance indicators, including ROA, ROE, EBITDA Margin, Current Ratio, and NPM. The largest coefficients influencing revenue contribution from BPJS Healthcare Security patients were the Current Ratio, EBITDA Margin, NPM, ROA, and ROE, in descending order of magnitude.

The findings highlighted the complexity of the relationship between financial performance, service quality, and patient revenue contribution of hospitals that serve participants in the NHI Program. This condition emphasized the need for a holistic and integrated approach in hospital management, where financial, operational, and service factors are interrelated and influence each other. To gain a deeper understanding of the factors that influence financial performance, further research can be conducted by involving further analysis of the relationship between NHI patient contributions, financial performance, and service quality, as well as other factors that may influence these dynamics assuming the availability of more complete, accurate and accountable data.

The analysis revealed that revenue contributions from BPJS Healthcare Security patients significantly impacted hospital financial performance. These results suggested that increases in revenue from BPJS Healthcare Security patients did not improve financial performance but rather led to a decline. In brief, the increase in BPJS Healthcare Security patients does not directly contribute positively to hospital financial performance.

The development of the partial model in Model 1 highlighted that among two hospitals with data on BPJS revenue, only Hospital M had a significant negative relationship between BPJS Healthcare Security patient contributions and the Current Ratio, indicating potential liquidity issues. However, for other hospitals, there was no significant relationship between BPJS Healthcare Security patient contributions and the Current Ratio, possibly due to other influential factors or data limitations. This result highlighted the complexity of analyzing hospital financial performance and the need for detailed and accurate data.

The development of partial hospital models in Model 2 indicated that out of the three observed hospitals, only two

of them, Hospital M and C, showed a significant relationship between the contribution of BPJS Healthcare Security participants to the total patient volume and the Current Ratio. Hospital M exhibited a significant relationship with a negative regression coefficient. This result signified that when the contribution of NHI participants to the total patient volume increases, Hospital M's Current Ratio tends to decrease. The decrease in the Current Ratio may indicate liquidity issues or financial pressure in managing additional patients from NHI participants.

Hospital C also showed a significant relationship with the Current Ratio but with a positive regression coefficient. This means that when the contribution of NHI participants to the total patient volume increases, Hospital C's Current Ratio tends to increase. This rise in the Current Ratio may indicate improved liquidity or efficiency in managing additional patients from NHI participants. In contrast, another hospital shows no significant relationship, suggesting other factors may be more influential in its financial performance.

The practical implications of this study's findings have significant impacts on hospital management and health policy. First, hospital managers may need to consider the diverse financial conditions. Second, in facing external situations, hospital management must increase flexibility and readiness in responding to changing circumstances that affect financial performance. Third, the finding that the income from BPJS Healthcare Security patient contribution has a negative impact on financial performance shows the importance of evaluation and adjustment in resource management and patient payment policies. Fourth, this study also encourages stakeholders in health policy to pay attention to the financial implications of the national health insurance program and to continue to improve policies that support the sustainability of hospital financial performance.

Meanwhile, the theoretical implications of the findings of this study cover several important aspects in the context of hospital management and health studies. First, the findings highlight the complexity of the relationship between financial performance and patient income contribution in the context of public hospitals serving participants in the National Health Insurance Program. Furthermore, these findings also provide insights into how external conditions can impact hospital financial performance.

Conclusion

Several recommendations can be considered to improve the financial performance of the hospital, especially in the context of services to BPJS Healthcare Security patients. First, hospitals need to conduct an in-depth evaluation of the BPJS Healthcare Security patient admission strategy to ensure that the increase in patient contributions does not have a negative impact on financial performance. This strategy can include proposing adjustments to the BPJS Healthcare Security tariff policy to the government, capacity management, and patient admission strategies to minimize its negative impacts, although the latter is contrary to the concept of UHC. Hospitals also need to develop sustainable business models to ensure that they can continue to operate efficiently and generate sufficient profits to cover operational costs and increase their health service capacity, including diversifying revenue sources, collaborating with other parties, and developing innovations in health services. By implementing these recommendations, it is hoped that hospitals can improve their performance in providing quality and sustainable health services, especially for NHI participants and the entire Indonesian community.

Abbreviations

UHC: Universal Health Coverage; BPJS: *Badan Penyelenggara Jaminan Sosial*/Social Security Administrative Body; NHI: National Health Insurance; ROA: Return on Assets; ROE: Return on Equity; EBITDA: Earnings Before Interest, Taxes, Depreciation, and Amortization; NPM: Net Profil Margin; PCA: Principal Component Analysis.

Ethics Approval and Consent to Participate

This study is unlikely to face ethical issues related to recruitment, gender issues, privacy and confidentiality, subject safety, conflict of interest, vulnerable populations, and security monitoring because this study is a study using financial report data with the unit of analysis being a private hospital unit whose data source is publicly accessible based on ethical approval No.: Ket- 579/UN2.F10.D11/PPM.00.02/2021 released by The Research and Community Engagement Ethical Committee of Faculty of Public Health Universitas Indonesia.

Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Availability of Data and Materials

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

Authors' Contribution

FI designed and performed the experiments, derived the models, analyzed the data, and wrote the manuscript. ACS and MN were involved in planning and supervising the work. FI and RH worked out almost all of the technical details and performed the numerical calculations for the suggested experiment.

Acknowledgment

The authors sincerely thank the editors and reviewers for their insightful recommendations, which made this paper much better. Legal disclaimer: This is an academic research work, and the opinions presented inside do not necessarily represent the opinions of the writers' employers. This document should not be interpreted as financial advice or an investment research report; rather, it is not investment advice.

References

1. Bouzaidi TD, Ragbi A. An analysis of the trend towards universal health coverage and access to healthcare in Morocco. Health Econ Rev. 2024; 14 (1): 1–15. DOI: 10.1186/s13561-023-00477-0.
2. Inter-Parliamentary Union, World Health Organization. The path towards universal health coverage. Geneva: Inter-Parliamentary Union and World Health Organization; 2022.
3. Chaudhuri A, Biswas N, Kumar S, et al. A theory of change roadmap for universal health coverage in India. Front Public Health. 2022; 10: 1040913. DOI: 10.3389/fpubh.2022.1040913.
4. Leadership for Universal Health Coverage. Leadership for universal health coverage program implementation manual: The Leadership Journey Version 3; 2020.
5. World Health Organization, World Bank. Healthy systems for universal health coverage: A joint vision for healthy lives. Washington, DC: World Health Organization, World Bank; 2018.
6. Presiden Republik Indonesia. Undang-Undang Republik Indonesia Nomor 24 Tahun 2011 Tentang Badan Penyelenggara Jaminan Sosial. Jakarta: Pemerintah Pusat; 2011.
7. Pratiwi AB, Setiyaningsih H, Kok MO, et al. Is Indonesia achieving universal health coverage? Secondary analysis of national data on insurance coverage, health spending, and service availability. BMJ Open. 2021; 11 (1): e050565. DOI: 10.1136/bmjopen-2021-050565.
8. Sadiq AR, Hakim A, Haryono BS, et al. Policy Implementation Model of National Health Insurance Through Social Health Insurance Institution (BPJS) in Indonesia. J Law Sustain Develop. 2024; 12 (1): e2448. DOI: 10.55908/sdgs.v12i1.2448.
9. Komariah F. Data 2023, 95 persen masyarakat terdaftar BPJS Kesehatan. Jakarta: Radio Republik Indonesia; 2023.
10. Asyary A. Indonesian primary care through universal health coverage systems: A feeling in bones. Public Health Indonesia. 2018; 4 (3): 138–145. DOI: 10.36685/phi.v4i3.200.
11. Karmilasari, Palutturi S, Darmawansyah, et al. Evaluation of the economic impact of implementing national health insurance (JKN) on hospitals at RSUD Tenriawaru Kab. Bone. Pharmacogn J. 2023; 15 (6): 1156–1162. DOI: 10.5530/pj.2023.15.210.
12. Mongan JJS. Pengaruh pengeluaran pemerintah bidang pendidikan dan kesehatan terhadap indeks pembangunan manusia di Indonesia. Indones Treasury Rev J Perbendaharaan Keuang Negara Kebijak Publik. 2019; 4 (2): 163–176.
13. Dubas-Jakóbczyk K, Ndayishimiye C, Szetela P, et al. Hospitals' financial performance across European countries: A scoping review protocol. BMJ Open. 2024; 14 (1): e077880. DOI: 10.1136/bmjopen-2023-077880.
14. Indonesia Stock Exchange. Financial Statements & Annual Report. Jakarta: Indonesia Stock Exchange; 2022.
15. Dubas-Jakóbczyk K, Kocot E, Kozieł A. Financial performance of public hospitals: A cross-sectional study among Polish providers. Int J Environ Res Public Health. 2020; 17 (7): 2188. DOI: 10.3390/ijerph17072188.
16. Dubas-Jakóbczyk K, Kocot E, Tambor M, et al. The Association Between Hospital Financial Performance and the Quality of Care – A Scoping Literature Review. Int J Health Pol Manag. 2022; 11 (12): 2816–2828. DOI: 10.34172/ijhpm.2022.6957.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 6

7-31-2025

Associated Factors in Willingness to Shift Tobacco Expenditure Into National Health Insurance Premium Among Subsidized Members

Mugi Wahidin
Esa Unggul University, Jakarta, wahids.wgn@gmail.com

Muhammad Agus Mikrajab
National Research and Innovation Agency, Jakarta, naufal0817@yahoo.com

Rozana Ika Agustiya
National Research and Innovation Agency, Jakarta, rozanaika@gmail.com

Veza Azteria
Esa Unggul University, Jakarta, veza.azteria@esaunggul.ac.id

Recommended Citation

Wahidin M , Mikrajab MA , Agustiya RI , et al. Associated Factors in Willingness to Shift Tobacco Expenditure Into National Health Insurance Premium Among Subsidized Members. *Kesmas*. 2025; 20(5): 47-54
DOI: 10.7454/kesmas.v20isp1.1306
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/6

Wahidin *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 47-54
DOI: 10.7454/kesmas.v20isp1.1306

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Associated Factors in Willingness to Shift Tobacco Expenditure Into National Health Insurance Premium Among Subsidized Members

Mugi Wahidin[1,2,3*], Muhammad Agus Mikrajab[2], Rozana Ika Agustiya[2], Veza Azteria[1]

[1]Department of Public Health, Faculty of Health Sciences, Esa Unggul University, Jakarta, Indonesia
[2]National Research and Innovation Agency, Jakarta, Indonesia
[3]Indonesia Epidemiological Association, Jakarta, Indonesia

Abstract

In Indonesia, subsidized members are the largest group in the National Health Insurance program. Hence, it is essential to understand their ability to pay (ATP) based on tobacco expenditure. This study aimed to determine the ATP of subsidized members based on tobacco expenditure and factors associated with their willingness to pay (WTP). This cross-sectional study used secondary data from the National Institute of Health Research and Development. The population included all subsidized members; 19,918 were sampled for ATP, and 14,560 were WTP. The independent t-test, ANOVA, and logistic regression were performed. Results showed that ATP from tobacco expenditure ranged from USD 4 to 4.8, higher than the minimum monthly payment, and WTP ranged from USD 0.1 to 1.2. About 73.6% of respondents preferred to pay less than USD 0.3 as an additional payment, while 3.5% were willing to pay more than USD 1. The ATP was higher than the monthly payment and WTP, but only a few were willing to be non-subsidized members. Factors associated with WTP were sex, age, education level, family member, occupation, expenditure, and history of health facility utilization, implying the subsidized members should be reviewed, especially among smokers.

Keywords: ability to pay, insurance, subsidized member, tobacco, willingness to pay

Introduction

The Indonesian Health Insurance program has been implemented since 2014 and is classified under Law No. 40 of 2004 concerning the National Social Insurance System. This government program was signed and aimed to socially protect all Indonesian citizens through the National Health Insurance (NHI) Scheme, managed by the Social Security Administrative Body/*Badan Penyelenggara Jaminan Sosial* (BPJS).[1] In 2019, 218 million people were registered as NHI members. The most prominent members were subsidized members, who comprised 96 million people, 44% of whom were NHI members. Membership of NHI by the Law consists of subsidized and non-subsidized members.[2]

Although the government pays the insurance premium, the ability to pay (ATP) and willingness to pay (WTP) should be assessed to determine if the membership is appropriate because such a special membership should be prioritized for eligible members with financial difficulty. Through the analysis of ATP, information about their money can be obtained and used as a consideration for additional insurance premiums. Meanwhile, the WTP provides insight into their awareness of paying premiums. Both ATP and WTP are crucial for future membership policy decisions.

The ATP is defined as the ability of a person to pay insurance premiums based on economic conditions counted from non-essential expenditure, such as tobacco expenditure.[3] In other words, ATP is a consideration for paying based on income to buy goods or services. It consists of three groups: non-food, non-essential, and essential expenditures.[3] The calculation of the ATP for health services is based on 5% household expenditure for non-food materials, such as housing and gasoline, and expenditure for non-essentials, such as tobacco, beauty, and ceremony.[4]

A person's WTP is a subjective desire to pay as demanded. Wedgwood stated that WTP is the maximum amount a person would pay for goods or services.[5] Meanwhile, Mankew stated that WTP is the highest price that a person wants

***Correspondence**:* *Mugi Wahidin, Department of Public Health, Faculty of Health Sciences, Esa Unggul University, Jakarta, Indonesia. Email: mugi.wahidin@esaunggul.ac.id, Phone: +6285691650243*

Received : March 7, 2024
Accepted : December 13, 2024
Published: July 31, 2025

to pay.[6] Noor *et al.* argued that WTP mirrors a person's behavior based on the assumption that every household will rationalize to maximize satisfaction and benefit from the resources utilized.[7]

The ATP based on tobacco expenditure in Indonesia, including from the subsidized members segment, is essential information for future membership policy decisions. The reason is that the prevalence of smokers in Indonesia is very high, and this habit leads to chronic diseases with high healthcare costs.[8] According to the 2022 National Socioeconomic Survey, the expenditure on tobacco accounted for 12% of all household expenditures, ranking second after the expenditure for rice/meal. Expenditure from smoking in rural areas was as high as in urban areas.[9]

Moreover, based on the Indonesian Basic Health Research, the number of active smokers in Indonesia reached more than 60 million people, with a prevalence rate of daily smoking of 34.7% in 2007, 36.5% in 2013, and 33.8% in 2018.[10–12] These data indicate that the ATP for health insurance from smoking expenditure is one of the main non-essential expenditures that should be considered when developing future policies of the BPJS membership. Since insurance covers the cost of treatment for chronic diseases, the smoker's ability and WTP are significant information for the government. Furthermore, the factors associated with the WTP will be a source of information to consider when developing appropriate insurance membership policies.

A previous study in Sleman District, Indonesia, showed that age and income level significantly affected WTP.[13] Similarly, a study in Banyumas District, Indonesia, suggested that age and food expenditure were associated with WTP on outpatient rates at the primary health care (PHC).[14] A study in 2018 revealed a consistent trend indicating that the total out-of-pocket health expenses for participants in the subsidized members' program exceeded those of non-participants.[15] Notably, in 2017, subsidized member beneficiaries incurred lower costs in categories such as pharmaceuticals and traditional healthcare providers than their non-beneficiary counterparts.[15] In short, information on the ATP, WTP, and related factors among subsidized members is needed for the evaluation of their membership. Nonetheless, since this information is very limited, this study was aimed to determine the ATP of subsidized members based on tobacco expenditure and factors associated with their willingness to pay (WTP).

Method

This cross-sectional study used secondary data from a 2019 study on ATP and WTP conducted by the National Institute of Health Research and Development (NIHRD) of the Indonesian Ministry of Health. In the parent report, which was a national survey, the analysis involved 12,870 households from all 24 provinces in Indonesia using multistage cluster random sampling. Data was collected using a structured questionnaire developed by the team based on relevant sources tested for validity and reliability. The selected household respondents of the previous survey were all members of NHI.

The inclusion criteria were individuals aged more than 18 years, while the exclusion criteria were those with chronic or mental diseases. The ATP was calculated using monthly tobacco expenditure based on the responses of smoker respondents. Meanwhile, the WTP was determined using the bidding game method. In this approach, the interviewer asked respondents about the highest amount they would pay for the monthly premium, starting with IDR 42,000 (USD 2.57) as the minimum payment, with responses indicating either a higher or lower amount.

This study was carried out in 2019, and its population was all subsidized members of BPJS. The sample was individuals who were selected from a multistage cluster random sampling. In total, 19,918 subsidized members were classified as the ATP sample, and 14,560 of those aged more than 18 years were included as the WTP sample. The sample was estimated to represent the total population by weighting it according to the age and sex distribution of the Indonesian population. After weighting, the ATP sample consisted of 96,487,415 individuals, and the WTP sample consisted of 70,543,860 individuals.

Variables included in this study were ATP and WTP based on tobacco expenditure, as well as the characteristics of the respondents, including sex, age, education level, occupation, utilization of First Level Health Facilities (FLHF) and hospitals, number of family members, and household expenditure. Education level was categorized as uneducated, low (elementary and junior high school), middle (senior high school), and high (university). Occupation was categorized as unemployed (including student and housewife), informal worker (farmer, fisherman, entrepreneur), and formal worker (civil servant, labor/private worker).

The collected data was analyzed using SPSS version 25 (free version). Description analysis assessed the ATP for insurance based on tobacco expenditure, WTP, and respondent characteristics. Comparison analysis was performed to determine the ATP's difference among characteristics using independent t-test (two categories) and ANOVA (more than

two categories). Additionally, bivariate analysis was performed using the Chi-square test to select determinants of WTP. Since all eight variables had p-values of <0.25, they were included in the multivariate analysis. Furthermore, multivariate analysis was also carried out using multiple logistic regression to examine the relationship between age, education, number of family members, occupation, household expenditure, utilization of FLHFs and hospitals, and WTP for an additional premium for social insurance (IDR ≥5,000/USD 0.31).

Results

The sex distribution of respondents in this study was equal. Most of them were in the productive age (18-67 years) (68.6%), had low education (47%), did not work (51.9%), never used a FLHF (69.8%), never been to hospitals (91.3%), had more than three family members (63.2%), and had low family expenses (the highest at quintile 2 for 66.1%). The overall distribution of the respondents is tabulated in Table 1.

Table 1. Distribution of NHI's Subsidized Members

Characteristics	n	%
Sex		
Male	48,360,044	50.1
Female	48,127,371	49.9
Age		
18 years	25,943,555	26.9
18-67 years	66,165,309	68.6
>67 years	4,378,550	4.5
Education level		
Uneducated	12,899,211	13.4
Low	45,329,691	47.0
Middle	36,654,586	38.0
High	1,603,927	1.7
Occupation		
Unemployed	50,030,125	51.9
Formal	4,157,786	4.3
Informal	42,299,504	43.8
Utilization of the First Level Health Facilities		
Never	67,343,296	69.8
Ever	29,144,120	30.2
Utilization of hospitals		
Never	88,110,109	91.3
Ever	8,377,307	8.7
Number of household members		
1-3	35,510,535	36.8
>3	60,976,881	63.2
Household expenditure (quintile)		
1 (lowest)	1,9717,973	20.4
2	2,3140,091	24.0
3	2,2385,358	23.2
4	1,9290,095	20.0
5 (highest)	1,1953,898	12.4

The ATP based on tobacco expenses ranged from IDR 60,821 (USD 4) to IDR 74,396 (USD 4.8). Meanwhile, the subsidized members generally had a WTP (contributive payment) for an average of IDR 1,804 (USD 0.1), with the highest being IDR 19,248 (USD 1.2). The willingness to spend on tobacco was far lower than the ATP (Table 2). For respondents whose contributions were greater than IDR 15,000 (USD 1.0), 13.8% were willing to become independent/non-subsidized, with a WTP average of IDR 32,827 (USD 2.01). However, this figure was still smaller than the ATP from tobacco expenses (IDR 54,498/USD 3.33) (Table 3).

Table 2. Ability to Pay for National Health Insurance Premium Based on Tobacco Expenditure and Willingness to Pay

Increase premium (IDR)	Mean of ability to pay from tobacco expenditure (IDR)	Mean of willingness to pay (IDR)	Population	
			N	%
<5,000	60,821	1,804	44,599,643	73.6
5,001-10,000	65,862	6,129	9,693,966	16.0
10,001-15,000	74,396	10,879	4,155,695	6.9
>15,000	71,432	19,248	2,136,831	3.5
Total			60,586,135	100.0

Note: IDR = Indonesian Rupiah. 1 USD = IDR 16,350

Table 3. Readiness to Change Membership from Subsidized to Non-Subsidized Member Based on Tobacco Expenditure*

Readiness to change to a non-subsidized member	Ability to pay from tobacco expenditure (IDR)	Willingness to Pay (IDR)	Population	
			N	%
Yes	54,498	32,827	295,106	13.8
No	71,433		1,841,725	86.2
Total			2,136,831	100.0

*Subsidized members who were ready to pay more than IDR 15,000 (USD 0.92)

The ATP for the NHI premium varied across respondent characteristics. For instance, men had higher ATP than women, respondents aged below 18 years had higher ATP than those aged 18-67 and over 67 years, individuals with low and middle education had higher ATP, and those who were unemployed had higher ATP than those employed. Regarding FLHF and hospitals, those who never used the facilities had a higher ATP than those who did.

In contrast, the ATP in a group with more than three household members was higher than the opposite. Meanwhile, in terms of household expenditure, the higher the expenditure, the higher the ATP. It is important to note that there was a difference in the mean of ATP between men and women (p-value <0.001), among age groups (p-value <0.001), education levels (p-value = 0.016), several household members (p-value <0.001), and household expenditure (p-value <0.001). However, there was no difference in ATP between occupation (p-value = 0.132), utilization of FLHF (p-value = 0.871), or hospitals (p-value = 0.772) (Table 4).

Table 4. Ability to Pay based on Tobacco Expenditure by Respondents' Characteristics

Characteristic	Ability to Pay NHI Premiums from Tobacco Expenditure (IDR)		p-value
	Mean	SD	
Sex*			<0.001
Male	56,200	86,380	
Female	49,800	83,300	
Age**			<0.001
<18 years	57,700	87,100	
18-67 years	53,100	85,500	
>67 years	23,700	49,730	
Education level**			0.016
Uneducated	49,200	71,000	
Low	53,900	86,360	
Middle	53,300	87,980	
High	44,600	91,140	
Occupation**			0.132
Unemployed	53,600	84,350	
Informal	52,900	87,200	
Formal	47,700	66,920	
Utilization of the First Level Health Facilities*			0.871
Never	53,800	85,290	
Ever	51,100	84,040	
Utilization of hospitals*			0.772
Never	53,200	84,280	
Ever	50,700	91,380	
Number of household members*			<0.001
1-3	41,000	80,360	
>3	59,900	86,670	
Household expenditure (quintile)**			<0.001
1 (lowest)	12,800	23,680	
2	33,000	41,300	
3	51,900	57,510	
4	72,900	71,250	
5 (highest)	119,000	169,100	

Notes: *) Independent t-test, **) ANOVA test, NHI = National Health Insurance, IDR = Indonesian Rupiah, SD = standard deviation. 1 USD = IDR 16,350

Results of the multivariate analysis indicated that sex, age, education level, number of household members, occupation, household expenditure, and utilization of FLHF and hospitals were all associated with the WTP, with a p-value of <0.001. The most influential determinants were the utilization of FLHF, hospitals, and age (Table 5).

Table 5. Factors Influencing Willingness to Pay for Insurance Among Subsidized Members

Variable	Willingness to Pay for IDR ≥5,000/USD 0.31				Adjusted OR	95% CI	p-value
	Yes		No				
	N	%	N	%			
Sex							<0.001
Male	13,786,013	39.5	21,132,383	60.5	0.998	0.997 – 0.999	
Female	13,761,461	38,6	21,864,003	61.4	1		
Age							<0.001
18-67 years	26,007,618	39.3	40,157,692	60.7	1.140	1.137 – 1.142	
>67 years	1,539,856	35.2	2,838,694	64.8	1		
Education level							<0.001
Uneducated	1,627,432	35.5	2,951,445	64.5	1		
Low	1,825,143	38.9	28,884,430	61.1	0.882	0.880 – 0.884	
Middle	6,986,176	40.0	10,463,935	60.0	0.847	0.845 – 0.849	
High	681,723	42.7	916,577	57.3	0.751	0.748 – 0.754	
Occupation							<0.001
Unemployed	9,438,551	38.5	15,083,437	61.5	1		
Informal	16,482,800	39.3	25,451,468	60.7	0.988	0.987 – 0.990	
Formal	1,626,122	39.8	2,461,481	60.2	1.018	1.016 – 1.020	
Utilization of the First Level Health Facilities							<0.001
Never	19,616,846	40.7	28,596,402	59.3	1.212	1.211 – 1.213	
Ever	7,930,628	35.5	14,399,984	64.5	1		
Utilization of hospitals							<0.001
Never	25,062,671	39.5	38,423,064	60.5	1.123	1.121 – 1.125	
Ever	2,484,803	34.7	4,672,322	65.3	1		
Number of household members							<0.001
1-3	12,127,121	39.2	18,787,220	60.8	1.036	1.035 – 1.-38	
>3	15,420,353	38.9	24,209,166	61.1	1		
Household expenditure (quintile)							<0.001
1 (lowest)	6,224,760	38.1	10,105,841	61.9	1		
2	7,075,667	41.2	10.091.538	58.8	0.893	0.892 – 0.894	
3	5,985,737	38.1	9,724,668	61.9	1.009	1.008 – 1.011	
4	5,139,143	39.2	7,962,304	60.8	0.964	0.962 – 0.965	
5 (highest)	3,122,167	37.9	5,112,034	62.1	1.017	1.015 – 1.019	

Note: IDR = Indonesian Rupiah, USD = United States Dollar, OR = odds ratio, CI = confidence interval

Discussion

Sociodemographic characteristics (sex, age, education level, occupation, utilization of the First Level of Health Facilities and hospitals, number of household members, and household expenditures) are important for policymakers when reviewing the status of subsidized membership. As for most members of the productive age, this group could be educated to secure jobs and a stable income, allowing them to become independent members. The low level of education indicated that the government should develop an insurance education program that can cater to the needs of this group. In addition, the public's literacy needs to be improved to make them realize that, instead of spending on tobacco, the money could be set aside to pay the premiums.

Regarding occupation, most of the subsidized members were unemployed. The government needs to create more initiatives and job opportunities to improve the overall well-being of society. Interestingly, 4.3% of the subsidized members had formal work, which is essential information, as many others do not. It is important to remember that subsidized membership was developed especially for someone without a regular income. Meanwhile, most respondents still need to access the health facility, indicating that the socialization of health access should be enhanced. On top of that, the burden of family is also an issue that needs prompt solutions. This study showed that the ATP based on tobacco expenditure ranged from IDR 60,821 (USD 4.0) to IDR 74,396 (USD 4.8). In comparison, the willingness to contribute to insurance premiums was between IDR 1,804 (USD 0.1) and IDR 19,248 (USD 1.2). In other words, the willingness to spend on tobacco was far lower than that of the ATP.

A study on the impact of smoking on personal and household expenditures showed that 75% of rural moderate/heavy smokers admitted that their expenditure on smoking affected their ATP for other things, compared to 45% of urban workers and 61% of migrants. The three significant specific spending cited were health care (51%), savings (45%), and purchasing of large household items (42%).[16] This ATP result indicates an opportunity for additional payment

(contributions) from subsidized members. This is important information for increasing BPJS finances and maintaining health services. All categories of respondents were found to have the capacity to pay more than IDR 60.000 for tobacco expenses, which is higher than the 3rd class premium of IDR 42.000 (USD 2.57).[17] Thus, it can be surmised that these respondents should not be included in the subsidized category due to their ATP. Currently, the number of subsidized members in Indonesia is estimated to be around 120 million people, or 46% of the total population in Indonesia.[2] This is a considerable number, even though subsidized members can actually pay for the insurance. Therefore, the membership data needs to be rechecked, especially in Indonesia, where the expenditure on tobacco is 12%, the second highest after rice.[9]

According to Government Regulation No. 76 of 2015, mandating that subsidized members are not allowed to contribute or share costs.[18] Meanwhile, the results of this study indicated that the subsidized members are not on target because they can pay the premium when the tobacco expenses are put aside. A previous study showed that the respondents still experienced additional treatment costs.[19] This study showed that 13.8% of subsidized members were willing to pay more than IDR 15,000 (USD 0.92) and changed their membership to become non-subsidized. This figure was quite large even though the average ATP of IDR 32,827 (USD 2.01) was still below the minimum class 3 contribution of IDR 42,000 (USD 2.57). For this reason, it is necessary to evaluate the membership of the current members to match the willingness and ATP contributions.

It was determined that both ATP and WTP, based on the characteristics of the respondents, were significantly varied. In particular, men have higher abilities than women, those aged below 18 years showed higher abilities than those aged 18-67 and over 67 years, those with low education displayed higher abilities than those with higher education, and those who do not work exhibited higher abilities than those who were employed. The higher ATP among respondents below 18 years of age was related to the fact that younger individuals do not have significant expenditures. Meanwhile, the higher ability among those with low education and who do not work is due to the characteristics of smokers who have low education and are unemployed. In a study conducted in Salatiga City, Indonesia, on 600 households, most of the respondents were over 42 years (53.7%), while the rest (46.3%) were aged below 42 years. Based on the education level, most respondents have high school education/equivalent (41.5%), followed by elementary education at 24%.[20] Meanwhile, most people who have not become NHI participants do so because they cannot afford it.[19] Not to mention, there were still many smokers, most of whom (82.19%) were classified as poor.[21]

Regarding utilizing FLHF and hospitals, respondents who have never used these services could pay higher contributions than they currently do. The ATP for households with more than three members was higher than those with the opposite. The quality of doctor's services and the availability of drugs were the two factors that influenced the patient's WTP for all classes of inpatient treatment.[21] A study in a hospital in Kendari City, Indonesia, showed that there was a relationship between the quality of service to the patient's willingness to pay for outpatient in the hospital.[22] Factors related to the utilization of health services at the health center were knowledge and WTP.[23] Another study showed that follow-up inpatient visits and follow-up outpatient visits decreased during the pandemic.[24] Meanwhile, a study in East Kalimantan showed that FLHF visited mainly PHC, followed by private practice doctors. In addition, most patients in Central Java Province went to PHC and clinics.[25]

Furthermore, as household expenditure increased, the ATP for NHI contributions from tobacco spending also increased. This result showed that most people with a high economic capacity could make the payment. Household spending on tobacco will reduce the spending on others. Every 10% increase in cigarette spending lowers household food expenditure by 1.75%, reduces household education expenditure by 0.75%, and reduces household health expenditure by 0.77%.[26] Most people with low incomes (nearly 90%) spent less than a quarter (25%) of their non-food expenditure on health.[26] The high tobacco production was due to the assumption of the relationship between tobacco and other foods.[26] Consumers of tobacco spend less on food than non-consumers. Tobacco expenditure crowded out more consumer durables, followed by foodgrains, healthcare, and education.[27] As a complement, tobacco is often found in activities such as smoking while drinking (tea/coffee/other beverages) or eating snacks. as well as during smoking activities after eating.[28]

Comparing ATP analysis showed a difference in the mean of ATP between men and women, among age groups, education level, number of household members, and household expenditure. In addition, there was no difference in ATP between occupation and utilization of FLHF and hospitals. The findings also showed that age, education level, number of household members, occupation, household expenditures, and history of utilizing FLHF and hospitals were associated with the WTP. The most significant factors influencing the WTP were age and utilization of FLHF and hospitals. These

results are in line with a previous study in Sleman District, Indonesia, which showed that age and income level significantly affected WTP.[13] Another study showed a relationship between age, ATP, and food expenditure with WTP on outpatient rates at a PHC in Banyumas District, Indonesia.[14] Similarly, a study of WTP in Yogyakarta showed that income affected WTP on NHI.[29]

Another study of ATP in the Public Health Care Insurance in Salatiga City showed that knowledge, attitude, beliefs about the benefits of the insurance, family support, and support from community leaders/religious leaders were related to willingness to become insurance participants.[20] According to the ATP concept, the ATP for health services is the expenditure for non-essential goods. The respondent's ability to determine the amount of BPJS contributions is highly dependent on various factors ranging from sources of income to a collection of assets.[3] Meanwhile, if viewed from the respondents' level of expenditure, there is no relationship between the level of expenditure and the size of the selection of BPJS contributions. This happens because, with different expenditure levels, respondents will naturally have different interests that depend on various factors, including lifestyle and individual needs.[30] Regarding WTP, a study on the informal sector in Sierra Leone showed that living outside the city and working in agriculture were associated with decreased WTP premiums.[31] On the other hand, the maximum WTP is positively related to work.[30]

This study had several limitations. The first related to the possibility of bias when discussing the WTP. The interviewer might influence the initial offer of WTP in terms of the amount of money contributed to the insurance premium. Unsure respondents might consider the first offer as the appropriate price and may not want to increase it. The subsequent bias was a hypothetical bias. This bias occurs when the respondent does not fully understand or accept the interviewer's explanation or because the respondent does not want to answer the question seriously.[32]

Conclusion

The ATP of subsidized members from tobacco expenditure is higher than the minimum monthly insurance payment. However, the WTP is lower than the ATP. Several subsidized members express their willingness to be non-subsidized. Sex, age, education level, number of household members, occupation, household expenditure, and utilization of FLHF and hospitals are associated with WTP. This implies that the subsidized members should be reviewed, especially among smokers. Future studies should focus on the WTP among subsidized members transitioning to non-subsidized and the methods to shift membership.

Abbreviations

NHI: National Health Insurance; BPJS: *Badan Penyelenggara Jaminan Sosial*/Social Security Administrative Body; ATP: Ability to Pay; WTP: Willingness to Pay; PHC: primary health care; NIHRD: National Institute of Health Research Development; FLHF: First Level Health Facility.

Ethics Approval and Consent to Participate

This study obtained approval from the Commission on Health Research Ethics – The National Institute of Health Research and Development, Indonesian Ministry of Health, to conduct secondary data analysis of the ATP and WTP Survey. The commission granted an ethical clearance certificate numbered LB.02.01/2/KE.340/2019 on August 26, 2019.

Competing Interest

The authors declare there is no conflict of interest.

Availability of Data and Materials

The study data was available upon request from the corresponding author.

Authors' Contribution

MW conceptualized the study, designed it, and prepared the initial draft and framework. MAM, RIA, and VA contributed to data analysis and discussions.

Acknowledgment

The authors thank the Head of the National Institute of Health Research and Development, who permitted the use of secondary data in this study.

References

1. Pemerintah Pusat Republik Indonesia. Undang-Undang Nomor 40 tahun 2004 tentang Sistem Jaminan Sosial Nasional. Pemerintah Pusat: Jakarta; 2004.
2. Dewan Jaminan Sosial Kesehatan, BPJS Kesehatan. Statistik JKN 2015-2019: Fakta dan Data Capaian Program Jaminan Kesehatan Nasional. Jakarta: BPJS Kesehatan; 2021.
3. Russell S. Ability to Pay for Health Care: Concepts and Evidence. Health Pol Plan. 1996; 11 (3): 219-237. DOI: 10.1093/heapol/11.3.219.

4. Gani A. Kemampuan Membayar (ATP) dan Kebijakan Tarif Pelayanan Kesehatan. Depok: Fakultas Kesehatan Masyarakat Universitas Indonesia; 1997.
5. Wedgwood A, Sansom K. Willingness-To-Pay Surveys - A Streamlined Approach: Guidance Notes For Small Town Water Services. Loughborough, WEDC: Loughborough University; 2003.
6. Mankiw NG. Pengantar Ekonomi Mikro (Principles of Economics). Sungkono C, Translator. 3rd ed. Jakarta: Salemba Empat; 2006.
7. Azimatun Noor A, Saperi S, Aljunid SM. The Malaysian community's acceptance and willingness to pay for a National Health Financing Scheme. Public Health. 2019; 175: 129–137. DOI: 10.1016/j.puhe.2019.07.008.
8. Meilissa Y, Nugroho D, Luntungan NN, et al. The 2019 economic cost of smoking-attributable diseases in Indonesia. Tob Control. 2022; 31(Suppl 2): s133-s139. DOI: 10.1136/tobaccocontrol-2021-056890.
9. Badan Pusat Statistik. Survei Sosial Ekonomi Nasional 2022 Maret (Modul Konsumsi dan Pengeluaran. Jakarta: Badan Pusat Statistik; 2022.
10. Badan Penelitian dan Pengembangan Kesehatan. Hasil Utama Riskesdas 2007 Jakarta: Kementerian Kesehatan Republik Indonesia; 2007.
11. Badan Penelitian dan Pengembangan Kesehatan. Hasil Utama Riskesdas 2013 Jakarta: Kementerian Kesehatan Republik Indonesia; 2013.
12. Badan Penelitian dan Pengembangan Kesehatan. Hasil Utama Riskesdas 2018. Jakarta: Kementerian Kesehatan Republik Indonesia; 2018.
13. Fadila R. Faktor-Faktor yang Mempengaruhi Willingness TO Pay (WTP) Iuran Peserta BPJS Kesehatan Kelas II di Kabupaten Sleman, Analisis Contingent Valuation Method (CVM) [Undergraduate Thesis]. Bantul: Universitas Muhammadiyah Yogyakarta; 2017.
14. Kurniawan A, Intiasari AD. Analisis Faktor-faktor yang Mempengaruhi Kemauan Membayar Pelayanan Rawat Jalan Puskesmas di Kabupaten Banyumas. Kesmas Indonesia. 2017; 4 (2): 105-118.
15. Sosodoro NL, Ramadhan RTF, Susamto AA. Subsidized health insurance impact among the poor: Evidence on out-of-pocket health expenditures in Indonesia. J Ekon Stud Pembang. 2023; 24 (1): 198–211. DOI: 10.18196/jesp.v24i1.17420.
16. Nguyen CV, Thi Le T, Nguyen NH. The Crowding-out Effect of Tobacco Expenditure on Health Expenditure: Evidence From a Lower-Middle-Income Country. Nicotine Tob Res. 2023; 25 (11): 1744-1752. DOI: 10.1093/ntr/ntad106.
17. Presiden Republik Indonesia. Peraturan Presiden (Perpres) Nomor 75 Tahun 2019 tentang Perubahan atas Peraturan Presiden Nomor 82 tahun 2018 tentang Jaminan Kesehatan. Pemerintah Pusat Republik Indonesia: Jakarta; 2019.
18. Pemerintah Pusat Republik Indonesia: Peraturan Pemerintah (PP) Nomor 76 Tahun 2015 tentang Perubahan Atas Peraturan Pemerintah Nomor 101 Tahun 2012 Tentang Penerima Bantuan Iuran Jaminan Kesehatan. Jakarta: Pemerintah Pusat Republik Indonesia; 2015.
19. Gultom NB, Jaya C, Atmiroseva. Survei Pendahuluan Biaya Tambahan* Peserta BPJS Kesehatan pada Rumah Sakit Faskes BPJS Kesehatan di Jabodetabek. J Kebijak Kesehat Indonesia. 2015; 04 (1): 3–10.
20. Suhardi S, Shaluhiyah Z, Patriajati S. Analisis Faktor-Faktor yang Berpengaruh Terhadap Kemauan Masyarakat Menjadi Peserta JPKM Mandiri di Wilayah Kota Salatiga. J Promosi Kesehat Indonesia. 2016; 9 (1): 90–103. DOI: 10.14710/jpki.9.1.90-103.
21. Yandrizal Y, Rifa'i R, Utami SP. Analisis Kemampuan dan Kemauan Membayar Iuran Terhadap Pencapaian UHC JKN di Kota Bengkulu. J Kesehat Masy Andalas. 2017; 10 (1): 3.
22. Atriyani R, Ahmad LOAI, Harun H. Faktor Yang Berhubungan dengan Kemauan Membayar (Willingness To Pay) Pasien Rawat Jalan Poli Interna RSUD Kota Kendari Tahun 2019. J Kesehat Masy Celeb. 2019; 1 (2): 12–17.
23. Su'udi A, Hendarwan H. Pemanfaatan Pelayanan Kesehatan Sasaran Program Jaminan Tabalong Sehat di Kabupaten Tabalong Kalimantan Selatan. J Penelit dan Pengemb Pelayanan Kesehat. 2017; 1 (2): 102–112.
24. Kurniawan MF. Langkah Strategis Keberlanjutan JKN - BPJS Kesehatan Pasca Pandemi Melalui Penerapan *Cost-Sharing*. Sleman: Pusat Kebijakan dan Manajemen Kesehatan FK-KMK Universitas Gadjah Mada; 2021.
25. Budiarto W, Kristiania L. Pemanfaatan Dana Kapitasi oleh Fasilitas Kesehatan Tingkat Pertama (FKTP) dalam Penyelenggaraan JKN. Bul Penelit Sist Kesehat. 2015; 18 (4): 437–445.
26. Ginting IR, Maulana R. Dampak Kebiasaan Merokok pada Pengeluaran Rumah Tangga. J Kebijak Kesehat Indonesia. 2020; 9 (2): 77–82. DOI: 10.22146/jkki.55879.
27. Jumrani J, Birthal PS. Does consumption of tobacco and alcohol affect household food security? Evidence from rural India. Food Sec. 2017; 9: 255–279. DOI: 10.1007/s12571-017-0660-8.
28. Anafia Y, Witcahyo E. Kemampuan dan Kemauan Pasien Umum Rawat Inap Dalam Membayar Pelayanan Kesehatan Rawat Inap di Rumah Sakit Umum Kaliwates Kabupaten Jember. J Ekon Kesehat Indonesia. 2019; 4 (2): Article 2. DOI: 10.7454/eki.v4i2.3222.
29. Rose LP. Faktor-Faktor Yang Mempengaruhi Willingness To Pay Pada Pasien Klinik Rawat Jalan Spesialistik Di Klinik Utama Asri Medical Center Yogyakarta [Thesis]. Bantul: Universitas Muhammadiyah Yogyakarta; 2017. Available from: http://repository.umy.ac.id/handle/123456789/11490
30. Noerjoedianto D. Kajian Ability To Pay (ATP) Bagi Calon Peserta BPJS Kesehatan dalam Pemilihan Besaran Iuran di Propinsi Jambi Tahun 2015. Jambi Med J. 2016; 4 (2): 156–171. DOI: 10.22437/jmj.v4i2.3580.
31. Jofre-Bonet M, Kamara J. Willingness to pay for health insurance in the informal sector of Sierra Leone. PLoS One. 2018; 13 (5): e0189915. DOI: 10.1371/journal.pone.0189915.
32. Whittington D, Briscoe J, Mu X, et al. Estimating the willingness to pay for water services in developing countries: A case study of the use of contingent valuation survey in Southern Haiti. Econ Dev Cult Change. 1990: 38 (2): 293-311.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 7

7-31-2025

Supporting and Hindering Factors Associated with COVID-19 Health Protocol Adherence Among Online Motorcycle Taxi Riders in Samarinda City, Indonesia

Dina Lusiana Setyowati
Mulawarman University, Samarinda, dinalusiana@fkm.unmul.ac.id

Tanti Asrianti
Mulawarman University, Samarinda, tantiasrianti.naim@gmail.com

Ismail Kamba
Mulawarman University, Samarinda, ismailkamba1976@gmail.com

Rina Tri Agustini
Mulawarman University, Samarinda, rinatriagustini.rta@gmail.com

Recommended Citation

Setyowati DL , Asrianti T , Kamba I , et al. Supporting and Hindering Factors Associated with COVID-19 Health Protocol Adherence Among Online Motorcycle Taxi Riders in Samarinda City, Indonesia. *Kesmas*. 2025; 20(5): 55-63
DOI: 10.7454/kesmas.v20isp1.2097
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/7

Setyowati *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 55-63
DOI: 10.7454/kesmas.v20isp1.2097

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Supporting and Hindering Factors Associated with COVID-19 Health Protocol Adherence Among Online Motorcycle Taxi Riders in Samarinda City, Indonesia

Dina Lusiana Setyowati[1], Tanti Asrianti[2]*, Ismail Kamba[3], Rina Tri Agustini[4]

[1]Department of Occupational Health and Safety, Faculty of Public Health, Mulawarman University, Samarinda, Indonesia
[2]Department of Epidemiology, Faculty of Public Health, Mulawarman University, Samarinda, Indonesia
[3]Department of Public Health Nutrition, Faculty of Public Health, Mulawarman University, Samarinda, Indonesia
[4]Department of Health Promotion, Faculty of Public Health, Mulawarman University, Samarinda, Indonesia

Abstract

The COVID-19 pandemic has underscored the importance of preventive health protocols, especially for high-contact occupations, such as online motorcycle taxi riders. However, adherence among these riders is inconsistent, particularly in economically constrained regions, such as Samarinda, a buffer zone for Indonesia's new capital. This study examined the influence of supporting and hindering factors on COVID-19 protocol compliance. A cross-sectional design was employed with 87 riders selected through quota sampling. Data were collected using structured questionnaires and analyzed using Spearman's rank correlation to assess the relationships between influencing factors and compliance levels. Economic barriers, especially high personal protective equipment (PPE) costs (46%), hindered protocol adherence, whereas supporting factors such as leadership and workplace-provided PPE showed no statistically impact on compliance. This finding suggested that financial constraints were the primary barrier, outweighing institutional support. Therefore, targeted financial assistance and strengthened public health policies are recommended to improve compliance. Enhancing community-level awareness and providing PPE subsidies could reinforce adherence and reduce transmission risk in high-contact occupations.

Keywords: COVID-19 preventive, health protocol compliance, hindering factors, online motorcycle taxi riders, supporting factors

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has posed unprecedented challenges to global public health, necessitating the rapid adoption of preventive behaviors, such as mask-wearing, physical distancing, and frequent hand hygiene, to mitigate virus transmission.[1] For online motorcycle taxi riders, who frequently interact with passengers and the public, adherence to such measures is critical. In Samarinda City, Indonesia, where approximately 1,500 riders operate, recent surveys show only about 60% compliance with health protocols, placing both riders and passengers at risk.[2] A key barrier to adherence is the high cost of personal protective equipment (PPE), including masks, face shields, and sanitizers, which must be regularly replaced in high-contact jobs.[2] This economic burden is worsened by a lack of formal employment benefits, such as health insurance or PPE subsidies, leaving riders to cover these costs independently. For many, meeting immediate financial needs precedes health expenses, indicating the need to explore how socioeconomic factors affect preventive behavior in this high-risk, economically vulnerable group.

Online motorcycle taxi riders play a crucial role in urban mobility in the rapidly developing areas, serving as potential vectors for virus transmission if health protocols are inconsistently practiced. Previous studies have emphasized the importance of both economic and social influences on COVID-19 preventive behaviors across various occupational groups, including high-contact professions.[3–5] However, limited research has focused specifically on online motorcycle taxi riders, particularly in economically dynamic buffer zones such as Samarinda City.

***Correspondence**:* *Tanti Asrianti, Department of Epidemiology, Faculty of Public Health, Mulawarman University, Samarinda, Indonesia*
Email: tantiasrianti.naim@gmail.com; Phone: +62 852 9995 0212

Received : August 30, 2024
Accepted : January 16, 2025
Published: July 31, 2025

Promoting preventive behaviors among online motorcycle taxi riders involves understanding both supporting factors, such as access to PPE, workplace policies, and social encouragement from community leaders, as well as hindering factors, including financial burdens, limited resources, and competing social norms.[2,6] This study used a combination of self-reported data and direct observation to measure compliance, defining "preventive behaviors" as the consistent use of masks, maintaining social distance when possible, and carrying hand sanitizer for personal use. While awareness of COVID-19 risks is generally high among online motorcycle taxi riders, adherence remains challenging due to external pressures, especially economic constraints that require prioritizing income over health expenses.[2,6]

In this study, supporting factors included access to PPE, company policies mandating health protocol compliance, and social encouragement from workplace leaders. Conversely, hindering factors included economic pressures, limited access to sanitation resources, and social norms that may not prioritize health protocol compliance. Research from Ghana and Bangkok has shown that online motorcycle taxi riders with access to PPE and organizational support report higher compliance, whereas those facing economic hardship tend to show lower adherence rates.[1,7] This study was built on the findings of the examination of these factors within Samarinda City, a buffer zone transitioning to Indonesia's new capital. Unlike studies on other urban centers, this study highlighted how economic and environmental pressures in an emerging capital zone influence pandemic compliance, providing insights specific to riders in this dynamic environment. By comparing findings with urban riders in other socioeconomic settings, this research emphasized the importance of targeted economic support to bolster compliance in high-risk, high-contact professions.

Although public health campaigns and government regulations have increased awareness, practical obstacles persist, including high PPE costs, limited access to resources, and misinformation, particularly in settings where economic pressures are significant.[2,8] Previous studies on vulnerable worker groups emphasize that COVID-19 preventive behavior compliance depends on various factors, including knowledge, social support, and attitudes.[9,10] This suggests that a multifaceted approach combining education, economic support, and workplace policies is critical for achieving sustained preventive behavior.

While research on COVID-19 preventive behaviors across various worker groups is extensive, studies focusing specifically on online motorcycle taxi riders are limited. Most research has targeted traditional taxi riders or urban settings, overlooking the unique dynamics and socioeconomic pressures that online motorcycle taxi riders face in buffer zones such as Samarinda City. This study aimed to fill this gap by examining factors that either support or hinder protocol adherence in this high-contact occupation. This study explored the relationship between supporting and hindering factors and adherence to COVID-19 preventive behaviors among online motorcycle taxi riders in Samarinda City. The findings were expected to provide practical recommendations for effective public health interventions that address both the socioeconomic realities and the high-risk nature of this workforce, ultimately contributing to broader efforts in pandemic control.

Method

This study utilized a cross-sectional design to explore the association between supporting and hindering factors and COVID-19 preventive behaviors among online motorcycle taxi riders in Samarinda City in November 2022. Samarinda City was chosen because it is one of Indonesia’s largest provincial cities undergoing rapid urbanization, with a significant population of approximately 1,500 online motorcycle taxi riders. This context intensifies the public health relevance of compliance with the COVID-19 protocols in high-contact occupations.

A sample size of 87 riders was selected using quota sampling to represent the population. The sample size was calculated to maintain a 95% confidence level and a 10% margin of error, allowing for practical data collection within the scope of the study. Although a larger sample size would improve precision, the sample size was deemed sufficient to observe meaningful patterns.

Data were collected using a structured questionnaire developed specifically for this study to capture the relevant factors influencing COVID-19 preventive behavior adherence. The questionnaire was based on established research on health protocol adherence and was modified for relevance to online motorcycle taxi riders. It included sections on demographics, preventive behaviors, and supporting and hindering factors affecting compliance.[1] To ensure accessibility, the survey was distributed electronically via Google Forms and shared through WhatsApp groups among riders. Participation was voluntary, and all participants provided informed consent.

Spearman's rank correlation test was chosen for its suitability in assessing ordinal data without assuming a linear relationship. Correlation coefficients were interpreted to indicate the strength (weak, moderate, or strong) and direction

(positive or negative) of relationships, with coefficients close to +1 or -1 indicating strong associations and values near 0 suggesting weaker associations.[3]

To enhance the understanding of the study's purpose, procedures, and confidentiality measures, participants were provided with a clear explanation before participation. Respondents were informed of the minimal risks involved, such as potential discomfort in answering personal questions and benefits, including contributing to public health policies for occupational safety. Informed consent was obtained digitally from each participant before beginning the survey.

Results

The average age of the respondents was 32.39±8.07 years, indicating a moderate age distribution among participants. A high proportion of respondents (97.7%) demonstrated positive COVID-19 preventive behaviors, reflecting strong effort among riders to comply with health protocols (Table 1).

Table 1. Respondents' Characteristics

Variable	Frequency	%
Age (mean: 32.39±8.071 years)		
≤32 years	43	49.4
>33 years	44	50.6
Sex		
Male	76	87.4
Female	11	12.6
Education level		
Uneducated	1	1.1
Elementary school	6	6.9
Junior high school	6	6.9
Senior high school/vocational school	64	73.6
Higher education	10	11.5
Last education level		
Low	13	14.9
High	74	85.1
Length of employment		
≤2.3 years	45	51.7
>2.3 years	42	48.3
Supporting factors		
Low	55	63.2
High	32	36.8
Hindering factors		
Low	47	54
High	42	46
Preventive behavior		
Negative	2	2.3
Positive	85	97.7

Table 2 provides insights into COVID-19 transmission prevention behaviors among online motorcycle taxi riders. Overall, the data reflects high adherence to recommended preventive practices, with most respondents consistently engaging in behaviors such as maintaining physical distance (98.9%), wearing double masks (95.4%), washing hands with soap (94.3%), and avoiding contact with infected individuals (94.3%). These findings demonstrating a strong commitment to health protocols in this population. As shown in table 3, 38 respondents (43.7%) identified the high price of PPE as a key barrier to adhering to COVID-19 health protocols. Other hindering factors included poor access to handwashing facilities (25.3%) and limited government socialization efforts (24.1%). However, more than half of the participants did not perceive these factors as major obstacles. These results suggested that the affordability of PPE remains a substantial issue, potentially limiting compliance with preventive measures.

Table 2. COVID-19 Transmission Prevention Behavior

COVID-19 Transmission Prevention Behavior	Yes		No	
	n=87	%	n=87	%
Avoiding direct contact with others (such as shaking hands, touching, etc.)	77	88.5	10	11.5
Avoiding contact with people infected with COVID-19	82	94.3	5	5.7
Covering mouth when someone sneezes nearby	80	92	7	8
Not touching items that others have also touched (e.g., using non-cash payments, hanging items on a fence)	81	93.1	6	6.9
Wearing double masks (two masks/layered masks)	83	95.4	4	4.6
Using hand sanitizer when water and soap are unavailable	81	93.1	6	6.9
Washing hands with soap for 20 seconds	82	94.3	5	5.7
Avoiding crowds	81	93.1	6	6.9
Maintaining a distance of at least 1 meter from others when outside	86	98.9	1	1.1
Getting vaccinated (complete with 2 doses)	76	87.4	11	12.6
Regularly taking vitamins	77	88.5	10	11.5
Using a personal helmet	77	88.5	10	11.5
Wearing gloves	77	88.5	10	11.5
Regularly disinfecting a phone or vehicle	82	94.3	5	5.7
Regularly checking body temperature	78	89.7	9	10.3
Exercising regularly (5 days per week, 30 minutes)	86	98.9	1	1.1
Getting adequate sleep/rest	86	98.9	1	1.1

Table 3. Hindering Factors in the Implementation of Health Protocols by Online Motorcycle Taxi Riders

Statement	Yes		No	
	n	%	n	%
The price of masks, face shields, hand sanitizer, or other PPE is expensive	38	43.7	49	56.3
Difficulty in accessing handwashing facilities (water and soap) in the surrounding environment	22	25.3	65	74.7
Family or relatives do not provide support for implementing health protocols	16	18.4	71	81.6
Neighbors or the community do not provide support for implementing health protocols	16	18.4	71	81.6
Lack of socialization from the government or local COVID-19 task force regarding health protocol implementation	21	24.1	66	75.9

Access to hygiene facilities was also a challenge, albeit to a lesser degree. Approximately 25.3% of the respondents reported difficulty finding handwashing stations with water and soap in their environment, highlighting a structural barrier that could discourage regular handwashing, indicating that infrastructure gaps could discourage consistent hand hygiene practices. Social support from family and community members appeared to be less problematic for most riders. This condition indicated that most respondents did not perceive a lack of social encouragement as a primary barrier, suggesting that family and community attitudes toward health protocols are generally favorable. Another notable barrier was the perceived lack of government outreach or socialization efforts regarding health protocols. It highlighted a potential gap in public health communication, as a more proactive approach from authorities could reinforce the importance of health behaviors and provide additional motivation and guidance for compliance.

Table 4. Supporting Factors in the Implementation of Health Protocols by Online Motorcycle Taxi Riders

Statement	Yes		No	
	n	%	n	%
Supervisors or leaders set an example by implementing health protocols	82	94.3	5	5.7
There are penalties for not implementing health protocols	77	88.5	10	11.5
There have been COVID-19 cases in the surrounding environment	47	54	40	46
Health protocols are strictly enforced in the surrounding environment	77	88.5	10	11.5
Facilities to implement health protocols are provided at the workplace (temperature checks, masks, etc.)	80	92	7	8

Table 4 shows the factors influencing health behavior changes when adapting to new COVID-19 preventive habits. The data indicated that leadership and workplace support significantly impact adherence to health protocols. "Leaders" primarily refer to supervisors or coordinators associated with the ride-hailing platform or local operational team. These may include team coordinators, platform representatives, or senior riders, who guide new riders on safety practices and promote compliance with health protocols. Because riders are generally independent contractors, these leaders provide support and guidance rather than traditional managerial oversight, emphasizing health practices without the authority of direct supervision.

Penalties for non-compliance also served as a strong motivator, with 88.5% of riders acknowledging that sanctions were in place for those who did not adhere to health protocols. This result suggested that enforcement mechanisms help ensure that riders took preventive measures seriously. Access to workplace-provided facilities was another crucial support factor, with 92% of respondents indicating that their workplace offers tools, such as temperature checks and masks. This accessibility likely reduced barriers to compliance as riders could conveniently access essential protective equipment, which can enhance their adherence to health protocols. Interestingly, only 54% of respondents reported

COVID-19 cases in their immediate environment, which means that the presence of cases nearby was not a strong motivator. However, this still represented the majority, suggesting that awareness of local COVID-19 cases might play a role in reinforcing the importance of following health protocols.

Table 5. Relationship of Supporting and Hindering Factors with COVID-19 Prevention Behavior

Variable	COVID-19 Transmission Prevention Behavior				Total		Sig.
	Negative		Positive				
	n	%	n	%	n	%	
Supporting Factor							
Low	1	1.8	54	98.2	55	100	1.000
High	1	3.1	31	96.9	32	100	
Hindering Factor							
Low	2	4.3	45	95.7	47	100	0.547
High	0	0	40	100	40	100	

Note: The "high hindering-negative behavior" category contains zero respondents, leading to a zero-cell issue.

Table 5 shows the relationship between the supporting and hindering factors and COVID-19 prevention behavior. Respondents with both low and high levels of supporting factors exhibited similarly high compliance rates (98.2% and 96.9%, respectively), with no statistically significant relationship (p-value = 1.000). Similarly, while hindering factors, such as high PPE costs, were expected to decrease compliance, the analysis showed no significant relationship between hindering factors and preventive behavior (p-value = 0.547). A zero-cell issue was identified in the "high hindering-negative behavior" category, where no respondents with high hindering factors exhibited negative preventive behavior. This issue reflected the limited variability in the dataset, potentially arising from high overall compliance among respondents. Although this could suggest a resilience mechanism, it also limited the robustness of the statistical analysis.

Discussion

This study showed no significant relationship between COVID-19 preventive behaviors and supporting factors. These results suggested that institutional support, such as leadership guidance and workplace-provided PPE, may not strongly influence adherence among online motorcycle taxi riders in Samarinda City. While leadership modeling and workplace-provided PPE were present, these measures alone did not suffice to drive compliance among economically constrained workers, such as online motorcycle taxi riders. To meet the study's aim, it is necessary to examine socioeconomic realities more critically. Riders expressed that workplace-provided PPE was sporadic or insufficient, requiring them to purchase replacements independently. Additionally, leadership examples, while impactful in fostering awareness, lacked reinforcement through tangible economic or policy support. Thus, riders perceived these supportive measures as helpful but inadequate in addressing their fundamental financial barriers, such as high PPE costs.

In contrast to previous studies that emphasized the strong influence of supporting factors,[1,3] the findings from Samarinda City indicated that personal motivation and risk awareness were the primary factors in compliance. Practical recommendations must incorporate mechanisms to reduce economic pressure, such as implementing PPE subsidies and enhancing workplace provisions to complement existing institutional support. Policies promoting consistent PPE availability at subsidized costs or free distribution at key ride-hailing hubs would address driver needs more effectively. Moreover, targeted interventions that leverage community leaders or local organizations could amplify workplace efforts and ensure more comprehensive support systems for riders.

Misinformation from social media occasionally leads to complacency, emphasizing the need for consistent public awareness campaigns to maintain adherence to health protocols.[6] The findings from the previous study align with this study's results that external support, without strong internal motivation or a high perceived risk of infection, may have limited effectiveness. In Samarinda City, where rapid urban development influences socioeconomic dynamics, riders may similarly prioritize economic needs, relying less on external cues or institutional support.

This study's findings further indicated that COVID-19 cases within the community and workplace-provided resources alone were insufficient indicators of protocol adherence. These results are consistent with other research findings emphasizing that social support and infrastructure provision can enhance compliance, but only when combined with strong policy enforcement and individual motivation.[11,12] In contrast, a study in Surabaya City, Indonesia, asserted that compliance remains low without strict policies and substantial environmental support, even when COVID-19 cases occur. This disparity suggests that policy rigor and perceived enforcement may play a more influential role in motivating compliance than the availability of supportive resources.[13] This highlights the importance of regulatory enforcement

along with supportive measures to ensure consistent compliance. The implications of these findings underscore that while workplace support, such as leadership modeling and access to PPE, can be beneficial, it is not sufficient to guarantee adherence among riders. Consistent with the literature, these results suggest that individuals may lack motivation to fully adhere to health protocols without robust policies and strong environmental support, even when COVID-19 cases are prevalent around them.[12,13]

According to Social Cognitive Theory (SCT), behavior change is influenced by reciprocal interactions among personal, environmental, and behavioral factors, suggesting that workplace support is part of a larger social context that impacts adherence.[14-16] The findings of this study suggested that SCT principles may not predictably lead to behavioral change in settings where financial and personal motivations overshadow external support. Psychological and behavioral interventions, along with company policies, could support compliance by fostering better health practices among riders.[14] Supporting factors such as role modeling by leaders, implementation of penalties for non-compliance, exposure to local COVID-19 cases, strict enforcement of preventive measures, and workplace facilities for health protocol adherence belong to the environmental domain and can encourage new habit formation among online motorcycle taxi riders.[15,16] However, the findings of this study suggested that these external supports may be insufficient in driving behavior change among economically constrained populations without addressing personal and economic motivators.

Expanding on individual influences, recent studies has underscored the role of health literacy in adherence to health protocols. Higher health literacy allows individuals to understand and act on health information effectively, promoting preventive behaviors.[17,18] Interpersonal and community factors also play a significant role in shaping COVID-19 prevention behaviors. Research indicates that supportive environments, including family and community backing, help stabilize and strengthen individuals' commitment to preventive actions.[19,20] This suggests that community-driven interventions promoting social support and peer adherence may enhance compliance among online motorcycle taxi riders.

Finally, psychological factors are crucial in motivating preventive behaviors. According to the Health Belief Model, perceptions of susceptibility and severity influence preventive behaviors.[21,22] However, while perceived risk can encourage adherence, supportive environments and behavioral modeling are necessary to sustain it. For riders, practical support combined with effective risk communication may foster a balanced approach to preventive behaviors.

The relationship between supporting factors and COVID-19 prevention behavior is complex and involves individual, interpersonal, and community interactions. Enhancing adherence among riders may require interventions that not only provide workplace resources but also address personal motivations, psychological resilience, and social support networks. Future strategies should adopt a multifaceted approach integrating economic support, health literacy programs, and community engagement to foster sustained compliance in high-risk occupational settings. This approach aligns with SCT's emphasis on addressing both internal motivations and external support to enhance preventive behaviors in high-contact professions.

The analysis in this study revealed no significant relationship between COVID-19 preventive behavior and the identified hindering factors. However, the zero-cell issue in the "high hindering-negative behavior" category highlights a limitation in data distribution. This absence may reflect the strong self-efficacy and motivation among riders who prioritize compliance despite economic barriers, such as high PPE costs. Alternatively, this may indicate insufficient sample diversity, which could obscure meaningful relationships. While the findings emphasized the resilience of riders, they also underlined the need for further investigation using larger and more diverse samples to avoid zero-cell issues. Advanced statistical techniques, such as logistic regression adjusted for covariates (e.g., education level, years of employment, and health beliefs), could provide deeper insights into the influence of hindering factors on preventive behavior.

To address socioeconomic realities comprehensively, public health interventions must prioritize direct economic support for this workforce. For example, government or corporate partnerships could establish financial assistance programs or insurance schemes for riders, thus offsetting the costs of protective measures. Beyond economic relief, education campaigns tailored to high-contact workers should integrate practical strategies for low-cost adherence, such as reusable masks or hand hygiene practices using accessible resources.

Psychological factors play a crucial role in determining adherence to preventive measures, as demonstrated in studies of perceived barriers and self-efficacy. A study in Sri Lanka found that individuals who perceive more barriers are less likely to engage in preventive behaviors.[23] Low self-efficacy is another major obstacle. An Iranian study emphasized that individuals with lower confidence in their ability to follow preventive behaviors are less likely to comply,

especially among those managing chronic conditions.[24] Although these psychological barriers are significant, riders in Samarinda City managed to prioritize COVID-19 protocols despite high PPE costs, possibly due to increased self-efficacy and personal motivation.

In alignment with findings in similar settings, this study indicates that economic barriers are substantial. However, they do not fully prevent compliance among high-risk workers. A previous study stated that although financial burdens impacted online motorcycle taxi riders' health behaviors, many riders prioritized preventive measures when they perceived the risks of COVID-19 to be high.[2] In other words, enhancing riders' risk awareness and providing ongoing health education could mitigate the impact of economic barriers on adherence. Conversely, these results differed from studies emphasizing the detrimental impact of economic barriers on protocol adherence. This study showed that Samarinda City riders continue to prioritize preventive behaviors, potentially due to strong personal motivation and self-efficacy. It further revealed that while economic challenges, such as high PPE costs, act as hindering factors, they do not entirely obstruct preventive behaviors. Although many riders considered PPE expensive, they still expressed intent to follow health protocols, motivated by risk awareness and community protection.[25,26] This aligned with research showing that higher health literacy, COVID-19 risk awareness, and workplace social support significantly enhance protocol adherence.[27,28]

Adapting to new health habits involves adjusting individuals' behaviors and lifestyles to meet health protocol requirements, especially for disease prevention. Research stated that various factors, such as health knowledge, supportive behaviors, adherence to health guidelines, and family support, influence this adaptation process.[29–31] However, time constraints, work conditions, and negative perceptions of health measures can be hindering factors, particularly in maintaining behaviors like handwashing.[25,32] Policies that support these behaviors, including handwashing, are essential for sustaining public health.[31]

In contrast, studies indicate that strict policies and consistent enforcement are necessary for high compliance, particularly when internal motivation is lacking. For example, a 2021 survey by Statistics Indonesia found that adherence to mask-wearing and travel restrictions was largely due to government mandates, which required mask usage in public spaces and promoted health education through mass media.[7,33] While social support and awareness are valuable, policy enforcement is essential for consistent compliance, especially in urban and buffer zones, such as Samarinda City.

Additionally, SCT emphasizes the role of the social environment, including interactions with peers and customers, in influencing adherence to health protocols. In this study, driver compliance may be affected by interactions with both customers and peers, who can either reinforce or diminish the perceived importance of protocols. Riders who observe compliance among peers are more likely to follow suit, while observing non-compliance may reduce their motivation to adhere.[14] Ensuring a supportive social environment with reliable and consistent health messaging is essential to maintaining preventive behaviors among riders, particularly given social media's impact on perceptions.[34] Social media plays a crucial role in disseminating health information, particularly to younger populations, highlighting the importance of accurate and consistent messaging. A previous study noted that higher education and supportive policies are associated with better workplace protocol adherence, a strategy that could benefit ride-hailing riders.[33]

The strength of this study laid in its focus on high-risk, economically vulnerable riders in Samarinda City, which provides insights into the specific hindering factors faced in this buffer zone. However, several limitations of this study should be addressed in future studies. First, the zero-cell issue in the "high hindering-negative behavior" category restricts the interpretability of the results, as no respondents in this group reported negative preventive behavior. This limitation, likely stemming from the small sample size and high overall compliance, suggests that the findings may not fully capture the relationship between hindering factors and preventive behaviors. Future research should address this issue by increasing the sample size and ensuring greater variability among respondents. Second, the study did not adjust for potential confounding variables such as education level, years of employment, and health beliefs, which may influence the relationships between factors and compliance. The use of multivariable regression in future studies could provide a clearer picture of these dynamics.

Despite these limitations, the findings offer valuable insights into the challenges faced by online motorcycle taxi riders in adhering to COVID-19 protocols and suggest practical recommendations for addressing economic and institutional barriers. Future interventions should address these hindering factors using a multifaceted approach that includes economic support, such as PPE subsidies, enhanced health education, and consistent enforcement of protocols. Combining economic support with public education and policy reinforcement in alignment with SCT principles may be the most effective way to sustain preventive behaviors among online motorcycle taxi riders in similar high-contact, high-

risk professions.

Conclusion

This study concludes that while online motorcycle taxi riders in Samarinda City demonstrate high levels of positive attitudes toward COVID-19 preventive behaviors, economic barriers, particularly the high cost of PPE, significantly hinder consistent adherence. These findings underscore the need for public health interventions to extend beyond awareness campaigns and institutional support. Addressing socioeconomic realities through targeted economic assistance programs, such as subsidized PPE distribution or financial relief packages, is critical for sustaining compliance among high-risk, economically vulnerable groups. Moreover, strengthening workplace policies with tangible and enforceable measures, such as guaranteed PPE provision, could enhance institutional support. By integrating these recommendations, this study provides actionable pathways for pandemic control efforts, aligning its findings with the study's aim to offer practical solutions. These interventions not only mitigate socioeconomic barriers but also foster a resilient, health-conscious workforce capable of maintaining preventive behaviors in high-contact occupations.

Abbreviations

COVID-19: coronavirus disease 2019; PPE: personal protective equipment; SCT: Social Cognitive Theory.

Ethics Approval and Consent to Participate

This study was approved by the Medical and Health Research Ethics Committee of the Faculty of Medicine, Mulawarman University (217/KEPK-FK/XI/2023).

Competing Interest

There are no conflicts of interest.

Availability of Data and Materials

The datasets generated and analyzed during the current study are not publicly available because of privacy or confidentiality concerns but are available from the corresponding author upon reasonable request.

Authors' Contribution

DLS: Concepts, design, definition of intellectual content, literature search, data acquisition, data analysis, statistical analysis, manuscript preparation, manuscript editing, manuscript review. IK: Definition of intellectual content, literature search, data acquisition, data analysis, manuscript editing, manuscript review. TA: Design, data acquisition, manuscript editing, and manuscript review. RTA: design, data acquisition, manuscript editing, data analysis.

Acknowledgment

The authors extend sincere gratitude to the Faculty of Public Health, Mulawarman University, for providing financial support.

References

1. Deesua A, Kaewpan W, Kalampakorn S, et al. Factors associated with COVID-19 preventive behaviors among taxi drivers in Bangkok. Front Public Health. 2023; 11: 1049877. DOI: 10.3389/fpubh.2023.1049877.
2. Setyowati DL, Paramita S, Ifroh RH, et al. Work readiness during COVID-19 among taxibike online drivers in Samarinda, Indonesia. IJPHS Int J Public Health Sci. 2021; 10 (3): 617–628. DOI: 10.11591/ijphs.v10i3.20870.
3. Kim JH, Song HY, Park JH, et al. A Study on the COVID-19 preventive behaviors of automobile manufacturing workers in South Korea. Healthcare (Basel). 2022; 10 (10): 1826. DOI: 10.3390/healthcare10101826.
4. Lee M, You M. Psychological and behavioral responses in South Korea during the early stages of coronavirus disease 2019 (COVID-19). Int J Environ Res Public Health. 2020; 17 (9): 2977. DOI: 10.3390/ijerph17092977.
5. Rohmah N, Setyowati DL, Agustini RT. The clean and healthy behavior of motorcycle online drivers in Samarinda, Indonesia. Proceedings of the 22nd International Conference of Public Health; 2022.
6. Agyemang E, Yaro JA. Knowledge, attitudes, and perception as predictors of COVID-19 safety practices of ride-hailing operators in Ghana: A cross-sectional study. Int J Environ Res Public Health. 2023; 20 (5): 4529. DOI: 10.3390/ijerph20054529.
7. Onoja AJ, Sanni FO, John S, et al. Baseline and postintervention assessment of sexual violence and condom use among female sex workers in a semiurban African community. Asian J Soc Heal Behav. 2020; 3 (3): 124-129. DOI: 10.4103/SHB.SHB_29_20.
8. Nanthamongkolchai S, Taechaboonsermsak P, Tawatting K, et al. Health-risk behaviors, COVID-19 preventive behaviors, and the impact of the COVID-19 pandemic on the working-age population of Bangkok, Thailand. Int J Environ Res Public Health. 2022; 19 (20): 13394. DOI: 10.3390/ijerph192013394.
9. Sun Z, Yang B, Zhang R, et al. Influencing factors of understanding COVID-19 risks and coping behaviors among the elderly population. Int J Environ Res Public Health. 2020; 17 (16): 5889. DOI: 10.3390/ijerph17165889.
10. Zhang M, Li Q, Du X, et al. Health behavior toward COVID-19: The role of demographic factors, knowledge, and attitude among Chinese college students during the quarantine period. Asia Pac J Public Health. 2020; 32 (8): 533–535. DOI: 10.1177/1010539520951408.
11. Muhith S, Ekawati D, Rosalina S, et al. Analisis kepatuhan penerapan protokol kesehatan COVID-19. J Aisyiyah Medika. 2021; 6 (2). DOI: 10.36729/jam.v6i2.651.

12. Nuraini W, Ningsih WT, Rofi'i AYAB. Persepsi dan perilaku masyarakat pasca vaksinasi COVID-19 terhadap penerapan protokol kesehatan di Kecamatan Tuban. J Locus Penelit Pengabdi. 2023; 2 (3): 253–261.
13. Minanton, Azizah N, Pranesia A, et al. Analisis hubungan pengetahuan masyarakat dengan kepatuhan penerapan protokol kesehatan pasca vaksinasi COVID-19 di Surabaya. J Ilm Ilmu Teknol Rekayasa. 2023; 5 (1): 39–45. DOI: 10.31962/jiitr.v5i1.148.
14. Chen X, Gu X, Li T, et al. Factors influencing smoking behaviour of online ride-hailing drivers in China: A cross-sectional analysis. BMC Public Health. 2021; 21: 1326. DOI: 10.1186/s12889-021-11366-8.
15. Bartholomew LK, Parcel GS, Kok G, et al. Planning health promotion programs: An intervention mapping approach. San Francisco: Jossey-Bass; 2006.
16. Hagger, MS, Linda CD, Hamilton K, Hankonen N, Lintunen T, editors. The handbook of behavior change. United Kingdom: Cambridge University Press; 2020.
17. Lastrucci V, Lorini C, Riccio MD, et al. The role of health literacy in COVID-19 preventive behaviors and infection risk perception: Evidence from a population-based sample of essential frontline workers during the lockdown in the Province of Prato (Tuscany, Italy). Int J Environ Res Public Health. 2021; 18 (24): 13386. DOI: 10.3390/ijerph182413386.
18. Li X, Liu Q. Social Media use, ehealth literacy, disease knowledge, and preventive behaviors in the COVID-19 pandemic: Cross-sectional study on Chinese netizens. J Med Internet Res. 2020; 22 (10): e19684. DOI: 10.2196/19684.
19. Fattahi H, Seproo FG, Fattahi A. Effective factors in people's preventive behaviors during COVID-19 pandemic: A systematic review and meta-synthesis. BMC Public Health. 2022; 22 (1): 1218. DOI: 10.1186/s12889-022-13621-y.
20. Aprianti A, Haikal H, Manglapy YM, et al. Support from community leaders and families related to COVID-19 prevention behavior in Indonesia. Malahayati Int J Nurs Heal Sci. 2022; 5 (2): 136–144. DOI: 10.33024/minh.v5i2.8013.
21. Alagili DE, Bamashmous M. The health belief model as an explanatory framework for COVID-19 prevention practices. J Infect Public Health. 2021; 14 (10): 1398–1403. DOI: 10.1016/j.jiph.2021.08.024.
22. Shahnazi H, Livani MA, Pahlavanzadeh B, et al. Assessing preventive health behaviors from COVID-19: A cross sectional study with health belief model in Golestan Province, Northern of Iran. Infect Dis Poverty. 2020; 9 (1): 157. DOI: 10.1186/s40249-020-00776-2.
23. Mahindarathne PP. Assessing COVID-19 preventive behaviours using the health belief model: A Sri Lankan study. J Taibah Univ Med Sci. 2021; 16 (6): 914-919. DOI: 10.1016/j.jtumed.2021.07.006.
24. Araban M, Mesri M, Karimy M, et al. Health beliefs associated with preventive health behaviors for COVID-19: Findings in a sample drawn from a major city in Iran (Preprint). J Educ Community Health. 2021; 8 (1): 1-6. DOI: 10.2196/preprints.21710.
25. James K, Thompson C, Bailey CC, et al. Taxi drivers and COVID-19 in Jamaica: Occupationally related income decline and health behaviour. Health Soc Care Community. 2022; 30 (5): 1818-1826. DOI: 10.1111/hsc.13561.
26. Natnael T, Adane M, Alemnew Y, et al. COVID-19 knowledge, attitude and frequent hand hygiene practices among taxi drivers and associated factors in urban areas of Ethiopia. PLoS One. 2021; 16 (8): e0253452.
27. Balci UG, Sofuoğlu Z, Merder D. The relationship between health literacy and adherence to personal protective anti-COVID-19 measures in health workers and their relatives: A mixed methods design. Medicine (Baltimore). 2024; 103 (24): e38505. DOI: 10.1097/MD.0000000000038505.
28. Panahi S, Ghalavand H. The mediating role of health literacy in the relationship between self-care and planned behavior against COVID-19. BMC Infect Dis. 2024; 24: 608. DOI: 10.1186/s12879-024-09513-8.
29. Gulo ED, Utami TA, Novita RVT. Hubungan karakteristik dan tingkat pengetahuan dengan kecemasan remaja pada masa adaptasi kebiasaan baru. Media Publ Promosi Kesehat Indones. 2022; 5 (10): 1296–1302. DOI: 10.56338/mppki.v5i10.2717.
30. Natanael Y, Fridayanti, Ansori MR, et al. Identifikasi dukungan keluarga sebagai moderator antara intrusi dan stres. Motiv J Psikol. 2023; 6 (2): 132–142. DOI: 10.31293/mv.v6i2.6760.
31. Akbar PS, Nugraheni R, Putri SI, et al. Identifying the factors affecting preventive behavior against COVID-19 transmission in East Java Indonesia. J Public Hlth Dev. 2023; 21 (1): 239–249. DOI: 10.55131/jphd/2023/210118.
32. Gbagbo FY, Opoku R, Quarcoo R. Towards prevention of new COVID-19 infections in institutions of higher education: Factors influencing compliance with mask-wearing among public university students in Ghana. BMC Infect Dis. 2024; 24: 236. DOI: 10.1186/s12879-024-09110-9.
33. Martias I, Pitriyanti L. Determinants factors of the implementation of health protocols to prevention of COVID-19. JPK. 2022; 11 (1): 7–11. DOI: 10.36929/jpk.v11i1.446.
34. Artanti S, Haryatmo S. Implementation of health protocols during the COVID-19 Pandemic. Jurkes. 2022; 11 (1): 58–64. DOI: 10.46815/jk.v11i1.79.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 8

7-31-2025

Sustaining Digital Health Interventions for Long-Term Cardiovascular Disease Prevention in the Energy Industry

Yul Isnadi
Universitas Indonesia, Depok, isnadi.yul@gmail.com

L. Meily Kurniawidjaja
Universitas Indonesia, Depok, meily.bobo@gmail.com

Doni Hikmat Ramdhan
Universitas Indonesia, Depok, donihr_05@yahoo.com

Recommended Citation

Isnadi Y , Kurniawidjaja LM , Ramdhan DH , et al. Sustaining Digital Health Interventions for Long-Term Cardiovascular Disease Prevention in the Energy Industry. *Kesmas*. 2025; 20(5): 64-72
DOI: 10.7454/kesmas.v20isp1.2122
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/8

Isnadi *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 64-72
DOI: 10.7454/kesmas.v20isp1.2122

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Sustaining Digital Health Interventions for Long-Term Cardiovascular Disease Prevention in the Energy Industry

Yul Isnadi[1]*, L. Meily Kurniawidjaja[2], Doni Hikmat Ramdhan[2]

[1]Doctoral Program, Department of Occupational Health and Safety, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia
[2]Department of Occupational Health and Safety, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

Abstract

Cardiovascular disease (CVD) is a major health concern for energy industry workers due to occupational risks. Digital health interventions (DHIs) offer innovative strategies for CVD prevention in this high-risk group. This study aimed to explore the effectiveness and sustainability of DHI by incorporating behavior change theories, behavior change techniques, and principles of persuasive system design. A literature review was performed using PubMed, Scopus, Web of Science, and CINAHL databases to collect relevant information on interventions for CVD prevention among energy sector workers. The results indicated that while DHI could improve physical activity, dietary habits, and medication adherence in the short term, sustaining these changes remained challenging due to intervention fatigue, lack of ongoing support, and changing user engagement. To maintain long-term effectiveness, strategies including adaptive interventions, gamification, social support, and iterative refinement based on user feedback are essential. Furthermore, employing a user-centered design approach and integrating DHIs with existing health programs can further enhance sustained behavior change. In conclusion, DHI holds significant potential for CVD prevention in the energy industry. However, its long-term success requires structured approaches, personalized strategies, and ongoing evaluation tailored to this unique occupational setting.

Keywords: cardiovascular disease, digital health interventions, effectiveness, energy industry

Introduction

Cardiovascular diseases (CVDs) are a leading cause of global morbidity, especially in high-risk occupations like energy.[1] Compared to others, workers in the energy sector face elevated risks due to occupational factors such as high stress, physical demands, and hazardous substance exposure.[2] These factors, along with hypertension, high cholesterol, obesity, smoking, and inactivity, elevate CVD risks among workers.[3] Research shows that offshore workers experienced a 121.2% increase in major adverse cardiovascular events (MACE) risk over ten years, with their risk of suffering CVDs rising from 9.2% to 20.4%, exceeding the high-risk threshold measured by the Framingham Risk Score (FRS).[4] A survey conducted among oil and gas workers revealed a significant health issue, with 62.4% being overweight, 35.5% having hypertension, 24.3% showing dyslipidaemia, and 3% with diabetes.[5]

The energy industry presents unique challenges for CVD prevention, including shift work,[6] disrupting circadian rhythms, and limited healthcare access.[3] The combination of hazardous substance exposure and intense physical demands necessitates specialized preventive measures, with customized health promotion strategies to improve workers' health.[7] Digital Health Interventions (DHIs) offer promising solutions to reduce the risk and prevent CVD in this sector through remote, personalized support via mobile apps, wearable devices, and online platforms.[8] The integration of artificial intelligence and machine learning using the method is expected to enhance personalization and adaptation to workforce needs.[9] For instance, the CV-PREVITAL study demonstrated significant improvements in cardiovascular risk scores through mHealth applications over 12 months.[10]

However, despite much research supporting the positive outcomes of the approach, a previous study indicated challenges in maintaining long-term DHI effectiveness in high-risk sectors.[11] Moreover, even though DHIs have shown success in reducing cardiovascular risk factors,[8] their impacts are often diminished due to user attrition, intervention

***Correspondence**:* *Yul Isnadi, Doctoral Program, Department of Occupational Health and Safety, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia.*
Email: isnadi.yul@gmail.com

Received : September 20, 2024
Accepted : December 13, 2024
Published: July 31, 2025

fatigue, and declining engagement.[12] Among the available DHIs is the INTERCEPT program, which incorporates wearables and telemedicine and has demonstrated feasibility in managing coronary heart disease risk.[13] Nonetheless, its application to the energy sector's unique challenges remains unexplored. The need for innovative approaches tailored to the energy industry's distinct occupational settings, characterized by remote work locations, high-stress environments, irregular shifts, hazard exposure, limited healthcare access, and workforce diversity. These challenges stem from the complexity of integrating DHIs into existing systems, the need for continuous stakeholder engagement, and the technical intricacies involved in their design and implementation. It is surmised that continuous innovation, adaptive interventions, and sustained engagement strategies are essential for successfully implementing DHI programs in this sector.

Method

A literature search was conducted from April to June 2024 using PubMed, Scopus, Web of Science, and CINAHL with keywords like 'digital health interventions,' 'cardiovascular disease prevention,' and 'energy industry.' Reference lists were manually reviewed for additional relevant studies. The term "reviewed manually" refers to the process in which the authors carefully examined the reference lists of selected articles to identify additional relevant studies, ensuring a broad and inclusive literature review. This manual review process was essential to ensure the inclusion of relevant resources beyond the databases, including books, systematic reviews, and meta-analyses, which are often overlooked in standard database searches.

This study followed a narrative literature review approach. Studies were selected based on relevance, peer-reviewed publication, and alignment with the study objectives, focusing on diverse sources, including books, systematic reviews, and meta-analyses, for comprehensive insight. A targeted search was conducted using relevant keywords in major databases, and studies that provided significant insights into the effectiveness of DHIs in CVD prevention among energy industry workers were included. This study targeted energy industry workers (oil and gas, renewable resources, and utilities) and focused on DHIs for CVD prevention, including mobile apps, wearable devices, and online platforms. Although no direct comparison group was used (the interventions were assessed without a separate, equivalent group that received standard care or no intervention for comparison), this review considered studies that compared different DHI approaches and varying levels of personalization. Instead, the outcomes of the interventions were evaluated based on pre- and post-intervention measurements within the same group of participants.

Primary outcomes included both short-term and long-term effectiveness of DHIs in reducing CVD risk factors and sustaining behavior change. This review included studies published since 2014 in peer-reviewed English journals, prioritizing those that incorporate behavior change theories and implementation strategies in high-risk occupational settings. Exclusions comprised narrative reviews, editorials, non-digital interventions, and studies lacking theoretical foundations. A narrative synthesis was conducted to analyze theoretical underpinnings, identify literature gaps, and provide recommendations for future research in DHI implementation for CVD prevention in the energy industry.

Results

Most of the selected literature did not specify the sex distribution; however, in studies that did, males slightly outnumbered females, with approximately 48%-54% of participants being male. However, it is essential to note that such demographic data can impact the applicability and generalizability of the findings, particularly in diverse workforce environments like the energy sector. The age range of participants varied, with older adults (50+) potentially influencing the implementation and effectiveness of DHI, particularly in high-risk sectors such as energy.

The framework for DHIs in CVD prevention was based on behavioral change theories, including the Transtheoretical Model (TTM), Theory of Planned Behavior (TPB), and Social Cognitive Theory (SCT). These theories provide a framework for understanding how behavioral change occurs and guide the design of interventions. TTM, also known as the Stages of Change model, proposes that behavior change happens in a series of five stages: pre-contemplation, contemplation, preparation, action, and maintenance. TTM has been applied to various health behavior interventions, including internet-based exercise behavior changes by DiClemente *et al.* in 2020.[14]

In examining the effectiveness of DHIs for CVD prevention, various studies explored diverse aspects of intervention design and user characteristics. Yardley *et al.* (2015) applied the Person-Based Approach (PBA) to understand user needs, emphasizing principles that improve engagement and adherence, which are crucial for sustained behavior change.[12] Similarly, DiClemente *et al.* (2020) based their interventions on TTM, focusing on the stages and processes of change,

motivational readiness, and tailored interventions. Although specific sex and age information was not provided, the study's approach highlights the importance of tailoring interventions to the individual's stage of change.[14]

Morren *et al.* (2021) conducted eHealth interventions in environmental behavior studies, noting that cultural variations significantly influence the effectiveness of the TPB factors. The study did not specify sex or age data. However, it highlighted how these factors can shape intervention outcomes, suggesting that cultural context plays a critical role in the success of DHIs.[15] Warner *et al.* (2020) focused on self-efficacy-based behavioral interventions, emphasizing mastery experience, vicarious experience, verbal persuasion, and affective and somatic states. Similar to other studies, this study did not specify sex or age, but these factors were identified as key to motivating participants and maintaining long-term engagement.[16] Mair *et al.* (2023) examined DHI targeting non-communicable diseases (NCDs) and emphasized the importance of credible sources, social support, prompts, graded tasks, goal setting, and human coaching in improving intervention effectiveness. The study included adult participants aged 18 years and older, but did not provide specific sex distribution.[17]

Wang *et al.* (2019) proposed a holistic framework for theory-based DHIs, integrating behavioral theories, behavior change techniques (BCTs), and persuasive system design (PSD), offering a flexible approach that can be tailored to the unique challenges of the energy sector, such as shift work and high physical demands. Like other studies, no sex or age data were provided, but the authors discussed how these frameworks can enhance the scalability and effectiveness of DHIs.[18] Van Gemert-Pijnen *et al.* (2018) focused on persuasive health technology interventions, with an emphasis on PSD principles, including primary task support, dialogue support, system credibility, and social support. This study did not provide specific details on sex or age, yet its findings suggest that these principles are vital for improving user engagement and adherence to interventions.[19] Xue *et al.* (2024) applied the Unified Theory of Acceptance and Use of Technology (UTAUT) model to assess performance expectancy, effort expectancy, social influence, and facilitating conditions in DHIs. The study involved participants with varied characteristics, but sex and age data were not specified, and it focused on the acceptance of technology in health behavior change.[20] Higgins *et al.* (2016) evaluated smartphone apps for health and fitness in adults aged 50 and above, with a focus on goal-setting, rapid intention formation, self-monitoring, and feedback. The study, which targeted older adults, offers valuable insights into how DHIs can effectively cater to this specific demographic.[21]

Sequi-Dominguez *et al.* (2020) investigated mobile health interventions for promoting physical activity and lifestyle changes, with a study population consisting of 52% females. This study found that mobile-based interventions were effective in significantly reducing BMI, blood pressure, and fasting glucose levels, highlighting the importance of tailored interventions for diverse populations.[22] Tong *et al.* (2024) also explored mobile apps, fitness trackers, and text message interventions, with a study population comprising 46% females. This study emphasized the cultural fit, user engagement, goal setting, and self-monitoring elements as key to promoting sustained health behavior change.[23] Perski *et al.* (2017) examined Digital Behavior Change Interventions (DBCIs) and found that the content, context, and behavioral target of the intervention influenced engagement. This study included adults aged 18 years and older, but did not provide specific data on sex distribution.[24] Finally, Murray *et al.* (2016) assessed evaluation strategies for DHIs, focusing on scalability, usability, engagement, cost-effectiveness, and sustainable implementation. This study did not provide specific sex or age data, yet it underscored the importance of these factors in determining the long-term success of DHIs.[25]

The TPB, developed by extending the Theory of Reasoned Action, posits that behavioral intention is influenced by factors like attitude toward the behavior and perceived social pressure (subjective norms) to perform or not perform a behavior. This theory incorporates perceived behavioral control, which refers to the belief in one's ability to perform the behavior that can influence both intention and actual behavior.[15] Meanwhile, according to the SCT, an individual's behavior results from the interplay of cognitive, environmental, and behavioral factors. A fundamental SCT construct is self-efficacy, the belief in one's ability to organize and execute actions to manage prospective situations. The theory suggests that by enhancing self-efficacy, one can facilitate behavior change.[16] Mair *et al.* (2023) observed that using these theories in internet-based behavior change interventions had a greater effect size, with TPB, TTM, and SCT being the most commonly used theories.[17] There are 82 behavioral theories that were classified into continuum and stage theories by Wang *et al.* (2019).[18]

One of the prevalent issues with behavioral theories is that they often provide abstract guidance that cannot be directly translated into concrete intervention techniques. This gap can be addressed using two common taxonomies (Behavior Change Techniques (BCT) Taxonomy and Persuasive Systems Design (PSD) principles) frequently used in DHI research. The BCT Taxonomy is a hierarchical list of 93 concrete BCTs, such as self-monitoring, goal setting, and action

planning, which serve as an intervention strategy. In contrast, the PSD principles comprise 28 principles organized into four categories (supporting task, dialogue, credibility, and social support) for designing persuasive digital technologies.[19] Wang *et al.* developed the "DHI Taxonomy" by integrating techniques from the BCT Taxonomy and overlapping principles from the PSD model into intervention strategy categories. They also proposed the TUDER framework (Targeting, Understanding, Designing, Evaluating, and Refining) to enhance comparability and evidence synthesis in DHI studies. TUDER incorporates behavioral theories, established BCT taxonomies, and persuasive design principles, comprising four key steps and two toolboxes: Behavioral Theories and the DHI Taxonomy for comprehensive DHI development.[18]

How individuals adopt new ways of doing things and use technology is critical to a successful DHI. The Unified Theory of Acceptance and Use of Technology (UTAUT) serves as a comprehensive model in this domain. This model identifies important determinants for technology acceptance and usage, such as performance expectancy, effort expectancy, social influence, and facilitating conditions. These factors influence users' intentions to use technology and their actual usage behavior. The DHIs can be developed to enhance these determinants so that the interventions seem helpful, easy to use, and supported by peers and the organization.[20]

Digital Health Intervention for CVD Prevention: Short-Term Effectiveness

To date, DHIs have shown promising short-term outcomes in the prevention of CVD through lifestyle modifications, medication adherence, and risk factor control. Recent studies indicate that DHIs effectively promote physical activity, improve dietary habits, and enhance adherence to medications among users.[21-23] One study has demonstrated that wearable technology, mobile apps, and online tools can lead to positive changes in physical activity levels, promote weight loss, reduce blood pressure, and lower cholesterol levels.[21]

Despite the considerable improvements in the short term, sustaining these positive changes in the long term remains a challenge. Evidence from systematic reviews and meta-analyses highlights that DHIs, particularly those delivered through mobile technologies, can effectively reduce key risk factors such as body mass index (BMI), waist circumference, and blood pressure, as well as promote faster plasma glucose production in individuals with metabolic syndrome. These technologies provide scalable, cost-effective, and accessible solutions by enabling personalized health support and reducing reliance on traditional in-person care models.[22]

Several factors contribute to the short-term success of DHIs, such as the novelty effect, where users are initially motivated and highly engaged due to the intervention's newness. Early engagement is also influenced by user perceptions of relevance and ease of use, as well as the integration of BCTs like goal setting and self-monitoring. A systematic review in 2024 emphasized that interventions through mobile apps and text messages with features such as tailored feedback, reminders, and culturally adapted content effectively improve user satisfaction and adherence in the short term. Additionally, the intuitive design and real-time feedback of these technologies enhance user experience and foster initial success in promoting health behaviors.[23]

Digital Health Intervention for CVD Prevention: Challenges in Sustaining Long-Term Effectiveness and Behavior Change

The application of DHIs to combat CVD faces several obstacles in terms of sustainability concerning user engagement and long-term behavior change. The most critical obstruction is intervention fatigue, where, over time, users become less motivated and engaged. Monotonous content and a lack of variety in engagement methods can further exacerbate this fatigue.[24] Another significant barrier is the absence of ongoing support. Consistent reinforcement is necessary for continued engagement, yet most DHIs lack long-term support mechanisms. This includes limited follow-up sessions, impersonal feedback, and insufficient access to health professionals.[23]

Personalization enhances engagement by addressing the specific needs and preferences of workers in the energy sector, while intuitive, user-friendly interfaces ensure ease of use, which is crucial in high-risk occupational settings where workers may have limited time or expertise to navigate complex systems. Conversely, poor design can cause frustration and dropout.[12] Social support boosts DHI adherence through peer, family, or professional involvement, fostering motivation and accountability. However, DHIs face limitations, including short engagement duration, poor integration with health systems, and insufficient real-time data analysis for personalized feedback, hindering long-term behavior change.[25]

Discussion

To achieve long-term behavior change, DHIs must be adaptive and dynamic, as well as able to evolve in response to user interactions and progress. A personalized feedback loop plays a central role in this approach by providing tailored recommendations and adjustments as users progress.[26] This necessitates the development of DHIs that can adapt over time to align with the users' changing needs and circumstances. By continuously providing relevant and engaging content, interventions are expected to become an integral part of users' daily routines, fostering sustained behavior change.[27]

Gamification enhances engagement, particularly in high-stress environments like the energy industry, by utilizing both intrinsic and extrinsic motivators, such as points, badges, and leaderboards. Gamification also provides motivation by setting achievable goals, providing instant feedback, and acknowledging user achievements. These approaches enhance user commitment, reduce attrition rates, and foster a sense of accomplishment as users track their progress and earn rewards. This, in turn, will alter their perception, making them consider healthy behaviors not just necessary but also enjoyable and sustainable.[28]

Gamification requires a structured approach for sustainable engagement, with the LIVE IT wellness program in Canada as a successful mode. This program utilized a web-based platform to integrate gamified elements, including team challenges, goal setting, leaderboards, and badges, alongside educational modules and biometric health assessments. The initiative was rolled out gradually, beginning with an 8-week physical activity challenge (MOVE IT), followed by nutrition-focused challenges (FUEL IT) and mental health activities (BALANCE IT). Employees were encouraged to participate through a combination of intrinsic motivators, such as social connections, and extrinsic rewards, including branded items and healthy competition. Key principles for workplace gamification include goal setting and feedback, where clearly defined health goals and real-time feedback keep participants engaged and aware of their progress. For example, tracking physical activity through pedometers or wearable devices was used in the LIVE IT program to enable participants to monitor daily steps and compete against peers. The LIVE IT program reported that 76% of participants tracked their activity on at least half of the days during challenges, illustrating the role of consistent tracking in maintaining engagement.[29]

Social support through teamwork and colleague interaction is crucial in the energy sector, as it fosters shared responsibility for health outcomes, reduces isolation, and helps workers adhere to behavior change goals, especially in remote and high-stress work environments. The implementation of online forums, group challenges, and peer mentoring may create community engagement and shared purpose. These social elements, including family and colleague involvement, are expected to foster sustainable behavior change by providing emotional support and reducing isolation while making the whole process enjoyable. According to a previous study on the topic, the integration of DHI with occupational health programs can be inferred to have the potential to enhance employees' well-being. Additionally, collaboration with healthcare providers offers professional oversight and personalized care plans, which boosts the credibility of interventions and supports long-term health outcomes.[28]

Continuous user engagement is critical for the sustained success of DHIs. Regular feedback mechanisms, including surveys, focus groups, and user analytics, provide valuable insights into user experiences and preferences.[30] By collecting and acting on this feedback, DHIs can be iteratively refined to better meet the needs and expectations of energy sector workers. Moreover, incorporating both quantitative and qualitative user input may enhance satisfaction and promote long-term adherence to the intervention. Besides, addressing context-specific determinants is crucial to achieving effective behavior change in this sector. Since factors such as shift work, activity levels, job demands, and the work environment affect the feasibility and sustainability of health behaviors, DHIs tailored to these unique contexts are necessary. Last but not least, organizational support, including leadership commitment, resource allocation, and structural changes, plays a pivotal role in the successful implementation and sustainability of DHIs.[7,31]

The design and development of sustainable DHIs for workers in the energy industry must be guided by user-centered design (UCD) principles. UCD focuses on meeting the needs, preferences, and specific contexts of users to create interventions that are both effective and easy to use.[32] For energy industry workers, this includes addressing unique challenges such as shift work, high-stress environments, and physical demands. Involving workers in the design process through participatory methods ensures that DHIs are tailored to their specific challenges and preferences, thereby enhancing usability and promoting long-term engagement.

The incorporation of evidence-based content and BCTs using techniques such as goal setting, self-monitoring, and feedback are systematically proven to influence behavior change and are critical for the effective implementation of DHIs.[14] For workers in high-demand settings like the energy industry, it is essential to select BCTs that can adapt to their

specific work conditions to enhance the intervention's relevance and promote sustained behavior change over time.

Systematic frameworks and metrics relevant to a robust evaluation are crucial for assessing the long-term effectiveness of DHIs. Frameworks such as RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) and PRECEDE-PROCEED (Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluation - Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development) offer comprehensive methodologies for evaluating public health interventions.[33] These frameworks aid in assessing immediate outcomes as well as the sustainability and scalability of interventions, which is particularly important for the dynamic and diverse environments found in the energy industry.

Additionally, pragmatic approaches can be employed to evaluate and develop DHIs that are relevant to the evolving global health discussions. Combining hybrid research designs with pragmatic trials provides valuable insights into the real-world effectiveness of DHIs. Hybrid designs blend elements of both effectiveness and implementation research, providing data on not only intervention outcomes but also the delivery process. Pragmatic trials, which evaluate interventions under real-world conditions, are especially applicable to the energy industry, where DHIs must adapt to various work environments and operational demands.[34]

Data privacy, security, and ethical considerations must be prioritized during the design and implementation of DHIs. Given the sensitivity of health data and the potential risks of misuse, strict measures are essential to protect user information. Furthermore, compliance with regulations, such as the General Data Protection Regulation (GDPR), and adherence to ethical guidelines for digital health research are essential.[35] Key strategies to safeguard user data include ensuring transparency, obtaining informed consent, and implementing appropriate data encryption protocols. By upholding data privacy and ethical standards, DHIs will be able to build trust among participants and encourage sustained user engagement.

Organizational readiness and stakeholder engagement are crucial for the successful implementation of DHIs in the energy industry. Preparing an organization for change requires an understanding of its current capabilities, resources, and the willingness of its members to embrace new interventions.[36] Strategies such as forming an advisory committee, conducting workshops, and facilitating regular dialogues to align the goals and expectations across all stakeholders can foster a shared vision for the intervention. Bringing DHIs into the energy sector's workplace culture is important for long-term success. To make this happen, it is necessary to follow a clear process that includes careful planning, implementing the plan, and regularly monitoring its effectiveness. It is also essential to address any resistance and create an environment that supports health programs.[37] This process includes developing a clear vision, effectively communicating the benefits of DHIs, and empowering employees to actively participate in the change process. By fostering a culture of health and wellness, organizations create a supportive framework that makes DHIs more acceptable and sustainable over time.

Meanwhile, adequate training and support systems for healthcare providers and facilitators must be implemented in parallel with other approaches to ensure the effective implementation of DHIs. On top of that, ongoing support through continuous education, peer support networks, and access to necessary resources ensures that healthcare providers remain competent and confident in delivering interventions.[38] This continuous support system is expected to maintain the integrity and effectiveness of the DHI implementation for an extended period.

Many researchers believe that incorporating DHIs into current health promotion programs improves their effectiveness and ensures long-term sustainability. This approach maintains consistency and aligns with broader health promotion efforts within the energy industry. Working alongside occupational health services, wellness programs, and external health agencies helps create a supportive environment that encourages behavior change and amplifies the reach and impact of DHIs. This method builds on existing structures to strengthen DHI strategies and supports a more holistic health promotion effort.

Compliance with regulatory and policy standards is a crucial consideration in implementing DHIs in the energy industry. Ensuring data privacy, security, and adherence to legal requirements is crucial for maintaining trust among employees and protecting their health information. Additionally, workplace policies that support the adoption and sustainability of DHIs, such as participation incentives and clear data protection provisions, further facilitate the successful implementation of these interventions. In brief, by adhering to guidelines like the GDPR and other ethical standards, a secure and trustworthy framework for digital health research and interventions can be established between an organization and its employees.[35]

While DHIs hold significant promise for the energy sector, several limitations persist. First, there was a lack of empirical studies that examined DHIs in the energy industry. Based on the literature review, most research focused on the general population or other occupational settings, with no specific focus on addressing the unique challenges and needs of the energy sector. This gap underscored the need for more industry-specific research to inform the development of effective interventions. Second, there was a selection bias in current studies, where participants are typically more computer-savvy, which limits the generalizability of findings. Additionally, there was an insufficient amount of longitudinal data on the effectiveness of DHIs, which is crucial, as CVD is a chronic condition requiring sustained intervention.

Furthermore, the diversity of cultures and organizational structures across the global energy industry presents an additional challenge. The unique, high-stress, and high-risk nature of work in this sector, combined with frequently remote and irregular working conditions, means that DHIs must be carefully developed to meet these specific needs. It must be pointed out that although the principles and strategies discussed here have broader applicability in other high-risk occupational settings, such as manufacturing, construction, or mining, the successful implementation of DHIs requires consideration of industry-specific factors. To date, DHI implementation has encountered numerous challenges. For example, platforms like District Health Information System version 2 (DHIS2) struggle to support collaborative work environments, with failure resulting in configuration errors, delays, and inefficiencies in health data management. Therefore, integration complexities with existing systems demand substantial resources and expertise.[39]

Conclusion

DHIs show great potential for preventing CVD in the energy sector by leveraging user-centered designs, behavior change techniques, and continuous engagement. Successful implementation requires organizational readiness, stakeholder involvement, and integration with existing health programs while addressing industry-specific challenges such as high-stress environments and irregular shifts. Future research should tailor DHIs for the energy sector, incorporating wearables and AI, and conduct longitudinal studies on their long-term impact on CVD prevention. Ethical considerations, cost-effectiveness, and scalability must also be prioritized to ensure sustainable impact. A comprehensive, user-centered approach will enhance worker health and well-being in this demanding industry.

Abbreviations

CVD: Cardiovascular Disease; DHI: Digital Health Intervention; TTM: Transtheoretical Model; TPB: Theory of Planned Behavior; SCT: Social Cognitive Theory; BCT: Behavior Change Techniques; PSD: Persuasive System Design; TUDER: Targeting, Understanding, Designing, Evaluating and Refining; BIT: Behavioral Intervention Techniques; UCD: user-centered design; GDPR: General Data Protection Regulation.

Ethics Approval and Consent to Participate

Not applicable.

Competing Interest

The author(s) have no conflict of interest in the research.

Availability of Data and Materials

The data and materials used in this research, including the Supplementary File, are available to the public for further review of the datasets and research findings.

Authors' Contribution

YI conceptualized the study and interpreted the data. LMK supported content development and review. DHR assisted with the title and manuscript structure. All authors approved the final manuscript.

Acknowledgment

The authors would like to express their sincere gratitude to the Lecturer of Academic Writing and Publication for their invaluable support and guidance in preparing this draft.

References

1. World Health Organization. Cardiovascular diseases (CVDs). Geneva: World Health Organization; 2021.
2. Tepe S, Eti S, Moda HM, et al. Evaluation of psychosocial risk factors encountered for energy sector employees by MAIRCA method. In: Dinçer H, Yüksel S, Deveci M, editors. Decision making in interdisciplinary renewable energy projects. Springer, Cham; 2024. p. 65-83. DOI: 10.1007/978-3-031-51532-3_6.
3. Angerer P, Schmook R, Elfantel I, et al. Night work and the risk of depression. Dtsch Arztebl Int. 2017; 114 (24): 404-411. DOI: 10.3238/arztebl.2017.0404.

4. Mochtar I, Modjo R. Risk of major cardiovascular events in offshore oil and gas industry workers in Qatar. Malays J Med Health Sci. 2024; 20 (2): 191-195. DOI: 10.47836/mjmhs.20.2.25.
5. Mannocci A, Pignalosa S, Saulle R, et al. Prevalence of major cardiovascular risk factors among oil and gas and energy company workers. Ann Ist Super Sanita. 2015; 51 (2): 148-153. DOI: 10.4415/ANN_15_02_13.
6. Vetter C, Devore EE, Wegrzyn LR, et al. Association between rotating night shift work and risk of coronary heart disease among women. JAMA. 2016; 315 (16): 1726-1734. DOI: 10.1001/jama.2016.4454.
7. Kurniawidjaja LM, Martomulyono S, Susilowati IH. Teori dan aplikasi promosi kesehatan di tempat kerja meningkatkan produktivitas. Jakarta: UI Publishing; 2020.
8. Widmer RJ, Collins NM, Collins CS, et al. Digital health interventions for the prevention of cardiovascular disease. Mayo Clin Proc. 2015; 90 (4): 469-480. DOI: 10.1016/j.mayocp.2014.12.026.
9. Lin MH, Yuan WL, Huang TC, et al. Clinical effectiveness of telemedicine for chronic heart failure: A systematic review and meta-analysis. J Investig Med. 2017; 65 (5): 899-911. DOI: 10.1136/jim-2016-000199.
10. Baldassarre D, Iacoviello L, Baetta R, et al. Rationale and design of the CV-PREVITAL study: An Italian multiple cohort randomized controlled trial investigating innovative digital strategies in primary cardiovascular prevention. BMJ Open. 2023; 13 (7). DOI: 10.1136/bmjopen-2023-072040.
11. Ventura F, Brovall M, Smith F. Beyond effectiveness evaluation: Contributing to the discussion on complexity of digital health interventions with examples from cancer care. Front Public Health. 2022; 10: 883315. DOI: 10.3389/fpubh.2022.883315.
12. Yardley L, Morrison L, Bradbury K, et al. The person-based approach to intervention development: Application to digital health-related behavior change interventions. J Med Internet Res. 2015; 17 (1). DOI: 10.2196/jmir.4055.
13. Gibson I, Jennings C, Neubeck L, et al. Using a digital health intervention "INTERCEPT" to improve secondary prevention in coronary heart disease (CHD) patients: Protocol for a mixed methods non-randomized feasibility study. HRB Open Res. 2023; 6: 43. DOI: 10.12688/hrbopenres.13781.1.
14. DiClemente CC, Graydon MM. Changing behavior using the transtheoretical model. In: Hagger MS, Cameron LD, Hamilton K, Hankonen N, Lintunen T, editors. The handbook of behavior change. Cambridge: Cambridge University Press; 2020. p. 136-149. DOI: 10.1017/9781108677318.010.
15. Morren M, Grinstein A. The cross-cultural challenges of integrating personal norms into the theory of planned behavior: A meta-analytic structural equation modeling (MASEM) approach. J Environ Psychol. 2021; 75: 101593. DOI: 10.1016/j.jenvp.2021.101593.
16. Warner LM, French DP. Self-efficacy interventions. In: Hagger MS, Cameron LD, Hamilton K, Hankonen N, Lintunen T, editors. The handbook of behavior change. Cambridge: Cambridge University Press; 2020. p. 461-78. DOI: 10.1017/9781108677318.032.
17. Mair JL, Salamanca-Sanabria A, Frese B, et al. Effective behavior change techniques in digital health interventions targeting non-communicable diseases: An umbrella review; 2023. DOI: 10.31219/osf.io/n4sav.
18. Wang Y, Fadhil A, Lange JP, et al. Integrating taxonomies into theory-based digital health interventions for behavior change: A holistic framework. JMIR Res Protoc. 2019; 8 (1): e8055. DOI: 10.2196/resprot.8055.
19. Van Gemert-Pijnen L, Kelders SM, Beerlage-de Jong N, et al. Persuasive health technology. In: van Gemert-Pijnen L, Kelders SM, Kip H, Sanderman R, editors. eHealth research, theory and development: A multi-disciplinary approach. Routledge; 2018. DOI: 10.4324/9781315385907-11.
20. Xue L, Rashid AM, Ouyang S. The unified theory of acceptance and use of technology (UTAUT) in higher education: A systematic review. SAGE Open. 2024; 14 (1): 1-12. DOI: 10.1177/21582440241229570.
21. Higgins JP. Smartphone applications for patients' health and fitness. Am J Med. 2016; 129 (1): 11-19. DOI: 10.1016/j.amjmed.2015.05.038.
22. Sequi-Dominguez I, Alvarez-Bueno C, Martinez-Vizcaino V, et al. Effectiveness of mobile health interventions promoting physical activity and lifestyle interventions to reduce cardiovascular risk among individuals with metabolic syndrome: Systematic review and meta-analysis. J Med Internet Res. 2020; 22 (8): e17790. DOI: 10.2196/17790.
23. Tong H, Alnasser A, Alshahrani N, et al. The use of mobile technologies to promote physical activity and reduce sedentary behaviors in the Middle East and North Africa region: Systematic review and meta-analysis. J Med Internet Res. 2024; 26: e53651. DOI: 10.2196/53651.
24. Perski O, Blandford A, West R, et al. Conceptualising engagement with digital behaviour change interventions: A systematic review using principles from critical interpretive synthesis. Transl Behav Med. 2017; 17 (2): 254-267. DOI: 10.1007/s13142-016-0453-1.
25. Murray E, Hekler EB, Andersson G, et al. Evaluating digital health interventions: Key questions and approaches. Am J Prev Med. 2016; 51 (5): 843-851. DOI: 10.1016/j.amepre.2016.06.008.
26. Nahum-Shani I, Smith SN, Spring BJ, et al. Just-in-time adaptive interventions (JITAIs) in mobile health: Key components and design principles for ongoing health behavior support. Ann Behav Med. 2018; 52 (6): 446-462. DOI: 10.1007/s12160-016-9830-8.
27. Äikäs AH, Absetz P, Hirvensalo MH, et al. What can you achieve in 8 years? A case study on participation, effectiveness, and overall impact of a comprehensive workplace health promotion program. J Occup Environ Med. 2019; 61 (12): 964-977. DOI: 10.1097/JOM.0000000000001699.
28. Koivisto J, Hamari J. The rise of motivational information systems: A review of gamification research. Int J Inf Manage. 2019; 45: 191-210. DOI: 10.1016/j.ijinfomgt.
29. Lowensteyn I, Berberian V, Belisle P, et al. The sustainability of a workplace wellness program that incorporates gamification principles: Participant engagement and health benefits after 2 years. Am J Health Promot. 2019; 33 (6): 850-858. DOI: 10.1177/0890117118823165.
30. Rapp A, Tirassa M, Tirabeni L. Rethinking technologies for behavior change: A view from the inside of human change. ACM Trans Comput Hum Interact. 2019; 26 (4): 22. DOI: 10.1145/3318142.
31. Rachmawati I, Krisnana IK, Kurnia ID, et al. Peer support and healthy lifestyle among adolescents in urban areas in Indonesia. Int J Public Health Sci. 2024; 13 (4): 1930. DOI: 10.11591/ijphs.v13i4.23890.
32. Goode AD, Frith MJ, Hyne SA, et al. Applying a user-centered design approach to optimize a workplace initiative for wide-scale implementation. Int J Environ Res Public Health. 2022; 19 (13): 8096. DOI: 10.3390/ijerph19138096.
33. De Moel-Mandel C, Lynch C, Issaka A, et al. Optimising the implementation of digital-supported interventions for the secondary prevention of heart disease: A systematic review using the RE-AIM planning and evaluation framework. BMC Health Serv Res. 2023; 23: 1347. DOI: 10.1186/s12913-023-10361-6.

34. Jin MF, Noseworthy PA, Yao X. Assessing AI solution effectiveness: The role of pragmatic trials. Mayo Clin Proc Digit Health. 2024; 2 (4): 499-510. DOI: 10.1016/j.mcpdig.2024.06.010.
35. Adekugbe AP, Ibeh CV. Navigating ethical challenges in data management for U.S. program development: Best practices and recommendations. Int J Multidiscip Educ Res. 2024; 6 (4): 982. DOI: 10.51594/ijmer.v6i4.982.
36. Chwiłkowska-Kubala A, Cyfert S, Malewska K, et al. The impact of resources on digital transformation in energy sector companies: The role of readiness for digital transformation. Technol Soc. 2023; 74: 102315. DOI: 10.1016/j.techsoc.2023.102315.
37. Roberts R, Flin R, Corradi L. Maximizing technology for the energy transition: An organisational innovation adoption culture survey. 2023. DOI: 10.2118/215557-ms.
38. Ramachandran HJ. Barriers and facilitators to the adoption of digital health interventions for COPD management: A scoping review. Heart Lung. 2023; 59: 117-127. DOI: 10.1016/j.hrtlng.2023.02.004.
39. Twabi AT, Mwakabira IF, Phiri Y, et al. On the enhancement of collaboration and group support in DHIS2 program rule management. In: 2022 International conference on electrical, computer and energy technologies (ICECET). Prague: IEEE; 2022. DOI: 10.1109/ICECET55527.2022.9872957.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 9

7-31-2025

Health Economics Perspective on Indonesian Telemedicine Platform Practices: A Qualitative Study

Yossico Ria Wibowo
Telkom University, Bandung, yossicoria@gmail.com

Rina Djunita Pasaribu
Telkom University, Bandung, rinadjunita@telkomuniversity.ac.id

Recommended Citation

Wibowo YR , Pasaribu RD . Health Economics Perspective on Indonesian Telemedicine Platform Practices: A Qualitative Study. *Kesmas*. 2025; 20(5): 73-82
DOI: 10.7454/kesmas.v20isp1.1892
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/9

Wibowo *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2024; 20 (Special Issue 1): 73-82
DOI: 10.7454/kesmas.v20isp1.1892

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Health Economics Perspective on Indonesian Telemedicine Platform Practices: A Qualitative Study

Yossico Ria Wibowo*, Rina Djunita Pasaribu

Master of Management Study Program, Faculty of Economics and Business, Telkom University, Bandung, Indonesia

Abstract

Telemedicine in Indonesia has experienced significant growth since its introduction in 2014. The financing system is regulated independently by each platform, leading to disparities in teleconsultation fees and medical incentives. This qualitative study, which involved a literature review and interviews with 33 participants, offered a health economics perspective on the implementation of telemedicine. The recommended teleconsultation fee ranges from USD 0.05 to USD 2.54, with medical incentives set at USD 1,59-3.18 for general practitioners and USD 4.77-6.36 for specialists, using telephone or video calls as the preferred means of teleconsultation. Although most patients and Indonesian Medical Association administrators generally agreed with these recommendations, platform managers expressed reservations, particularly regarding the fees for specialists. Video calls were widely accepted as the preferred medium for teleconsultations. This study concludes that the maximum recommended teleconsultation fee is USD 2.54, with minimum medical incentives of USD 1.59 for general practitioners and USD 4.77 for specialists, and that the teleconsultation medium for making a diagnosis on the telemedicine platform is chat, with a mandatory feature allowing optional use of video calls, which can be used according to the mutual agreement and adjustment of teleconsultation fees.

Keywords: health economics, medical incentives, teleconsultation fee, telemedicine

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has altered the habits of Indonesian patients, shifting from in-person visits to telemedicine consultations.[1] Centers for Disease Control and Prevention (CDC) analysis in January, as of March 2020, stated that the number of telemedicine visits in the United States increased by 50% compared to 2019.[2] Meanwhile, in Indonesia, telemedicine use increased by 44.1% in 2022 compared to 2021.[3]

The implementation of telemedicine in Indonesia refers to the Minister of Health Regulation Number 20 of 2019.[4] This regulation does not regulate patient consultation fees, medical incentives for doctors, or teleconsultation media on private telemedicine platforms.[4] This has led to significant disparity in teleconsultation costs and medical incentives. General practitioner (GP) teleconsultation fees range from USD 0.5 to USD 4.45, while those for specialists range from USD 1.59 to USD 22.24. The amount of health incentives received by doctors is 70%–80% of the teleconsultation fee, depending on the platform.[5]

This study compared teleconsultation costs and medical incentives in Indonesia, based on gross domestic product (GDP) per capita, as well as teleconsultation media, with global benchmarks from high-income countries, including the United States, Australia, Belgium, Denmark, France, Germany, China, the Netherlands, and Singapore.[6-8] High-income countries serve as the benchmark because Indonesia is classified as an upper-middle-income country by the World Bank.[9]

This economic evaluation of telemedicine is crucial for understanding its potential cost savings, improved patient outcomes, and overall impact on the healthcare system.[10] A previous study has primarily been conducted in developed countries, focusing on the amount of patient fees and medical incentives.[11] This study aimed to elaborate on the perceptions of telemedicine users and healthcare providers regarding the amount of patient fees and medical incentives relative to GDP per capita and the use of telemedicine modalities that fit the Indonesian culture. This information is critical

***Correspondence**:* *Yossico Rio Wibowo, Master of Management Study Program, Faculty of Economics and Business, Telkom University, Bandung, Indonesia. E-mail: yossicoriawibowo@student.telkomuniversity.ac.id or yossicoria@gmail.com*

Received : May 8, 2024
Accepted : April 28, 2025
Published: July 31, 2025

for policymakers, healthcare providers, and insurance companies to make informed decisions on the implementation and funding of telemedicine services.

Method

This study employed a qualitative approach, incorporating a literature review and in-depth interviews. The preliminary literature review aimed to provide recommendations for the appropriate teleconsultation fee, medical incentives, and types of teleconsultation media. In addition, in-depth interviews were conducted to determine whether or not participants agreed with the teleconsultation fees, medical incentives, and teleconsultation media recommended based on the results of the previous literature review, and the reasons behind their answers.

The First Stage: Literature Study and Gross Domestic Product Standardization

The determination of teleconsultation costs in Indonesia was conducted by comparing the ratio of teleconsultation costs to GDP per capita with high-income countries, such as Australia, China, and Singapore (Table 1).[12-14] These countries were chosen as comparators because patients, similar to the system in Indonesia, fully bore the costs of teleconsultation. Based on this standardization, the ideal ratio of teleconsultation costs in Indonesia compared to GDP per capita was 1:100,000–50:100,000. Indonesia's GDP per capita in 2023 was USD 4,919.7.[9] Assuming this ratio was converted to USD, and the ideal teleconsultation fee was USD 0.05 - USD 2.54 per session.

Table 1. Teleconsultation Fees Abroad, Gross Domestic Product per Capita, and Comparison of Gross Domestic Product per Capita with Teleconsultation Fees

Country	Author (year)	Teleconsultation Fees	GDP per capita (USD) (World Bank, 2023)	Comparison of teleconsultation fees with GDP per capita (standardized per 100,000 GDP per capita)
Australia[12]	Snoswell *et al.* (2022)	USD0.68–USD27.26 per session	63,487	1:100,000–43:100,000
China[13]	Xie *et al.* (2022)	USD25 per session	50,030	50:100,000
Singapore[14]	Chua *et al.* (2022)	USD20–USD40 per session	84,500.4	24:100,000–47:100,000

1 USD = IDR 15,734 (currency per February 11, 2024)
The formula for c, comparison of GDP per capita with teleconsultation fees = teleconsultation fees × 100,000 : GDP per capita.

Medical incentives in Indonesia are formulated by comparing the ratio of medical incentives for GPs and specialists to GDP per capita with high-income countries, such as the Netherlands, Denmark, France, and Belgium (Table 2).[15-16] Based on this standardization, the ideal ratio of GPs' medical incentives in Indonesia to GDP per capita is 6:100,000–60:100,000, considering that Indonesia's GDP per capita in 2023 was USD 4,919.7. The ideal ratio of specialist medical incentives in Indonesia to GDP per capita is 27:100,000–621:100,000. Indonesia's GDP per capita is USD 4,919.7.[9] If this ratio is converted to USD (1 USD = IDR 15,734 based on currency per February 11, 2024), the ideal GPs medical incentive for teleconsultation services is USD 0.35-3.05 per session, and the ideal specialist's medical incentive for teleconsultation services is USD 1.39-31.65 per session. This figure reflects the Circular Letter from the Indonesian Medical Association in 2013 regarding the reference rates for doctors' medical services, which stated that medical incentives for face-to-face GPs were USD 1.59–3.18, and for face-to-face specialists were USD 4.77–6.36.[17] Thus, the recommended medical incentives for GPs are USD 1.59–3.18. and for specialists are USD 4.77–6.36.

Table 2. Amount of Medical Incentives in Various Countries

Country	Medical Incentives (USD)	GDP per capita (USD) (World Bank, 2023)	Comparison of medical services provided by teleconsultation doctors with GDP per capita (standardized per 100,000 GDP per capita)
Denmark[15]	GPs: USD4.26-USD24.7 Specialist: USD19.18-USD443.55	71,402	GPs: 6:100,000-35:100,000 Specialist: 27:100,000-621:100,000
France[15]	GPs: 27.64	46,315	60:100,000
Netherlands[15]	GPs: USD5.81-USD23.25	61,769.7	9:100,000-38:100,000
Belgium[16]	GPs: USD29.6 Specialist: USD29-USD68.65	53,567	GPs: 55:100,000 Specialist: 54:100,000-128:100,000

1 USD = IDR15,734 (currency per February 11, 2024)
The formula for comparison of GDP per capita with medical incentives = medical incentives x 100,000: GDP per capita.

The Second Stage: In-depth Interviews

This study employed purposive sampling, with 33 respondents divided into four groups: telemedicine patients (n = 15), telemedicine doctors (n = 11), platform managers (n = 3), and administrators from the Indonesian Medical Association (n = 4). The inclusion criteria for this study were doctors who had provided teleconsultation services for at least 1 year, patients who had used teleconsultation services for at least 2 years, individuals currently managing telemedicine, and individuals currently serving as administrators of the Indonesian Medical Association. Participants were recruited until the responses reached saturation, indicating that no new information was obtained.

Interviews were conducted online via video conference between April and May 2024 and lasted 30–45 minutes. Patients were asked questions regarding teleconsultation fees and the use of teleconsultation media. Doctors received questions about medical incentives and teleconsultation media. Telemedicine platform managers and administrators of the Indonesian Medical Association received questions regarding teleconsultation fees, medical incentives, and the use of teleconsultation media.

Participants were invited via short messages. Interviews were conducted after the researcher obtained participant consent via short messages. The aim of this research, the purpose of the interview, the guarantee of data confidentiality, and the rights and obligations of the participant were orally conveyed before the interview took place. Participants' identities were kept confidential. This in-depth interview utilized an interview guide (as outlined in the supplementary file "Interview Question Guide"), which could be tailored to the specific interview conditions. The interviews were recorded and then transcribed verbatim. The interview transcripts were securely stored on a computer and could only be accessed by the authors. Only the obtained information was used for publication. The authors used Miles and Huberman's qualitative research analysis, which comprises three main stages: data reduction, data presentation, and conclusions. Participants received compensation in the form of internet quotas.

Results

Participant Characteristics

This study examined teleconsultation fees, medical incentives, and the use of teleconsultation media. Patients shared their views on fees and media, while doctors expressed their opinions on incentives and media. Platform managers and the administrators of the Indonesian Medical Association addressed all three variables. The demographic data are summarized in Table 3.

Table 3. Participant Characteristics

Characteristics	Participants (n=33)
Age (years), mean (SE; range)	33 (6.2; 24–47)
Sex, n%	
Female	9 (27%)
Male	24 (73%)
Domicile, n%	
Bali	1 (3%)
Bekasi	1 (3%)
Depok	1 (3%)
Jakarta	21 (64%)
Balikpapan	1 (3%)
Palembang	1 (3%)
Surabaya	4 (12%)
Tangerang	3 (9%)
Category	
Doctor	11 (33%)
Patient	15 (46%)
The telemedicine platform manager	3 (9%)
The administrators of the Indonesian Medical Association	4 (12%)

Table 4. Participant Details

Participant	Characteristics		
	Age (years)	Sex	Domicile
Doctor 1	33	Female	Bali
Doctor 2	34	Male	Palembang
Doctor 3	34	Male	Tangerang
Doctor 4	34	Male	Tangerang
Doctor 5	31	Male	Jakarta
Doctor 6	33	Male	Jakarta
Doctor 7	33	Male	Jakarta
Doctor 8	33	Male	Jakarta
Doctor 9	31	Male	Jakarta
Doctor 10	34	Male	Surabaya
Doctor 11	33	Female	Jakarta
Patient 1	33	Male	Depok
Patient 2	40	Female	Surabaya
Patient 3	47	Male	Surabaya
Patient 4	45	Female	Surabaya
Patient 5	33	Male	Balikpapan
Patient 6	33	Female	Tangerang
Patient 7	32	Female	Jakarta
Patient 8	32	Male	Jakarta
Patient 9	28	Male	Jakarta
Patient 10	33	Male	Bekasi
Patient 11	47	Male	Jakarta
Patient 12	33	Male	Jakarta
Patient 13	29	Male	Jakarta
Patient 14	34	Male	Jakarta
Patient 15	28	Female	Jakarta
Platform manager 1	40	Male	Jakarta
Platform manager 2	35	Female	Jakarta
Platform manager 3	33	Male	Jakarta
The administrators of the Indonesian Medical Association 1	49	Male	Jakarta
The administrators of the Indonesian Medical Association 2	45	Male	Jakarta
The administrators of the Indonesian Medical Association 3	44	Female	Jakarta
The administrators of the Indonesian Medical Association 4	35	Male	Jakarta

Teleconsultation Fee

Based on the previous literature review, the recommended teleconsultation fee is USD 0.05–2.54. All patients (100%) agreed, finding it affordable, but also considered the impact on doctors' medical incentives.

"Agree, [if the fee is] below USD 1.27, then it will be too cheap because it corresponds with the appreciation of the knowledge obtained by the doctor who gives the service with a big effort. However, let the telemedicine doctor decide whether they are willing to be paid at that price and give the best to the patients." (Patient 1)

Platform managers agreed that the recommended fees were in line with current rates for GPs but deemed them too low for specialists. Their fees are based on market surveys showing that Indonesians are willing to pay USD 0.95 for GPs and USD 2.86 for specialists.

"Yes [I agree] the price is still plausible for general practitioners, but for specialists, it is still underpriced. We conducted a market survey and found that patients are willing to pay around USD 2.86 for specialists and USD 0.95 for general practitioners. Therefore, we decided to apply one price in our platform, USD 0.95 for general practitioners and USD 2.86 for specialists." (Platform Manager 2)

"I concur with the fee for the public. Standard teleconsultation fee in our platform is USD 0.95 for a general practitioner and USD 3.18 for a specialist." (Platform Manager 3)

All administrators of the Indonesian Medical Association (100%) agreed that the recommended fees are accessible to all, but emphasized the need for a remuneration system that reflects the doctors' competence.

"Agree, it is very cheap so that it can cover all groups, but you need to think about how to calculate the doctor's remuneration. If the teleconsultation costs are that amount, the doctor cannot be paid that low." (The administrators of the Indonesian Medical Association 3)

"Agree. so far, there have been no clear regulations from the government regarding teleconsultation in Indonesia, so in reality, the market is free to determine prices; it is necessary to think about appropriate prices for the doctors and the patients so that they are mutually beneficial." (The administrators of the Indonesian Medical Association 4)

Medical Incentive

Based on the previous literature review, the recommended medical incentive is USD 1.59-3.18 for GPs and USD 4.77-6.36 for specialists. All doctors (100%) agreed. They view teleconsultations as equivalent to face-to-face consultations in terms of professionalism and effort, and expect incentives equivalent to those in face-to-face practice.

"I agree, in my opinion, the medical incentives should just be the same [with regular visit], still, because doctors serve patients according to each patient's complaints." (Doctor 1)

"Agree, because even though doctors are online, they also have to be on standby during online working hours; it is the same as working in a hospital or clinic." (Doctor 2)

"I agree because our professionalism as doctors is no different when we meet patients in the clinic and in telemedicine. Patients who come are treated according to their complaints. The medicine cannot be the same [for all patients]. If there are patients who are allergic to medicine A, the medicine must be adjusted for the patient." (Doctor 3)

All telemedicine platform managers (100%) disagreed with the medical incentive recommendations due to misalignment with their business models. Platform 1 treats GPs as employees with fixed incomes and specialists as partners with incentives and commissions, while platforms 2 and 3 consider all doctors as external partners. paid through commissions.

"I disagree with the recommendation; it cannot be implemented on our platform. General practitioners who provide teleconsultations on our platform are employees. We offer general practitioners a monthly salary of approximately USD 762.68. While specialists are partners, their medical services will be calculated per patient. Specialists have "standby fees" for one day that are approximately USD 6.36-9.53, depending on the specialist. Then every time someone consults, they get another USD 1.27 - USD 1.59." (Platform Manager 1)

"For medical incentives, the system is a 70:30 commission. The doctor gets 70%, so if our general practitioner's teleconsultation fee is USD 0.95, then the doctor gets USD 0.67 per session. Specialists charge the same consultation fee of USD 2.86; therefore, the medical incentive received is USD 2 for each teleconsultation. If we have to increase the medical incentives for doctors, but the teleconsultation costs are still not included in our system, I do not think they can be included in our system." (Platform Manager 2)

"Doctors on our platform are partners; before signing the contract, we have informed them of the medical incentives that will be received, payment with a commission split of 80:20, 80% for the doctor. Our standard price for general practitioners is USD 0.95 and for specialists USD 3.18." (Platform Manager 3)

Only 25% of the administrators of the Indonesian Medical Association agreed with the health incentive recommendation, which aligns with the Indonesian Medical Association's 2013 Circular Letter. The remaining 75% disagreed, arguing that the incentive recommendation is lower than the local rates. They proposed incentives of USD 6.36-7.94 for GPs and USD 15.89-25.42 for specialists per session.

"Remuneration should be based on the Circular Letter; there should be no difference in medical incentives between teleconsultation and face-to-face doctors. Until now, there are no regulations regarding medical incentives for telemedicine doctors; apart from that, the government has not differentiated the legal risks between telemedicine and face-to-face doctors, so medical incentives should also be equalized." (The administrators of the Indonesian Medical Association 4)

"So, in my opinion, it seems that if general practitioners and specialists are paid according to your recommendation, it is too low, maybe around USD 6.36 to USD 7.94, it still covers general practitioners, using the same benchmark as examining patients at the polyclinic. For a specialist, in my opinion, it is around USD 15.89 - USD 19.07." (The administrators of the Indonesian Medical Association 1)

"The telemedicine medical incentive of USD 6.36 for general practitioners and USD15.89 for specialists is appropriate, it is adjusted the same as an offline doctor." (The administrators of the Indonesian Medical Association 2)

"Actually, it should be the same as offline. In my opinion, a general practitioner is USD 6.36, and a specialist doctor should be USD 27.24 up to USD 25.42." (The administrators of the Indonesian Medical Association 3)

Teleconsultation Media

Based on the previous literature review, the recommended teleconsultation media are telephone or video calls. Most patients (73%) preferred video calls for better interaction, fostering a personal connection, empathetic communication, and more accurate diagnosis.

"Agree, I think video calls allow doctors and patients to interact directly, similar to meetings in a doctor's office. This creates a more personal relationship between the doctor and patient, allowing the doctor to better understand the patient's condition and provide the necessary emotional support." (Patient 7)

"Agreed, it will increase diagnostic accuracy and make it easier for patients to explain symptoms." (Patient 15)

Some patients (27%) preferred chat or telephone over video calls for teleconsultation, favoring written records, review of diagnoses, education, and prescriptions.

"I disagree because if you make a telephone or video call, there is no record, via chat, I can reread the diagnosis and prescription." (Patient 1)

Most doctors (67%) favored video calls because they enhance communication and allow the use of teaching aids for better patient education.

"Agree, telemedicine in Indonesia should at least use video calls, so you can make direct observations regarding the patient's physical condition. Also, lactation counselor doctors can provide education using teaching aids." (Doctor 3)

"Agree, so that the patient can visually show the part they are complaining about, and the doctor can understand the patient's emotions." (Doctor 4)

A minority (23%) of doctors preferred chat over video calls, as this approach allows simultaneous treatment of multiple patients, matching offline practice earnings. They suggest adjusting the medical incentives for video call services.

"I disagree with telephone or video calls because usually at one time I can handle several patients at once by chat." (Doctor 9)

"Currently, I disagree with the use of video calls. We need to consider the amount of incentives, because telemedicine is one source of income for doctors." (Doctor 8)

All telemedicine platform managers (100%) disagreed with the use of video calls because patient surveys showed a preference for chatting during work hours due to convenience and flexibility. Doctors also favor chat because it allows them to serve many patients simultaneously.

"From the patient's side, they still prefer chat because sometimes they are consulted while they are working, during office hours, or while taking a break. We have tried converting from chat to telephone, but most patients do not want to because they are working. Just because of consumer behavior, it seems like video calls are not very suitable yet." (Platform Manager 1)

"We do not have videos. We have surveyed the patients and the doctors. Only 10% of patients want a video call with a doctor, as they are nervous and must wear appropriate clothes. It is impossible to use a negligee to call a doctor like that, right? Then, they sometimes forget what they want to say and ask. Well, that is a problem from the patient's side. We also conducted a survey with our doctors on whether they were willing to make video calls. They ask how much the fee is. Because during video calls, it's only one-on-one. If you do teleconsultation using chat, you can serve 3–4 patients at the same time. If it is four patients, four times 45 thousand, that's 180 thousand for me once I am online. If it is a video call, how much do you want to pay? There is only one way. You cannot video call to serve many patients at the same time. So we decided not to use video calls." (Platform Manager 2)

A telemedicine platform is developing a video call feature with a booking system that requires at least one day's notice and higher fees compared to chat-based teleconsultation.

"We are currently developing video calls for teleconsultations, with a booking system at least one day in advance. We developed this in response to several requests from patients. According to patients, consultations are limited to words when chatting. The advantage of a video call is that it can show the condition of the disease and the doctor's explanation to the patient can be longer and wider. Currently, we are also determining suitable teleconsultation fees for the video call feature; of course, the video call price is higher than chat." (Platform Manager 3)

All administrators of the Indonesian Medical Association (100%) prefer video calls for teleconsultations because they enable doctors to observe patients' expressions and body language, and verify their identity.

"It is called teleconsultation; it is professional, the same as a face-to-face consultation at a polyclinic, so use the most suitable video so that the patient's smile and body language look like that, you know. So, if using chat and telephone, you cannot see all of that." (The administrators of the Indonesian Medical Association 1)

"Actually, chat and telephone are very limited, because if we do anamnesis, we need body language, expressions, etc. We usually have to make a video call, because we have to be able to see the patient's expression, whether he provided correct information regarding his condition. So if we just chat, we do not know who is chatting. Then, if we call, we do not know whether it is really the patient, and so on. So, at least teleconsultation on the telemedicine platform should be a video call." (The administrators of the Indonesian Medical Association 4)

Discussion

This study highlighted the agreements among doctors, administrators of the Indonesian Medical Association, patients, and platform managers regarding teleconsultation fees, medical incentives, and the use of teleconsultation media. Although the proposed fees are broadly accepted, they do not align with the cost structures of telemedicine providers. Doctors and the administrators of the Indonesian Medical Association supported medical incentives that comply with the 2013 Circular Letters; however, the current incentives were below professional standards. Patients favored chat. The administrators of the Indonesian Medical Association and platform managers emphasized the importance of video and telephone calls, prompting efforts to introduce video calls as an alternative teleconsultation media modality.

The recommended teleconsultation fee of USD 0.05–2.54 has been agreed upon by patients, platform managers, and the administrators of the Indonesian Medical Association as affordable for most Indonesians, in line with their average wages. This indicated that the role of price is very important in attracting consumer interest.[18] According to Statistics Indonesia data in 2021, most Indonesians worked as laborers, employees, or staff (37.02%).[19] In 2023, the average national

wage was USD 184.31 per month, with the highest in the real estate sector (USD 306.34) and the lowest in the services sector (USD 113.77).[20] Based on the Pareto method, which allocates 80% of income to priority needs and 20% to savings, teleconsultation costs are still included in the 20% allocation; therefore, in theory, it can be affordable for all levels of society.

Platform managers agreed that a medical incentive is suitable for GPs but not specialists on the grounds that market surveys show people's willingness to pay USD 0.32 for GPs and USD 2.86-3.18 for specialists. Participants agreed that fees directly affected doctors' remuneration and platform revenues, thereby emphasizing the need for a fair remuneration system. Globally, South Korea and Taiwan use centralized National Health Insurance (NHI) systems to finance teleconsultation.[21] South Korea reimburses 80% of the cost, with additional incentives for special circumstances; Taiwan offers high incentives for remote area services.[22] Indonesia's centralized NHI, managed by BPJS Healthcare Security, currently does not cover teleconsultation costs. However, funding for telemedicine was prioritized in the 2024 National Budget Plan. Patients hope that BPJS Healthcare Security will cover telemedicine services entirely or, through cost-sharing, that Indonesia can adopt best practices from South Korea and Taiwan by integrating teleconsultation into the NHI system using an effective financing scheme and Health Technology Assessment to ensure quality, accessibility, and sustainable funding.

The potential for high platform maintenance, advertising, and medical incentives should not be covered solely by the teleconsultation fee. The calculated fee based on GDP per capita, the international telemedicine funding scheme, and the agreement from the respondents indicated that the cost of telemedicine in Indonesia is not yet ideal. Therefore, this study highlights the need for multiple revenue streams for regular platforms rather than cost-based pricing that burdens patients.

Doctors agree to medical incentives of USD 1.59- 3.18 for GPs and USD 4.77-6.36 for specialists; however, in reality, the incentives received are much lower, specifically USD 0.67 for GPs and USD 2 for specialists per session. Two out of the three platform managers disagree because the incentive fees were considered too high. Meanwhile, the administrators of the Indonesian Medical Association recommended larger incentives, USD 6.36-7.94 for GPs and USD 15.89-25.42 for specialists. However, this recommendation exceeded the medical service rates in Indonesia for GPs but is still more appropriate for specialists than those in other countries: USD 1.39-31.65.[17]

The interview's results showed a gap between the interviewees' expectations and the field conditions. For this reason, there is a need for a governmental role that allows doctors to earn a decent income without burdening patients. Multiple sources of revenue should be leveraged to bridge the gap between the consultation fee and professional incentives. Therefore, gaining a balance between adequate professionalism and a low financial burden of consultation.

Regarding teleconsultation media, in the United States, Australia, France, and Germany, telephone or video call features are utilized during teleconsultations for diagnosis, follow-up, and therapy.[23-27] Meanwhile, in Belgium, Canada, Qatar, and Spain, apart from diagnosis and follow-up, teleconsultation via video call or telephone is also used for emergency triage.[28-31] In Indonesia, there were different opinions among the participants. Most patients and doctors support the use of video calls for improved communication, but some prefer chat services due to their ease of access and flexibility. Chat allows doctors to serve multiple patients simultaneously, although it risks compromising the quality of service. All platforms support chat based on market surveys, whereas the administrators of the Indonesian Medical Association recommend video calls as the optimal option for visual inspection. Video calls also have the potential to increase doctor and platform revenues if special incentives accompany them. In Indonesia, teleconsultation in telemedicine primarily uses the chat feature. Additionally, the trend in telemedicine use in Indonesia is to simplify the process of obtaining sick permits, non-visual diagnosis, and medical prescriptions. These services can be facilitated regardless of whether a previous doctor visit has occurred.[5] The government is expected to increase internet bandwidth to support this feature. Integration with the One Health System is mandatory to ensure that chronic patient care histories are maintained, thereby supporting social justice in telemedicine services in Indonesia.

This study served as a pilot for a larger study that aims to encourage policymakers, platform managers, healthcare providers, and insurance companies to adopt multiple revenue schemes, thereby reducing the costs of teleconsultation that patients often bear. A gap exists between financial capability and medical professionalism in the provision of medical services in Indonesia. Based on the interviews, most doctors were willing to disband payments in return for medical services. If such a practice is sustained over the long term, telemedicine in Indonesia will not become the primary service channel for most doctors. This gap can only be filled if regulations support the need for multiple revenue streams as a minimum standard for telemedicine.

However, the teleconsultation media for making a diagnosis on the telemedicine platform primarily involves chat, with a mandatory optional feature to use video calls, which can be used according to the agreement and adjustment of teleconsultation fees for doctors who provide services via video call. Video calls may add to the operational cost of the telemedicine platform. Based on the interviews, this step is currently being managed by some platform managers. The video call feature is an additional revenue model for the platform. The use of paid video calls, multiple business models offered by the platform, and external collaboration to provide services beyond teleconsultations can help alleviate the cost burden on patients. Telemedicine connects doctors (supply), patients (demand), and partners (insurance, pharmacies, laboratories, delivery services, and referral institutions). Currently, the platform's revenue is obtained from patients in the form of consultation fees (B), and the platform provides medical services (JM) to doctors. The doctor gives the diagnosis (Dx) to the patient. In addition to income from patients, telemedicine revenue streams can also be generated from insurance companies, pharmacies, laboratories, couriers, and other healthcare facilities, such as clinics and hospitals.[32]

This study was not conducted in-depth qualitative research involving opinions from BPJS Healthcare Security or employ quantitative approaches; therefore, it limits stakeholders' ability to make informed decisions. However, this study served as a pilot project to provide scientific insight into the comparison of ideal teleconsultation fees and incentives based on GDP per capita. This research also suggests that, based on the GDP per capita ratio, multiple revenue streams for telemedicine are mandatory to accommodate the wider economic gap in Indonesia.

Conclusion

Based on the GDP per capita ratio, the maximum teleconsultation fee on the telemedicine platform is USD 2.54, and the amount of medical incentive on the telemedicine platform for GPs is a minimum of USD 1.59 and USD 4.77 for specialists. To achieve this, governments and the private sector must collaborate to establish a minimum standard for the telemedicine financing model, thereby decreasing the teleconsultation burden on patients and increasing the appreciation of professionals.

Abbreviations

GP: general practitioner; GDP: gross domestic product; NHI = National Health Insurance.

Ethics Approval and Consent to Participate

The study was conducted following the ethical approval of the Health Research Ethics Committee of the Faculty of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia, Number 11/05/KEP-FKIKUAJ/2024.

Competing Interest

The authors declare no conflict of interest in the writing of this article.

Authors' Contribution

The authors confirm their contributions to the paper as follows: YRW and RDP performed conceptualization, methodology, and project administration. YRW performed data curation, formal analysis, investigation, resources, visualization, and writing of the original draft. RDP performed supervision, data validation, and reviewed the final version of the manuscript. All authors have approved the final version of the manuscript.

Acknowledgment

The authors thank dr. Daniel Edbert, M.Ked.Klin., Sp.MK (Atma Jaya Catholic University of Indonesia) for guidance, discussions, and experience working on the telemedicine platform.

References

1. Lubis ZI. Analisis kualitatif penggunaan telemedicine sebagai solusi pelayanan kesehatan di Indonesia pada masa pandemik COVID-19. Physiotherapy Health Sci. 2021; 2 (2): 76–82. DOI: 10.22219/physiohs.v2i2.15148.
2. Koonin LM, Hoots B, Tsang CA, et al. Trends in the use of telehealth during the emergence of the COVID-19 pandemic - United States, January-March 2020. Morbidity and Mortal Wkly Rep. 2020; 69 (43): 1595–1599. DOI: 10.15585/mmwr.mm6943a3.
3. Setyowati D. Jumlah pengguna baru layanan telemedicine capai 44% dalam 6 bulan. Jakarta: Katadata; 2022.
4. Kementerian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 20 Tahun 2019 Tentang Penyelenggaraan Pelayanan Telemedicine Antar Fasilitas Pelayanan Kesehatan. Jakarta: Kementerian Kesehatan; 2019.
5. Wibowo YR. Kajian platform telemedicine ditinjau dari aspek biaya telekonsultasi, jasa medis, dan media diagnosis [Thesis]. Bandung: Universitas Telkom; 2025.
6. Andrianto W, Fajrina AR. Tinjauan perbandingan penyelenggaraan telemedicine antara Indonesia dan Amerika Serikat. J Huk Kesehat Indonesia. 2021; 1 (2): 70–85. DOI: 10.53337/jhki.v1i02.7.
7. Budiyanti RT, Suryoputro A, Murni, et al. Studi komparasi regulasi telekonsultasi antara Indonesia dengan Singapura. J Crepido. 2022; 4 (1): 1–11. DOI: 10.14710/crepido.4.1.1-11.
8. Dewayanti I, Suryono A. Tinjauan etika dan hukum praktik kedokteran melalui telemedicine pasca pandemi COVID-19. J Huk dan Pembang Ekon. 2023; 11 (1): 27–40. DOI: 10.20961/hpe.v11i1.68662.
9. World Bank. GDP per capita (current US$). Washington DC: World Bank; 2023.

10. Pasaribu RD, Kartini D, Oesman YM, et al. The effect of customer demand and supplier performance in competitive strategy and business performance (case of fixed broadband in Indonesia). International J Scientific Technol Res. 2016; 5 (2): 123–129. DOI: 10.1201/9780429295348-178.
11. Birch S, Gafni A. Health Economics. In: Gellman, M.D., Turner, J.R. (eds) Encyclopedia of Behavioral Medicine. New York: Springer-Verlag; 2013.
12. Snoswell CL, Whitty JA, Caffery LJ, et al. Consumer preference and willingness to pay for direct-to-consumer mobile teledermoscopy services in Australia. Dermatology. 2022; 238 (2): 358–367. DOI: 10.1159/000517257.
13. Xie Z, Chen J, Or CK. Consumers' willingness to pay for ehealth and its influencing factors: Systematic review and meta-analysis. J Med Internet Res. 2022; 24 (9): e25959. DOI: 10.2196/25959.
14. Chua V, Koh JH, Koh CHG, et al. The willingness to pay for telemedicine among patients with chronic diseases: Systematic review. J Med Internet Res. 2022; 24 (4): e33372. DOI: 10.2196/33372.
15. Raes S, Trybou J, Annemans L. How to pay for telemedicine: A comparison of ten health systems. Health Syst and Reform. 2022; 8 (1): e2116088. DOI: 10.1080/23288604.2022.2116088.
16. Raes S, Annemans L, Willems R, et al. Physicians' views on optimal use and payment system for telemedicine: A qualitative study. BMC Health Serv Res. 2023; 23 (1): 292. DOI: 10.1186/s12913-023-09314-w.
17. Pengurus Besar Ikatan Dokter Indonesia. Acuan (tarif) jasa medik dokter. Jakarta: Perdatin Aceh; 2013.
18. Yudha KSA. Pengaruh harga dan citra merek terhadap minat berlangganan Spotify Premium pada mahasiswa di Indonesia [Undergraduate Thesis]. Bandung: Telkom University; 2021.
19. Annur CM. Layanan telemedicine yang paling banyak digunakan di Indonesia, apa saja?. Jakarta: Databoks; 2022.
20. Annur CM. Berikut besaran rata-rata upah buruh di Indonesia pada Februari 2023, terbesar sektor Real Estate. Databoks; 2023.
21. Budiyanti RT, Suryawati C, Murni, et al. User expectations on telemedicine financing in the National Health Insurance Era. J Manaj Kesehat Indonesia. 2022; 10 (3): 209–217. DOI: 10.14710/jmki.10.3.2022.209-217.
22. Bajowala SS, Milosch J, Bansal C. Telemedicine pays: Billing and coding update. Curr Allergy Asthma. 2020; 20 (60). DOI: 10.1007/s11882-020-00956-y.
23. Abbott LM, Miller R, Janda M, et al. Practice guidelines for teledermatology in Australia. Australasian J Dermatology. 2020; 61 (3): e293–e302. DOI: 10.1111/ajd.13301.
24. Thai-Van H, Bakhos D, Bouccara D, et al. Telemedicine in Audiology. Best practice recommendations from the French Society of Audiology (SFA) and the French Society of Otorhinolaryngology-Head and Neck Surgery (SFORL). Eur Ann Otorhinolaryngol Head Neck Dis. 2021; 138 (5): 363–375. DOI: 10.1016/j.anorl.2020.10.007.
25. Richter JG, Chehab G, Reiter J, et al. Evaluation of the use of video consultation in German rheumatology care before and during the COVID-19 pandemic. Front Med. 2022; 9: 1052055. DOI: 10.3389/fmed.2022.1052055.
26. Ghosh A, Gupta R, Misra A. Telemedicine for diabetes care in India during COVID-19 pandemic and national lockdown period: Guidelines for physicians. Diabetes Metab Syndr. 2020; 14 (4): 273–276. DOI: 10.1016/j.dsx.2020.04.001.
27. Pairon A, Philips H, Verhoeven V. A. A scoping review on the use and usefulness of online symptom checkers and triage systems: How to proceed? Front Med. 2023; 9: 1040926. DOI: 10.3389/fmed.2022.1040926.
28. Talla PK, Makansi N, Michaud PL, et al. Virtual oral health across Canada: A critical comparative analysis of clinical practice guidances during the COVID-19 pandemic. Int J Environ Res Public Health. 2023; 20 (5): 4671. DOI: 10.3390/ijerph20054671.
29. Dijkstra HP, Ergen E, Holtzhausen L, et al. Remote assessment in Sport and Exercise Medicine (SEM): A narrative review and teleSEM solutions for and beyond the COVID-19 pandemic. Br J Sports Med. 2020; 54 (19): 1162–1167. DOI: 10.1136/bjsports-2020-102650.
30. Rivas JG, Serrano AR, Loeb S, et al. Telemedicine and smart working: Spanish adaptation of the European Association of Urology recommendations. Actas Urol Esp. 2020; 44 (10): 644–652. DOI: 10.1016/j.acuro.2020.08.010. (31)
31. Budiyanti RT, Suryawati C, Hanifah M. Pembiayaan jaminan kesehatan nasional untuk layanan telemedicine di Indonesia, Taiwan, dan Korea Selatan. J Kesehat. 2023; 11 (1): 33–41. DOI: 10.25047/j-kes.v11i1.391.
32. Torregrossa M. Platform economy: The 4 key business models. Medium; 2018.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 10

7-31-2025

Determinants of School Health Unit Program Implementation in Junior High Schools of Boyolali District, Indonesia

Ayu Khoirotul Umaroh
Universitas Muhammadiyah Surakarta, Surakarta, aku669@ums.ac.id

Noor Alis Setiyadi
Universitas Muhammadiyah Surakarta, Surakarta, nas260@ums.ac.id

Kusuma Estu Werdani
Universitas Muhammadiyah Surakarta, Surakarta, kusuma.werdani@ums.ac.id

Tanjung Anitasari Indah Kusumaningrum
Universitas Muhammadiyah Surakarta, Surakarta, tik122@ums.ac.id

Purwo Setiyo Nugroho
Universitas Muhammadiyah Surakarta, Surakarta, purwo.skm@umkt.ac.id

Recommended Citation

Umaroh A , Setiyadi NA , Werdani KE , et al. Determinants of School Health Unit Program Implementation in Junior High Schools of Boyolali District, Indonesia. *Kesmas*. 2025; 20(5): 83-90
DOI: 10.7454/kesmas.v20isp1.2125
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/10

Umaroh *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 83-90
DOI: 10.7454/kesmas.v20isp1.2125

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Determinants of School Health Unit Program Implementation in Junior High Schools of Boyolali District, Indonesia

Ayu Khoirotul Umaroh[1]*, Noor Alis Setiyadi[1], Kusuma Estu Werdani[1], Tanjung Anitasari Indah Kusumaningrum[1], Purwo Setiyo Nugroho[2,3]

[1]Department of Public Health, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia
[2]Department of Public Health, Universitas Muhammadiyah Kalimantan Timur, Samarinda, Indonesia
[3]Institute for Population and Social Research, Mahidol University, Nakhon Pathom, Thailand

Abstract

Adolescent health problems such as stunting, attempted suicide, and tobacco use in Indonesia require attention. To address these challenges, the School Health Unit Program, a school-based health initiative, aims to improve student health and academic achievement. This study examined the relationship between human resources, teachers' knowledge, facilities and infrastructure, financial resources, and the planning process for implementing the School Health Unit Program in junior high schools in Boyolali District, Indonesia. A cross-sectional design was utilized, involving 50 junior high school teachers responsible for the School Health Unit as respondents, with data collected through structured questionnaires. Multivariate logistic regression analysis revealed that financial resources (p-value = 0.001; Exp(B) = 12.93; CI = 2.878–58.060) and teachers' knowledge (p-value = 0.028; Exp(B) = 6.67; CI = 1.230–36.117) were related to School Health Unit implementation. Schools with poor financial resources were over 12 times more likely, and teachers with a poor level of knowledge were approximately 6 times more likely, to implement the School Health Unit Program suboptimally. It is recommended that teachers participate in training programs, effective financial planning, and resource management to improve their capacity to manage the program more effectively.

Keywords: health budgeting, school health unit program, teachers' knowledge

Introduction

Indonesian students face a myriad of health challenges.[1] Junior high school students aged about 13-15 years were severely stunted (7.2%), stunted (18.5%), underweight (6.8%), and obese (4.8%).[2] Malnutrition can cause organ function to be disrupted,[3] while obesity in children can trigger non-communicable diseases in adulthood.[4] Another challenge based on the results of the Global School Health Survey (GSHS) is that the percentage of attempted suicide increased from 5.54% in 2015[5] to 10.7% in 2023[6] among junior high school students.

Health is fundamental to education; therefore, poor health can have detrimental effects on students' school and academic achievement. Schools offer students opportunities to acquire knowledge in various fields of education and maintain good health throughout their lives.[7] Schools are also increasingly seen as important places not only to promote long-term educational attainment but also to support the health and well-being of students.[8]

Schools are a strategic place to provide education and health initiatives to students.[9] Indonesia has a program called the School Health Unit that became a health initiative in schools. The three core components of the School Health Unit Program are health education, health services, and fostering a healthy school environment. These are supplemented by the School Health Unit management.[10] Several studies have shown that School Health Unit activities can improve the health level of students,[11] and play a role in delivering reproductive health information[12,13] and obesity control.[14] Healthy school models can improve student health and well-being as well as academic achievement.[15] Unfortunately, the evaluation and monitoring of the implementation of this program are still weak.[16] The evaluation conducted to assess this program is called *Sistem Stratifikasi UKS*, and evaluates how the three core components of the School Health Unit Program and their management are implemented periodically.[17]

***Correspondence**:* *Ayu Khoirotul Umaroh, Department of Public Health, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia*
Email: aku669@ums.ac.id

Received : September 23, 2024
Accepted : May 8, 2025
Published: July 31, 2025

Variations in the implementation of the School Health Unit across different regions in Indonesia highlight disparities in quality and effectiveness. For instance, a study in a junior high school in Banyuwangi District, Indonesia, reported an overall implementation score is 54%, categorized as sufficient, with health services scoring particularly low at 38.6%.[18] In contrast, schools in Bandar Lampung City, Indonesia, demonstrated relatively better School Health Unit management, though further coaching was needed to enhance program effectiveness.[19]

The implementation of the School Health Unit in Indonesia faces several significant obstacles that hinder its effectiveness, including inadequate infrastructure, insufficient training, and insufficient financial support. For example, areas such as libraries and bathrooms often fail to meet health standards, which affects overall school hygiene.[20] Additionally, teachers and school administrators frequently lack sufficient knowledge of School Health Unit management, and training programs for the personnel are often inadequate, resulting in poor preparedness for emergency health situations.[21] Financial constraints also play a major role, limiting schools' ability to enhance the facilities and services.[22] A previous study has highlighted the impact of well-structured policies and planning on the overall effectiveness of this program, underscoring the importance of strategic planning in enhancing children's health outcomes through schools.[23]

A preliminary survey conducted by the authors at nine junior high schools in Boyolali District, Indonesia, found that 6 out of 9 teachers were unfamiliar with the evaluation of this program and had never participated in the training. Given that *Sistem Stratifikasi UKS* serves as a key measurement tool for evaluating the program's implementation, this lack of awareness suggests that many schools do not fully understand the extent to which they have implemented the program. Initial findings also revealed that only 2 out of 9 schools actively managed the School Health Unit by empowering students as health cadres. Some schools also reported that their budget planning was inadequate, although they expressed support for the program's sustainability. Although the data was not part of a formal, large-scale study, it serves as an early indication of the current challenges in implementing this program. Additionally, the information from the Boyolali District Health Office indicated that the implementation of this program is still not optimal.

Although the School Health Unit program has been implemented in Boyolali District as a part of the school initiative, there remains a lack of quantitative research examining the factors influencing its implementation. This study aimed to address this gap by analyzing the relationship between human resources, teachers' knowledge, facilities and infrastructure, financial resources, and the planning process as determinants in the implementation of the School Health Unit in junior high schools of Boyolali District, Indonesia.

Method

This study employed a quantitative cross-sectional study design, where independent and dependent variables were measured simultaneously at a single point in time. Quantitative research analyzed independent variables (human resources, teachers' knowledge, facilities and infrastructure, financial resources, and program planning) concerning the dependent variable (implementation of the School Health Unit program). This study was conducted in Boyolali District, Indonesia, from December 2023 to February 2024.

The target population consisted of 100 junior high school teachers, because they represented a critical intervention period for adolescent health, aligned with the School Health Unit Program priorities, and allowed for a more feasible and focused study. The sample population consisted of those responsible for the School Health Unit. The minimum sample size was calculated using the Sample Size 2.0 software from the World Health Organization (WHO), with a 95% confidence level, a 10% margin of error, and a proportion of 0.5. Based on these calculations, the minimum sample size obtained for this study was 50. Simple random sampling was used. This study did not require ethical approval beforehand, as it was observational and did not involve direct interventions or risks to participants. However, the study adhered to ethical principles by obtaining informed consent from the respondents, maintaining anonymity, and obtaining permission from the Boyolali District Education Office and the Faculty of Public Health, Universitas Muhammadiyah Surakarta.

The questionnaire used to measure independent variables includes items such as human resources, teachers' knowledge, facilities and infrastructure, financial resources, and program planning. Human resources were evaluated based on the presence of teachers, active health cadres, and the involvement of parents in implementing the School Health Unit Program. Human resources scores greater than 3 were categorized as "good" (coded as 1), and lower scores were categorized as "not enough" (coded as 2). Teachers' knowledge was measured based on their understanding of the main aspects of the program (health education, health services, and fostering a healthy school environment). Teachers'

knowledge scores greater than 5 were categorized as "good" (coded as 1), and lower scores were categorized as "not enough" (coded as 2). Facilities and infrastructure were assessed using indicators such as a dedicated School Health Unit room, first aid medical equipment, administrative documents, sinks, separate beds for male and female students, and health education materials. Facilities and infrastructure scores greater than 5 were categorized as "good" (coded as 1), and lower scores were categorized as "not enough" (coded as 2). Financial resources refer to operational budgeting, including sources of funds from the school and outside sources, adequacy, and whether budgets meet the needs. Financial resources scores greater than 3 were categorized as "good" (coded as 1), and lower scores were categorized as "not enough" (coded as 2). Program planning refers to the processes and steps taken by schools to compile, organize, and implement School Health Unit activities. Program planning scores greater than 3 were categorized as "good" (coded as 1), and lower scores were categorized as "not enough" (coded as 2).

The implementation of the School Health Unit Program was measured based on the *Sistem Stratifikasi UKS* measurement provided by the Indonesian Ministry of Health, including the implementation of health education, health services, fostering a healthy school environment, and School Health Unit management. The questionnaire used to measure the dependent variable (School Health Unit implementation) includes items such as the existence and use of School Health Unit rooms, the availability of medical equipment, administrative documents, health counseling programs, and student involvement as health cadres. Respondents were asked a series of yes/no questions. For each variable, the individual item scores were summed to create an overall score for that variable. A higher sum of scores indicated a higher level of knowledge, better financial resources, or a better planning process. The implementation of the School Health Unit Program consisted of health education scores greater than 7.5, health service scores greater than 4.5, environmental health scores greater than 12.5, and health management scores greater than 8 were categorized as "good" (coded as 1), and lower scores were categorized as "not enough" (coded as 2). The results of good implementation are evident in the success of carrying out all the main components of this program.

The validity test refers to the correlation table value of 0.361, with 47 valid questions out of the 57 questions posed. Four questions were found to be invalid and were subsequently removed. In contrast, six invalid questions were retained after rewording, as they were deemed relevant and important to ask. The reliability coefficient was 0.900 (>0.6), indicating that the questionnaire is reliable. Data analysis used a multivariate logistic regression test with a 95% confidence interval, and the data analysis tool used was IBM SPSS Statistics Version 30.0 (full version trial).

Results

Table 1 presents the demographic characteristics of the respondents, including age, working period, and managing the School Health Unit period. Most respondents were teachers from public junior high schools in Boyolali District, Indonesia, with an average age of 33 years. The respondents had less than seven years of work experience and less than three years of experience in managing the School Health Unit. Most respondents had relatively recent tenure, both at the school and in managing the School Health Unit. This indicated a significant potential for capacity development or more targeted training opportunities.

Table 1. Respondents' Characteristics

Numeric Characteristic	**Min-Max**	**Mean ± SD**
Age	22–59 years	33.64 ± 10.79
Characteristic Category	**N**	**%**
Working period	12	24.0
≥7 years	38	76.0
<7 years		
Managing the School Health Unit period	12	24.0
≥ 3 years	38	76.0
< 3 years		
Type of school		
Public	29	58.0
Private	21	42.0

Table 2. Distribution of Independent and Dependent Variables

Variable	n	%
Human resources		
There is an assignment letter for the teacher responsible for SHU	45	90.0
The teacher responsible for SHU receives an allowance	6	12.0
The teacher responsible for SHU receives a reward	2	4.0
The teacher responsible for SHU receives the same academic workload as other teachers	41	82.0
Teachers' knowledge		
Have read SHU guidelines	18	36.0
Know three core components of SHU	20	40.0
Know health education	43	86.0
Know health services	49	98.0
Know the development of a healthy environment	33	66.0
Facilities and infrastructure		
Dedicated SHU room	43	86.0
First aid medical equipment	50	100.0
Administrative documents	32	64.0
Sinks	17	34.0
Separate beds for male and female students	38	76.0
Health education media	28	56.0
Financial resources		
Operational budgeting of SHU	44	88.0
Funding sources of SHU from school	38	76.0
Funding sources of SHU from outside	14	28.0
Budget adequate for SHU program	24	48.0
Funding sources can facilitate the development of the UKS program	23	46.0
Program planning		
Create an activity plan	34	68.0
The teacher in charge receives SHU training	30	60.0
Cadres receive SHU training	25	50.0
Getting assistance from the Primary Health Care	50	100.0
Getting assistance from universities	12	24.0
Getting assistance from other institutions	12	24.0
The implementation of SHU		
Health education	33	66.0
Health service	41	82.0
Environmental development	34	68.0
SHU management	32	64.0

Notes: SHU = school health unit

The analysis indicated that the implementation of the School Health Unit was well-established, particularly in terms of facilities such as the availability of rooms (86%) and first aid equipment, as well as support from the primary health care (100%). However, several aspects required further attention. Most respondents had official assignments and basic knowledge of health services; however, their understanding of School Health Unit guidelines requires improvement, as only 36% of teachers have read the guidelines. Operational funding, although available in most schools, was perceived as insufficient by nearly half of the respondents. Furthermore, the low level of collaboration with universities and other institutions presented an opportunity to strengthen the program.

Table 3. Bivariate Analysis Among Independent Variables and Dependent Variables

Variable	The Implementation of the School Health Unit						p-value
	Good		Not enough		Total		
	n	%	n	%	n	%	
Human resources							
Good	19	51.4	18	48.6	37	100.0	0.633
Not enough	5	38.5	8	61.5	13	100.0	
Teachers' knowledge							
Good	21	61.8	13	38.2	34	100.0	0.011*
Not enough	3	18.8	13	81.2	16	100.0	
Facilities and infrastructure							
Good	9	75.0	3	25.0	12	100.0	0.069
Not enough	15	39.5	23	60.5	38	100.0	
Financial resources							
Good	17	81.0	4	19.0	21	100.0	<0.001*
Not enough	7	24.1	22	75.9	29	100.0	
Program planning							
Good	14	66.7	7	33.3	21	100.0	0.050*
Not enough	10	34.5	19	65.5	29	100.0	

The results of the bivariate analysis indicated that several independent variables had a statistically significant relationship with the implementation of the School Health Unit. Teachers' knowledge, financial resources, and program planning have been shown to significantly contribute to effective implementation. Teachers with a high level of knowledge support the effectiveness of this program's implementation (61.8%), in contrast to teachers with less knowledge (18.8%). Schools with good financial resources relate to good School Health Unit implementation (81.0%), in contrast to those with insufficient financial support (24.1%). Thorough planning also increases the likelihood of good implementation of this program. Schools that have good planning implement this program well (66.7%) in contrast to those with insufficient planning (34.5%). Although human resources, as well as facilities and infrastructure, were considered important, neither of these variables showed a significant relationship in this analysis.

Table 4. The Last Model of Multivariate Logistic Regression

Variable	Sig.	Exp(B)	CI (95%)
Financial resources	0.001	12.927	2.878 – 58.060
Teachers' knowledge	0.028	6.665	1.230 – 36.117

Reference Category: First (Good)

The results of the multivariate analysis showed that financial resources and teachers' knowledge were related to the implementation of the School Health Unit. The financial resources variable had the greatest influence, with an Exp(B) value of 12.927, indicating that schools with poor financial resources are over 12 times more likely to have suboptimal implementation of the School Health Unit compared to schools with good financial resources. The teachers' knowledge was also a significant determinant, with an Exp(B) value of 6.665, indicating that teachers with a poor level of knowledge were approximately six times more likely to experience suboptimal implementation than schools with good teacher knowledge. These findings emphasized the importance of investing in both aspects to strengthen the implementation of the School Health Unit in schools.

Discussion

This study revealed that the variable most related to the implementation of the School Health Unit in junior high schools in Boyolali District, Indonesia, was financial resources. Schools with poor financial resources had a 12.9 times greater chance of having suboptimal implementation of the program. This study aligns with a previous study, which states that the availability of financial resources is crucial for the successful implementation of the School Health Unit. Financial resources allow school management to address both clinical and administrative requirements.[24] A study conducted in elementary schools in Jepara City, Indonesia, found that financial resources play a significant role in the implementation of the School Health Unit. Schools receive funds from the government through the School Operational Assistance Fund,[25] supplemented by contributions from parent committees, which are used for basic program activities such as initial medical treatment. However, the funds are often insufficient, especially in suburban schools, where additional community support is necessary.[26]

A comprehensive approach to the School Health Unit Program is also described in the Whole School, Whole Community, Whole Child (WSCC) framework.[27] This framework emphasizes the importance of synergy between financial policies, school leadership, and community partnerships in creating a school environment that supports both health and learning.[27] Thus, adequate financial support not only enhances the availability of resources but also fosters essential cross-sector collaboration that is critical to the success of school health programs.[28] Prioritizing the budget based on needs can help allocate resources more efficiently. Schools with limited financial resources must maximize the available funds to achieve the greatest health impact for their students.[29] In the context of school health programs, urgent needs can be based on the current health issues in the school and what actions the school can take to address those health problems. Utilizing technology is another way to achieve budget efficiency. Despite limited funding, technology can lead to optimal health outcomes. For example, the eLearning initiative demonstrates that an online health education program not only expands the reach of knowledge to parents and students in public schools but also results in cost efficiency, as it is considered more practical and economical for the community.[30]

This study also highlighted that teachers' knowledge is related to the implementation of the School Health Unit. Schools with poor teachers' knowledge had a 6.6 times greater chance of having suboptimal implementation of this program. A previous study also found that a higher level of knowledge among teachers correlates with enhanced quality and responsiveness of school health services.[31] Similarly, another study emphasizes that teachers' understanding of school health policies is instrumental in implementing these programs and influences the overall efficacy of health

services provided in schools.[32] Teachers play a crucial role in the success of school health program implementation by providing information, and by assessing and guiding students in health practices.[33] A study in India illustrated that when teachers possess robust awareness regarding topics such as oral health, they can better relay critical preventive measures to students, thereby aligning with national policies that call for comprehensive teacher training in health promotion.[34] Teachers who understand the concepts of healthy lifestyles and relevant health issues can integrate this knowledge into the learning process, providing students with practical guidance on adopting healthy habits.[35]

A study conducted among public elementary school teachers indicated that teachers with more than one qualification (particularly those with two qualifications) were found to have significantly better knowledge of school health programs compared to those with fewer qualifications. Teachers aged 40 years and above demonstrated a significantly better understanding of school health programs compared to their younger counterparts, possibly due to their greater life and work experience.[36] Also, teachers who are motivated to learn and implement health programs will be more successful in integrating health topics into daily learning activities.[37] To enhance school health program implementation, it is recommended that training programs focusing on teachers' roles in promoting health within the school community should be provided by the government and other stakeholders.[38] For example, the "Choose Health by Avoiding Tobacco" (CHAT) program, as implemented by Kankane *et al.*, effectively educated teachers about the dangers of tobacco use and encouraged them to adopt a tobacco-free lifestyle. The program included interactive training sessions, motivational talks, and the promotion of tobacco-free school policies. It significantly improved teachers' knowledge of tobacco control and motivated them to adopt a tobacco-free lifestyle.[39]

An earlier study found that teachers who received online training, or a combination of online and in-person training, demonstrated higher implementation fidelity, conducting more sessions and core activities than those with no training. Higher implementation fidelity was associated with improved student outcomes, including reproductive health skills, self-efficacy, and intention. Teacher training and coordinator monitoring were identified as key strategies for supporting school-based interventions, even during public health emergencies and natural disasters.[40] Schools with less effective programs might face policy-related obstacles, such as unclear guidelines or insufficient enforcement mechanisms, which could hinder program implementation. Regional cultural attitudes towards health promotion and education also play a significant role, with communities that prioritize health more likely to develop and sustain successful health programs.

Furthermore, there may be unexamined factors, such as the leadership styles of school administrators or the level of parental involvement, that could influence the outcomes of this program. These aspects offer interesting avenues for further investigation, and the authors suggested that future studies explore these potential variables to provide a more comprehensive understanding of the factors influencing program effectiveness. This study provided valuable insights into the determinants of implementing the School Health Unit, but several limitations should be noted. The cross-sectional design, with a limited ability to establish causal relationships between variables, as data were collected concurrently, makes it impossible to trace the temporal sequence of events. The limited sample size may affect the generalizability of the findings to a broader population. To minimize bias and ensure the sample accurately reflects the broader population, this study employed simple random sampling. This technique provided every individual with an equal chance of selection, minimizing selection bias and preventing researcher preferences from influencing the sample, thereby enhancing objectivity and fairness. Future studies should consider increasing the sample size to enhance statistical power and provide more reliable and generalizable results. Adopting advanced sampling techniques, such as stratified random sampling, could help ensure greater representativeness across different school types and contexts. In addition, reliance on self-reported data could introduce response bias and compromise the accuracy of the results, as it depends solely on the respondents' recollection. To address this issue, the questionnaire provided specific instructions to focus on events within the past 12 months, thereby offering a clear timeframe to facilitate respondents' memory recall.

Conclusion

Schools with insufficient financial resources and inadequate teacher knowledge contribute to the suboptimal implementation of the School Health Unit Program. Financial constraints often hinder schools from optimizing their health initiatives. Improving teachers' understanding of the School Health Unit Program guidelines is essential to ensure the program is executed as intended. Training and capacity-building efforts must be consistently provided to

teachers responsible for health-related activities in schools. Effective planning and budgeting should be institutionalized at the school level to support sustainable implementation. Schools should also establish partnerships with local health centers, universities, and other relevant institutions to enhance resources and technical support. Stakeholder collaboration plays a vital role in strengthening school-based health interventions. Future policy development should emphasize structured monitoring, clear evaluation tools, and dedicated budget lines for the School Health Unit. Overall, a comprehensive approach involving financial, human, and institutional support is essential for improving the health environment in schools.

Abbreviations

Not applicable.

Ethics Approval and Consent to Participate

This study did not obtain ethical approval beforehand because it was observational and did not involve direct interventions or risks to participants. However, the study has adhered to ethical principles by obtaining informed consent from the respondents, maintaining anonymity, and obtaining permission from the Education Office of Boyolali Regency and the Faculty of Public Health at UMS.

Competing Interests

There are no conflicts of interest.

Availability of Data and Materials

There is no supplementary material.

Authors' Contribution

AKU, NAS, KEW, and TAIK contributed to the design and implementation of the research. AKU conducted the data analysis, supervised by NAS and PSN. AKU, NAS, KEW, TAIK, and PSN were involved in manuscript preparation, content, and administration. All the authors discussed the results and contributed to the final manuscript.

Acknowledgment

This research work is funded by the Institute of Research and Innovation (Lembaga Riset dan Inovasi), Universitas Muhammadiyah Surakarta.

References

1. United Nation Children's Fund. Indonesia Adolescent Health Profile 2024. Jakarta: United Nation Children's Fund; 2024.
2. Kementerian Kesehatan Republik Indonesia. Laporan Riset Kesehatan Dasar 2018. Jakarta: Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan (LPB); 2019.
3. Morales F, Paz SM, Leon MJ, et al. Effects of malnutrition on the immune system and infection and the role of nutritional strategies regarding improvements in children's health status: A literature review. Nutrients. 2023; 16 (1): 1. DOI: 10.3390/nu16010001.
4. Balasundaram P, Krishna S. Obesity effects on child health (archived). StatPerls [Internet]; 2023.
5. World Health Organization. Global School-based Student Health Survey Indonesia 2015 fact sheet. Indonesia: World Health Organization; 2015.
6. World Health Organization. Global School-based Student Health Survey Indonesia 2023 fact sheet. Indonesia: World Health Organization; 2023.
7. Jourdan D, Gray NJ, Barry, MM, et al. Supporting every school to become a foundation for healthy lives. Lancet Child Adolesc Health. 2021; 5 (4): 295–303. DOI: 10.1016/S2352-4642(20)30316-3.
8. Frazier T, Fosco SLD. Nurturing positive mental health and wellbeing in educational settings - the PRICES model. Front Public Health. 2024; 11: 1287532. DOI: 10.3389/fpubh.2023.1287532.
9. Cenedesi RTF, Malta AdMM, Guimarães PA, et al. Health education in the school environment: Interdisciplinary practices, constitutional guarantees, and full development of the individual. Revista Observatorio De La Economia Latinoamericana. 2024; 22 (2): 1–25. DOI: 0.55905/oelv22n2-086.
10. Kementerian Pendidikan dan Kebudayaan Republik Indonesia. Buku Pedoman Pembinaan dan Pengembangan UKS. Jakarta: Direktorat Jenderal Pendidikan Dasar dan Menengah; 2019.
11. Vilian MT, Minsih. Budaya sekolah dalam mewujudkan sekolah sehat nasional di SD Muhammadiyah 1 Ketelan Surakarta. J Pendidik Dasar. 2021; 2 (1): 152–161. DOI: 10.51494/jpdf.v2i1.419.
12. Sari EP, Utami RD. Applying sexual education to elementary school children in the digital native era. J Pendidik Guru Sekol Dasar. 2023; 10 (2): 223–240. DOI: 10.30997/dt.v10i2.9779.
13. Widananda C, Arifah I. The effect of premarital sex prevention education modifying the Cublak-Cublak Suweng Game on knowledge and attitudes. J Kesehat. 2024; 17 (1): 70–79. DOI: 10.23917/jk.v17i1.2933.
14. Fridayanti DV, Prameswari GN. Peran UKS (Usaha Kesehatan Sekolah) dalam upaya penanggulangan obesitas pada anak usia sekolah. J Health Education. 2016; 1 (2): 8–14.
15. Langford R, Bonell C, Jones H, et al. The World Health Organization's health promoting schools framework: A cochrane systematic review and meta-analysis. BMC Public Health. 2015; 12 (15): 130. DOI: 10.1186/s12889-015-1360-y.
16. World Health Organization. Making every school a health-promoting school: Country case studies. World Health Organization and the United Nations Educational, Scientific and Cultural Organization; 2021.

17. Kementerian Kesehatan RI. Petunjuk Teknis Pembinaan Penerapan Sekolah/Madrasah Sehat. Jakarta: Kementerian Kesehatan RI; 2021
18. Putri FA, Rahayu IP, Febriawan W, et al. Penilaian pelaksanaan Trias UKS di SMP Negeri 1 Giri Banyuwangi berdasarkan Pedoman Pelaksanaan UKS. J Kesmas Untika Luwuk: Public Health J. 2018; 9 (2): 18–26. DOI : 10.51888/phj.v9i2.10.
19. Novariana N, Hermawan NSA. Analisis pengelolaan Trias Usaha Kesehatan Sekolah (UKS) di tingkat SMP Se-Kota Bandar Lampung (studi kualitatif). J Kesehat. 2018; 9 (1). DOI: 10.26630/jk.v9i1.720.
20. Putra SIM, Fitri IZ, Alfiyani D, et al. Peran UKS dalam meningkatkan kesehatan lingkungan sekolah di SDN Cipondoh 06 Kota Tangerang. J Penelit Guru Indonesia. 2024; 4 (5): 3615–3625. DOI: 10.58578/tsaqofah.v4i5.3395.
21. Salam LON, Abdullah R, Kasim E, et al. Pentingnya pengetahuan pengelolaan dan fungsi manajamen UKS untuk kondisi darurat siswa di SMA Bawakaraeng. Aspirasi: Publ Has Pengabdi Kegiat Masy. 2023; 1 (4): 48–53. DOI: 10.61132/aspirasi.v1i4.400.
22. Schiff M, Jha A, Walker, et al. Collectively achieving primary health care and educational goals through school-based platforms: financing solutions for intersectoral collaboration. Front Public Health. 2023; 11. DOI: 10.3389/fpubh.2023.1241594.
23. Sulistyowati M, Soedirham O. Analysing the Healthy Public Policy's impact on the school health program: Usaha Kesehatan Sekolah (UKS). Proc Annu Meet Indonesian Health Econ Association (INAHEA 2017). 2017; 5–9. DOI: 10.5220/0007022500050009.
24. Medeiros ERd, Holanda LMdSLd, Pinto ESG, et al. Structure of services and material health resources associated with the School Health Program. Rev Bras Enferm. 2020; 73 (6): e20190073. DOI: 10.1590/0034-7167-2019-0073.
25. Halimah L, Muslihin HY, Asphar FQ, et al. Efektivitas penyaluran dana Bantuan Operasional Sekolah (BOS) di SD. Manaj Pendidik. 2023; 18 (1): 11–25. DOI: 10.23917/jmp.v18i1.21711.
26. Lathifah U, Woro O, Handayani K, et al. Analysis of program implementation health business school (UKS) in Primary and Sub-Urban Urban in The District Jepara. Public Health Perspec J. 2019; 4 (3): 188–95.
27. Rasberry CN, Slade S, Lohrmann DK, et al. Lessons learned from the whole child and coordinated school health approaches. J Sch Health. 2015; 85 (11): 759–765. DOI: 10.1111/josh.12307.
28. Hunt P, Barrios L, Telljohann SK, et al. A whole school approach: Collaborative development of school health policies, processes, and practices. J Sch Health. 2015; 85 (11): 802–809. DOI: 10.1111/josh.12305.
29. Bagepally BS, Kumar SS, Sasidharan A. Is State-Wise Healthcare Budget Allocation Consistent With the Disease Burden in India? A Quinquennial Account (2015-2019). Front Public Health. 2022; 10. DOI: 10.3389/fpubh.2022.893257.
30. Gulzar S, Saeed S, Kirmani ST, et al. Enhancing the knowledge of parents on child health using eLearning in a government school in the semi-rural community of Karachi, Pakistan. Plos Glob Public Health. 2022; 2 (6): e0000500. DOI: 10.1371/journal.pgph.0000500.
31. Ranga A, Majra JP. Status of knowledge regarding school health services among school teachers: A cross sectional study from a northern Indian state. Int J Community Med Public Health. 2021; 8 (1): 359–365. DOI: 10.18203/2394-6040.ijcmph20205722.
32. Opoku JA, Brenyah JK, Mohammed A, et al. Assessment of school health policy in Ghana; Perspective of teachers in second cycle institutions in the Kwadaso Municipal Area, Kumasi. Int J Educational Dev Africa. 2023; 8 (1): 24. DOI: 10.25159/2312-3540/13890.
33. Lisu ES, Takaeb AEL, Ndun HJN. Study on Implementation of School Health Program (UKS). J Health Behavioral Sci. 2022; 4 (3): 379–394. DOI: 10.35508/jhbs.v4i3.5312.
34. John JR, Raghavelu R, Selvakumar R, et al. Oral health awareness among school teachers in Thiruvallur District of Tamilnadu. J Oral Health Community Dentistry. 2016; 10(1):26-29. DOI:10.5005/johcd-10-1-26.
35. Cheng NYI, Wong MYE. Knowledge and attitude of school teachers towards promoting healthy lifestyle to students. Health. 2015; 7(1): 119–126. DOI: 10.4236/health.2015.71014,
36. Adebayo AM, Onadeko MO. Knowledge of school health programme among public primary school teachers in Oyo State, South-West Nigeria: A Rural-Urban comparative study. Afr J Reprod Health. 2015; 19 (3): 55–60.
37. Husseini MN, Zwas DR, Donchin M. Teacher training and engagement in health promotion mediates health behavior outcomes. Int J Environ Res Public Health. 2022;19 (5): 3128. DOI: 10.3390/ijerph19053128.
38. Bosede AO, Obembe TA, Adebayo AM. Knowledge of school teachers and the associating factors in the effective delivery of the school health programme in Nigeria. Pan Afr Med J. 2022; 43 (4). DOI: 10.11604/pamj.2022.43.4.30838.
39. Kankane N, Gupta VK, Mishra G, Singh SK, Malhotra S. Effectiveness of teacher's training program for tobacco control in schools of Lucknow: A quasi-experimental study. Natl J Maxillofac Surg. 2024;15 (3):505–512. DOI: 10.4103/njms.njms_117_23.
40. Deveaux L, Schieber E, Cottrell L, et al. Implementing a school-based HIV prevention program during public health emergencies: Lessons learned in The Bahamas. Implement Sci. 2022; 17 (68). DOI: 10.1186/s13012-022-01240-5.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 11

7-31-2025

Google Review Analysis of "Duta We Care" Excellent Service as a Featured Service at a Central General Hospital in Padang

Alfitri Alfitri
RSUP DR. M. Djamil Padang, Padang, alfitrii1075@gmail.com

Ricvan Dana Nindrea
Universitas Negeri Padang, Bukittinggi, ricvan@fk.unp.ac.id

Adek Setiawan
RSUP Dr. M. Djamil Padang, Padang, dxstwn@gmail.com

Elsa Yuniarti
Universitas Negeri Padang, Bukittinggi, dr_elsa@fmipa.unp.ac.id

Recommended Citation

Alfitri A , Nindrea RD , Setiawan A , et al. Google Review Analysis of "Duta We Care" Excellent Service as a Featured Service at a Central General Hospital in Padang. *Kesmas*. 2025; 20(5): 91-98
DOI: 10.7454/kesmas.v20isp1.2099
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/11

Alfitri *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 91-98
DOI: 10.7454/kesmas.v20isp1.2099

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Google Review Analysis of "*Duta We Care*" Excellent Service as a Featured Service at a Central General Hospital in Padang

Alfitri[1*], Ricvan Dana Nindrea[2], Adek Setiawan[1], Elsa Yuniarti[3]

[1]RSUP Dr. M. Djamil Padang, Padang, Indonesia
[2]Department of Medicine, Faculty of Medicine, Universitas Negeri Padang, Bukittinggi, Indonesia
[3]Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, Indonesia

Abstract

Improving healthcare service quality required both technical and interpersonal enhancements through a personalized approach, as demonstrated by the *"Duta We Care*" program at a Central General Hospital in Padang. This study aimed to evaluate the program's effectiveness by analyzing patient feedback from Google Reviews. A descriptive quantitative design examined 2,035 patient reviews from March 2013 to June 2024. Using NVivo 12 software, the data analysis generated word clouds. The results showed that 68.20% of reviews received a 5-star rating, 9.48% a 4-star rating, 4.35% a 3-star rating, 2.27% a 2-star rating, and 15.70% a 1-star rating. Words like "*friendly,*" "*professional,*" "*fast,*" and "*good*" frequently appeared, which highlighted patient appreciation for the program's interpersonal aspects. The *"Duta We Care*" program successfully raised patient satisfaction, evident from the increased ratings from 3.8 to 4.6. It was determined that staff friendliness and professionalism played a key role in this improvement. However, complaints about waiting times and limited facilities suggested the need for further operational and infrastructural enhancements.

Keywords: excellent service, Google review, patient satisfaction

Introduction

Quality healthcare services are an important component of the overall well-being of a society.[1,2] For hospitals in Indonesia, especially the Central General Hospital in Padang City, a national referral hospital, the challenge often lies in balancing technical improvements with enhancing the interpersonal quality of care.[3,4] Generally, such an issue is resolved by embracing technology-based innovations across various sectors, including healthcare.[5] However, the Central General Hospital has taken a unique approach by launching the "*Duta We Care*" program in 2019. This program highlights the importance of interpersonal interactions in healthcare by emphasizing empathy, clear communication, and attentive patient care to showcase the lasting value of human connection.[6] The program was established as a public service initiative led by nurses acting as service ambassadors.[6]

Established as a public service initiative, the program designates nurses as service ambassadors (*duta*) who are specifically trained to strengthen compassionate, patient-centered communication.[6,7] To qualify as a "*Duta We Care*", nurses must meet several criteria, including having a minimum of one year of clinical experience, demonstrating consistent empathy and effective communication skills, and showing a commitment to sincere and professional service delivery. They are also required to complete a structured training program in excellent service, which equips them to act as change agents in fostering a culture of excellence and hospitality in hospital settings.[7]

Once appointed, these ambassadors actively engage with patients and their families to address concerns throughout the patient's hospital stay until discharge.[7] Their responsibilities include welcoming patients warmly, facilitating timely resolution of service-related complaints, offering brief education on patients' rights and responsibilities, and evaluating the friendliness and communication effectiveness of hospital staff.[6,7] These efforts are aimed at building a positive patient experience and fostering trust and loyalty.[6,7]

Correspondence*: *Alfitri, RSUP Dr. M. Djamil Padang, Indonesia, Phone: +628116661075, Email: nsalfitri@rsdjamil.co.id.*

Received : August 31, 2024
Accepted : December 13, 2024
Published: July 31, 2025

Despite positive outcomes since its implementation, such as higher patient satisfaction and fewer complaints, research on the program's effectiveness remains limited.[6,7] Most studies tend to focus on technical improvements and overlook the interpersonal and emotional aspects that are central to healthcare service programs.[8,9] Additionally, it is important to note that patient-centred practices vary among hospitals, and this situation underlines the need for research that investigates how such programs operate within actual service settings.[10] To address this gap, this study evaluated the effectiveness of the "*Duta We Care*" program by analyzing patient feedback on Google Reviews. This direct insight into patient experiences with the program aims to highlight strengths, identify areas for improvement, and provide empirical evidence to support the further development of the program. The findings were also expected to guide other hospitals when they consider similar approaches to enhancing patient-centered care.

Method

This study employed a descriptive design with a quantitative approach to analyze Google Review data and provide patient perceptions. A total of 2,035 reviews from March 2013 to June 2024 were analyzed to generalize the perceptions of patients and their families regarding the *"Duta We Care"* program. The inclusion criteria for this study included Google Review data from March 2013 to June 2024 about patient interactions, excellent service quality, or the "*Duta We Care*" program, written in the Indonesian language, as well as those with a star rating (1-5) to assess overall patient satisfaction. Only one review per patient or family member per visit was included to avoid duplicate entries. The exclusion criteria consisted of Google Review data written in other languages.

The "*Duta We Care*" program was officially launched in 2019 at Central General Hospital in Padang as an innovation in excellent service delivery. It is a patient-centered initiative that assigns nurses and healthcare staff as *Duta* (service ambassadors) who serve as role models for empathy, hospitality, and effective communication. To qualify as a *Duta*, staff must meet several criteria: (1) a minimum of one year of clinical experience; (2) demonstrated skills in empathy and patient communication; and (3) a strong commitment to sincere and professional healthcare service. They are also required to undergo formal training in the principles of excellent service and interpersonal care before being officially assigned as *Duta*.

To evaluate the impact of the program, the reviews were categorized into two time periods: before the implementation of "*Duta We Care*" (March 2013 to December 2018), comprising 845 reviews, and after its implementation (January 2019 to June 2024), with 1,190 reviews.[11] Of 2,035 reviews, the departments/units mentioned were the non-surgical installation, the maternity installation, the high care unit (HCU), the neurology unit, the pediatric unit, the internal medicine HCU unit, the geriatrics unit, the intensive care unit (ICU), and the pharmacy unit. The data were manually extracted from Google Review (https://g.co/kgs/js6qjnV) and converted into a CSV file for further analysis. NVivo 12 (licensed) was used to generate word clouds. Word cloud analysis was used to examine patient testimonials regarding the "*Duta We Care*" program. This method created a visualization of the most frequently mentioned words in the data, with larger words indicating higher frequency. The color of each word was inconsequential, but it was used because it created a good visual. Through word cloud analysis, the most prominent keywords were easily identified, reflecting patients' feedback about the program. This analysis simplified and visualized complex data, offering quick insights into patients' perceptions of the quality of care they received.

Additionally, a mind map was developed to interpret the underlying patterns and conceptual relationships in the data, with a focus on aspects of excellent service valued by patients.[11,12] The analysis process involved several steps, including open coding, categorization of keywords, and theme development. Patient satisfaction was analyzed using the 1–5 star ratings as a proxy for a Likert scale, where 1 indicated very dissatisfied and 5 indicated very satisfied. Two authors independently coded the review data to ensure reliability and consistency. They initially worked separately, analyzing the content based on a predefined coding framework and without discussing results with each other during the initial coding phase. Their findings were then compared to ensure validity through consensus. To strengthen the credibility of the analysis, data triangulation was conducted by comparing the results of the word cloud and mind map with findings from existing literature on healthcare service quality.

Results

Table 1 describes patient satisfaction ratings for excellent service quality at Central General Hospital in Padang. It revealed that 68.20% of total reviews received a 5-star rating (very satisfied), 9.48% received a 4-star rating (satisfied), 4.35% received a 3-star rating (fairly satisfied), 2.27% received a 2-star rating (dissatisfied), and 15.70% received a 1-

star rating (very dissatisfied). Changes in patient satisfaction ratings for excellent service quality before and after implementing the *"Duta We Care*" program are presented in Figure 1.

Table 1. Patient Satisfaction Ratings for Excellent Service Quality at Central General Hospital in Padang

Rating	n (%)
1-star	319 (15.70)
2-star	46 (2.27)
3-star	89 (4.35)
4-star	193 (9.48)
5-star	1,388 (68.20)
Total	2,035 (100%)

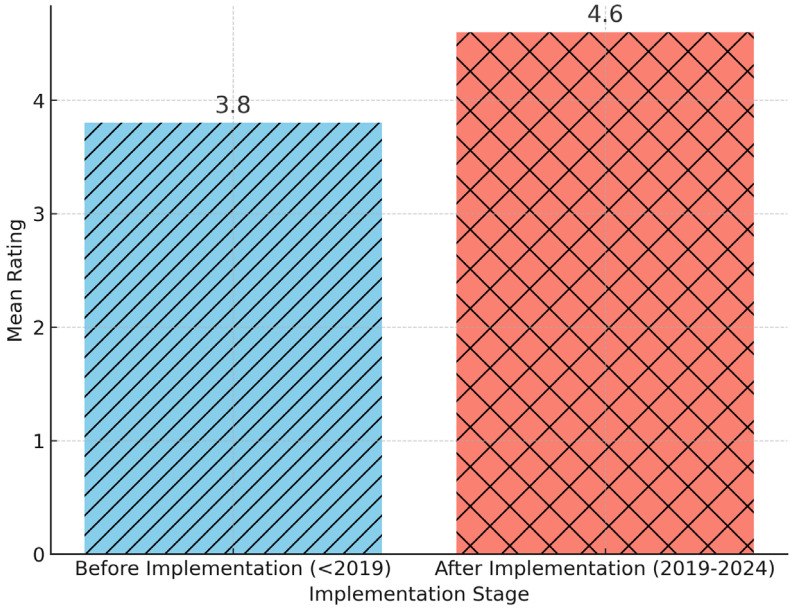

Figure 1. Changes in Patient Satisfaction Ratings for Excellent Service Quality Before and After the Implementation of the *"Duta We Care*" Program

Figure 1 shows that before the implementation of the "*Duta We Care*" program, the average rating was 3.8. However, after the program was implemented, it increased to 4.6. According to the Google Reviews for the "*Duta We Care*" program, service units were the most frequently discussed department. While this improvement may also reflect better clinical services or staff performance, many reviews specifically highlight the helpfulness, empathy, and responsiveness of service staff, key roles played by "*Duta We Care*" ambassadors. The frequent mention of service units further suggests that interpersonal care, as promoted by the program, significantly contributed to the rise in patient satisfaction. Figure 2 shows that the Non-Surgical Inpatient Installation received more attention than other units, such as the Maternity, High Care Unit, and others. This result suggested a higher level of complexity and intensity of care in the Non-Surgical Inpatient Installation, where patients have more specific needs, making it a primary focus for care.

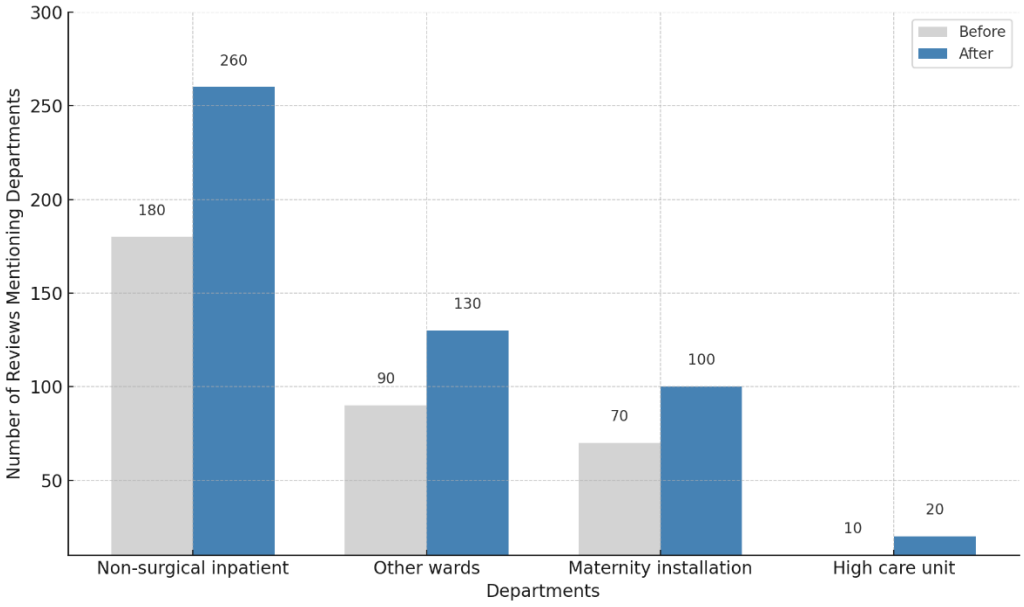

Figure 2. Frequency of Departments Mentioned in Google Reviews for the "*Duta We Care*" Program

Figure 3. Word Cloud of Frequently Used Words in Patient Testimonials Based on the "*Duta We Care*" Program

Figure 3 displays the word cloud of frequently used words in patient testimonials based on the *"Duta We Care"* program. It reveals that the "*Duta We Care*" program at Central General Hospital in Padang received positive responses from patients. In particular, the most frequently mentioned words were "*friendly*" (120 times), "*professional*" (90 times), "*quick*" (75 times), and "*care*" (60 times). Figure 4 shows the excellent service conditions and patient experiences based on testimonials for the "*Duta We Care*" program.

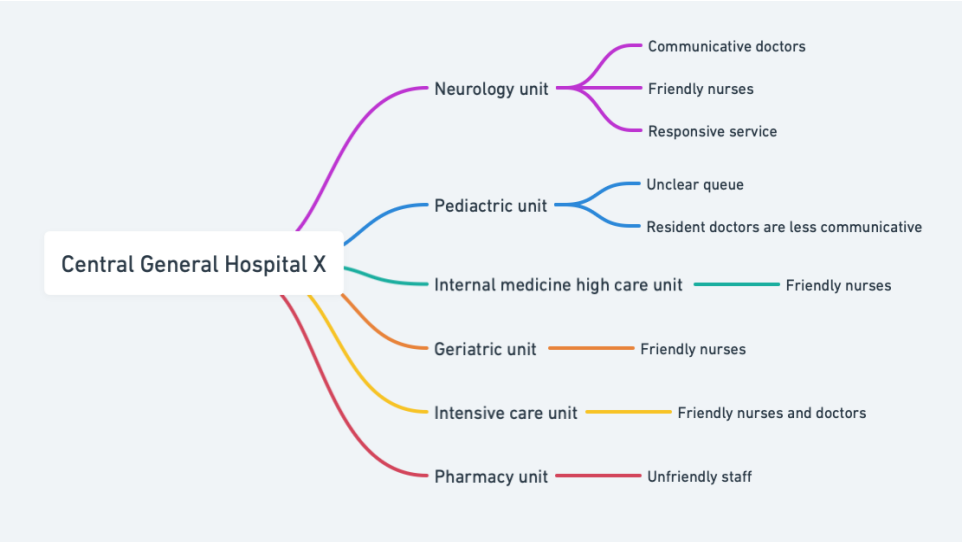

Figure 4. Excellent Service Conditions and Patient Experiences Based on Testimonials for the "*Duta We Care*" Program

Figure 4 indicates that the Non-Surgical Inpatient Installation received the highest number of reviews, especially the Neurology Unit (highlighting communicative doctors, friendly nurses, and responsive services), the Internal Medicine High Care Unit (noted for friendly nursing care), and the Geriatric Ward (also praised for friendly nursing services). Most reviews for this unit were positive, with commendations for the friendliness and professionalism of the staff and the quality of care provided. However, some complaints about waiting times were noted, particularly in the neurology unit.

Data analysis also revealed positive feedback on the attitudes and skills of hospital staff, including doctors, nurses, administrative personnel, and particularly the "*Duta We Care"* ambassadors. They were commonly described as friendly, professional, and responsive, indicating that both clinical and non-clinical staff contributed to a positive patient experience. Additionally, patients appreciated the facility's quality and effective communication. However, areas needing improvement included long waiting times, limited medical equipment, and unclear information occasionally provided by medical personnel.

Discussion

The results of this study suggested that the "*Duta We Care*" program implemented in Central General Hospital in Padang has improved patient satisfaction. The improvement suggested that the program effectively addressed excellent service areas, such as staff friendliness, professionalism, and service efficiency. These findings are consistent with previous research that highlights the critical role of interpersonal interactions in healthcare. For example, a previous study found that effective communication and emotional support from healthcare providers were strongly associated with higher patient satisfaction scores in hospital settings.[7] Similarly, another study emphasized that provider empathy significantly enhances patient trust and perceived quality of care, especially in high-contact services like inpatient care. These similarities reinforce the notion that programs like "*Duta We Care*", which prioritize empathetic and patient-centered communication, can produce measurable improvements in patient experiences.[13] In both this study and the cited literature, it is evident that enhancing the human aspect of service beyond technical or clinical improvements plays a pivotal role in shaping patient perceptions and loyalty.

Data from Google Reviews, which served as the primary data source for this study, revealed positive patient responses to the "*Duta We Care*" program. The frequent appearances of terms such as "*friendly*," "*professional*," "*quick*," and "*good*" underscored the importance patients place on the interpersonal aspects of excellent service. This result suggests that a focus on friendly attitudes, professionalism among staff, and prompt service significantly contributes to improving the patient experience at Central General Hospital in Padang. This positive feedback is consistent with the literature showing that positive interactions and empathy from health providers can enhance overall patient satisfaction.[12,13]

Despite the program's overall success in raising patient satisfaction, certain areas required further attention. For instance, some patients complained about long waiting times, limited facilities, especially concerning the number of medical equipment, and unclear communication from medical staff. These issues indicate that operational and infrastructural improvements are still needed for optimal patient satisfaction.[14,15] Although the "*Duta We Care*" program

excels in interpersonal areas, operational efficiency, and physical facilities development are required to improve the overall excellent service quality comprehensively.

Additionally, this study also highlighted operational issues such as long waiting times and limited medical facilities, which impact overall patient satisfaction. Long waiting times, a common issue in healthcare settings, not only affect patient satisfaction but can also reduce the quality of care, as patients may experience delays in receiving necessary treatment.[16,17] Potential solutions to this problem include implementing a more streamlined appointment scheduling system, adopting digital queue management to minimize physical waiting times, and optimizing resource allocation by analyzing peak times to ensure adequate staffing.[18] Other than that, introducing telemedicine services is expected to reduce in-person appointment demand and effectively shorten wait times for critical cases.[19]

Meanwhile, the limited availability of medical facilities and equipment can be addressed through strategic investments and partnerships to enhance resource availability. Hospitals might consider prioritizing equipment purchases based on demand and operational needs or exploring collaborations with medical equipment suppliers to ensure timely access to essential devices.[20] Allocating the budget for infrastructure upgrades, particularly in high-demand departments like neurology and high-care units, will also contribute to more effective service delivery.[21] Furthermore, a systematic approach that incorporates continuous feedback from patients and staff can help identify specific bottlenecks in service delivery. Last, regular audits and process evaluations, supported by performance metrics, can ensure that operational improvements are sustained over time.

This study's findings had significant practical implications for hospital management. The "*Duta We Care*" program can serve as a model for other hospitals that want to boost patient satisfaction through a high-quality service approach. Given the program's effectiveness, other hospitals may consider adopting similar strategies, especially those that need a positive improvement in terms of healthcare professionals' interpersonal skills, empathy, and responsiveness to patient needs.[22] To further enhance the program's impact, hospital management must also address operational factors to reduce waiting times and improve the available infrastructure. Besides, national healthcare quality policies should consider integrating programs like "*Duta We Care*" to establish more patient-centred service standards. Ongoing evaluation and context-based adaptations of such programs could significantly improve the healthcare system across different hospitals in the country.[23,24]

Using Google Reviews as the primary data source for evaluating this program provided valuable insights. These reviews offered direct perspectives from patients regarding their experiences and perceptions of service quality. After analyzing over two thousand reviews, a comprehensive understanding of patient assessments of the "*Duta We Care*" program has been obtained, discussed, and elaborated. This analysis was crucial in helping hospitals understand their current service strengths and weaknesses from the patients' perspective so that they could make changes accordingly.

This study has several strengths. It provides a comprehensive overview of patient satisfaction after the implementation of the "*Duta We Care*" program, using a large dataset of 2,035 Google Reviews to capture authentic patient perspectives. The data reflects spontaneous feedback across various service units over time, offering real-world insights into the program's impact. Despite these strengths, some limitations exist. First, while operational issues were identified (e.g., long waiting times), the study did not explore them in depth, as its focus remained on interpersonal service quality. Second, although Google Reviews lack the structure of formal surveys, we applied strict inclusion criteria such as relevance, language, and one review per visit to ensure data consistency. Third, potential selection bias was addressed by including a large sample over an extended period, helping balance extreme opinions. Additionally, independent dual coding and data triangulation with literature were used to strengthen validity.[26-30]

Furthermore, the absence of a comparative group or control makes it challenging to isolate the effects of the "*Duta We Care*" program from other hospital-wide changes that may also influence patient satisfaction. To reduce selection bias, future studies could combine data from different sources, such as internal satisfaction surveys, to capture more balanced and diverse patient opinions. Reporting bias could also be minimized by using anonymous, structured surveys, allowing patients to share feedback more openly and accurately.

Conclusion

This study demonstrates that the "*Duta We Care*" program has contributed to improving patient satisfaction at Central General Hospital in Padang by enhancing interpersonal aspects of care, such as friendliness, professionalism, and responsiveness of staff. Analysis of Google Reviews revealed a significant increase in satisfaction ratings following the program's implementation, along with recurring positive feedback related to service interactions. While challenges

remain, such as waiting times and limited facilities, the program has shown potential as an effective model for patient-centered service improvement. Moving forward, integrating regular patient feedback mechanisms and expanding the program to other service units or hospitals could further enhance healthcare service quality and operational effectiveness across Indonesia.

Abbreviations
Not applicable.

Ethics Approval and Consent to Participate
Not applicable.

Competing Interest
The authors declared no competing interests.

Availability of Data and Materials
The data underlying the results presented in this study are available from the corresponding author upon reasonable request.

Authors' Contribution
Conceptualization, methodology, and data analysis, A, RDN, and AS; writing—original draft preparation, A and EY; resources, writing—review and editing, A and EY. All authors have read and approved the published version of the manuscript.

Acknowledgment
Not applicable.

References

1. Kruk ME, Gage AD, Arsenault C, et al. High-quality health systems in the Sustainable Development Goals era: Time for a revolution. Lancet Glob Health. 2018; 6 (11): e1196-e1252. DOI: 10.1016/S2214-109X(18)30386-3.
2. van Weel C, Kidd MR. Why strengthening primary health care is essential to achieving universal health coverage. CMAJ. 2018; 190 (15): E463-E466. DOI: 10.1503/cmaj.170784.
3. Marzo RR, Bhattacharya S, Ujang NB, et al. The impact of service quality provided by healthcare centers and physicians on patient satisfaction. J Educ Health Promot. 2021; 10: 160. DOI: 10.4103/jehp.jehp_979_20.
4. Edgman-Levitan S, Schoenbaum SC. Patient-centered care: Achieving higher quality by designing care through the patient's eyes. Isr J Health Policy Res. 2021; 10: 21. DOI: 10.1186/s13584-021-00459-9.
5. Endalamaw A, Khatri RB, Erku D, et al. Successes and challenges towards improving quality of primary health care services: A scoping review. BMC Health Serv Res. 2023; 23: 893. DOI:10.1186/s12913-023-09917-3.
6. Alfitri A, Kurniati F, Sefitri I. Pengaruh penerapan pelayanan prima "Duta We Care" terhadap kepuasan pelayanan keperawatan di RSUP Dr. M. Djamil Padang. J Kesehat Med Saintika. 2023; 14 (1): 235–242. DOI: 10.30633/jkms.v14i1.1912.
7. Alfitri A, Kurnati F, Maharani A, et al. Pengaruh penerapan pelayanan prima "Duta We Care" (Customer Service Mobile Nursing) terhadap caring perawat di IRNA non bedah RSUP Dr. M. Djamil Padang. J Kesehat Med Saintika. 2021; 12 (1): 65–72. DOI: 10.30633/jkms.v12i1.1115.
8. Hannawa AF, Wu AW, Kolyada A, et al. The aspects of healthcare quality that are important to health professionals and patients: A qualitative study. Patient Educ Couns. 2022; 105 (6): 1561-1570. DOI: 10.1016/j.pec.2021.10.016.
9. Wheeler KJ, Miller M, Pulcini J, et al. Advanced practice nursing roles, regulation, education, and practice: A global study. Ann Glob Health. 2022; 88 (1): 42. DOI:10.5334/aogh.3698.
10. Savard I, Al Hakim G, Kilpatrick K. The added value of the nurse practitioner: An evolutionary concept analysis. Nurs Open. 2023; 10 (4): 2540-2551. DOI: 10.1002/nop2.1512.
11. Zitek T, Bui J, Day C, et al. A cross-sectional analysis of Yelp and Google reviews of hospitals in the United States. J Am Coll Emerg Physicians Open. 2023; 4 (2): e12913. DOI: 10.1002/emp2.12913.
12. Nindrea RD, Sari NP, Lazuardi L, et al. Validation: The use of google trends as an alternative data source for COVID-19 surveillance in Indonesia. Asia Pac J Public Health. 2020; 32 (6-7): 368-369. DOI:10.1177/1010539520940896.
13. Qin Y, Liu J, Li J, et al. How do moral hazard behaviors lead to the waste of medical insurance funds? An empirical study from China. Front Public Health. 2022; 10: 988492. DOI: 10.3389/fpubh.2022.988492.
14. Ferreira DC, Vieira I, Pedro MI, et al. Patient satisfaction with healthcare services and the techniques used for its assessment: A systematic literature review and a bibliometric analysis. Healthcare. 2023; 11 (5): 639. DOI: 10.3390/healthcare11050639.
15. McFarland S, Hay A. Digital and in-person interpersonal emotion regulation: The role of anxiety, depression, and stress. J Psychopathol Behav Assess. 2023; 45: 256-263. DOI: 10.1007/s10862-022-10010-y.
16. Fahmi MN, Pradjatmo H, Astuti I, et al. Cytokines as prognostic biomarkers of epithelial ovarian cancer (EOC): A systematic review and meta-analysis. Asian Pac J Cancer Prev. 2021; 22 (2): 315-323. DOI:10.31557/APJCP.2021.22.2.315.
17. Alrasheedi KF, Al-Mohaithef M, Edrees HH, et al. The association between wait times and patient satisfaction: Findings from primary health centers in the Kingdom of Saudi Arabia. Health Serv Res Manag Epidemiol. 2019; 6. DOI: 10.1177/2333392819861246.
18. Ala A, Chen F. Appointment scheduling problem in complexity systems of the healthcare services: A comprehensive review. J Healthc Eng. 2022; 2022: 5819813. DOI: 10.1155/2022/5819813.
19. Haleem A, Javaid M, Singh RP, et al. Telemedicine for healthcare: Capabilities, features, barriers, and applications. Sens Int. 2021; 2: 100117. DOI: 10.1016/j.sintl.2021.

20. Hinrichs-Krapels S, Ditewig B, Boulding H, et al. Purchasing high-cost medical devices and equipment in hospitals: A systematic review. BMJ Open. 2022; 12 (9): e057516. DOI: 10.1136/bmjopen-2021-057516.
21. Homauni A, Markazi-Moghaddam N, Mosadeghkhah A, et al. Budgeting in healthcare systems and organizations: A systematic review. Iran J Public Health. 2023; 52 (9): 1889-1901. DOI: 10.18502/ijph.v52i9.13571.
22. Nugroho DCA, Adisaputro K, Sigilipoe MA, et al. Exploring disparities of teleconsultation readiness: A comparative analysis of healthcare facilities in Indonesia. Digit Health. 2024; 10. DOI:10.1177/20552076241278296.
23. Lipoeto NI, Masrul, Nindrea RD. Nutritional contributors to maternal anemia in Indonesia: Chronic energy deficiency and micronutrients. Asia Pac J Clin Nutr. 2020; 29(Suppl 1): S9-S17. DOI:10.6133/apjcn.202012_29(S1).02.
24. Cipta DA, Andoko D, Theja A, et al. Culturally sensitive patient-centered healthcare: A focus on health behavior modification in low and middle-income nations-insights from Indonesia. Front Med. 2024; 11. DOI: 10.3389/fmed.2024.1353037.
25. Gong C, Yang Y. Google effects on memory: A meta-analytical review of the media effects of intensive Internet search behavior. Front Public Health. 2024; 12. DOI:10.3389/fpubh.2024.1332030.
26. Briscoe S, Abbott R, Lawal H, et al. Feasibility and desirability of screening search results from Google Search exhaustively for systematic reviews: A cross-case analysis. Res Synth Methods. 2023; 14 (3): 427-437. DOI:10.1002/jrsm.1622.
27. Nindrea RD, Sari NP, Harahap WA, et al. Survey data of COVID-19 awareness, knowledge, preparedness and related behaviors among breast cancer patients in Indonesia. Data Brief. 2020; 32: 106145. DOI: 10.1016/j.dib.2020.106145.
28. Hendriyani H, Sudargo T, Lusmilasari L, et al. Complementary feeding self-efficacy: A concept analysis. Open Access Maced J Med Sci. 2020; 8 (F): 11-22. DOI: 10.3889/oamjms.2020.3326.
29. Nindrea RD, Aryandono T, Lazuardi L, et al. Family history of breast cancer and breast cancer risk between malays ethnicity in Malaysia and Indonesia: A meta-analysis. Iran J Public Health. 2019; 48 (2): 198-205. DOI: 10.18502/ijph.v48i2.814.
30. Nindrea RD, Djanas D, Warsiti, et al. The risk factors and pregnant women's willingness toward the SARS-CoV-2 vaccination in various countries: A systematic review and meta-analysis. Clin Epidemiol Glob Health. 2022; 14: 100982. DOI: 10.1016/j.cegh.2022.100982.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 12

7-31-2025

Socioeconomic Status, Environmental Health Knowledge, and Housewives' Behavior in Maintaining Healthy Housing at Subsidized Flats in East Jakarta, Indonesia

Alfitra Firizkia Luthfiana Dewi
Universitas Indonesia, Depok, alfitrafirizkia@gmail.com

Laila Fitria
Universitas Indonesia, Depok, lfitria@ui.ac.id

Recommended Citation

Dewi AF , Fitria L . Socioeconomic Status, Environmental Health Knowledge, and Housewives' Behavior in Maintaining Healthy Housing at Subsidized Flats in East Jakarta, Indonesia. *Kesmas*. 2025; 20(5): 99-106
DOI: 10.7454/kesmas.v20isp1.2108
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/12

Dewi *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 99-106
DOI: 10.7454/kesmas.v20isp1.2108

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Socioeconomic Status, Environmental Health Knowledge, and Housewives' Behavior in Maintaining Healthy Housing at Subsidized Flats in East Jakarta, Indonesia

Alfitra Firizkia Luthfiana Dewi[1], Laila Fitria[2*]

[1]Bachelor Program of Environmental Health, Department of Environmental Health, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia
[2]Department of Environmental Health, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

Abstract

Healthy behavior among housewives is a crucial aspect of efforts to maintain healthy housing. This study aimed to analyze the relationship of socioeconomic status (e.g., household income, level of education of family head and housewives, and family head's occupation) and environmental health knowledge with housewives' behavior (e.g., vector control, waste management, home ventilation, cigarette smoking, and hand sanitation hygiene) in maintaining healthy housing in the subsidized flats in East Jakarta, Indonesia. This cross-sectional study employed the two-proportion hypothesis test formula and a simple random sampling method, recruiting 137 housewives for interviews. Data were analyzed via logistic regression to determine factors related to housewives' behavior. Analysis demonstrated a significant relationship of housewives' level of education (OR = 2.883; 95% CI = 1.339−6.209), the family heads' level of education (OR = 3.856; 95% CI = 1.711−8.690), and housewives' environmental health knowledge (OR = 2.687; 95% CI = 1.304−5.294) with housewives' behavior. Multivariate analysis demonstrated that the level of education of family heads and the environmental health knowledge of housewives were the dominant factors influencing housewives' behavior in maintaining healthy housing. The findings offer useful insights for planning and maintaining flats in other areas, considering the growing number of residents.

Keywords: environmental health knowledge, health behavior, housewives, socioeconomic status

Introduction

Healthy housing is a complex system that goes beyond the physical structure of a home, encompassing the support of mental well-being by offering a sense of security, privacy, and protection from external factors.[1] A healthy housing aims to create a house that provides its occupants with security, comfort, and privacy.[2] The World Health Organization has identified factors (internal: physical, chemical, biological, and building factors; external: social factors) that influence residence and health.[1,2] Internal factors include being structurally sound, protection from the elements and excess moisture, and facilitation of comfortable temperature, adequate sanitation and illumination, sufficient space, safe fuel or electricity connection, and defense from pollutants, injury hazards, mold, and pests.[2] Alternatively, external factors refer to multifamily housing, high-rise housing, housing quality, and mental health.[2,3]

To date, regulations in Indonesia related to residential health are governed by the Ministry of Health Regulation Number 829 of 1999, which concerns Housing Health Requirements. These regulations were subsequently updated by Ministry of Health Regulation Number 1077 of 2011, concerning Guidelines for Indoor Air Health, and Ministry of Health Regulation Number 2 of 2023, which pertains to the implementation of Government Regulation Number 66 of 2014 concerning Environmental Health. In addition, Ministry of Public Works Regulation Number 60 of 1992 outlines the technical requirements for the construction of flats, which serve as the basis for planning, supervision, management, and development of flats to improve the quality of life among residents. These requirements are also intended to ensure their security, safety, health, and comfort.[4]

***Correspondence**:* *Laila Fitria, Department of Environmental Health, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia, Email: lfitria@ui.ac.id*

Received : September 11, 2024
Accepted : July 7, 2025
Published: July 31, 2025

Several important aspects in the design of flats that support the achievement of these goals include ventilation, lighting, building durability, water access, waste and wastewater management, and the building's floor area. The maintenance of healthy housing is primarily related to the behavior of residents, particularly in terms of their health. Specifically, health behavior refers to a personal attribute, characteristic, behavioral pattern, action, or habit related to the maintenance, restoration, and improvement of health.[5] It must be practiced at home to support the achievement of access to a habitable and healthy home amid increasing population growth.[1] In line with its function, a house as a basic need of humans denotes a decent place to live, a means of family development, a reflection of the dignity and honor of a family, and an asset for its owner.[6,7] This need continues to intensify and becomes increasingly important, as it provides shelter and protection for its occupants with changes in demographic and climate conditions.[1,8]

Globally, 1.2 billion people, or 20% of the population, live in slums with uninhabitable housing quality.[7] This condition can lead to health risks for occupants, which include diarrhea and tuberculosis.[1] In 2019, 1.53 million deaths due to diarrhea were recorded worldwide, and 32.72% of these cases occurred in toddlers.[9] In addition, 3.8 million deaths worldwide are due to indoor air pollution.[1] High housing density also caused 3,500 deaths per year in Europe as of 2016.[1]

As one of the largest cities in Indonesia, access to decent housing in Jakarta remained at 40% as of 2021.[11] This scenario is further exacerbated by the high cost of land and building materials, the heightened need for community housing, and an increasingly narrow land area.[10] As a result, this condition most affects people who belong to low economic brackets.[10,11] In response to this problem, the government has built flats that can be rented at affordable prices to rejuvenate slum areas in urban areas.[10,12] This program targets low-income communities and accommodates households affected by relocation. The establishment of these flats is expected to benefit low-income communities, as mandated by Law Number 20 of 2011 concerning flats. However, the rental status of these flats induces low levels of concern among residents regarding the housing and settlement environment.[13,14] Alternatively, the level of education and knowledge of residents plays a major role in maintaining healthy housing.[15]

In 2017, the Jakarta Provincial Government surveyed 23 rental flats, with results demonstrating that 79.5% of subsidized flats were allocated to relocated families.[16] One of the subsidized flats was built for residents relocated from a slum eviction site in the Ciliwung River basin area, and the residents may possess different characteristics. This study aimed to investigate whether the level of socioeconomic status has a positive impact on the perception of environmental health aspects among residents of the subsidized flat compared to their previous homes.[17] The fact that subsidized flats are mainly intended for low-income communities renders importance to socioeconomic status in assessing the quality of housewives' behavior. Additionally, the health knowledge of housewives affects the health of their families.[18] In other words, the role of housewives is critical in maintaining healthy housing in flats.[19] For this reason, this study is required regarding the relationship between socioeconomic status and health knowledge with housewives' behaviors toward disease vectors, waste management, home ventilation, exposure to cigarette smoke, and hand sanitation hygiene in maintaining healthy housing in the subsidized flat, in East Jakarta.

Method

This study used a cross-sectional design. Data collection was conducted from May to June 2023, in one of the subsidized flats in East Jakarta, Indonesia. The Special Capital Region of Jakarta Provincial Government built this subsidized flat in 2013 and inaugurated it in 2015. This flat consists of two towers (A and B), each with 16 floors. The total number of units owned by this flat is 518, with Tower A having 19 housing units per floor and Tower B having 18 housing units per floor. Out of the available units, 420 are allocated for relocation residents (mainly from Kampung Pulo, an ethnic community region in West Java Province, Indonesia), and 98 are reserved for general residents. The floor area measures 30 m^2, featuring the following facilities: two bedrooms, one bathroom, and a room that can be combined to serve as a living room and kitchen. The rental fee is USD 18 for residents who are scheduled to relocate and USD 28 for general residents (approximately 1 USD = IDR 16,340). These rates exclude water and electricity costs, which are directly charged to the residents according to usage. The authors obtained official permission from the flat management (research permit number 1634/KL.03.03) before the data collection.

The population consisted of housewives residing in the subsidized flat, with inclusion criteria that included housewives living in the flat for at least one year prior to 2023, who had to provide informed consent after being given a brief explanation of the study. Meanwhile, the exclusion criteria were housewives who were unwilling to continue the interview and those undergoing a lease extension to another person during the period from May to June 2023. The sample was calculated using the two-proportion hypothesis test formula. The calculation used α 5% and β 10% and two

proportions; P_1 (63.4%) and P_2 (34.2%), which were derived from a study on knowledge and health behavior and conducted in Lampung Province.[20] A minimum sample of 120 was obtained. To address sampling errors, this study increased the minimum number of samples by 10% of the minimum number, resulting in a total sample size of 134.

As the flat complex features two towers (A and B), the sample size for both was proportionally determined according to the number of housewives living in each tower. The results indicated that 69 and 65 housewives belonged to Towers A and B, respectively. The authors conducted sampling on both towers using simple random sampling via the random.org generator and used a sampling framework in the form of a list of residents obtained from the Flats Management Unit. The data consisted of secondary and primary data. Secondary data included 518 occupied units, 598 family heads, 2,122 residents, and other supporting information obtained from the Flats Management Unit. Primary data were collected through interviews with housewives selected as samples using a questionnaire.

The questionnaire in this study was divided into four parts: (A) Demographics: age of housewives', number of family members, and type of apartment residents; (B) Socioeconomic status: housewives' level of education, family head's level of education, household income, and family head's employment status; (C) housewives' environmental health knowledge such as disease vectors, waste management, home ventilation, exposure to cigarette smoke, and hand sanitation hygiene; and (D) behaviors of housewives toward disease vectors, waste management, home ventilation, exposure to cigarette smoke, and hand sanitation hygiene.

Prior to statistical analysis, the researchers processed the data using the following steps. Data on socioeconomic status were based on the housewives' level of education, the family head's level of education, household income, and the family head's occupational status. Socioeconomic status was considered high if the housewife and family head's level of education was equal to or higher than junior high school, the household income was above regional minimum wage, and the family head's occupational status was employed. The Environmental Health Knowledge section in the questionnaire consisted of 30 statements on disease vectors, waste management, home ventilation, exposure to cigarette smoke, and hand sanitation hygiene, with the following response options: "do not know," "wrong," and "true." The housewives' level of environmental health knowledge was calculated based on the scores obtained. The responses of "do not know" and "wrong" were given a score of 0, while "true" was given a score of 1, with a maximum score of 30. The median value of the scores was then calculated to determine the categories of poor and good knowledge. Poor knowledge indicated a score of less than the median, while good knowledge corresponded to a score that is more than or equal to the median. This knowledge score was then converted into a value of 100 by dividing the median score for knowledge by 100 and multiplying by 100%. In this manner, the overall knowledge value would be obtained by the conversion result of the knowledge score calculation expressed in percentage units.

The "Housewife's Behavior" section in the questionnaire consisted of 20 questions on disease vectors, waste management, home ventilation, exposure to cigarette smoke, and hand sanitation hygiene, with the following response options: 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always. However, the score for the cigarette question was calculated in reverse (4 = never, 3 = rarely, 2 = sometimes, 1 = often, and 0 = always). The maximum score was 80. The median value of the scores was then calculated to determine the categories of poor and good behavior. A score below the median indicates poor behavior, while a score equal to or above the median implies good behavior. This behavior score was then converted into a value of 100 by dividing the median by 100 and multiplying by 100%. In this manner, the overall behavioral value would be obtained through the results of the conversion of the behavioral score calculation expressed in percentage units. Data were then analyzed using IBM SPSS Statistics 22 (free version). Descriptive analysis was conducted to describe the dependent variable (environmental health behavior) and the independent variables (socioeconomic status and environmental health knowledge) in the form of frequency distributions for each variable. The objective was to obtain a description of the characteristics of housewives' level of education, family head's level of education, household income, family head's employment status, knowledge of environmental health, and housewives' behavior. Statistical analysis was performed using the Chi-square test and multivariate analysis with logistic regression to examine the relationship between the independent and dependent variables.

Results

To facilitate the subsequent statistical analysis, the level of education among housewives and family heads was grouped into two categories: below junior high school and equal to or higher than junior high school. This study recruited 137 housewives, most of whom had completed junior high school or higher (70.8%). The same results were observed for

family heads. Of 137 family heads, most of them completed junior high school or higher (73%). This study demonstrated that the average household income was USD 153.37, resulting in most respondents (86.9%) having a household income below the minimum wage in the Special Capital Region of Jakarta Province (USD 300.75). Of 137 family heads, only 10 were unemployed. Furthermore, the level of education of housewives and family heads, household income, and family heads' occupational status were then combined into a socioeconomic status variable consisting of two categories: low and high. The results indicated that 123 respondents had low socioeconomic status (89.8%) (Table 1).

Table 1. Distribution of Respondents' Characteristics

Variables	n	%
Housewives' level of education (detailed)		
Less than elementary school	6	4.4
Elementary school	34	24.8
Junior high school	35	25.5
Senior high school	54	39.4
Higher education	8	5.8
Housewives' level of education (categorized)		
<Junior high school	40	29.2
≥Junior high school	97	70.8
Family heads' level of education (detailed)		
Uneducated	5	3.6
Less than elementary school	32	23.4
Elementary school	29	21.2
Junior high school	64	46.7
Senior high school	7	5.1
Family heads' level of education (categorized)		
<Junior high school	37	27
≥Junior high school	100	73
Household income (detailed)*		
USD 76.69	16	11.7
USD 76.69 to < USD 153.37	38	27.7
USD 153.37 to <USD 230.06	41	29.9
USD 230.06 to <USD 306.75	24	17.5
≥USD 306.75	18	13.1
Household income (categorized)		
<Regional minimum wage	119	86.9
≥Regional minimum wage	18	13.1
Family heads' occupation status		
Unemployed	10	7.3
Civil/public servant	0	0
Private employee	32	23.4
Service provider (e.g., electronics device, cleaning service, security personnel, taxi bike, and online driver)	40	29.2
Tradesman	34	24.8
Factory workers	19	13.9
Other (daily wager)	2	1.5
Family heads' occupational status		
Unemployed	10	7.3
Employed	127	92.7
Socioeconomic status		
Low	123	89.8
High	14	10.2
Total	**137**	**100**

*) approximately 1 USD = IDR 16,340

Table 2. Distribution of Housewives' Environmental Health Knowledge and Behavior

Variables	n	%
Housewives' environmental health knowledge		
Poor	56	40.9
Good	81	59.1
Housewives' behavior		
Poor	64	46.7
Good	73	53.3
Total	**137**	**100**

The environmental health knowledge of housewives was described using 30 statements related to disease vectors, waste management, ventilation use, smoking behavior, and hand sanitation hygiene. The results for the knowledge category were divided and grouped according to <median and ≥median scores. The median value of housewives'

environmental health knowledge was more than or equal to 27 out of a maximum value of 30. If converted into a percentage, the value of the environmental health knowledge among housewives has reached 90%, indicating that it is good. Furthermore, the results highlighted that 81 housewives' (59.1%) exhibited good environmental health knowledge.

The behavior of housewives was examined using 20 statements. The results of the knowledge category were then grouped according to <median and ≥median scores. The median value of housewives' behavior reached more than or equal to 66 out of the maximum value of 80. If converted into a percentage, the value of housewives' behavior reached 82.5%, categorized as good. Furthermore, the results indicated that 73 housewives (53.3%) exhibited good health behavior.

The results of the statistical analysis emphasized significant relationships of housewives' behavior in maintaining healthy housing with housewives' level of education (OR 2.89, 95% CI 1.34–6.21), family heads' level of education (OR 3.86, 95% CI 1.71–8.69), and housewives' environmental health knowledge (OR 2.69, 95% CI 1.30–5.29). Meanwhile, although the study did not observe a statistically significant relationship between household income and family heads' occupational status, the OR values were relatively high (OR = 1.90 [household income], OR = 2.87 [family heads' occupational status]) (Table 3). Multivariate analysis demonstrated that, among the factors of socioeconomic status, the level of education of family heads was the dominant factor related to housewives' behavior in maintaining healthy housing (adjusted OR: 3.39, 95% CI = 1.49–7.78). Another variable was housewives' environmental health knowledge (adjusted OR = 2.25, 95% CI = 1.09–4.67).

Table 3. Distribution of Housewives' Behavior Based on Socioeconomic Status and Environmental Health Knowledge

Variables	Housewives' Behavior				Total	p-value	OR (95% CI)
	Poor		Good				
	n	%	n	%			
Housewives' level of education							
<Junior high school	26	65	14	35	40	**0.006**	2.88
≥Junior high school	38	39.2	59	60.8	97		(1.34–6.21)
Family heads' level of education							
<Junior high school	26	70.3	11	29.7	37	**0.001**	3.86
≥Junior high school	38	38	62	62	100		(1.71–8.69)
Household income							
<Regional minimum wage	58	48.7	61	51.3	119	0.222	1.90
≥Regional minimum wage	6	33.3	12	66.7	18		(0.67–5.40)
Family heads' occupational status							
Unemployed	7	70	3	30	10	0.125	2.87
Employed	57	44.9	70	55.1	127		(0.71–11.59)
Socioeconomic status							
Low	58	47.2	65	52.8	123	0.760	1.19
High	6	42.9	8	57.1	14		(0.39–3.63)
Housewives' environmental health knowledge							
Poor	34	60.7	22	39.3	65	**0.006**	2.63
Good	30	37	51	63	72		(1.30–5.29)

Table 4. Socioeconomic Status and Environmental Health Knowledge Association with Housewives' Behavior in Maintaining Healthy housing

Variables	p-value	OR (95% CI)
Family heads' level of education		
<Junior high school	**0.004**	3.39 (1.49–7.78)
Housewives' environmental health knowledge		
Poor	**0.029**	2.25 (1.09–4.67)

Discussion

This study measured socioeconomic status based on the following variables: the level of education of housewives and family heads, household income, and the occupational status of family heads. This indicator of socioeconomic status was used to examine its relationship with housewives' behavior. A previous study stated that socioeconomic status influences a person's level of insight into sanitation, environment, and housing.[20] In addition, another study found that socioeconomic status influenced indoor environmental quality.[21] This study's results revealed that 70.8% housewives and 73% family heads had graduated from Junior High School or higher, 92.7% of the family heads were employed, but most of the household income was less than the Special Capital Region of Jakarta Province's minimum wage (86.9%). These variables were then combined and categorized, resulting in 89.8% of households having a low socioeconomic status.

Housewives' level of education was significantly associated with the housewives' behavior in maintaining healthy housing (OR = 2.88, 95% CI = 1.34–6.21). Housewives with levels of education below junior high school displayed a 2.88 times greater chance of having poor behavior in maintaining healthy housing. Family heads' level of education also exhibited a significant relationship with housewives' behavior in maintaining healthy housing (OR = 3.86, 95% CI = 1.71–8.69), which meant that if family heads obtained a level of education below junior high school, then the chance of housewives to display poor behavior toward the maintenance of healthy housing was 3.86 times greater. These findings align with a previous study, which stated that the level of education plays a crucial role in improving public health.[20] In addition, another study identified a significant relationship between housewives' level of education (below junior high school) and their clean and healthy living behaviors (OR = 5.37).[22] These findings were also in line with the theory that a good level of education will determine a person's ability to absorb information, make decisions, and behave.[5,23]

This study found that household income was not significantly associated with housewives' behavior in maintaining healthy housing (OR = 1.90, 95% CI = 0.67–5.40). Although not significant, the OR value was relatively high, which could be interpreted as follows: a household with an income less than the minimum regional wage has a 1.90 times greater chance of housewives adopting poor behaviors in maintaining healthy housing. A previous study has pointed to a relationship between income and the health behaviors of housewives. The reason is that income is part of the social determinant of health; therefore, income also influences behavior.[24]

The occupational status of family heads was not significantly associated with housewives' behavior in maintaining healthy housing (OR = 2.87; 95% CI = 0.71–11.59). Although not significant, the OR value was also relatively high. Housewives whose family head's occupational status was unemployed obtained a 2.87 times greater chance of adopting poor behaviors in maintaining healthy housing. According to a previous study, occupational status influences household income.[23] Moreover, income is part of the social determinant of health which can influence health behavior.[24] In other words, occupational status has an indirect influence on health behavior.

Socioeconomic status and the composite of variables (i.e., housewives' and family heads' level of education, family heads' occupational status, and household income) were analyzed into poor and good behavior. The results of statistical analysis for the composite variable were poor, given that no significant association was noted between housewives' behavior in maintaining healthy housing and a low OR value. Thus, this study inferred that the composite variable was insufficient for analyzing its relationship with the housewives' behavioral variables. Knowledge is the result of sensing a particular object so that someone becomes aware. Without knowledge, people will make decisions based on a foundation.[25] Knowledge is closely related to the level of education. As such, good education can influence one's decision-making. Additionally, good education influences the acceptance of proposed health interventions.[20] Therefore, high levels of education could lead to the easy absorption and practice of materials related to increasing capacity and knowledge.

In this study, the factors examined to assess housewives' environmental health knowledge included disease vector control, waste management, use of ventilation, indoor smoking behavior, and hand sanitation hygiene behavior. The housewives generally exhibited good environmental health knowledge, with a knowledge score conversion percentage of 90%. Moreover, the proportions of housewives with levels of education above or equal to junior high school (70.8%) and environmental health knowledge that belong under the good category (59.1%) were the largest. The results demonstrated that environmental health knowledge was associated with housewives' behavior in maintaining healthy housing (OR = 2.63, 95% CI = 1.30–5.29). Housewives with poor environmental health knowledge were 2.63 times more likely to exhibit poor behavior in maintaining healthy housing. This can be supported by the experiences of others or knowledge obtained from the respondents, which aligned with the components of the Health Belief Model, specifically perceived benefits. According to the theory, perceived benefits are a result of actions taken.[5] In addition, another study supported these findings, stating that environmental health knowledge plays a significant role in maintaining environmental health.[17]

Studies on this topic were relatively scarce. Most studies have been conducted in settlements and focused on the condition of units, not assessing socioeconomic status, environmental health knowledge, and health behavior in subsidized flats from public and environmental health perspectives, as this study does. In addition, studies conducted in subsidized flats primarily focus on assessments in the fields of economics, social sciences, and engineering, particularly civil engineering and architecture. This study had several limitations, including the difficulty of finding articles that examine similar variables. Therefore, in compiling the study, the authors referred to articles that are most closely aligned with the current context: clean and healthy living behaviors. Conversely, this study analyzed self-reported data, particularly on behaviors, which were prone to social desirability and recall bias. Another limitation was the sample size calculation, which only partially justified the effect size or power assumption. This study did not account for potential

confounding variables, such as cultural factors and access to healthcare services, which could also influence behavior. Therefore, measuring cultural factors, access to health services, and other confounding factors associated with housewives' behavior in maintaining healthy housing should also be considered in the future studies.

Conclusion

The education level of family heads and the environmental health knowledge of housewives were key factors influencing housewives' behavior in maintaining healthy housing in the subsidized flat in East Jakarta, Indonesia. The Flat Management Unit should offer counseling programs to enhance housewives' knowledge of environmental health, considering local conditions like flat infrastructure, accessibility, and socioeconomic factors. The need for strict enforcement of facility maintenance to ensure a quality living environment also needs to be emphasized. This study offers useful insights for public health efforts in developing and managing other flat housing areas amid growing urban residency. Further research is required to assess other related variables that influence housewives' behavior in maintaining healthy housing, including factors of socioeconomic status and environmental health knowledge, among others, by creating specific and in-depth interview questions.

Abbreviations

Not applicable.

Ethics Approval and Consent to Participate

This research underwent an ethical review procedure and was approved for implementation by the Research Expert and Research Ethics Commission of the Faculty of Public Health, Universitas Indonesia, as stated in Ethical Clearance Letter Number: Ket-546/UN2.F10.D11/PPM.00.02/2023, dated: June 26, 2023. The participants provided written informed consent prior to the study.

Competing Interest

The authors declare no conflict of interest. This study was conducted with the authors' personal funding.

Availability of Data and Materials

Not applicable.

Authors' Contribution

AFLD conceptualized, designed, and interpreted the data. LF prepared the initial draft and edited the manuscript.

Acknowledgments

This research was conducted with permission from the West Jatinegara Subsidized Flats Management Unit, East Jakarta, Indonesia. The authors thank all the staff of the Management Unit who supported the research.

References

1. World Health Organization. Promoting healthy housing for all – Towards an implementation strategy for the WHO Housing and health guidelines. Geneva: World Health Organization; 2021.
2. World Health Organization. WHO housing and health guidelines. Geneva: World Health Organization; 2018.
3. World Health Organization. Healthy housing: Raising standards, reducing inequalities. Geneva: World Health Organization; 2019.
4. Menteri Pekerjaan Umum Republik Indonesia. Peraturan Menteri Pekerjaan Umum Nomor 05/PRT/M/2007 Tahun 2007 Tentang Pedoman Teknis Pembangunan Rumah Susun Sederhana Bertingkat Tinggi. Jakarta: Kementerian Pekerjaan Umum dan Perumahan Rakyat Republik Indonesia; 2007.
5. Glanz K, Rimer BK, Viswanath K. Health behavior: Theory, research, and practice. 5th ed. Wiley; 2015.
6. Presiden Republik Indonesia. Undang-Undang Republik Indonesia Nomor 1 Tahun 2011 Tentang Perumahan dan Kawasan Permukiman. Jakarta: Pemerintah Pusat; 2011.
7. United Nations Human Settlements Programme. Envisaging the Future of Cities. Kenya: United Nations Human Settlements Programme; 2022.
8. United Nations. World Urbanization Prospects: The 2018 Revision. New York: United Nations; 2018.
9. Dattani S, Spooner F, Ritchie H, et al. Diarrheal diseases. Our World in Data; 2023.
10. Swope C, Hernández D. Housing as a determinant of health equity: A conceptual model. Soc Sci Med. 2019; 243 (112571). DOI: 10.1016/j.socscimed.2019.112571.
11. World Bank. Indonesia public expenditure review: Spending for better results. USA: World Bank Group; 2020.
12. Presiden Republik Indonesia. Undang-Undang Republik Indonesia Nomor 20 Tahun 2011 Tentang Rumah Susun. Jakarta: Pemerintah Pusat; 2011.
13. Wulandari DW, Mori S. Social Living Environment in Kost Private Rental Housing Based on Tenants' Experience: A case of urban settlement in Jakarta, Indonesia. J Archit Plann. 2019; 84 (757): 527–536. DOI: 10.3130/aija.84.527.
14. Candrawati RD, Wiguna PK, Malik MF, et al. Promosi dan perilaku kesehatan. Jawa Tengah: Eureka Media Aksara; 2023.

15. Hermawan Y. Hubungan Antara Tingkat pendidikan dan persepsi dengan perilaku ibu rumah tangga dalam pemeliharaan kebersihan lingkungan. J Bumi Lestari. 2015; 5 (2): 5.
16. Pemerintah Provinsi DKI Jakarta. Potensi Pengembangan Perekonomian di Rumah Susun DKI Jakarta 2017. Jakarta: Pusat Pelayanan Statistik Dinas Komunikasi Informatika dan Statistik Pemerintah Provinsi DKI Jakarta; 2017.
17. Sari DAP, Madonna S, Fitriani A. Environmental health evaluation for Jatinegara apartment from the perception of Kampung Pulo displaced people. Int J Eng Technol. 2018; 7 (2.14): 224–228. DOI: 10.31227/osf.io/a58ht.
18. Suryanegara W, Simanjuntak EGM. The Relationship between Housewives' Knowledge and Attitudes towards Clean and Healthy Living Behavior. Int J Trop Dis Heal. 2024; 45 (7): 117–25. DOI: 10.9734/ijtdh/2024/v45i71567.
19. Islam N, Istiadi Y. Hubungan antara pengetahuan pencemaran lingkungan dan kecerdasan emosional dengan partisipasi ibu rumah tangga dalam menjaga kesehatan lingkungan. J Pendidik Lingkung Hidup. 2017; 5 (1):12–22.
20. Adliyani ZON, Angraini DI, Soleha TU. Pengaruh pengetahuan, pendidikan dan ekonomi terhadap perilaku hidup bersih dan sehat pada masyarakat Desa Pekonmon Kecamatan Ngambur Kabupaten Pesisir Barat. Majority. 2017; 7 (1): 6–13.
21. Diaz LPE, Siegel JA. Indoor environmental quality in social housing: A literature review. Build Environ. 2018; 131: 231–241. DOI: 10.1016/j.buildenv.2018.01.013.
22. Herutomo T. Hubungan pengetahuan dan sikap keluarga dalam praktek perilaku hidup bersih dan sehat (PHBS) di Kabupaten Purwakarta. J Holist Health Sci. 2022; 6 (1): 1–8. DOI: 10.51873/jhhs.v6i1.162.
23. Pinem M. Pengaruh pendidikan dan status sosial ekonomi kepala keluarga bagi kesehatan lingkungan masyarakat. J Ilmu Pemerintah Sos Polit UMA. 2016; 4 (1): 96–106. DOI: 10.31289/jppuma.v4i1.896.
24. Short SE, Mollborn S. Social determinants and health behaviors: conceptual frames and empirical advances. Curr Opin Psychol. 2015; 5 (10): 78–84. DOI: 10.1016/j.copsyc.2015.05.002.
25. Pakpahan M, Siregar D, Susilawaty A, et al. Promosi kesehatan dan perilaku kesehatan. Medan: Yayasan Kita Menulis; 2021.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 13

7-31-2025

Noncommunicable Diseases (Hypertension or Diabetes Mellitus) Among Private University Lecturers and Related Factors

Ummi Kalsum
Universitas Jambi, Jambi, ummi2103@unja.ac.id

Melati Puti Andini
Universitas Jambi, Jambi, melatiputi04@gmail.com

Hendra Dhermawan Sitanggang
Universitas Jambi, Jambi, hendrasitanggang@unja.ac.id

Helmi Suryani Nasution
Universitas Jambi, Muaro Jambi, helmisuryani@unja.ac.id

Recommended Citation

Kalsum U , Andini MP , Sitanggang HD , et al. Noncommunicable Diseases (Hypertension or Diabetes Mellitus) Among Private University Lecturers and Related Factors. *Kesmas*. 2025; 20(5): 107-115
DOI: 10.7454/kesmas.v20isp1.2135
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/13

Kalsum *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 107-115
DOI: 10.7454/kesmas.v20isp1.2135

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Noncommunicable Diseases (Hypertension or Diabetes Mellitus) Among Private University Lecturers and Related Factors

Ummi Kalsum*, Melati Puti Andhini, Hendra Dhermawan Sitanggang, Helmi Suryani Nasution

Faculty of Medicine and Health Sciences, Universitas Jambi, Jambi, Indonesia

Abstract

Excessive workload, lack of rest, poor diet, stress, and insufficient physical activity are some contributing factors to a high risk of noncommunicable diseases (NCDs) for lecturers. This study aimed to develop a predictive model for the risk of NCDs among lecturers at a private university in Jambi City, Indonesia. A cross-sectional design was used, and the sample included 93 lecturers who met the inclusion criteria. The independent variables were workload, rest pattern, diet, physical activity, stress, smoking, and family history. The dependent variable was NCDs (hypertension or diabetes mellitus), measured through interviews based on a doctor's diagnosis. Data analysis was performed using Cox multivariate regression analysis. The proportion of NCDs among the lecturers was 25.8%. The factors associated with NCDs include workload, rest patterns, and family history. Lecturers are advised to adopt preventive behaviors, and universities must implement early detection of NCD programs to foster health-promoting environments.

Keywords: lecturer, noncommunicable diseases, rest pattern, university, workload

Introduction

Noncommunicable diseases (NCDs) are chronic due to their prolonged duration and gradual progression. In 2018, the World Health Organization (WHO) reported that approximately 71% or 41 million of the 57 million deaths worldwide occurred, with a prevalence of cardiovascular disease (44%), cancer (22%), chronic respiratory diseases (9%), and diabetes (4%).[1] The Indonesian Ministry of Health stated that the occurrence of NCDs in Indonesia was 69.91% in 2019.[2] According to data from the 2018 Indonesian Basic Health Research, the prevalence of NCDs has increased compared to the 2013 risks, including cancer, stroke, chronic kidney disease, diabetes mellitus (DM), and hypertension. The prevalence of cancer increased from 1.4% to 1.8%, stroke increased from 7% to 10.9%, chronic kidney disease increased from 2% to 3.8%, DM increased from 6.9% to 8.5%, and hypertension increased from 25.8% to 34.1%.[3-4]

The increase in the prevalence of NCDs is related to lifestyle factors, including smoking, consumption of alcoholic beverages, physical activity, and consumption of fruits and vegetables. The Indonesian Basic Health Research stated that the proportion of smoking among adolescents (10-18 years) continued to increase from 7.2% in 2013 to 9.1% in 2018. The proportion of alcohol consumption has increased from 3% (2013) to 3.3% (2018). The proportion of poor physical activity increased from 26.1% (2013) to 33.5% (2018). In addition, the proportion of poor fruit and vegetable consumption is still high in the population at 95.5% in 2018.[3-4] According to WHO, the major seven risk factors that cause NCDs are closely related to unhealthy lifestyle, including alcohol consumption, insufficient physical activities, smoking habbit, high blood pressure, sodium consumption, diabetes, and obesity, aside from low socioeconomic factors, which then cause a decrease in life expectancy by 2.1 years at the age of 40-85 years.[5] NCDs are beginning to threaten the productive age group.[5]

Lecturers are vulnerable to NCDs. A previous study found that 31% of lecturers had less rest, 76% had a poor diet, 23% experienced stress, 18.7% lacked physical activity, and 40% had a heavy workload.[6] In Indonesia, lecturers must fulfil the Three Pillars of Higher Education both at state and private universities. The Three Pillars of Higher Education consist of education, research, and community service activities simultaneously performed and reported at each

***Correspondence**:* *Ummi Kalsum, Faculty of Medicine and Health Sciences, Universitas Jambi, Jambi, Indonesia, Email: ummi2103@unja.ac.id*

Received : September 26, 2024
Accepted : January 20, 2025
Published: July 31, 2025

semester's end. The Three Pillars approach enables universities to develop superior human resources possessing skills in education, research, and community service. It also guides students towards social services to enhance their academic and non-academic abilities and, consequently, to demonstrate their competencies to institutions and society.[7]

A study conducted in Jambi City shows that the main causes of death among public university lecturers are NCDs (96%), with DM and heart attacks each accounting for 28%, followed by hypertension (8%), liver cancer (8%), and autoimmune disorders (8%).[8] Another study reveals that the causes of NCDs in lecturers are workload, work stress, family history, poor eating, and poor rest patterns.[6] This study aimed to obtain a prediction model for the risk of NCDs among lecturers at a private university in Jambi City. This study contributes to developing efforts to prevent NCDs in special groups of workers among high-risk occupational categories, specifically the intellectual worker group, by identifying the dominant cause. The implementation of preventive behavior needs to continue through campaigns, and the development of a healthy campus model on all campuses, including private universities whose management is more oriented towards profit and competition between universities, including competition with public universities.

Method

This cross-sectional study was conducted in 2023 at one of the private universities in Jambi City, Indonesia. The total population was 204 lecturers, while the eligible population consisted of 168 lecturers. However, 75 participants refused to be interviewed because they were busy, leaving 93 participants who met the criteria (the response rate for this study was 55.35%). A total sampling was performed in this study. The inclusion criteria were permanent lecturers with at least three years of work experience (since 2020) who were willing to participate. The factors of workload, diet, stress, rest patterns, sleep habits, physical activity, smoking, and family history of NCDs (hypertension or DM) were analyzed.

The NCDs' status was assessed through interviews and-clinical measurements, including blood pressure and blood glucose testing. Respondents were classified as having NCDs if they were identified as having hypertension or DM based on a doctor's diagnosis. The occurrence of NCDs was calculated based on the proportion of lecturers who experienced hypertension or DM to the number of subjects who responded (actual subjects).

Participants were categorized into two age groups: "Young Adults" (aged <60 years) and "Elderly" (aged ≥60 years). The sex of participants was categorized as either "Male" or "Female." Participants were grouped as "Single" if they were unmarried and "Married" if they had a spouse. The number of household members was classified as having "less than 4 people" or "equal to or more than 4 people." The number of children was categorized as having "less than 2 children" or "equal to or more than 2 children." Respondents who had financial or caregiving responsibilities for individuals outside their nuclear family (e.g., parents, relatives) were marked as "Yes," while those without such dependents were marked as "No."

Participants were classified based on their highest level of education: "Bachelor/Master" or "Doctorate." Duration of employment was divided into two groups: "less than 14 years" and "equal to or more than 14 years." Participants were grouped into academic rank categories of "III" and "IV." Functional positions were categorized as "Non-professors" or "Professor." Respondents were classified as "Yes" when they had other duties than teaching (e.g., administrative roles); otherwise, they were classified as "None." Income level was grouped into "less than USD 306" and "equal to or more than USD 306." Participants were grouped by faculty affiliation: "Agriculture," "Technical," "Economics," "Law," and "Education."

The diet was described as a pattern of consuming high-risk foods, including the frequency of consuming items high in saturated fat, salt, or sugar, which were grouped based on the median number reported in the Food Frequency Questionnaire. Participants were categorized into "Poor" if total score < median and "Good" diet quality if total score ≥ median. Rest pattern was categorized as "Sufficient" if participants slept ≥8 hours per day and "Poor" if they slept <7 hours per day. Participants were marked "Yes" if they currently smoked and "No" if they did not. Participants assigned to more than 12 credits per semester were considered to have a "Heavy" workload, while those with fewer than 12 credits per semester were classified as having a "Light" workload. Stress was categorized into two groups: "Yes" and "No."

Family history of NCDs was categorized as "Yes" if there was a history of hypertension or DM from their grandparents, parents, and siblings, and "No" if there were none. The Global Physical Activity Questionnaire (GPAQ), a measuring tool based on the Metabolic Equivalent Task (MET) indicator, was used to quantify physical activity, and a standard questionnaire was used to measure stress. A MET of more than 3,000 was classified as "High," a MET of 600 to

3,000 as "Moderate," and a MET of less than 600 as "Light" physical activities. Participants diagnosed with hypertension were marked "Yes," otherwise "No." Diagnosis of DM was recorded as "Yes" or "No." Participants were grouped as "Yes" if diagnosed with any or both NCDs (hypertension and DM), otherwise "No."

The authors explained the explanatory script on the questionnaire to the participants before they decided to accept or refuse participation, providing informed consent prior to the interview and measurement. Explanations for the participants were provided by the authors via phone (for those who could not be met in person) or by leaving an explanatory manuscript and an informed consent sheet with the education staff or the head of Academic Affairs to explain this study. Data were collected over a two-month period, from March to April 2023. Data collection was approved in advance by the university rector. Sampling frames and supporting data were obtained by communicating directly with the education staff. Data were collected through interviews and physical measurements, including blood pressure and blood sugar assessments.[8]

The data analysis conducted in this study included univariate, bivariate, and multivariate approaches. Univariate analysis aimed to describe categorical variables based on their frequency distribution or proportion, whereas the description of numeric data variation uses the mean, median, standard deviation, and minimum-maximum values. Bivariate analysis was performed using the Chi-square test with a 95% confidence interval. The conclusion was determined if the p-value ≤α (0.05), the null hypothesis was rejected, indicating a relationship between the independent and dependent variables. The association measure used was the Prevalence Ratio (PR).

Multivariate analysis aimed to simultaneously analyze the relationship between several independent variables and the dependent variable, and determine the dominant independent variable based on the Cox Regression test. This analysis was used because the occurrence of NCDs in this study was >15% (not a rare disease). The steps in conducting multivariate Cox Regression analysis began with screening candidate models using the Chi-square test on each independent variable with the dependent variable. If the Chi-square test results produced a p-value of <0.25, the variable becomes a multivariate candidate.

However, suppose the independent variable produced a p-value of >0.25 but is substantially important and related to the respondents, it can be included as a candidate variable for the multivariate model. Multivariate modeling was performed using the enter method. The next step was performing initial modeling, i.e., entering all candidate variables. A confounding test was conducted based on the statistical significance value. If an independent variable had a p-value of >0.05, it was removed from the model. Variables were removed gradually, starting from the largest p-value. The Cox Regression test was repeated after removing the variables until no variables had a p-value of >0.05.

Results

This study found that the proportion of NCD was 24 among 93 lecturers (25.8%) since the lecturers diagnosed with any or both hypertension or diabetes mellitus were included. Most lecturers were aged <60 years (95.7%), female (52.7%), married (93.5%), having more than 4 family members (74.2%), having more than 2 children (62.4%), having no dependents (86%), having a master's degree (78.5%), working for ≥14 years (50.5%), rank III (73.1%), not a professor in a functional position (77.4%), having no additional duties (55.1%), and having an income of ≥USD 306 (60.2%). Else, most lecturers had poor diets (51.6%), poor rest patterns (63.4%), heavy workloads (60.2%), stress (74.2%), family histories of NCDs (54.8%), high physical activity (77.4%), and did not smoke (82.8%). Approximately 17.2% had hypertension, and 3.2% had DM (Table 1).

Table 1. Characteristics of Lecturers at a Private University in Jambi City, Indonesia

Characteristic	Frequency (n)	Percentage (%)
Age		
Young adults (<60 years)	89	95.7
Elderly (≥ 60 years)	4	4.3
Sex		
Male	44	47.3
Female	49	52.7
Marital status		
Single	6	6.5
Married	87	93.5
Number of household members		
<4 people	24	25.8
≥4 people	69	74.2
Number of children		
<2 people	35	37.6
≥2 people	58	62.4
Dependents outside the nuclear family		
No	80	86.0
Yes	13	14.0
Last education		
Bachelor/Master	73	78.5
Doctorate	20	21.5
Working period		
<14 years	46	49.5
≥14 years	47	50.5
Rank		
III	68	73.1
IV	25	26.9
Functional positions		
Non-professors	72	77.4
Professors	21	22.6
Additional tasks		
None	52	55.9
Yes	41	44.1
Income		
<USD 306	37	39.8
≥USD 306	56	60.2
Faculty		
Agriculture	13	14.0
Technical	21	22.6
Economics	25	26.9
Law	15	16.1
Education	19	20.4
Diet		
Poor	48	51.6
Good	45	48.4
Rest pattern	59	63.4
Poor	34	36.6
Sufficient		
Smoking habits		
Yes	16	17.2
No	77	82.8
Workload		
Heavy	56	60.2
Light	37	39.8
Stress		
Yes	69	74.2
No	24	25.8
Family history of NCDs		
Yes	51	54.8
No	42	45.2
Physical activity		
Light	2	2.2
Moderate	19	20.4
High	72	77.4
Hypertension status		
Yes	16	17.2
No	77	82.8
Diabetes Mellitus status		
Yes	3	3.2
No	90	96.8

Characteristic	Frequency (n)	Percentage (%)
NCD status		
Yes	24	25.8
No	69	74.2

Notes: NCD = noncommunicable diseases, USD 1 = IDR 16,310.

The Chi-square test and calculation of the PR were employed to determine the strength of the relationship. The results of the association size, precision, and significance tests between risk factors for NCDs and NCDs are shown in Table 2. Risk factors were included in the multivariate analysis based on the range of prevalence ratios and the results of the bivariate significance test (p-value <0.05). These variables had a p-value of <0.25. The variables in the question were rest pattern, workload, and family history of NCDs. As all variables were included in the multivariate analysis, the results showed that rest patterns, workload, and family history of NCDs were not related to the proportion of NCDs because the p-value was >0.05 (Table 3).

Table 2. Cross-Tabulation Between Risk Factors of Noncommunicable Diseases

Variable	Noncommunicable Diseases						PR (95% CI)	p-value
	Yes		No		Total			
	n	%	n	%	n	%		
Diet								
Poor	14	29.2	34	70.8	48	100	1.31	0.598
Good	10	22.2	35	77.8	45	100	(0.65-2.64)	
Rest pattern								
Poor	20	33.9	39	66.1	59	100	2.88	0.035
Sufficient	4	11.8	30	88.2	34	100	(1.07-7.73)	
Smoking habits								
Yes	4	25.0	12	75.0	16	100	0.96	1.000
No	20	26.0	57	74.0	77	100	(0.38-2.43)	
Workload								
Heavy	8	14.3	48	85.7	56	100	0.33	0.004
Light	16	43.2	21	56.8	37	100	(0.15-0.69)	
Stress								
Yes	16	23.2	53	76.8	69	100	0.69	0.470
No	8	33.3	16	66.7	24	100	(0.34 – 1.41)	
Family history of NCDs								
Yes	20	39.2	31	60.8	51	100	4.11	0.003
No	4	9.5	38	90.5	42	100	(1.52 –11.11)	
Physical activity								
Light	1	50.0	1	50.0	2	100	1.89 (0.45-7.98)	0.470
Moderate	4	21.1	15	78.9	19	100	0.79 (0.30–2.06)	0.770
Heavy	19	26.4	53	73.6	77	100	Reff	

Table 3. Prediction Model of Noncommunicable Diseases Proportion

Variable	β	PR	95% CI	p-value	p-value (Omnibus)
Heavy workload	-0.693	0.500	(0.204-1.225)	0.130	0.003
Family history of NCDs	1.122	3.072	(0.992-9.510)	0.052	
Poor rest pattern	0.946	2.577	(0.877-7.571)	0.085	

Discussion

The proportion of NCDs among lecturers in this study was relatively higher than that among lecturers working at the public Polytechnic in the same year (17.3%).[6] The disparity in the proportion of NCDs can be attributed to the varying operational definitions employed. The proportion of NCDs in the previous study was assessed solely through two disease categories: hypertension and DM. Conversely, this study encompassed all potential types of NCDs rather than being limited to DM and hypertension.[6]

According to the 2018 Indonesian Basic Health Research, the prevalence of NCDs in the general population of Indonesia varied from 1.8% for cancer and 8.5% for DM to 34.1% for hypertension in 2018.[4] The 2023 Indonesian Health Survey results showed that the prevalence of cancer in people of all ages was 1.2% (Indonesia), while in Jambi Province was 0.7% (95% CI, 0.4 – 1.1% per mile).[9] The prevalence of cancer based on lecturer diagnosis in the age group ≥15 years was 14.3% per mile, of which more were in women with higher education and who were not working (2.4%) and employed as government officers (2%), living in urban areas (1.5%), and with the top quintile socioeconomic level (1.8%).[9]

Meanwhile, the prevalence of DM in the population aged ≥15 years in Indonesia is 2.2%; in Jambi Province, it is only 1.3%, with a 95% CI of 1.1 – 1.5%.[9] The prevalence of DM, when analyzed by age group, is most pronounced in individuals aged 65-74 years (6.7%), with a higher incidence among women, those possessing a university degree (2.9%), individuals employed as government officers (4.1%), residents of urban areas (2.7%), and those belonging to the highest socioeconomic quintile (3.3%).[4]

The prevalence of hypertension in Indonesia, as reported by the 2023 Indonesian Health Survey, is 8.6% based on physician diagnosis and 30.8% based on measurement results.[9] In Jambi Province, the prevalence is 5.7% according to physician diagnosis and 23.6% based on measurements (95% CI, 22.3-24.9%).[9] Higher prevalence is observed among women, particularly in the elderly demographic, and is more pronounced in communities with lower educational attainment. Additionally, urban residents exhibit a prevalence of 9.1% based on clinical diagnosis and 29.7% based on measurements. Regarding socioeconomic status, the highest quintile has a 9.1% prevalence, as determined by clinical diagnosis, whereas the lowest socioeconomic status shows a prevalence of 31.8% based on measurements.[9]

The pattern observed in the 2023 Indonesian Health Survey data supports the findings of this study.[9] The lecturers, at least, hold a master's degree, with an average income of USD 306 (in the top quintile), and reside in urban areas with a prevalence of NCDs that is relatively similar to this study's results.[9] Factors related to the occurrence of NCDs among participants in this study were family history, rest patterns, and workload. Meanwhile, diet, smoking habits, stress, and physical activity were not proven to be significantly related. A prediction model revealed that family history was the dominant factor, even after controlling for the rest pattern and workload. Another study reported similar results, indicating that factors related to the incidence of DM and hypertension among lecturers included workload, family history, diet, rest pattern, and stress, with workload being the most dominant factor.[9]

This study found that family history was the dominant factor in the occurrence of NCDs. The participants with a family history of NCDs had a greater risk of suffering from NCDs than those without a family history after being controlled for the variables of rest patterns and workload. This study's finding supported another study, which found that family history is the dominant factor in the proportion of NCDs, especially hypertension, where families with a history of suffering from hypertension are 38.86 times (95%CI 7.76-194.50) more likely to suffer from hypertension than those who do not have a family history of hypertension.[10] Similarly, another study stated that family history is the dominant factor in the proportion of NCDs, especially DM; families with a history of DM have 11.074 times (95%CI 2.538-48.310) greater chance of occurrence of NCDs than those who do not have a family history of DM.[11]

Another study in Bandar Lampung revealed that family history is a dominant factor in the occurrence of noncommunicable diseases, especially breast cancer. A person whose parents had breast cancer was 10.9 times more likely to develop breast cancer (p-value <0.001, OR= 10.9).[12] The results indicated that family history is the primary determinant, presenting an 11.2-fold increased risk for individuals with parents who have coronary heart disease (CHD). The familial factor plays a very close role in the pathogenesis of CHD, and it tends to occur among people who have parents suffering from early CHD.[12] Another study in Tacoma, Washington, also revealed the same results, which found that a person with a family history of maternal (female) hypertension and type 2 DM has increased risk factors for NCDs.[13] A person with a family history of a father or grandfather (male) has a level of risk similar to that of the mother. This result shows that fathers and mothers who have a history of hypertension and DM are 2.1 times more likely to suffer from NCDs compared to fathers and mothers who do not have a history of NCDs.[13]

The bivariate analysis results showed a significant relationship between rest patterns and the proportion of NCDs. The lecturers who had poor rest patterns were more likely to suffer from NCDs than those who had good or adequate rest patterns. The multivariate analysis in this study revealed that lecturers with poor rest patterns were 2.57 times more likely to develop NCDs than lecturers with good or sufficient rest. A correlation exists between sleep patterns and the proportion of NCDs, such as DM, attributed to inadequate sleep quality, characterized by frequent nocturnal awakenings.[14] This sleep pattern disorder affects the balance of the body, including blood sugar levels.[14] A connection between resting patterns and the occurrence of DM.[15] Sleep quality is divided into qualitative and quantitative categories: the duration of one night's sleep, the time needed to sleep, and whether or not it is restful.[15] However, another study stated that there is no relationship between resting patterns (sleep) and increased blood sugar levels (p-value: 0.822), where age and activity in the movement are risk factors for the occurrence of NCDs, especially DM.[16]

This study also demonstrated a relationship between workload and the proportion of NCDs. Lecturers with heavy workloads were at greater risk of developing NCDs than lecturers with light workloads, as stated in the bivariate analysis results. However, the results of multivariate analysis showed that workload was a confounding factor for the occurrence

of NCDs. The multivariate analysis in this study showed that lecturers with a heavy workload had a 0.500 times higher risk of suffering from NCDs compared to lecturers with a light workload after being controlled for workload and NCD family history. These findings aligned with a previous study that found a relationship between workload and the occurrence of hypertension (p-value = 0.002). Lecturers burdened with excessive workloads report diminished performance, which correlates with occupational exhaustion; individuals suffering from exhaustion and elevated stress levels may face a heightened risk of various ailments, particularly hypertension. A lecturer's obligation, known as the Three Pillars of Higher Education, coupled with the excess of credits, generally 12 credits per semester, is the obligation to conduct research and service. It is not uncommon for lecturers to experience fatigue.[17]

Heavy workload influences the occurrence of NCDs, especially hypertension. Factors such as age, education, working period, and stress contribute to this susceptibility. Elderly individuals with higher education levels are more prone to degenerative diseases, thus necessitating regular health assessments for lecturers.[17] Fatigue leads to depression, which becomes the second killer NCD after heart disease, so the death rate due to fatigue at work tends to be higher.[18] However, another study found no relationship between mental workload and blood pressure in educators; this is because the lecturers in this study have been exposed to accurate information about health, causing their increased awareness to conduct health checks (medical check-ups).[19]

The workload of lecturers that the law has regulated includes planning lessons, conducting the learning process, evaluating learning outcomes, conducting research, assigning additional assignments, guiding and training students, and participating in community services. According to Law Number 13 of 2003 Concerning Manpower, the working hours for employees working 6 days a week are 7 hours a day and 40 hours a week. As for employees with 5 days a week, their work obligations are 8 hours/day and 40 hours/week. However, most lecturers' working hours exceed normal working hours. Even on Saturdays and Sundays or even on national holidays, most lecturers still carry out their work activities, such as conducting research or carrying out community service, as well as guiding and testing the students and preparing teaching materials.[6,20]

Workload is a significant source of stress that gives rise to a type of psychological reaction that is damaging and fosters symptoms of burnout.[21] A study in Semarang City found that the mental workload of lecturers can be quantified by the amount of work they must complete.[20] The lecturers' workload includes planning to learn, carrying out the learning process, evaluating learning, guiding and training, conducting research, performing additional tasks, and engaging in community services, collectively referred to as the Three Pillars of Higher Education. The workload is at least equivalent to 12 credits and a maximum of 16 credits per semester; however, many are found to exceed 16 credits per semester. A workload that is too high can cause stress that triggers adrenaline and gradually affects the heart rate, which results in the occurrence of NCDs.[20]

A study conducted in Padang City found a relationship between stress and CHD, where a person who feels stress increases the frequency of heart workload, causing CHD. People who experience stress are twice as likely to suffer from CHD, which can also increase blood pressure and cholesterol.[22] A relationship between work stress and the occurrence of hypertension was due to an increase in blood pressure, the release of the hormone adrenaline, and the narrowing of arterial blood vessels, as well as an increase in heart rate.[23] A person who experiences continuous stress is likely to increase the risk of developing hypertension, heart disease, stroke, and death.[23]

Lecturers with heavy workloads tended to have limited time for exercise or engage in low physical activity. Continuous low physical activity poses the danger of the emergence of NCDs, especially hypertension.[24] A person with difficulty performing physical activity easily gains weight because the calories stored in the body are not burned and continue to accumulate. If a person regularly exercises, their heart rate increases, the heart muscle contracts more strongly, and blood vessels dilate, allowing the pumped blood to contain more oxygen.[24] One way to reduce the risk of NCD incidents among lecturers is to implement several programs, such as periodical health checks and early detection of NCDs. These programs should include eliminating cigarette smoke, engaging in diligent exercise, maintaining a balanced diet, getting adequate rest, and practicing stress management. The university also needs to reactivate the Health Promoting University program to reduce the risk of NCDs. It is essential to adopt a healthy lifestyle to prevent NCDs, particularly among lecturers with a family history of NCDs, who often face heavy workloads and inadequate rest patterns.[25]

A limitation of this study was the low response rate among lecturers as research subjects, which raised concerns about non-response bias. However, the characteristics of lecturers who refused were relatively similar to those of lecturers who were willing to participate. Hence, the results of this study were sufficient to accurately represent the

existing subjects. The study design employed cross-sectional data, which introduced the possibility of ambiguous temporality bias and the potential for recall bias in dietary assessment variables, as dietary measurement was conducted solely through semi-structured interviews using the food frequency questionnaire.

Conclusion

Variables associated with NCDs include workload, rest patterns, and family history. The dominant factor in NCDs was family history, controlled by workload and rest patterns. Lecturers are advised to adopt preventive behaviors and implement several programs, including periodic health checks, early detection of NCDs, and reactivation of the Health Promoting University.

Abbreviations

NCD: noncommunicable disease; WHO: World Health Organization; DM: diabetes mellitus; GPAQ: Global Physical Activity Questionnaire; MET: Metabolic Equivalent Task; PR: prevalence ratio; CHD: coronary heart disease.

Ethics Approval and Consent to Participate

This study was approved by the Research Ethics Committee of the Health Polytechnic of the Ministry of Health Jambi with the number LB.02.06/2/15/2023.

Competing Interest

The authors declare no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The primary author can provide all data and materials used in this study.

Authors' Contribution

UK, MPA, and HSN contributed to the design and implementation of the study, as well as manuscript preparation. HDS was involved in the data analysis, while the UK provided supervision and finalization of the manuscript. All authors have reviewed and contributed to the final manuscript.

Acknowledgment

The authors express their sincerest gratitude to the Faculty of Medicine and Health Sciences, Universitas Jambi, LPPM/Institute for Research and Community Services of Universitas Jambi, which has funded this research through the internal budget based on Decree Number 1656/UN21/PT/2023 and contract number: 179/UN21.11/PT.01.05/SPK/2023 dated April 17, 2023. The authors also thank the private university in Jambi City, which became the study area, and all of the participants.

References

1. Hasnah F, Lestari Y, Abdiana A. The risk of smoking with stroke in Asia : Meta-analysis. J Prof Medika. 2020; 14 (1): 111-117. DOI: 10.33533/jpm.v14i1.1597.
2. Irwan. Buku epidemiologi penyakit tidak menular. Gorontalo: UNG Repository; 2017.
3. Badan Penelitian dan Pengembangan Kesehatan. Hasil Utama Riskesdas 2013 Jakarta: Kementerian Kesehatan Republik Indonesia; 2013.
4. Badan Penelitian dan Pengembangan Kesehatan. Hasil Utama Riskesdas 2018. Jakarta: Kementerian Kesehatan Republik Indonesia; 2018.
5. Stringhini S, Carmeli C, Jokela M, et al. Socioeconomic status and the 25 × 25 risk factors as determinants of premature mortality: A multicohort study and meta-analysis of 1·7 million men and women. Lancet. 2017; 389 (10075): 1229-1237. DOI:10.1016/S0140-6736(16)32380-7.
6. Kalsum U, Gusmawati P, Fitri A, et al. Determinants of the incidence of non-communicable diseases and early death among lecturers at the Health Polytechnic, Ministry of Health, Jambi. Ris Inf Kesehat. 2024; 13 (1): 54. DOI:10.30644/rik.v13i1.863.
7. Direktorat Jenderal Pendidikan Tinggi, Riset, dan Teknologi Kementerian Pendidikan dan Kebudayaan. Keputusan Direktur Jenderal Pendidikan Tinggi Kementerian Pendidikan dan Kebudayaan Nomor 12/E/KPT/2021 tentang Pedoman Operasional Beban Kerja Dosen. Jakarta: Kementerian Pendidikan dan Kebudayaan; 2021.
8. Kalsum U, Nasution HS, Ibnu IN. Individual characteristic and the causes of death in lecturers at Jambi, Indonesia. In: Proceedings of the 3rd Green Development International Conference (GDIC 2020). Atlantis Press; 2020. DOI:10.2991/aer.k.210825.075.
9. Badan Kebijakan Pembangunan Kesehatan Kementerian Kesehatan. Survei kesehatan indonesia (SKI) 2023 dalam angka. Jakarta: Kementerian Kesehatan, Badan Pusat Statistik; 2023.
10. Wulandari FW, Ekawati D, Harokan A, et al. Faktor-faktor yang berhubungan dengan kejadian hipertensi. J Aisyiyah Plb. 2023; 8 (1): 286-299. DOI: 10.53690/inj.v1i01.114.
11. Rediningsih DR, Lestari IP. Riwayat keluarga dan hipertensi dengan kejadian diabetes melitus tipe II. JPPKMI. 2022; 3 (1): 8-13. DOI: 10.15294/jppkmi.v3i1.52087.
12. Kamsa KN. Hal-hal yang ada hubungan dengan penyakit jantung koroner pada penderita di beberapa lokasi wilayah indonesia periode tahun 2010 sampai dengan 2021 (systematic review) [Undergraduate Thesis]. Makassar: Universitas Bosowa; 2022. 107 p.
13. Kay VR, Wedel N, Smith GN. Family History of hypertension, cardiovascular disease, or diabetes and Risk of developing preeclampsia: A Systematic review. J Obstet Gynaecol Canada. 2020; 43 (2): 227-236.e19. DOI: 10.1016/j.jogc.2020.08.010.
14. Arzaq M, Hamidi MNS, Mufti L, et al. Hubungan tingkat stres dan pola tidur dengan kadar gula darah penderita diabetes melitus tipe II di wilayah kerja UPTD BLUD Puskesmas Airtiris. S-JKT. 2022; 1 (1): 11-19. DOI: 10.31004/s-jkt.v1i3.9077.

15. Basir AA, Misnarliah. Hubungan antara pola tidur terhadap kadar glukosa darah pada penderita diabetes melitus di wilayah kerja Puskesmas Leworeng Kecamatan Donri Donri Kabupaten Soppeng. JHNMSA J Health Nurs Midwifery Sci Adpertisi. 2020; 1 (2): 2746-4636.
16. Amroh DCF. Hubungan kualitas tidur dengan kadar glukosa darah mahasiswa tingkat 3 program studi DIII teknologi laboratorium medis di Poltekkes Kemenkes Palembang 2022 [Undergaduate Thesis]. Palembang: Poltekkes Kemenkes Palembang; 2022.
17. Sunarsih S, Ilyas H. Hubungan beban kerja dengan terjadinya penyakit hipertensi di Poliklinik Universitas Lampung. J Ilm Keperawatan Sai Betik. 2018; 13 (1): 42-47. DOI: 10.26630/jkep.v13i1.849.
18. Utami SF, Kusumadewi I, Suarantalla R. Analisis kelelahan kerja terhadap faktor umur, masa kerja, beban kerja dan indeks masa tubuh pada dosen reguler Fakultas Teknik, Universitas Teknologi Sumbawa tahun 2019. Hexagon J Teknik Sains Fak Teknik Univ Teknol Sumbawa. 2020; 1 (1): 58-62. DOI: 10.36761/hexagon.v1i1.474.
19. Ratman YP. Hubungan beban kerja mental dengan tekanan darah pada tenaga kependidikan Fakultas Kedokteran Universitas Jenderal Soedirman [Undergraduate Thesis]. Purwokerto: Universitas Jenderal Soedirman; 2022.
20. Pertiwi EM, Denny HM, Widjasena B. Hubungan antara beban kerja mental dengan stres kerja dosen di suatu fakultas. JKM J Kesehat Masy. 2017; 5 (3): 260-268. DOI: 10.14710/jkm.v5i3.17220.
21. Zulkifli Z, Rahayu ST, Akbar SA. Hubungan Usia, Masa Kerjadan Beban Kerja dengan Stres Kerja pada Karyawan *Service Well Company* PT. ELNUSA TBK Wilayah Muara Badak. KESMAS UWIGAMA: J Public Health. 2019; 5 (1): 46-61.
22. Ramadini I, Lestari S. Hubungan Aktivitas Fisik dan Stress dengan Nyeri Dada Pasien Penyakit Jantung Koroner. J Human Care. 2017; 2 (3).
23. Maligan DF, Bagiansah M, Ruqayyah S, et al. Hubungan aktivitas fisik dan stres dengan kejadian hipertensi pada pra-lansia di RSUD Dr. R. Soedjono Selong - Lombok Timur. NHJ. 2023; 2 (10): 67-75. DOI: 10.59003/nhj.v2i10.801.
24. Sagalulu RS, Febriyona R, Sudirman AN. Hubungan Aktivitas Fisik dengan Kejadian Hipertensi pada Wanita Menopause di Wilayah Kerja Puskesmas Telaga Kabupaten Gorontalo. J Educ Innov Public Health. 2023; 1 (2): 126-143.
25. Kalsum U, Nasution HS, Syukri M, et al. Pembentukan Posbindu dan Sosialisasi Health Promoting University di STIKES Harapan Ibu Jambi. J Pengabdi Harapan Ibu Jambi JPHI. 2025; 7 (1): 51-61. DOI: 10.30644/jphi.v7i1.968.

Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 14

7-31-2025

Factors of Anxiety Symptoms Due to Large-Scale Social Restriction Policy During the COVID-19 Pandemic in Indonesia

Indri Hapsari Susilowati
Universitas Indonesia, Depok, indri@ui.ac.id

Sudibyo Alimoeso
Universitas Respati Indonesia, Jakarta, salimoeso5511@gmail.com

Susiana Nugraha
Universitas Respati Indonesia, Jakarta, susiana.nugraha@gmail.com

Bonardo Prayogo Hasiholan
Ministry of Health of the Republic of Indonesia, Jakarta, bonardo.prayogo@gmail.com

Magda Sabrina Theofany Simanjuntak
Indonesia National Population and Family Planning Board, Jakarta, magdastsimanjuntak@gmail.com

See next page for additional authors

Recommended Citation

Susilowati I , Alimoeso S , Nugraha S , et al. Factors of Anxiety Symptoms Due to Large-Scale Social Restriction Policy During the COVID-19 Pandemic in Indonesia. *Kesmas*. 2025; 20(5): 116-123
DOI: 10.7454/kesmas.v20isp1.1951
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/14

Factors of Anxiety Symptoms Due to Large-Scale Social Restriction Policy During the COVID-19 Pandemic in Indonesia

Authors

Indri Hapsari Susilowati, Sudibyo Alimoeso, Susiana Nugraha, Bonardo Prayogo Hasiholan, Magda Sabrina Theofany Simanjuntak, and Nur Rachmat Satria

Susilowati *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2024; 20 (Special Issue 1): 116-123
DOI: 10.7454/kesmas.v20isp1.1951

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Factors of Anxiety Symptoms Due to Large-Scale Social Restriction Policy During the COVID-19 Pandemic in Indonesia

Indri Hapsari Susilowati[1]*, Sudibyo Alimoeso[2], Susiana Nugraha[2], Bonardo Prayogo Hasiholan[3], Magda Sabrina Theofany Simanjuntak[4], Nur Rachmat Satria[5]

[1]Department of Occupational Health and Safety, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia
[2]Centre for Family and Ageing Studies, University of Respati Indonesia, Jakarta, Indonesia
[3]Directorate General of Primary and Community Health, Ministry of Health, Jakarta, Indonesia
[4]Indonesia National Population and Family Planning Board, Jakarta, Indonesia
[5]Center for Assessment of Occupational Health and Safety, Universitas Indonesia, Depok, Indonesia

Abstract

The Indonesian Government took some preventive measures to slow the spread of the COVID-19 virus, including social restrictions and encouraging individuals to stay at home and avoid needless gatherings. This study aimed to identify factors related to anxiety symptoms during large-scale social restrictions. This study employed a cross-sectional design using the snowball technique in an online survey. A total of 788 respondents comprised the target population to detect the smallest effect size (Cohen's dz = .2), with the level of power of 0.8 using G*Power 3.1, specifically targeting adults aged over 18 years. Out of 1,194 people who took part in the survey, 847 completed all the answers. The findings revealed that 42% of participants experienced feelings of nervousness, anxiety, or agitation, and 42.5% became easily agitated during the COVID-19 pandemic. Nonetheless, 81.7% of those surveyed reported being able to manage their concerns, and 80.7% had good time management during the COVID-19 pandemic. Descriptive analysis showed that sex, residence, marital status, number of children, occupational status, being infected by COVID-19, health concern, and time management had a relationship with anxiety symptoms.

Keywords: anxiety, COVID-19, factors, large-scale social restriction

Introduction

The coronavirus disease 2019 (COVID-19) pandemic had a drastic impact on everyday life, and the reactions varied across different countries. Most countries are facing public health, social, and economic crises, although the scope, length, and evolution of these crises over time are unknown. However, the impact of the crisis will be severe and long-lasting. The World Health Organization (WHO) Regional Office for Africa, in a 2020 report, had projected that between 83,000 and 190,000 people in Africa might die from COVID-19 and that 29 to 44 million could become infected within the first year if containment efforts were unsuccessful. The report also cautioned that the pandemic could turn into a prolonged crisis lasting several years.[1]

The government in many countries has implemented containment measures, including quarantine. Quarantine has been historically used in public health to separate and restrict the movement of people exposed to a contagious disease, allowing them to be monitored to see if they become sick, thereby reducing the risk of infecting others.[2] Examples of quarantine measures used include quarantines in China and Canada during the 2003 Severe Acute Respiratory Syndrome (SARS) and some cities in Western African countries during the Ebola outbreak in 2014.[3]

Since March 2, 2020, when the first case of COVID-19 was reported in Indonesia, the government has announced preventive measures to contain the spread of the virus.[4] Additionally, several provinces implemented large-scale social restrictions (LSSR) after receiving a letter of authorization from the Indonesian Ministry of Health.[5] Travel restrictions

***Correspondence**:* *Indri Hapsari Susilowati, Department of Occupational Health and Safety, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia.*
Email: indri@ui.ac.id,

Received : May 21, 2024
Accepted : January 21, 2025
Published: July 31, 2025

were put in place, public events were canceled, schools were closed, and people were urged to stay at home and avoid needless crowds.[6] As a result, the Indonesians and the people worldwide were obligated to stay at home for the last two months.

In addition, studies conducted on similar health situations have shown the emotional, psychological, and behavioral impact of quarantine and confinement on people. Quarantine has been linked with post-traumatic stress reactions, elevated levels of anxiety, confusion, anger, feelings of uncertainty, rejection, and isolation.[3] The same condition also happened in Indonesia, where several factors, such as age and sex, were associated with anxiety during the initial phase of the COVID-19 pandemic.[7] From another study, it is found that during the COVID-19 pandemic in Indonesia, school-age community experienced higher anxiety compared with the working-age community, and people living on the island of Java have a greater incidence of anxiety compared with people living outside Java.[8]

Another study pointed out that anxiety is a feeling of unease that comes with both emotional and physical reactions, often triggered by the fear of something going wrong.[8] This study aimed to identify which single factors are associated with anxiety symptoms related to the LSSR policy. This study hypothesized that there was a relationship between sociodemographic factors and a person's time management when experiencing lockdown with anxiety symptoms. The findings from this study could serve as a starting point for understanding the factors linked to anxiety. They could help guide the creation of public policies that provide better psychosocial support during future pandemics.

Method

This study was part of a multi-country study on Personal and Family Coping with COVID-19 in the Global South. Indonesia was one of the 22 participating countries. The study design was cross-sectional, utilizing an online survey distributed throughout Indonesia from June to July 2020. G*Power 3.1 was used for the a priori power analysis. A total sample of 788 participants was required to detect the smallest effect size (Cohen's dz = .2) and achieved a generally accepted minimum level of power of 0.80. Participants were restricted to Indonesian adults aged 18 years and older who lived in Indonesia during the LSSR period in the COVID-19 pandemic. In general, the study employed the snowball technique with an online web-based survey design and distributed through social media and communications platforms (mainly WhatsApp). Each respondent was asked to give their informed consent before filling out the questionnaire. A total of 1,194 adults participated in the survey, with 847 completing all questions. Respondents had the option to choose not to answer or mark questions as not applicable.

Furthermore, data on respondents' sociodemographic information, perception related to COVID-19, and anxiety level for the last two weeks during the LSSR period in the COVID-19 pandemic in Indonesia were collected between June 12, 2020, and July 13, 2020. Demographic information included age, sex, marital status, number of children, education, and occupational status. Education was classified into two categories: uneducated-secondary (elementary, junior, or high school) and higher education (post-secondary, such as diploma, bachelor, master, or doctorate). Residence consisted of people living in urban and rural areas, classified based on Statistic Indonesia. Socioeconomic status was classified into high (above the regional minimum wage), middle (equal to the regional minimum wage), and low (below the regional minimum wage).

Information regarding COVID-19 included whether they have been infected by the COVID-19, someone in the household infected by COVID-19, someone close to them infected by COVID-19, someone close to them died from COVID-19, their concern about supporting family financially because of COVID-19, respondents' concern about their and family members health status, and their time management during COVID-19 situation. The answer was coded as 0 = No, 1 = Not sure, and 2 = Yes, as it represented their perception and opinion regarding COVID-19 information.[9] This instrument was validated in previous studies with Cronbach's alpha of .86 (Botswana sample), $\alpha = .85$ (Zimbabwean data), $\alpha = .84$ (Ghanaian data), and $\alpha = .88$ (Malaysian data), as well as ($\alpha > .7$) for the selected demographic subgroups.[9,10]

The level of anxiety was measured using the Generalized Anxiety Disorder (GAD-7), a self-assessment tool for anxiety symptoms screening among adults aged 18 to 95 years old.[11] The Indonesian version of GAD-7 was translated by Budikayanti *et al.*,[12] and was both valid and reliable with Cronbach's alpha of .86. The questionnaire included seven items asking how often participants experienced anxiety symptoms over the past two weeks, using a 4-point scale ranging from 0 (not at all), 1 (several days), 2 (more than half the days), and 3 (nearly every day). For bivariate analysis, the full answer for all indicators was categorized into two categories: "YES" indicates having anxiety symptoms with a score greater than 9, and "NO" indicates having no anxiety symptoms with a score of 0–9. The written informed consent was obtained from the respondents. Respondents could answer "not applicable" or "prefer not to answer," and these

responses would not be included in the bivariate data analysis. Additionally, the bivariate analysis employed the Chi-square test using the licensed SPSS statistical software version 24.

Results

The respondents were mostly female (66.4%), aged 18-34 years (67.5%), living in an urban area (79%), single (53.2%), and had a low income, below the regional wage standard (62%). The psychometric results revealed that 42.2% of participants experienced feelings of nervousness, anxiety, or agitation; 38.8% could not seem to stop worrying; 39.5% worried excessively; 38.2% found it difficult to unwind; 56.7% were agitated and found it difficult to remain still; 42.9% were easily agitated or agitated; and 38.8% were afraid that something negative might occur (Table 1). The respondents experienced all of those feelings for more than half of the day, almost every day.

The respondents stated that they could control their feelings of worry, anxiety, and fear during the COVID-19 pandemic (81.7%). Moreover, 80.7% of respondents felt they could manage time well during the pandemic (Table 2). The respondents found that 95.5% of them did not drink alcohol during the implementation of the LSSR policy in the COVID-19 pandemic. It also showed that 25.9% felt motivated by most things they did, 27.8% found something to do or watch to keep their interest, 61.5% disagreed with sitting around doing nothing, and 24.5% did something exciting, even dangerous.

Table 1. Symptoms of Generalized Anxiety Disorders

Indicators	%	n
Feeling nervous, anxious, or on edge		
Not at all sure	14.0	167
Several days	18.7	223
Over half the days	42.0	501
Nearly every day	24.7	295
Not applicable or not answered	0,7	8
Not being able to stop or control worrying		
Not at all sure	10.0	119
Several days	14.7	176
Over half the days	36.1	431
Nearly every day	38.5	460
Not applicable	0.7	8
Worrying too much about different things		
Not at all sure	14.0	167
Several days	16.1	192
Over half the days	38.9	465
Nearly every day	29.6	354
Not applicable or not answered	1.3	16
Trouble relaxing		
Not at all sure	11.1	132
Several days	13.3	159
Over half the days	37.9	453
Nearly every day	36.9	441
Not Applicable or not answered	0.8	9
Being so restless that it is hard to sit still		
Not at all sure	7.5	89
Several days	9.0	107
Over half the days	26.5	316
Nearly every day	56.2	671
Not applicable or not answered	0.9	11
Becoming easily annoyed or irritable		
Not at all sure	8.0	96
Several days	13.7	163
Over half the days	34.8	416
Nearly every day	42.5	508
Not applicable or not answered	0.9	11
Feeling afraid as if something awful might happen		
Not at all sure	15.5	183
Several days	18.8	222
Over half the days	38.8	459
Nearly every day	27.0	320
Not applicable or not answered	0.8	10

Table 2. Participants' Time Management During the Implementation of Large-Scale Social Restriction Policy

Indicators	%	n
Have a drink containing alcohol		
Never	95.5	1,136
Monthly or less	3.3	39
2-4 times a month	1.0	12
2-3 times a week	0.2	2
4 or more times a week	0.1	1
Feel motivated by most things that I do		
Disagree	50.2	596
Neutral	23.9	284
Agree	25.9	308
Find something to do or watch to keep interested		
Disagree	41.2	462
Neutral	31.0	347
Agree	27.8	312
I just sit around doing nothing		
Disagree	61.5	732
Neutral	12.5	149
Agree	26.0	310
Unless I am doing something exciting, even dangerous, I feel half dead and dull		
Disagree	54.6	650
Neutral	20.9	249
Agree	24.5	295
Do you think you are using your time well during the COVID-19 situation?		
Yes	80.7	683
No	19.3	164
Not applicable or prefer not to say	29.1	347
Do you think you are managing your contacts with other people well during the COVID-19 situation?		
Yes	88.3	1,056
No	11.4	136
Not Applicable or prefer not to say	0.1	2
Do you think you are controlling your worries well during the COVID-19 situation?		
Yes	81.7	975
No	18.3	216
Not applicable or prefer not to say	0.1	3

Based on the bivariate analysis, each independent variable was associated with anxiety symptoms, including sex, residence, marital status, number of children, occupational status, infection by COVID-19, health concern, and time usage management. Males were more likely to experience anxiety symptoms than females, 1,446 times (Table 3). Respondents living in urban areas, single, and working were also more likely to experience anxiety. Married respondents, especially those with children, did not cope with anxiety as well as other groups. The participants who were not sure about their COVID-19 infection status, and someone related to them, had an association with anxiety symptoms. Respondent who were concerned about their family and their health status had a relationship with anxiety. Furthermore, respondents who did not use their time well were 1.63 times more likely to have anxiety symptoms than those who made good use of their time.

Table 3. Bivariate Analysis

Variables	Anxiety Symptoms							
	Yes		No		Total		p-value	OR (CI 95%)
	n	%	n	%	n	%		
Sex [a,b]								
Female	421	68.7	141	60.3	562	66.4		1
Male	192	31.3	93	39.7	285	33.6	0.025*	1.44 (1.058-1.977)
Age [b]								
18-34	397	64.8	175	74.8	572	67.5		1
35-54	192	31.3	55	23.5	247	29.2	0.076	2.64 (0.904-7.736)
≥55	24	3.9	4	1.7	28	3.3	0.335	1.71 (0.572-5.164)
Residence [a,b]								
Rural	143	23.3	35	15.0	178	21.0		1
Urban	470	76.7	199	85.0	669	79.0	0.01*	1.73 (1.154-2.594)
Marital status [a,b]								
Married	306	49.9	90	38.5	396	46.8		1
Single	307	50.1	144	61.5	451	53.2	0.004*	1.59 (1.173-2.168)
Number of Children [a,b]								
No Children	322	52.5	153	65.3	475	56.1		1
1-2	197	32.1	60	25.6	257	30.3	0.012*	0.64 (0.453-0.907)
>2	94	15.3	21	9.0	115	13.6	0.004*	0.47 (0.282-0.784)
Education [b]								
Uneducated–secondary	184	30.0	67	28.6	251	29.6		1
Post-secondary–higher education	429	70.0	167	71.4	596	70.4	0.756	1.06 (0.767-1.490)
Occupational status [a,b]								
Unemployed	360	58.7	159	67.9	519	61.3		1
Employed	253	41.3	75	32.1	328	38.7	0.017*	0.67 (0.488-0.923)
Income [b]								
High	51	8.3	26	11.1	77	9.1		1
Middle	178	29.0	67	28.6	245	28.9	0.279	0.73 (0.426-1.279)
Low	384	62.6	141	60.3	525	62.0	0.207	0.72 (0.432-1.2)
Infected by COVID-19 [a,b]								
No	532	86.8	188	80.3	720	85.0		1
Yes	3	0.5	0	0	3	0.4	0.999	-
Unsure	78	12.7	46	19.7	124	14.6	0.012*	1.66 (1.118-2.491)
Someone in the household infected by COVID-19 [a,b]								
No	555	90.5	198	84.6	753	88.9		1
Yes	2	0.3	2	0.9	4	0.5	0.302	2.80 (0.392-20.033)
Unsure	56	9.1	34	14.5	90	10.6	0.022*	1.70 (1.079-2.685)
Someone close to you infected by COVID-19 [a,b]								
No	511	83.4	176	75.2	687	81.1		1
Yes	49	8.0	20	8.5	69	8.1	0.543	1.18 (0.685-2.049)
Unsure	53	8.6	38	16.2	91	10.7	0.001*	2.08 (1.327-3.266)
Someone close to you died from COVID-19 [b]								
No	582	94.9	216	92.3	798	94.2		1
Yes	16	2.6	6	2.6	22	2.6	0.983	1.01 (0.390-2.616)
Unsure	15	2.4	12	5.1	27	3.2	0.052	2.15 (0.993-4.679)
Concerned about your own health and health of your family [a,b]								
No	0	0	3	1.3	3	0.4		1
Yes	613	100	231	98.7	844	99.6	0.021*	3.65 (3.273-4.078)
Concerned about supporting family financially because of COVID-19 [b]								
No	223	36.4	69	29.5	292	34.5		1
Yes	334	54.5	140	59.8	474	56.0	0.075	1.35 (0.970-1.893)
Unsure	56	9.1	25	10.7	81	9.6	0.186	1.44 (0.838-2.484)
Do you consume alcohol during COVID-19? [b]								
No	591	96.4	223	95.3	814	96.1		1
Yes	22	3.6	11	4.7	33	3.9	0.583	1.32 (0.632-2.777)
Do you think you are using your time well during COVID-19 situation? [a,b]								
Yes	508	83.0	175	74.8	683	80.7		
No	105	17.0	59	25.2	164	19.3	0.01*	1.63 (1.135-2.343)

Notes: [a]p-value <0.05; [b]Participants that answered "N/A" or "prefer not to answer" were not included in the bivariate data analysis. Thus, the total number of respondents who completed the survey was 847

Discussion

This study used an online survey to make it easier and practical for participants to join. However, there were some limitations, such as limited eligibility and relying on voluntary participation, which might have caused some bias in the results. Most respondents were female, aged between 18 and 34 years, living in urban areas, had completed higher education, were unemployed, and had low incomes. Similar findings have also been seen in other online studies in Indonesia that looked at the pandemic's impact on mental health, which had a majority of female participants, a younger

age, and completed higher education.[7,8] On the other hand, based on the National Census in 2020, 56.7% of the Indonesian population lived in urban areas, 70% were of productive age (15-64 years old), the number of males and females was roughly the same, 67% were employed, and only 10.2% had completed higher education.[13,14] Therefore, the findings from this study might not fully reflect the overall Indonesian population.

This study found that employed participants were more likely to experience anxiety. This is different from other studies in Indonesia, where unemployed participants had a higher chance of developing anxiety during the LSSR period in the COVID-19 pandemic compared to those who had a job.[7,8] The findings from another study indicated that the overall prevalence of Post-Traumatic Stress Disorder among healthcare workers following the SARS epidemic was 14% (95% CI: 10–17%), with higher rates during the epidemic (16%) and within the first six months post-outbreak (19%). Notably, symptoms persisted in 8% of healthcare workers even after one year, and 10% remained affected at the three-year follow-up.[15] This study's findings provided a deeper understanding of anxiety employed by respondents to manage their concerns during the pandemic. The source of the anxiety problem was based on the Generalized Anxiety Disorder 7-item instrument.[16] Additionally, occupational status and monthly income were also factors related to anxiety, according to the study in Wuhan City, China.[17] Another study in Turkey stated that 89 out of 250 respondents experienced anxiety because they were laid off during the COVID-19 pandemic, meaning that occupational status was one of the factors related to anxiety.[18]

This study found that respondents living in urban areas were at risk of anxiety. Previous studies in Turkey, the United States, and China also stated that urban people were at risk of anxiety due to the COVID-19 pandemic.[18-20] In the other Indonesian study, residence between the island of Java and outside Java did not appear to have a significant relationship with anxiety, although the incidence of anxiety was higher in Java by 74.7% compared to those outside Java.[8] Therefore, living in urban areas is a risk factor for anxiety, and following research conducted by Islam *et al.*[21] stated that residents who live in urban areas are more likely to experience anxiety by 64.9% than those who live in rural areas.

Male respondents were more at risk of experiencing anxiety during the COVID-19 pandemic, which is in line with studies in Canada, the United States, South Korea, and the United Arab Emirates.[22-25] The intense anxiety experienced by males during the COVID-19 pandemic can be attributed to several factors. Males have a higher likelihood of receiving a COVID-19 diagnosis and being hospitalized due to the virus, with their fatality rate being twice that of females,[26] and information about it was probably widely spread across different media channels, potentially leading to heightened anxiety among males.[23] A study on millennial men found that when working from home during the pandemic lockdown, they experienced higher levels of distraction due to household responsibilities compared to women. They encountered more difficulties in staying organized and maintaining a consistent work routine, and also struggled to find adequate sources of self-motivation, which led to anxiety among them.[27] Males tend to delay seeking help or treatment compared to women, or they might find it more challenging to do so.[28]

On the other hand, respondents who were married and had children had poor coping mechanisms for anxiety because they were fearful and concerned about their health as well as their families. These results were also related to the health concerns variable. The more respondents understood the importance of maintaining their health and that of their families, the more they would seek information related to COVID-19. Meanwhile, the respondents who were not concerned about health would feel less worried. A previous study reported that parents experience high levels of anxiety and parental burnout during the COVID-19 pandemic.[29] A study in Poland also stated that having children is a risk factor for anxiety during the COVID-19 pandemic.[30] These findings may reflect individuals' heightened anxiety and concern for the health of their children and partners.

This study found that participants who were not sure about their COVID-19 infection status had a relationship with anxiety. This echoed with another study that found the anxiety level of patients suspected to have COVID-19 was scarce.[7] Furthermore, this study found that the respondents who were concerned about their own and family members' health status have a significant relationship with anxiety. During the lockdown and quarantine period, being alone, far away, separated from family members, and dealing with negative stigma were other problems that could make people's mental health even worse.[31,32] Another study also stated that emotional and psychological stress during the COVID-19 outbreak in health care workers in Italy was due to a prolonged pandemic and the uncertainty of when this pandemic would end.[33] The unsure COVID-19 infection status of household members and someone close to participants had a significant relationship with anxiety. This finding was in contrast with several previous studies.[7,18] Several things might influence anxiety, so more studies are needed to understand it, especially during the pandemic, lockdown, and quarantine period.

There are some differences when comparing the anxiety during the COVID-19 pandemic and post-pandemic. During the COVID-19 pandemic, respondents felt anxious due to the decrease in their household income because of the LSSR policy. At the same time, they were anxious about spreading the virus if they went to work. Meanwhile, during the COVID-19 post-pandemic, since this study was not conducted in that era, a study suggests that the cause of anxiety is loneliness due to changing social dynamics.[34] This study found that respondents who were not using the time well during the LSSR have a higher chance of developing anxiety.[34] Another study from China also found that the COVID-19 pandemic and the lockdown policy significantly affect cities' citizens in getting trouble falling asleep, which probably owes to the fear of COVID-19 disease and the anxiety for corresponding economic loss.[35] The other studies about self-efficacy and management might be related to time management during the LSSR period in the COVID-19 pandemic, where greater self-efficacy for self-management was associated and could be an important aspect to reduce the burden of long COVID-19 symptoms.[36] Also, anxiety has a significant impact on the sense of self-efficacy.[37] This study used a descriptive approach, which provides a broad overview; therefore, the results should be interpreted with caution. An analytical model was not employed to account for covariate or confounding variables that might have influenced the outcomes. This limits the ability to understand the role of other contributing factors fully.

Conclusion

Factors that are contributing to anxiety symptoms during the LSRR period in the COVID-19 pandemic in Indonesia are sex, residence, marital status, number of children, occupational status, infection by COVID-19, health concerns, and time usage management. Future research should consider these variables to explore the relationships more deeply and provide a more detailed understanding of the findings.

Abbreviations

COVID-19: coronavirus disease 2019; WHO: World Health Organization; SARS: Severe Acute Respiratory Syndrome; LSSR: Large-Scale Social Restriction.

Ethics Approval and Consent to Participate

This research had ethical clearance from the Research and Community Engagement Ethical Committee, Faculty of Public Health Universitas Indonesia, number 308/UN2.F10.D11/PPM.00.02/2020.

Competing Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Availability of Data and Materials

The raw data supporting the conclusions of this article will be made available by the authors, with reservation by email correspondence author.

Authors' Contribution

IH was responsible for the study concept and design. MST was contributed to data or analysis tools. IH, SA, SN, BPH, and MST were responsible for data collection. IH and MST performed the data analysis. IH, SA, SN, BPH, MST, and NRS wrote the manuscript. IH, SA, SN, BPH, MST, and NRS provided critical revision of the manuscript for intellectual content. All authors critically reviewed and approved the final version of the manuscript submitted for publication.

Acknowledgment

The authors would like to thank all community members that willingly participated in this study.

References

1. World Health Organizaition. New WHO estimates: Up to 190 000 people could die of COVID-19 in Africa if not controlled. Brazzaville: World Health Organization Africa; 2020.
2. Centers for Disease Control and Prevention. Fact Sheet on SARS isolation and quarantine. Atlanta, GA: Centers for Disease Control and Prevention; 2005.
3. Brooks SK, Webster RK, Smith LE, et al. The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. Lancet. 2020; 395 (10227): 912–20. DOI: 10.1016/S0140-6736(20)30460-8.
4. Ibrahim F, Natasha A, Saharman YR, et al. Preliminary report of COVID-19 testing: experience of the clinical microbiology laboratory Universitas Indonesia, Jakarta, Indonesia. New Microbes New Infect. 2020; 37: 100733. DOI: 10.1016/j.nmni.2020.100733.
5. Anugerah AR, Muttaqin PS, Purnama DA. Effect of large-scale social restriction (PSBB) during COVID-19 on outdoor air quality: Evidence from five cities in DKI Jakarta Province, Indonesia. Environ Res. 2021; 197: 111164. DOI: 10.1016/j.envres.2021.111164.
6. Adi GN, Rochman A. Regions close schools, cancel public events because of COVID-19. Jakarta: The Jakarta Post; 2020.
7. Anindyajati G, Wiguna T, Murtani BJ, et al. Anxiety and its associated factors during the initial phase of the COVID-19 pandemic in Indonesia. Front Psychiatry. 2021; 12: 634585. DOI: 10.3389/fpsyt.2021.634585.

8. Triastuti NJ, Herawati E. Demographic characteristics and anxiety in the educational setting during the COVID-19 pandemic in indonesia: A cross-sectional study. Health Sci Rep. 2022; 5 (5): e792. DOI: 10.1002/hsr2.792.
9. Boateng GO, Doku DT, Enyan NIE, et al. Prevalence and changes in boredom, anxiety and well-being among Ghanaians during the COVID-19 pandemic: A population-based study. BMC Public Health. 2021; 21 (1): 985. DOI: 10.1186/s12889-021-10998-0.
10. Pheko MM, Mhaka-Mutepfa M, Mfolwe LM, et al. Psychometrics validation of the WHO-5 wellbeing index in Botswana, Zimbabwe, and Malaysia: Coping with COVID-19 pandemic in the global south study. Sage Open. 2023; 13 (4). DOI: 10.1177/21582440231198387.
11. Jaya ES, Novrianto R, Dewantary NI, et al. The universality of anxiety experiences between Germany, Indonesia, and the US: A measurement invariance analysis. J Affect Disord. 2024; 361: 334-340. DOI: 10.1016/j.jad.2024.06.046.
12. Budikayanti A, Larasari A, Malik K, et al. Screening of generalized anxiety disorder in patients with epilepsy: Using a valid and reliable Indonesian version of generalized anxiety disorder-7 (GAD-7). Di Lazzaro V, editor. Neurol Res Int. 2019; 5902610. DOI: 10.1155/2019/5902610.
13. Badan Pusat Statistik. Penduduk Berumur 15 Tahun Ke Atas Menurut Pendidikan Tertinggi yang Ditamatkan dan Jenis Kegiatan Selama Seminggu yang Lalu, 2008–2020. Jakarta: Badan Pusat Statistik; 2020.
14. Badan Pusat Statistik. Statisik Indonesia 2020. Jakarta: Badan Pusat Statistik; 2020.
15. Alberque B, Laporte C, Mondillon L, et al. Prevalence of post-traumatic stress disorder (PTSD) in healthcare workers following the first SARS-CoV epidemic of 2003: A systematic review and meta-analysis. Int J Environ Res Public Health. 2022; 19 (20): 13069. DOI: 10.3390/ijerph192013069.
16. Spitzer RL, Kroenke K, Williams JBW, et al. A brief measure for assessing generalized anxiety disorder: The GAD-7. Arch Intern Med. 2006; 166 (10): 1092–1097. DOI: 10.1001/archinte.166.10.1092.
17. Fu W, Wang C, Zou L, et al. Psychological health, sleep quality, and coping styles to stress facing the COVID-19 in Wuhan, China. Transl Psychiatry. 2020; 10: 225. DOI: 10.1038/s41398-020-00913-3.
18. Özdin S, Bayrak Özdin Ş. Levels and predictors of anxiety, depression and health anxiety during COVID-19 pandemic in Turkish society: The importance of gender. Int J Soc Psychiatry. 2020; 66 (5): 504-511. DOI: 10.1177/0020764020927051.
19. Danek R, Taylor HL, Hilts KE. Changes in reported levels of depression and anxiety among rural and urban populations during the COVID-19 Pandemic. Ment Health Sci. 2023: 1 (3); 128–135. DOI: 10.1002/mhs2.24.
20. Liu L, Xue P, Li SX, et al. Urban-rural disparities in mental health problems related to COVID-19 in China. Gen Hosp Psychiatry. 2021; 69: 119-120. DOI: 10.1016/j.genhosppsych.2020.07.011.
21. Islam MA, Barna SD, Raihan H, et al. Depression and anxiety among university students during the COVID-19 pandemic in Bangladesh: A web-based cross-sectional survey. PLoS One. 2020; 15 (8): e0238162. DOI: 10.1371/journal.pone.0238162.
22. Cénat JM, Mahdi M, Darly R. Prevalence and determinants of depression, anxiety, and stress symptoms among black individuals in Canada in the context of the COVID-19 pandemic. Psychiatry Res. 2023; 326: 115341. DOI: 10.1016/j.psychres.2023.
23. Curtis AF, Rodgers M, Miller MB, et al. Impact of sex on COVID-19 media exposure, anxiety, perceived risk, and severity in middle-aged and older adults. J Aging Health. 2022; 34 (1): 51-59. DOI: 10.1177/08982643211025383.
24. Jeong H, Yim HW, Lee SY, et al. Impact of the COVID-19 pandemic on gender differences in depression based on national representative data. J Korean Med Sci. 2023; 38 (6): e36. DOI: 10.3346/jkms.2023.38.e36.
25. Saravanan C, Mahmoud I, Elshami W, et al. Knowledge, anxiety, fear, and psychological distress about COVID-19 among university students in the United Arab Emirates. Front Psychiatry. 2020; 11: 582189. DOI: 10.3389/fpsyt.2020.582189.
26. Klein SL, Dhakal S, Ursin RL, et al. Biological sex impacts COVID-19 outcomes. PLoS Pathog. 2020; 16 (6): e1008570. DOI: 10.1371/journal.ppat.1008570.
27. Raišienė AG, Rapuano V, Varkulevičiūtė K. Sensitive men and hardy women: How do millennials, xennials and gen x manage to work from home? J Open Innov Technol Mark Complex. 2021; 7 (2): 106. DOI: 10.3390/joitmc7020106.
28. Ando S, Nishida A, Usami S, et al. Help-seeking intention for depression in early adolescents: Associated factors and sex differences. J Afect Disord. 2018; 238: 359–365. DOI: 10.1016/j.jad.2018.05.077.
29. Kerr ML, Rasmussen HF, Fanning KA, et al. Parenting during COVID-19: A study of parents' experiences across gender and income levels. Fam Relat. 2021; 70 (5): 1327-1342. DOI: 10.1111/fare.12571.
30. Malesza M, Kaczmarek MC. Predictors of anxiety during the COVID-19 pandemic in Poland. Pers Individ Dif. 2021; 170: 110419. DOI: 10.1016/j.paid.2020.110419.
31. Upadhyay R, Sweta Singh B, Singh U. Psychological impact of quarantine period on asymptomatic individuals with COVID-19. Soc Sci Humanit Open. 2020; 2 (1): 100061. DOI: 10.1016/j.ssaho.2020.100061.
32. Benke C, Autenrieth LK, Asselmann E, et al. Lockdown, quarantine measures, and social distancing: Associations with depression, anxiety and distress at the beginning of the COVID-19 pandemic among adults from Germany. Psychiatry Res. 2020; 293: 113462. DOI: 10.1016/j.psychres.2020.113462.
33. Puci MV, Nosari G, Loi F, et al. Risk perception and worries among health care workers in the COVID-19 pandemic: Findings from an Italian survey. Healthcare (Basel). 2020; 8 (4): 535. DOI: 10.3390/healthcare8040535.
34. Novita RS, Koesma RE, Sahrani R. The relationship of feelings of loneliness with symptoms of social anxiety in early adulthood due to changes in social dynamics after the pandemic. RIWAYAT Educ J Hist Human. 2023; 6 (4): 2823–2834. DOI: 10.24815/jr.v6i4.35444.
35. Kong G, Kong D, Shi L. Sleeplessness in COVID-19 pandemic: Lockdown and anxiety. J Asian Econ. 2022; 80: 101460. DOI: 10.1016/j.asieco.2022.101460.
36. Owen R, Ashton RE, Bewick T, et al. Profiling the persistent and episodic nature of long COVID symptoms and the impact on quality of life and functional status: A cohort observation study. J Glob Health. 2025; 15: 04006. DOI: 10.7189/jogh.15.04006.
37. Amiri M, Jamalzadeh, A, Khosravi, A. Investigating the anxiety caused by COVID-19 and its relationship with self-efficacy and general health in Iranian nurses. Open Public Health J. 2024; 17. DOI: 10.2174/0118749445308986240603064738.