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TABLE OF CONTENTS

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Cholinesterase Enzyme Association with Quality of Life Among Farmers in Khong Chai District, Kalasin Province, Thailand

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Abstract

The agricultural sector in Thailand faces challenges that impact farmers' health and quality of life. This study examines the quality of life, cholinesterase enzyme levels, and factors associated with quality of life among farmers in Khong Chai District, Kalasin Province, Thailand. This cross-sectional analytical study was conducted using systematic random sampling. The respondents had a mean age of 54.97 ± 10.50 years (range 25–75 years) and comprised 75.56% females (n = 204), 24.44% males (n = 66). Data collection included demographic information, blood samples to assess cholinesterase enzyme safety levels, and responses to the World Health Organization Quality of Life Brief-Thai (WHOQOL-BREF-THAI) questionnaire. Data were analyzed using descriptive and inferential statistics. Multiple linear regression was utilized to identify factors associated with WHOQOL-BREF-THAI scores, presenting adjusted mean differences, 95% confidence intervals (95% CI), and p-values. The mean of WHOQOL-BREF-THAI score was 89.97 ± 10.34. Factors associated with higher quality of life scores included gender (male: 3.06; p = 0.032), agricultural land size of 10 Rai (1600 m^2) or more (2.55; p = 0.039), frequency of cholinesterase blood testing (1 time: 3.01; never: 3.40; p = 0.039; reference: 2 times or more), and blood cholinesterase enzyme safety levels (unsafe: 1.69; p = 0.037). These findings highlight the need for interventions to reduce risk factors, particularly among farmers with unsafe cholinesterase enzyme levels, to improve the quality of life in this population.

Keywords: cholinesterase enzyme safety levels, farmers, quality of life (QoL)

Abstrak

Enzim Kolinesterase Berhubungan dengan Kualitas Hidup Petani di Distrik Khong Chai, Provinsi Kalasin, Thailand. *Sektor pertanian di Thailand menghadapi tantangan yang mempengaruhi kesehatan dan kualitas hidup petani*. *Penelitian ini mengeksplorasi kualitas hidup, kadar enzim kolinesterase, dan faktor-faktor yang berhubungan dengan kualitas hidup petani di Distrik Khong Chai, Provinsi Kalasin, Thailand*. *Kami melakukan studi analisis* cross-sectional *terhadap petani yang dipilih menggunakan teknik* systematic random sampling. *Responden memiliki usia rata-rata 54,97 ± 10,50 tahun dengan rentang usia antara 25 hingga 75 tahun*. *Sebanyak 75,56% responden adalah perempuan* (*n = 204*)*, 24,44% adalah laki-laki* (*n = 66*). *Keuesioner terstruktur mengumpulkan data demografi, sampel darah untuk tingkat keamanan enzim kolinesterase, dan respon terhadap kuesioner* World Health Organization Quality of Life Brief-Thai (WHOQOL-BREF-THAI). *Data dianalisis menggunakan statistik deskriptif dan inferensial*. *Regresi linear berganda digunakan untuk mengidentifikasi faktor-faktor yang terkait dengan skor* WHOQOL-BREF-THAI*, menyajikan* adjusted mean differences*, 95%* confidence intervals (*95%* CI)*, dan nilai p*. *Penelitian mengungkapkan bahwa rerata skor* WHOQOL-BREF-THAI *adalah 89,97 ± 10,34*. *Faktor-faktor yang berhubungan dengan skor ini antara lain jenis kelamin* (*laki-laki*: *3,06; p = 0,032*)*, luas lahan pertanian 10 Rai* (*1600 m^2*) *ke atas* (*2,55; p = 0,039*)*, frekuensi tes darah kolinesterase* (*1 kali*: *3,01; tidak pernah*: *3,40; p = 0,039; referensi*: *2 kali atau lebih*)*, dan tingkat keamanan enzim kolinesterase darah* (*tidak aman*: *1,69; p = 0,037*). *Temuan ini menyoroti perlunya intervensi untuk mengurangi faktor-faktor risiko, khususnya di kalangan petani dengan tingkat enzim kolinesterase yang tidak aman, guna meningkatkan kualitas hidup pada populasi ini.*

Kata Kunci: *kualitas hidup, petani, tingkat keamanan enzim kolinesterase*

Introduction

In the fiscal year 2018, the Royal Thai government, specifically the Office of the Prime Minister, issued a directive aimed at enhancing the quality of life (QoL) in local communities. This directive serves as a comprehensive guide for improving QoL among residents in designated areas by fostering collaboration among government agencies, private entities, and local communities. The primary focus of these QoL development initiatives is on central population centers, addressing various challenges and improving access to essential services, such as healthcare and social support, to ensure sustainability (Department of Provincial Administration, Ministry of Interior et al., 2018). Aligned with this directive, the Twelfth National Economic and Social Development Plan (2017–2021) prioritizes the enhancement of the QoL of Thai farmers (Ministry of Agriculture and Cooperatives, 2017). However, the agricultural sector faces numerous challenges that directly impact farmers' health and QoL. One of the most pressing issues is exposure to pesticides, which have been linked to various acute and chronic health conditions. In line with "Sustainable Development Goal 3, "Good Health and Well-being", which aims to ensure healthy lives and promote well-being for all ages, monitoring and evaluation processes are essential for measuring outcomes such as satisfaction and QoL (Fukuda-Parr, 2016).

QoL has gained significant global attention, with organizations such as the World Health Organization (WHO) defining it as an individual's perception of their position in life within the context of culture, value systems, life goals, standards, and priorities (Bahramnezhad et al., 2017). Kalasin Province has proactively aligned its policies with WHO and Thai government directives to enhance QoL among its residents. In Khong Chai District, Kalasin Province, farming is the predominant occupation. Farmers in this area rely heavily on pesticides to protect crops from pests and diseases, maintain high yields, and meet market demands. This widespread use of pesticides makes it crucial to understand how these exposures affect the local farming community. Previous studies have identified specific factors associated with farmers' QoL, including demographic variables such as gender, occupational characteristics such as agricultural land size, and health-related indicators such as the frequency of cholinesterase blood testing and blood cholinesterase enzyme safety levels (Suwunnakhot, 2024). As farming is predominant in this district, initiatives are underway to improve QoL, with a particular focus on food safety and factors affecting farmers' well-being (Suwunnakhot, 2024).

Several studies have highlighted the detrimental effects of pesticide exposure on farmers' health. For instance, Perwitasari et al. (2017) found that chronic exposure to organophosphate pesticides significantly reduces cholinesterase activity, leading to various health issues, including neurological and psychological disorders. Similarly, Taghavian et al. (2016) emphasized the adverse effects of pesticide exposure on both physical and mental health, highlighting the need for protective measures. Farming occupations inherently pose risks due to pesticide exposure, resulting in acute and chronic health conditions that affect multiple bodily systems (Division of Occupational and Environmental Disease, 2020). In addition to environmental hazards and chronic illnesses, farmers face economic, personal, and behavioral challenges that further affect their QoL (Chomphoosri et al., 2020).

Understanding the concept of QoL and government policies is crucial for addressing issues in Khong Chai District, with a focus on promoting safe farming practices, improving farmer well-being, and reducing health risks. To assess QoL, the World Health Organization Quality of Life Brief-Thai (WHOQOL-BREF-THAI) instrument was utilized, covering four dimensions: physical health, psychological, social relationships, and environment (Mahatnirunkul et al., 1998). Existing literature highlights the detrimental effects of pesticide exposure on farmers'

health and underscores the critical need for effective interventions to improve their QoL. To address these complex challenges and inform local public health initiatives, a comprehensive understanding of the current QoL and health status among farmers in this specific district is essential. Therefore, this study aims to explore QoL, cholinesterase enzyme levels, and associated factors among farmers in Khong Chai District, Kalasin Province, Thailand.

Methods

This cross-sectional analysis study was conducted following approval from the Kalasin Provincial Public Health Office Research Ethics Committee (reference no. KLS.REC 43/ 2566), Kalasin Province, Thailand. Written informed consent was obtained from all participants before their inclusion in the study. The sample size was determined using Wayne's formula (1998), resulting in an approximate sample size of 270 farmers selected using systematic random sampling. This involved identifying a random starting point in each village and subsequently selecting every fifth farmer on the list for participation. The inclusion criteria were literate farmers over the age of 18, while exclusion criteria were individuals with communication impairments, including hearing loss, psychological disorders, or any form of physical disability.

A structured questionnaire was designed to collect data on independent variables, including gender, age, education level, marital status, body mass index (BMI), farm size, monthly income, experience with cholinesterase blood testing, health insurance coverage, smoking, alcohol consumption, energy drink consumption, coffee and tea consumption, underlying diseases, and blood samples for assessing cholinesterase enzyme safety levels. Blood cholinesterase enzyme safety levels were categorized into four groups: normal (> 100 Units/mL), safety (87.5–100 Units/mL), risk (75.0–87.5 Units/mL), and unsafe (< 75.0 Units/mL) (Kachaiyaphum et al., 2010).

The primary outcome measure of this study was assessed using the WHOQOL-BREF-THAI questionnaire, comprising 26 items across four domains: physical health (7 items), psychological health (6 items), social relationships (3 items), and environmental health (8 items), along with additional items on overall QoL and general health. The reliability of the WHOQ OL-BREF-THAI instrument was assessed with a Cronbach's alpha coefficient of 0.84 (Mahatnirunkul et al., 1998).

Following data collection, descriptive statistics, including frequency, percentage, mean, standard deviation (SD), minimum (min), and maximum (max) values, were used to analyze all variables. Factors associated with WHOQOL-BREF-THAI scores were identified using simple linear regression. Those with significance at p-value < 0.20 were entered into multiple linear regression analyses. Results were presented as adjusted mean differences with 95% confidence intervals (95% CI), with statistical significance at $p < 0.05$ (Greenland et al., 2016).

Results

Table 1 presents the characteristics of the study participants. The mean age was 54.97 ± 10.50 years, mean BMI was 23.43 ± 3.33, mean monthly income was 4,132.47 ± 4,332.38 Baht, and the average farm size was 9.63 ± 7.73 Rai (equivalent to 1600 m^2). The majority of respondents were female (75.56%), married (77.78%), and had attained primary school education (64.81%). Regarding health-related factors, 41.11% of the participants reported undergoing cholinesterase blood tests once, and 72.22% were covered under the Universal Health-care Coverage Scheme (UCS).

Most participants reported no smoking (85.93%), no alcohol consumption (72.22%), no energy drink consumption (73.33%), and no coffee or tea consumption (50.74%). Additionally, 69.63% reported having no underlying diseases. Blood cholinesterase enzyme levels showed that 22.22% had normal levels, 38.52% had safety

Table 1. Characteristics of Respondents

Characteristic	n (%)
Gender	
Male	66 (24.44)
Female	204 (75.56)
Age	
< 50 years	64 (23.70)
50–59 years	127 (47.04)
> 60 years	79 (29.26)
Marital status	
Single	21 (7.78)
Married	210 (77.78)
Widowed	35 (12.96)
Divorced/Separated	4 (1.48)
Education level	
Primary school	175 (64.81)
High school and above	95 (35.19)
Body mass index (BMI)	
< 22.9 (normal)	132 (48.89)
> 23.0 (overweight/obese)	138 (51.11)
Agricultural land size (1 Rai: 1600 m^2)	
< 10 Rai (1600 m^2)	144 (53.33)
> 10 Rai (1600 m^2)	126 (46.67)
Monthly income (Baht)	
< 2,500 Baht	90 (33.33)
2,500–4,999 Baht	100 (37.04)
> 5,000 Baht	80 (29.63)
Experience with cholinesterase blood testing	
Never	59 (21.85)
Once	111 (41.11)
Two or more times	100 (37.04)
Health insurance	
Universal Coverage Scheme (UCS)	222 (72.22)
Civil Servants Medical Benefit Scheme (CSMBS)	27 (10.00)
Social Security Scheme (SSs)	5 (1.85)
Private health insurance	16 (5.93)
Smoking	
No	232 (85.92)
Yes	38 (14.08)
Alcohol consumption	
No	195 (72.22)
Yes	75 (27.78)
Energy drink consumption	
No	198 (73.33)
Yes	72 (26.67)
Coffee/tea consumption	
No	137 (50.74)
Yes	133 (49.26)
Underlying disease	
None	188 (69.63)
Diabetes Mellitus	21 (7.78)
Hypertension	28 (10.38)
Musculoskeletal diseases	7 (2.59)
Gastroenteritis	8 (2.96)
Allergic rhinitis	7 (2.59)
Dermatitis	2 (0.74)

Characteristic	n (%)
Glaucoma	9 (3.33)
Blood cholinesterase enzyme safety level	
Normal (> 100 U/mL)	60 (22.22)
Safety (87.5–100 U/mL)	104 (38.52)
Risk (75.0–87.5 U/mL)	80 (29.63)
Unsafe (< 75.0 Unit/mL)	26 (9.63)

Table 2. WHOQOL-BREF-THAI Scores by Domain and Overall

Domain	Mean	SD.	Min	Max	Interpreted level
Physical health	24.92	3.23	15	35	Moderate
Psychological	20.91	2.69	15	30	Moderate
Social relationships	10.50	1.73	4	15	Moderate
Environment	27.16	3.37	20	40	Moderate
Overall score	89.97	10.34	66	128	Moderate

levels, 29.63% had risk levels, and 9.63% had unsafe levels.

Table 2 presents the mean WHOQOL-BREF-THAI scores, with an overall mean score of 89.97 ± 10.34, indicating a moderate level of QoL. The mean scores for each domain were as follows: physical health 24.92 ± 3.23 (moderate level), psychological health 20.91 ± 2.69 (moderate level), social relationships 10.50 ± 1.73 (moderate level), and environmental health 27.16 ± 3.37 (moderate level).

Table 3, using multiple linear regression analysis, illustrates the relationship between QoL and various factors. The mean QoL score was 89.97 ± 10.34, indicating a moderate level. The analysis revealed statistically significant associations ($p < 0.05$) between QoL and several factors: Gender: Being male was associated with an increase in QoL of 3.06 units (95% CI: 0.18–5.91; $p = 0.032$). Participants farming on plots of land sized approximately 10 Rai (1600 m^2) or larger had an increase in QoL of 2.55 units (95% CI: 0.11–5.00; $p = 0.039$).

Participants who underwent cholinesterase blood testing once reported a QoL increase of 3.01 units (95% CI: 0.25–5.77), while those who never underwent the test showed an increase of 3.40 units (95% CI: 0.12–6.67) compared to those tested two or more times ($p = 0.045$). Participants with normal and safe blood cholinesterase enzyme levels demonstrated a QoL increase of 1.69 units (95% CI: 0.45–2.07; $p = 0.037$). These findings emphasize the importance of considering demographic and health-related factors in understanding and improving the quality of life in the study population.

Discussion

This study found that the mean WHOQOL-BREF-THAI score and the scores across the four domains were at a moderate level. These findings align with other studies, including Chomphoosri et al. (2020), who also reported moderate WHOQOL-BREF-THAI scores across domains among Thai farmers. Prommawai et al. (2019) also found that the overall QoL among farmers in the Northeast region of Thailand was moderate, with one-third experiencing poor QoL. In contrast, a study among Vietnamese farmers by Nguyen et al. (2020) reported poor overall QoL, with the psychological dimension scoring the highest and the environmental dimension scoring the lowest.

Additionally, a study among China's farm workers found poor QoL, reflecting challenges associated with the transition from rural to urban labor markets (Lu et al., 2015). The authors

Table 3. Mean Differences in Quality of Life by Factors Based on Multiple Linear Regression

Factors	n	Mean	SD	Mean difference			p
				Un-adjusted	Adjusted	95% CI	
Sex							0.032*
Female	204	89.22	9.54	0	0	Ref.	
Male	66	92.27	12.30	3.04	3.06	0.18 – 5.91	
Size of farming area (1 Rai: 1600 m^2)							0.039*
< 10 Rai (1600 m^2)	144	88.80	10.73	0	0	Ref.	
> 10 Rai (1600 m^2)	126	91.30	9.75	2.50	2.55	0.11 – 5.00	
Experience with cholinesterase blood testing							0.045*
Never	59	87.83	9.96	0	0	Ref.	
Once	111	91.26	9.70	3.43	3.01	0.25 – 5.77	
Two or more times	100	91.17	11.66	3.33	3.40	0.12 – 6.67	
Blood cholinesterase enzyme safety levels							0.037*
Risk – Unsafe Levels	106	91.00	9.35	0	0	Ref.	
Normal – Safety Levels	164	89.30	10.92	1.70	1.69	0.45 – 2.07	

SD: Standard Deviation, 95% CI: 95% Confidence Interval, p: p-values < 0.05, m^2: Square meters
*Significant p-value

emphasized that reducing workload and promoting reasonable work conditions and lifestyles are essential for improving QoL among farmers. It is also important to mitigate occupational burdens and foster more sustainable labor practices and healthier lifestyles among agricultural workers. The People's Republic of China has increasingly emphasized improving farmers' quality of work-life and facilitating entrepreneurship within rural communities as pivotal strategies for sustaining rural livelihoods and promoting endogenous local economic development (Kong et al., 2019).

Drawing upon the recommendations of Swasthaisong et al. (2022) regarding guidelines for enhancing farmers' QoL, initial priorities should include facilitating economic development, fostering positive attitudes among farmers towards the principles of the sufficiency economy, and incentivizing practices such as self-reliance, organic agriculture, and the reduction of synthetic fertilizer use. Similarly, Panyurat (2022) underscored the necessity of integrating QoL enhancement with the advancement of the primary health care (PHC) system. This integration highlights the importance of identifying relevant health risk factors and associated indicators that are critical for improving QoL and creating healthy built environments. Consequently, the overarching strategic approach should emphasize the development of policies, planning, and management frameworks that are accountable for promoting QoL and improving health outcomes among targeted populations within specific community contexts.

The study indicated that a substantial proportion of participants (60.74%) exhibited blood cholinesterase enzyme levels within the normal-safety range. Conversely, a notable segment of the study population (39.26%) presented with levels indicative of potential risk or unsafe conditions. This pattern is likely related to the participants' predominant engagement in year-round agricultural activities, given that farming is their primary occupation. A study by Ngomsangud et al. (2022) among farmers in Sisaket reported similar findings. However, Juntarawijit et al. (2021) observed contrasting results, with higher rates of unsafe cholinesterase levels at 27.00%. Additionally, Boonkhao and Baukeaw (2020) reported negligible levels within the safety range, with a substantial proportion of participants falling into risk and unsafe categories. These discrepancies may

reflect differences in pesticide exposure levels and usage practices among study populations. Exposure to organophosphate toxicity is known to decrease cholinesterase activity among farmers, with potential adverse effects on physical health and QoL (Perwitasari et al., 2017).

The study revealed statistically significant associations between QoL and several factors, including blood cholinesterase enzyme levels and experience with cholinesterase blood testing. Additionally, a statistically significant relationship was observed between chronic exposure to organophosphate pesticides and the measured outcomes. Exposure to these pesticides, as highlighted by Taghavian et al. (2016) and Perwitasari et al. (2017), can adversely affect farmers' psychological and physical health, resulting in lower QoL scores compared to the general population. Implementing pesticide safety education, as suggested by Jambari et al. (2020), and promoting the proper use of personal protective equipment (PPE), as recommended by Wilaiwan and Siriwong (2017), may help mitigate these risks and contribute to improving farmers' QoL.

Moreover, the study by Swasthaisong et al. (2022) demonstrated that the structural equation model affecting predicting Thai farmers' QoL had a high level of accuracy, with statistical significance at the 0.01 level. Governmental support was identified as the variable that directly affects farmers' QoL. Similarly, Romyen (2018) proposed that improvements in farmers' QoL should focus on three areas: the economy, education, and health. In line with these findings, Suwunnakhot (2024) reported a correlation between blood cholinesterase enzyme levels and QoL among farmers across different regions and recommended promoting knowledge and awareness regarding the safe use of organophosphate pesticides. Regular monitoring of blood cholinesterase enzyme levels among farmers and their family members was also recommended to safeguard their health, food, environment, and QoL.

The study identified statistically significant associations between QoL and certain demographic and agricultural factors, specifically gender and the size of the farming area. Similar findings were reported by Nguyen et al. (2020), Paunpankum and Jaitae (2023), and Prommawai et al. (2019), who identified various factors significantly associated with QoL among farmers. Gao et al. (2021) highlighted the importance of understanding the role of land size in pesticide use for policy formulation and in reducing pesticide-related risks. In addition, the study by Windon and Robotham (2021) found an association between farmers' QoL and self-leadership and leadership competencies, suggesting the need to support farmers in maintaining work-life balance during busy seasons and in managing difficult conversations with farm employees.

Contrary to findings in the existing literature, the present study did not identify significant associations between farmers' QoL and commonly cited demographic or socioeconomic factors, including age, marital status, income, type of housing, educational attainment, or healthcare entitlements. This contrasts with prior research, such as Sabillón et al. (2022), which highlighted the influence of social determinants—including access to agricultural information systems and indicators of on-farm sustainability—on the QoL of agricultural workers. Similarly, Hettich et al. (2022) reported that younger age, lack of a cohabiting partner, and immigrant status were associated with lower QoL, while higher income, home ownership, and advanced education were positively correlated with improved QoL. These discrepancies may be attributed to contextual differences in geographic settings, cultural norms, socioeconomic conditions, or variations in policy implementation across study populations.

The Department of Disease Control, Ministry of Public Health (2022) reported that QoL among Thai agricultural workers were significantly influenced by health insurance coverage,

the regularity of occupational health check-ups, the availability of complete blood cholinesterase assessments, and health literacy related to pesticide use. Collectively, these contrasting findings highlight the need for more localized, context-specific investigations to better understand the complex and multidimensional determinants of QoL among farming populations.

A notable strength of this study was the availability of comprehensive data obtained through a representative face-to-face survey, which included detailed information on participants' personal and sociodemographic characteristics. The sampling methods were strategically designed to ensure a representative sample of the Khong Chai farming population.

However, it is important to acknowledge the limitations of this cross-sectional study, which may not fully capture the complexity of diseases and illnesses resulting from farmers' occupational exposures. To effectively address the health challenges faced by farmers in Khong Chai district, it is crucial to implement targeted interventions based on the study's findings. Enhancing the QoL of these farmers requires a multifaceted approach that integrates health monitoring, education, policy reforms, and community support. The recommendations proposed in this study are designed to mitigate the negative impacts of pesticide exposure, improve health outcomes, and promote a sustainable and healthy farming environment. Future research should investigate farmers' knowledge, behaviors, and work characteristics to better understand their health and QoL within agricultural settings.

Conclusion

This study highlights the moderate QoL among farmers in Khong Chai district, revealing significant associations between QoL and blood cholinesterase enzyme levels, prior experience with blood testing, gender, and farm size. These findings underscore the critical importance of monitoring cholinesterase enzyme levels as a key health indicator for farmer well-being. Consequently, targeted interventions are essential, particularly for farmers with at-risk cholinesterase levels, to promote healthier behaviors and improve QoL. While specific to Thai farmers, these findings have significant implycations for nursing practice and policy in agricultural communities globally. Nurses can adopt a proactive, community-based approach to occupational health by implementing routine cholinesterase monitoring and culturally sensitive health education programs focused on pesticide safety and alternative farming methods. Nurses play a vital role in advocating for policies that enforce stricter regulations on pesticide use, promote access to PPE, and support the transition to sustainable agricultural practices.

Future research should build upon these findings by evaluating the effectiveness of targeted interventions, evaluating the long-term impact of cholinesterase normalization on QoL, and investigating broader socioeconomic factors that may influence these relationships within agricultural communities. Furthermore, employing participatory action research could provide valuable insights for developing sustainable policies and health promotion programs for farmers locally and internationally, fostering healthier and more fulfilling lives for agricultural workers worldwide.

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Community-Based Intervention for Type 2 Diabetes Management in Developing Countries: A Systematic Review

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Abstract

Type 2 Diabetes Mellitus (T2DM) poses a significant public health challenge, especially in developing countries with limited healthcare resources. There is a critical need for community-based interventions (CBIs) to promote healthy lifestyles for individuals with T2DM. This study explores CBIs to improve health behavior among T2DM patients in developing countries. It systematically reviews articles from PubMed, Scopus, CENTRAL, and CINAHL databases. The search strategy employed specific keywords following the PRISMA Extension for Systematic Reviews. The quality of the included articles was appraised using the Joanna Briggs Institute (JBI). A narrative synthesis summarized the key findings across the selected articles. The inclusion criteria were full-text primary research reporting randomized controlled trials (RCTs) conducted in developing countries, focusing on community-based interventions, and published between 2014 and 2023. A review of twelve articles, with sample sizes ranging from 54 to 12,140 participants, explored interventions such as exercise, empowerment, peer support, and web-based programs. These interventions showed significant effectiveness: six articles reported improvement in health behavior, two in medical adherence, three in physical activity, four in positive attitudes, and two in quality of life (QoL). Five articles reported a consistent trend toward reduced HbA1c levels. This review highlights the potential of CBIs as effective strategies for addressing the complex challenges of T2DM in developing countries. Community health nurses may play a pivotal role in implementing and leading these interventions, particularly those involving technology-based approaches, to enhance self-care practices and improve glycaemic outcomes among individuals with T2DM.

Keywords: community-based intervention, chronic disease, developing countries, healthy behavior, type 2 diabetes mellitus

Abstrak

Intervensi Berbasis Komunitas untuk Manajemen Pasien dengan Diabetes Mellitus Tipe 2 di Negara Berkembang: Tinjauan Sistematis. *Diabetes Mellitus Tipe 2 (DMT2*) *merupakan tantangan kesehatan yang signifikan, terutama di negara berkembang dengan sumber daya kesehatan yang terbatas. Intervensi berbasis komunitas sangat diperlukan untuk meningkatkan perilaku hidup sehat individu dengan DMT2. Tinjauan ini mengeksplorasi intervensi berbasis komunitas untuk meningkatkan perilaku kesehatan pasien* T2DM *di negara berkembang. Tinjauan literatur sistematis dilakukan menggunakan basis data* PubMed, Scopus, CENTRAL, *dan* CINAHL. *Strategi pencarian menggunakan kata kunci khusus mengikuti* PRISMA Extension *untuk Tinjauan Sistematis. Kualitas studi yang disertakan dinilai menggunakan* JBI. *Sintesis data menggunakan pendekatan naratif, merangkum temuan kunci dari studi yang masuk ke dalam kriteria penyertaan, yaitu merupakan penelitian utama* RCT *teks lengkap yang dilakukan di negara berkembang, berfokus pada intervensi berbasis komunitas, dan diterbitkan antara tahun 2014-2023. Tinjauan terhadap dua belas artikel, dengan ukuran sampel berkisar antara 54 hingga 12.140 peserta, mengeksplorasi intervensi seperti olahraga, pemberdayaan, dukungan sebaya, dan program berbasis web. Intervensi dalam studi-studi tersebut menunjukkan efektivitas yang signifikan, dengan enam artikel melaporkan peningkatan dalam perilaku kesehatan, dua artikel dalam kepatuhan medis, tiga artikel dalam aktivitas fisik, empat artikel dalam sikap positif, dan dua artikel dalam* QoL. *Selain itu, lima artikel melaporkan tren penurunan kadar HbA1c yang konsisten. Tinjauan ini menyoroti potensi intervensi*

berbasis komunitas sebagai strategi yang efektif untuk mengatasi tantangan kompleks dari DMT2 di negara berkembang. Perawat kesehatan masyarakat dapat berperan penting dalam melaksanakan dan menjadi garda depan intervensi ini, khususnya yang melibatkan pendekatan berbasis teknologi, guna meningkatkan praktik perawatan mandiri dan hasil glikemik pada individu dengan DMT2.

Kata Kunci: *diabetes melitus tipe 2, intervensi berbasis komunitas, negara berkembang, penyakit kronis, perilaku sehat*

Introduction

Type 2 diabetes mellitus (T2DM) has emerged as a critical global public health concern, with an increasing prevalence in developing countries (Ibrahim et al., 2016). In 2023, the World Health Organization (WHO) estimated that 463 million individuals worldwide were affected by diabetes, with approximately 79% of these cases occurring in low- and middle-income countries (WHO, 2024). These countries bear the substantial economic implications as approximately 80% of T2DM cases occur in these regions (Ibrahim et al., 2016), and projections indicate that this figure is expected to rise in the coming years (Salvatore et al., 2023). Notably, the burden of T2DM is exceptionally high in Africa, the Middle East, Southeast Asia, and Central America (International Diabetes Federation [IDF], 2021).

Managing T2DM demands sustained attention to multiple lifestyle factors, including adherence to medication, dietary regulation, and regular physical activity, to maintain optimal blood glucose levels and prevent complications (Sreedevi et al., 2017). However, the implementation of effective and equitable diabetes management strategies remains a significant challenge in many developing countries. For example, patients must still bear the full cost of medications, placing a considerable financial burden on individuals and families (Chow et al., 2018; Mohan et al., 2020). The prevalence of T2DM can also be attributed to a lack of awareness about healthcare resources and a fear of medical interventions, which is due to low income and educational background (Unnikrishnan et al., 2018). Inadequate information about diabetes and unhealthy lifestyles (Aung et al., 2018) contributes to failure in achieving optimal diabetes management and preventing complications (Karachaliou et al., 2020).

Amid these challenges, community-based interventions (CBIs) have emerged as a promising strategy to address the gaps in diabetes prevention and management in resource-limited settings. These interventions offer cost-effective, culturally appropriate solutions that can be delivered through local networks and infrastructure (Ibrahim et al., 2016). The resource-efficient and practical interventions often involve educationnal programs targeting lifestyle changes within the community (Shirinzadeh et al., 2019). When effectively implemented, such strategies can reduce disease prevalence over the long term and improve health outcomes across entire populations (Dunkley et al., 2014; Shirinzadeh et al., 2019).

Although previous systematic reviews have examined CBIs for supporting individuals with T2DM, evidence on their effectiveness in developing countries remains lacking. To the best of our knowledge, this is the first systematic review to focus specifically on enhancing healthy lifestyle behavior through CBIs in developing countries. Previous reviews have primarily examined interventions conducted in developed countries (Modesti et al., 2016) and the migrant population in industrialized countries (Rawal et al., 2023). However, developing countries often have strong community-oriented cultures (Rawal et al., 2023), highlighting the need for evidence on CBIs tailored to these contexts. Such interventions have the potential to generate benefits to the community level. Accordingly, this systematic review aims to synthesize existing research to support the development of more

effective CBIs for individuals living with T2DM in developing countries.

Methods

Study Design. This study adopts systematic review design, primarily emphasizing RCTs. The review has been registered with PROSPERO (registration number: CRD42024507143).

Search Strategy. The search strategy for this study followed the PRISMA guideline (Page et al., 2021; Tricco et al., 2018). The guiding research question was: What are the effectiveness and characteristics of CBIs to improve health behaviour in patients with T2DM in developing countries? An extensive search was conducted to identify eligible studies using specific search strings and keywords in four major online databases: PubMed, Scopus, CINAHL, and CENTRAL. The keyword adjusts the Medical Subject Headings (MeSH) term using a Boolean operator, including "AND" and "OR" were used to refine the search string. For example, the search strategy in PubMed was: ("Community-Based Participatory Research" [MeSH] OR "Community participation" [MeSH] OR "Community intervention" OR "Community implementation" OR "Community action" OR "Community development" OR "Community involvement") AND ("Health Behavior" [MeSH] OR "Healthy lifestyle" OR "Lifestyle" OR "Health-related behavior") AND ("Diabetes Mellitus, Type 2"[MeSH] OR "Type 2 diabetes" OR "Noninsulin-dependent diabetes mellitus").

Eligibility Criteria. The inclusion criteria were studies published in English within the past ten years (January 2014 to December 2023), full-text, peer-reviewed articles, reporting studies conducted in developing countries and involving interventions utilizing community-based approaches. Two independent reviewers (LL and IJW) screened the titles and abstracts. Full-text articles were then retrieved and evaluated against predefined eligibility criteria. The exclusion criteria were studies that did not focus on CBIs to improve healthy behaviors. The study selection process was conducted and reported following the PRISMA 2020 guidelines (Figure 1).

The criteria for this study were measured using the PICO framework, which includes: 1) Population: Adult patients aged 18 years and older, diagnosed with T2DM; 2) Intervention: Community-based interventions; 3) Comparison: Usual care; 4) Outcome: The primary outcome focused on improving healthy behaviors in patient with T2DM, including increased medication adherence, enhanced physical activity, positive attitude, improved quality of life (QoL), and decreased HbA1c levels.

Data Extraction. After reviewing the full-text articles, two authors (AZ and FW) independently performed the data extraction. Any discrepancies were resolved by the third author (LL). Data were extracted based on the following criteria: 1) general information, including author(s), title and the year and country of publication; 2) study characteristics; 3) intervention and setting; and 4) outcome data consisting of baseline and follow-up measures. The extraction table was designed to clearly present the review findings.

Quality Appraisal. The quality of the included studies was assessed using the JBI critical appraisal tool, which evaluates the quality of published studies. The JBI checklist was used with permission from The University of Adelaide (Moola et al., 2020). The JBI criteria were adapted to align with the Cochrane RoB and ROBINS standards. The assessment criteria were scored as "yes," "no," "unclear," and "not applicable," with a "yes" receiving 1 point and all other responses receiving 0 points. The total score was calculated to determine each article's overall eligibility.

To be included in the review, studies were required to score above 75%, ensuring the inclusion of only methodologically robust articles. Visual representations of these assessments were generated using Robvis, a web application designed to visualize risk-of-bias assessments

within systematic reviews. Robvis produced "traffic light" plots showing domain-level judgments for each study and weighted bar plots illustrating the distribution of risk-of-bias judgments across different bias domains.

Data Analysis. The full text of the selected articles was analyzed by all authors. A descriptive analysis method was employed. The findings were organized into manual tables following an in-depth analysis of the full texts. The authors then provided a comprehensive description of the systematic review results, allowing for comparison with prior studies. Various interventions were identified, categorized based on their similarities, and discussed accordingly.

Results

Article Identification and Screening. The initial search identified a total of 5,706 articles. After removing duplicates, 5,382 articles remained. Title and abstract screening narrowed this number to 64 articles for closer examination. Following a full-text review, 12 articles were selected for further analysis and underwent rigorous assessment using the JBI critical appraisal tool.

Risk of Bias. The risk of bias evaluation, presented in Figure 2, used the JBI tool to classify studies into three groups. Ten studies scored above 70%, indicating high quality, while two studies scored between 60% and 70% (Maslakpak et al., 2017; Ramadas et al., 2018), indicating medium quality (Rahardian et al., 2024).

Study Characteristics. Table 1 highlighted that the included studies have a comprehensive geographic coverage, encompassing several countries: India (n = 2), Iran (n = 2), Malaysia (n = 2), Indonesia (n = 1), Bangladesh (n = 1), South

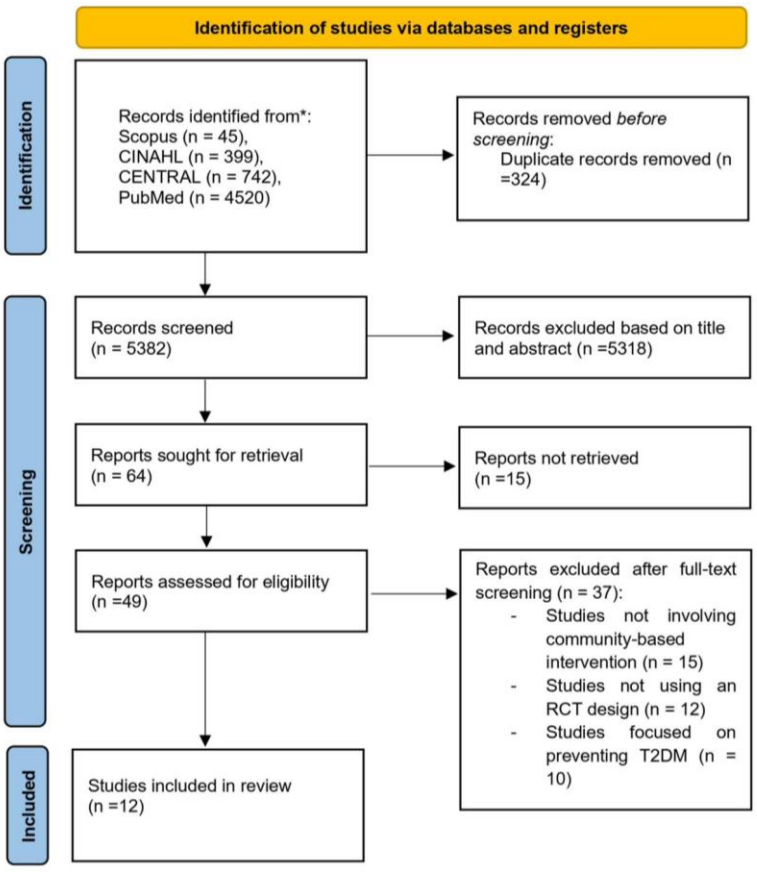

Figure 1. PRISMA Flow Chart for Study

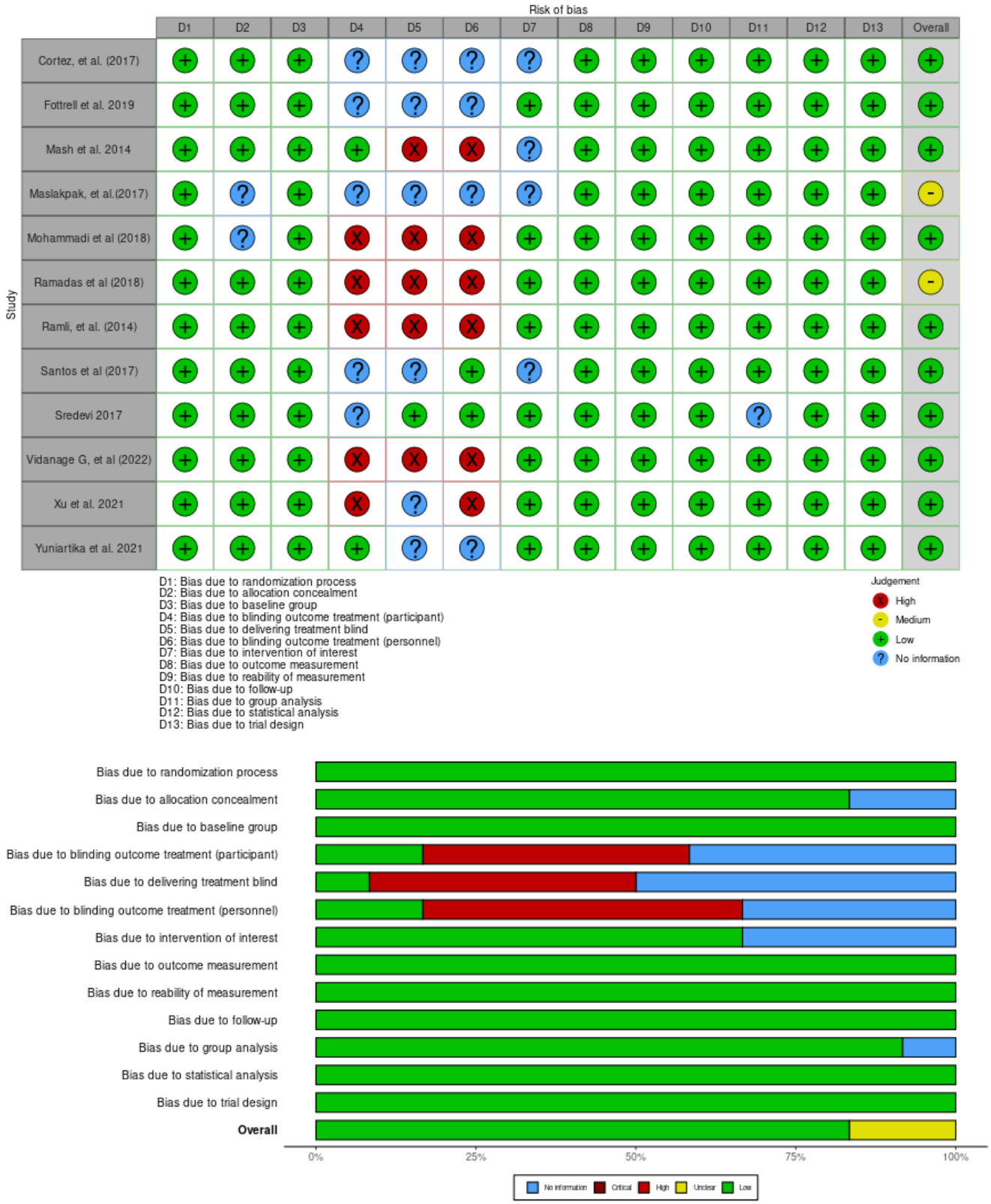

Figure 2. Quality Appraisal Visualization of Included Studies

Table 1. Characteristics of Included Studies

Author	Location	Design	Age	Gender (%)	Sample
Cortez et al. (2017)	Brazil	RCT	C: 57.5 ± 9.7 years I: 58 ± 9.2 years	CG M: 38 (34.2) F: 73 (65.8) IG M: 42 (33.1) F: 85 (66.9)	238
Fottrell et al. (2019)	Bangladesh	RCT	mHealth 30–39: 1329 (33%) 40–49: 1068 (26%) 50–59: 765 (19%) 60–69: 659 (16%) 70–100: 250 (6%) PLA 30–39: 1388 (35%) 40–49: 992 (25%) 50–59: 761 (19%) 60–69: 610 (15%) 70–100: 270 (7%) Control 30–39: 1391 (34%) 40–49: 991 (24%) 50–59: 767 (19%) 60–69: 648 (16%) 70–100: 251 (6%)	mHealth M: 1845 (45) F: 2226 (55) PLA M: 1889 (47) F: 2132 (53) C M: 1950 (48) F: 2098 (52)	12.280
Mash et al. (2014)	South Africa	RCT	C: 56.4 I: 55.8	CG M: 209 F: 650 IG M: 202 F: 508	1570
Maslakpak et al. (2017)	Iran	RCT	C: 50.6± 3.74 Face to Face Group: 49.9 ± 4.98 Telephone Group: 49.46 ± 4.76	CG M: 19 (36.7) F: 11 (63.3) Face to Face Group M: 15 (50) F: 15 (50) Telephone Group M: 17 (56.7) F: 13 (43.3)	90
Mohammadi et al. (2018)	Iran	RCT	30-50 years C: 46 (46%) I: 45 (45%) 51- 65 years C: 54 (54%) I: 55 (55%)	NA	200

Author	Location	Design	Age	Gender (%)	Sample
Ramadas et al. (2018)	Malaysia	RCT	C: 49.6 years I: 51.5 years	CG M: 47 (75.8) F: 15 (24.2) IG M: 41 (62.1) F: 25 (37.9)	128
Ramli et al. (2014)	Malaysia	RCT	C: 57± 0.5years I: 58 ± 0.48years	CG M: 149 (35.7) F: 268 (64.3) IG M: 180 (38.2) F: 291 (61.8)	888
Santos et al. (2017)	Brazil	RCT	57.8 ± 9.4	M: 80 (33.6) F: 158 (66.4)	238
Sreedevi et al. (2017)	India	RCT	C: 51.92 ± 6.57 Yoga: 51.97 ± 7.4 Peer Support: 51.92 ± 8.32	F: 124 (100)	124
Vidanage et al. (2022)	India	RCT	I: 53.20 ± 6.38 years C: 54.70 ± 5.41 years	CG M: 32 (42.6) F: 43 (57.4) IG M: 33 (44) F: 42 (56)	150
Xu et al. (2021)	China	RCT	I: 63.81 ± 9.94 C: 62.91 ± 9.59	CG M: 218 (35.68) F: 393 (64.32) IG M: 186 (31.16) F: 411 (68.84)	1208
Yuniartika et al. (2021)	Indonesia	RCT	Walking 40-50: 2 (11.1) 51-60: 5 (27.8) 61-70: 7 (38.9) >71: 4 (22.2) Yoga 40-50: 8 (44.4) 51-60: 8 (44.4) 61-70: 2 (11.1) >71: 0 C: Yoga 40-50: 8 (44.4) 51-60: 9 (50) 61-70: 1 (5.6) >71: 0	Yoga M: 7 (38.9) F: 11 (61.1) Walking group M: 5 (27.8) F: 13 (72.2) C: M: 8 (44.4) F: 10 (55.6)	54

Abbreviations: C, Control; I, Intervention; F, Female; M, Male; CG, Control group, IG, intervention group

Africa (n = 1), China (n = 1), and Brazil (n = 2). The mean age of study participants ranged from 45 to 58 years, with most studies reporting a mean age of 53.17 years or older. Sample sizes varied from 90 to 12,140 participants, with an average of 1,275 respondents. The synthesis of findings, presented in Table 2, shows the predominant features of the studies. Notably, most of the research (n = 10) is concentrated in Asia, with a significant prevalence of offline interventional methods (n = 8). Furthermore, a substantial portion of the studies are conducted within hospital or clinic settings (n = 6), while others take place in community settings (n = 5).

Synthesis of Findings. Intervention models and outcomes of RCT studies are outlined in Table 3. The outcomes of each study are further classified into four groups, as detailed below:

Empowerment. The EMPOWER intervention demonstrated that a comprehensive year-long intervention could significantly lower HbA1c levels and enhance patient self-care practices in managing blood glucose (Ramli et al., 2014). Cortez et al. (2017) highlighted that a 12-month empowerment program significantly improved self-care behaviors, including dietary habits and physical activity, leading to better metabolic control. This study reported notable improvements in key health metrics such as HbA1c, total cholesterol, HDL, and LDL, underscoring the effectiveness of structured empowerment programs in chronic disease management.

Technology-Based Interventions. Maslakpak et al. (2017) showed that face-to-face and telephone-based education over three months enhanced self-care behaviors such as diet, exercise, blood glucose monitoring, and medication adherence, with comparable efficacy for telephone-based education. Ramadas et al. (2018) reported that a six-month web-based intervention improved dietary knowledge, behaviors, and glycemic control, with significant reductions in fasting blood glucose and HbA1c.

Exercise Interventions. Sreedevi et al. (2017) highlighted that three month of yoga and peer support improved QoL in women with T2DM. Yuniartika et al. (2021) confirmed that both yoga and walking therapies significantly reduced fasting glucose levels over 12 weeks. Vidanage et al. (2022) found that aerobic exercises enhanced taste sensitivity and reduced preference for sweet taste, aiding glycemic control.

Health Education and Peer Support Interventions. Santos et al. (2017) showed that education strategies and home visits over a year improved medication adherence, self-care, and empowerment. Mohammadi et al. (2018) reported that self-efficacy education over three months improved knowledge and QoL in T2DM

Table 2. Summary of Findings

Domain	Number of Studies	n	%
Design			
RCT	12	18.591	100
Location			
South America	1	238	1.2
Asia	10	16.783	90.2
Africa	1	1570	8.6
Intervention model			
Online	1	128	8
Offline	8	1813	11.5
Online and Offline	3	13.818	87.6
Setting			
Home	1	238	1.2
Hospital/Clinic	6	1793	9.6
Community	5	16.560	89.2

patients. In contrast, Mash et al. (2014) found no significant improvement in primary outcomes, except for reductions in blood pressure. Xu et al. (2021) demonstrated that group cognitive behavioral therapy significantly reduced anxiety and depression scores over a year. Fottrell et al. (2019) reported that PLA interventions reduced T2DM prevalence by 48%, while mHealth interventions improved knowledge but had no significant impact on disease outcomes.

Table 3. Intervention Models and Outcomes of RCT Studies

Author	Intervention	Number of Sessions	Follow-up	Duration	Instruments	Findings
Cortez et al. (2017)	Empowerment program for self-care	• pre- education • sensibilization • myths and facts • attitudes and self-care • post education test • laboratory examination	1 month after session 1 Follow-ups at 3-month intervals × 3 1 months after follow-up 3	a year	The questionnaire that evaluates knowledge (DKN), The questionnaire about user attitudes (ATT)	Self-care practices (eating habits and physical activity) and metabolic control improved in IG. (HbA1c 7.5% vs 8.1%; TC 171.5 vs 180.8; HDL 46.2 vs 47.5; LDL 89.6 vs 95.9) with $p < 0.001$.
Fottrell et al. (2019)	Participatory learning and action (PLA) through mHealth	3 (mHealth Intervention, PLA Intervention, Follow up)	18 months	2 Years	N/A	The PLA intervention reduced the prevalence of type 2 diabetes by 48% compared to the CG (305 [8%] of 3,757 vs. 493 [13%] of 3,821; adjusted odds ratio [stratified by cluster and wealth design] 0.52, 95% CI: 0.38–0.71; $p < 0.0001$).
Mash et al. (2014)	Group diabetes education	4 monthly sessions	1 follow up after 12 months	4 months	• questionnaires on self-efficacy • locus of control • self-care activities and QoL	No significant improvements were found in any of the primary or secondary outcomes, except for a significant reduction in mean systolic blood pressure (-4.65 mmHg, 95% CI: 9.18 to -0.12; P = 0.04) and diastolic blood pressure (-3.30 mmHg, 95% CI: -5.35 to -1.26; P = 0.002).
Maslakpak et al. (2017)	Face-to-face and Telephone-Based Family-Oriented Education on Self-Care Behavior	• education, • intervention • follow up	Twice a week in the first and second months and once a week in the third month	3 months	Summary of Diabetes Self-Care Activities (SDSCA)	Lest cost intervention and improving diet (I: 30.5 ± 9.59 vs C: 12.96 ± 6.91). Exercises (I: 10.73 ± 2.71 vs C: 3.8 ± 3.18)

Author	Intervention	Number of Sessions	Follow-up	Duration	Instruments	Findings
						Blood glucose monitor (I: 8.63 ± 3.46 vs C: 74 ± 1). Foot ulcer prevention (I: 29.93 ± 5.28 vs C: 11.23 ± 8.5). Medication adherence (I: 21 ± 0.001 vs C: 20.46 ± 2.92) significantly different with CG ($p < 0.001$).
Mohammadi et al. (2018)	Self-Efficacy Education	• educational intervention • post-intervention follow-up	Visit to determine the progress of the participants	3 months	Coalition and Diabetes Knowledge Questionnaire (DKQ-24) The Diabetes Quality of Life (DQOL)	Increasing knowledge, health beliefs, and QoL the in IG significantly different with CG. (I: 29.8 ± 2.81 vs C: 22.3 ± 5.91; $p < 0.001$).
Ramadas et al. (2018)	Web-based dietary intervention, health cognitions, and glycaemic control	• education • intervention • post-intervention evaluation	Followed-up with text messages	6 months	International Physical Activity Questionnaire (IPAQ) Dietary Knowledge, Attitude and Behaviour Questionnaire (DKAB-Q)	Significant improvements were seen in DKAB scores (11.1 ± 0.9 vs. 6.5 ± 9.4, $p < 0.001$), Dietary Stages of Change (DSOC) (199.7 ± 18.2 vs. 193.3 ± 14.6, $p = 0.046$), fasting blood glucose (FBG) (7.9 ± 2.5 vs. 8.9 ± 3.9 mmol/L, $p = 0.015$), and HbA1c levels (8.5 ± 1.8% vs. 9.1 ± 2.0%, $p = 0.004$).
Ramli et al. (2014)	EMPOWER Participatory Action Research	• briefing • Intervention • follow up	In the last a year	a year	The site feasibility questionnaire (SFQ)	HbA1C in the IG was found to be lower and improved patient self-care practices to control their blood glucose (I: 8.4% vs C: 8.5%).
Santos et al. (2017)	Education group strategies and home visits	• pre-education • education intervention • post-education	Phone monitoring	a year	Diabetes Empowerment Scale-Short Form (DES-SF)	Both the education group and home visits significantly improved medication adherence, self-care management, and empowerment compared to the CG (Education: 4.25, Home Visits: 4.13, Control: 4.0).

Author	Intervention	Number of Sessions	Follow-up	Duration	Instruments	Findings
Sreedevi et al. (2017)	Yoga and Peer support	• yoga intervention • peer-support intervention follow-up	Every week followed by a phone call	3 months	N/A	The peer support group showed significant increases in social and environmental QOL, with improvements of 7.69 (P = 0.014) and 4.07 (P = 0.019).
Vidanage et al. (2022)	Aerobic exercises and taste perception	• aerobic intervention • taste perception • follow up	Tele-Phone reminders in the second week of each month.	6 months	Labelled Magnitude Scale (LMS)	An increase in taste sensitivity, particularly to sucrose, and a decreased preference for sweet taste were observed in patients with diabetes at 3 months (mean difference for 2.02M: 6.63 ± 2.50, p = 0.048; for 0.64M: +7.26 ± 2.76, p = 0.026) and at 6 months (mean difference for 0.64M: +7.79 ± 4.49, p = 0.044).
Xu et al. (2021)	Group Cognitive Behavioral Therapy	10 Sessions in 10 consecutive days and each session lasted 40-50 minutes + 10 to 15 minutes discussion	Every 3 months	a year	Patient Health Questionnaire-9 [PHQ-9] General Anxiety Disorder questionnaire (GAD-7)	The IG showed significantly greater improvement in GAD-7 and PHQ-9 scores compared to the control group at 2 months post-baseline (GAD-7: T = −6.46, p < 0.0001; PHQ-9: T = −5.29, p < 0.001), 6 months (GAD-7: T = −4.58, p < 0.001; PHQ-9: T = −4.37, p < 0.001), and 1 year post-intervention (GAD-7: T = −3.91, p < 0.001; PHQ-9: T = −3.57, p < 0.001).
Yuniartika et al. (2021)	Yoga therapy and walking therapy	Yoga: 3 sessions/week, 60 minutes each, for 12 weeks. Walking Therapy: 3 sessions/week, 30 minutes each, for 12 weeks.	A checklist of activities and motivated by health cadres each week	3 months	N/A	Both Yoga and Walking therapies significantly reduced fasting glucose levels. Yoga group: 217.00 to 187.72 (p = 0.001). Walking group: 209.89 to 193.83 (p = 0.001). Control group: 221.50 to 225.17 (p = 0.067).

Abbreviations: CG, Control Group; IG, Intervention Group; EG, Educational Groups; HV, Home Visits

Discussion

This systematic review examined the effectiveness of CBIs in managing T2DM in developing countries. The interventions, including empowerment (Cortez et al., 2017; Ramli et al., 2014), health education (Mash et al., 2014; Maslakpak et al., 2017; Santos et al., 2017; Widayanti et al., 2021), web-based programs (Fottrell et al., 2019; Maslakpak et al., 2017; Ramadas et al., 2018), psychological interventions (Xu et al., 2021), and exercises (Sreedevi et al., 2017; Vidanage et al., 2022; Yuniartika et al., 2021), significantly improve health behaviors and self-management among T2DM patients. These findings are aligned with previous studies demonstrating the benefits of empowerment programs in improving metabolic control and better self-care practices (Cortez et al., 2017; Ramli et al., 2014). Empowerment is crucial in resource-limited settings, where scarce healthcare resources require patients to take a more proactive role in managing their conditions.

In contrast, some studies reported less success with group-based diabetes education. Mash et al. (2014) observed only modest improvements in self-management behaviors compared to other educational interventions that yielded more favorable outcomes (Mohammadi et al., 2018; Santos et al., 2017). This discrepancy may stem from variations in delivery methods or cultural barriers that affect patient engagement, highlighting the need for flexible interventions tailored to cultural and contextual factors of the target population.

Technology-based interventions showed mixed results. Ramadas et al. (2018) demonstrated that web-based programs significantly improved dietary knowledge and glycemic control, consistent with findings from other studies (Bretschneider et al., 2023; Stevens et al., 2022). However, Fottrell et al. (2019) reported that mobile health (mHealth) interventions, while effective in spreading information, had less impact on clinical outcomes such as glycemic control. This suggests that although technology offers significant potential, its effectiveness may be influenced by factors such as digital literacy, internet accessibility, and the chosen intervention platform.

Exercise interventions consistently showed positive outcomes across studies. Both Sreedevi et al. (2017) and Yuniartika et al. (2021) found that structured exercise programs, such as yoga and walking, significantly improved glycemic control and overall health. Additionally, Vidanage et al. (2022) reported improvements in taste sensitivity and a reduced preference for sweet tastes in patients following aerobic exercise. These findings underscore the vital role of physical activity in managing diabetes, particularly in community settings where exercise programs can be offered at low cost and adapted to local cultural practices.

The findings have important implications for healthcare strategies, especially in developing countries. Community-based interventions, particularly those focusing on empowerment and education, should be prioritized in managing T2DM. These interventions not only lead to improved patient outcomes but also reduce healthcare costs and empower individuals to take control of their health. Moreover, incurporating culturally relevant approaches enhances the effectiveness of interventions (Rawal et al., 2023; Xu et al., 2021). Based on our analysis, technology-based interventions such as mHealth and phone-based monitoring demonstrated consistent outcomes in improving T2DM management. These interventions are particularly effective in developing countries as they are scalable, cost-efficient, and capable of reaching individuals in remote or underserved areas with limited access to healthcare facilities (Ebekozien et al., 2024).

However, this review also highlights several limitations. The variability in intervention types, duration, and delivery methods across studies may limit the generalizability of the findings. Additionally, some studies relied on self-re-

ported health behaviors, which could introduce bias. Lastly, the review focused exclusively on developing countries, and the findings may not apply to other settings, such as high-income countries with different healthcare infrastructures. Future research should investigate the long-term effects of these interventions and assess their applicability in diverse populations and settings.

Conclusion

CBIs have proven effective in enhancing health behaviors among individuals with T2DM in developing countries. These interventions, such as empowerment programs, structured health education, psychological support, web-based platforms, and physical activity, contribute to better medication adherence, increased physical activity, improved attitudes, enhanced QoL, and reduced HbA1c levels. Among these, interventions centered on empowerment and structureed education, and technology-based interventions have consistently demonstrated significant improvements in self-care practices and metabolic control, making them vital components of diabetes management strategies. Future systematic reviews may benefit from employing meta-analysis to quantitatively evaluate intervention effectiveness. Such analyses would offer clearer insights into which strategies are most effective in promoting healthy lifestyle behaviors and achieving glycemic control among individuals with T2DM in developing countries.

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Correlation Between Family Support and Depression Among Pre-Elderly Individuals with HIV in Jakarta

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Abstract

Depression among pre-elderly with human immunodeficiency virus (HIV) can significantly impact their quality of life. Family is often the primary source of support for this demographic and is recognized as a protective factor against depression. Therefore, identifying protective factors against depression is essential for promoting healthy aging among pre-elderly with HIV. This study aimed to determine the correlation between family support and depression among pre-elderly with HIV in Jakarta. A total of 120 pre-elderly with HIV from the Indonesia AIDS Coalition who were receiving HIV care at health centers across Jakarta participated in this cross-sectional study. The participants were recruited using convenience sampling. Data collection involved demographic questions, a family support questionnaire, and the Depression Anxiety Stress Scales 21 (DASS-21). The analysis comprised univariate and bivariate analyses. The univariate analysis described the characteristics, family support, and depression levels, while the bivariate analysis assessed the correlation between the variables using the Spearman test. The results indicated that pre-elderly with HIV primarily received support from siblings and spouses. The participants reported low family support (median 25.00) and mild depressive symptoms (median 8.00). A significant moderate negative correlation was found between family support and depression in this population (r = -0.344). This study suggests that enhancing family support for pre-elderly with HIV can help reduce depression. Consequently, there is a critical need for healthcare providers to engage families in the treatment of pre-elderly with HIV to mitigate depression and promote healthier aging.

Keywords: depression, family support, HIV, pre-elderly

Abstrak

Korelasi antara Dukungan Keluarga dan Depresi: Sebuah Studi pada Pra-lansia dengan* HIV *di Jakarta. *Depresi pada pra-lansia dengan* HIV *dapat memengaruhi kualitas hidupnya. Keluarga dapat menjadi sumber dukungan utama bagi pra-lansia dan diketahui merupakan faktor protektif terhadap depresi. Maka dari itu, perlu dilakukan identifikasi terkait faktor protektif terhadap depresi agar pra-lansia dengan* HIV *dapat menua dengan baik. Penelitian ini bertujuan untuk melihat korelasi antara dukungan keluarga dengan depresi pada pra-lansia dengan* HIV *di Jakarta. Penelitian* cross-sectional *ini diikuti oleh 120 pra-lansia dengan* HIV *yang tergabung di* Indonesia AIDS Coalition *dan menerima pengobatan* HIV *di layanan kesehatan Jakarta dengan metode* convenience sampling*. Digunakan kuesioner karakteristik, kuesioner dukungan keluarga, dan* DASS-21*. Analisis data terdiri atas analisis univariat untuk melihat gambaran karakteristik, dukungan keluarga, dan depresi, sedangkan analisis bivariat untuk menguji korelasi menggunakan* Spearman test*. Pra-lansia dengan* HIV *menerima dukungan keluarga utamanya dari saudara kandung dan pasangan. Didapatkan bahwa partisipan mendapatkan dukungan keluarga yang relatif rendah (median 25,00) dan tingkat depresi yang ringan (median 8,00). Terdapat korelasi negatif yang signifikan dengan tingkat sedang antara dukungan keluarga dengan depresi pada pra-lansia dengan* HIV *di Jakarta (r = -0,344). Studi ini menunjukkan bahwa peningkatan dukungan keluarga pada pra-lansia dengan* HIV *dapat membantu menurunkan depresi. Dengan demikian, menjadi penting bagi tenaga kesehatan untuk melibatkan peran keluarga dalam tatalaksana pra-lansia dengan* HIV*. Melibatkan keluarga dalam perawatan pra-lansia dengan* HIV *perlu mendapat perhatian khusus untuk mengurangi depresi dan mendukung proses penuaan yang lebih sehat.*

Kata Kunci: *depresi, dukungan keluarga,* HIV*, pra-lansia*

Introduction

Human immunodeficiency virus (HIV) is a pathogen that causes chronic infections, which can progress to acquired immunodeficiency syndrome (AIDS). In the early years of HIV epidemic, there were significant reports of deaths, with infected individuals having a life expectancy of only about one year following diagnosis (Ghosh, 2023). Over the past few decades, there has been considerable progress in the knowledge and treatment of HIV infection. Moreover, accessibility to these therapies has notably increased (Jocelyn et al., 2024). As a result, mortality rates and life expectancy for people living with HIV (PLWHIV) have changed. By age 40, individuals receiving antiretroviral therapy (ARV) can expect to gain an additional 35 years of life (Trickey et al., 2023). In addition, the number of pre-elderly (aged 45–59) living with HIV has increased significantly over the last decade. In 2021, those over 50 years old accounted for 8% of the global population of PLWHIV (The Joint United Nations Programme on HIV and AIDS [UNAIDS], 2021). In Indonesia, there has been a significant increase in this population since 2010, rising from 3.9% to 8.1% in 2021 (Ministry of Health Republic Indonesia, 2021).

As individuals enter the pre-elderly stage, they experience multiple changes, including shifts in social participation and functional capacity. These changes can affect their health, including their psychological conditions (Carmona-Torres et al., 2021). Depression and anxiety are common psychological issues in this age group, with depression being the second-leading cause of disability in 2019 (Santomauro et al., 2021). Globally, the prevalence of depression tends to increase with age, rising from 4.1% in those aged 25–59 to 5.8% in those aged 55–59 (Institute for Health Metrics and Evaluation [IHME], 2020). Moreover, the prevalence of depression among the urban population in Jakarta increased during the pandemic and has not returned to pre-pandemic levels since then (Hardi et al., 2023).

Multiple studies have shown a higher prevalence of depression among PLWHIV compared to those living without the virus and it stands out as the primary concern among various psychological issue (Den Boer et al., 2025; Gooden et al., 2022). A study conducted in 2020 showed that the prevalence of depression in PLWHIV over the age of 50 reached 44.8%, significantly higher than the 20.4% prevalence among those without HIV (Luo et al., 2020). A similarly high rate of depression, at 50.9%, was reported among PLWHIV in Jakarta (Yunihastuti et al., 2021). These rates highlight the urgent need to address depression in PLWHIV, particularly in the pre-elderly population, due to its potentially detrimental effects on their overall well-being.

Depression can negatively impact adherence to ARV therapy, worsen existing health conditions, accelerate the progression of HIV to AIDS, decrease quality of life, and increase the risk of mortality (Tran et al., 2019). Several factors are known to elevate the risk of depression. In pre-elderly with HIV, socioeconomic factors, such as unemployment and low monthly income, act as significant stressors (Tan et al., 2022). Additionally, the increase in other comorbidities may contribute to depression in this demographic (Bernard et al., 2020). Common social prejudices and discrimination against PLWHIV are other psychological stressors that can heighten the risk of depression (Matsumoto et al., 2017).

Adequate family support can significantly enhance health and well-being. In patients with chronic diseases, family support serves as a protective factor against depression (Wulandari & Livana, 2022; Wulandari et al., 2022). The buffering theory explains this protective effect, suggesting that family support acts as a buffer against negative stressful impact of critical life events, thereby reducing the risk of depression (Buchwald, 2017; Manczak et al., 2018). While there are different types of social support, family support is one of the most essential during times of illness (Amiya et al., 2014). For pre-elderly with HIV, family can be the primary

source of support, particularly when social network participation decreases. Sufficient family support can assist PLWHIV in coping with their condition, improving therapy adherence, and enhancing quality of life (Huang et al., 2021). Conversely, inadequate family support can lead to maladaptive coping mechanisms, making individuals more susceptible to psychological disturbances and negatively impacting their quality of life (Tavares et al., 2019).

Depression in PLWHIV affects not only younger individuals but also remains prevalent among the elderly, as previously noted. Given the harmful effects of depression, particularly as PLWHIV age, preventing it before they enter later life stages is crucial. As more PLWHIV begin to age, the pre-elderly period becomes a critical window for early intervention. Recent studies on family support and depression have primarily focused on the general population of PLWHIV, with none specifically examining the pre-elderly demographic (Umar et al., 2025; Yulianti et al., 2019). Therefore, this study aims to identify a potential factor that can help reduce depression by exploring the correlation between family support and depression in pre-elderly with HIV.

Methods

A cross-sectional study was conducted from May to July 2023. The target population comprised pre-elderly with HIV who received treatment at health centers across Jakarta or were integrated with the Indonesia AIDS Coalition (IAC). This community-based organization encompasses PLWHIV throughout Indonesia. The participants were included based on the following criteria: 1) HIV positive; 2) aged 45–59 years; 3) willing to participate in the study and having signed the informed consent. The exclusion criteria eliminated those who were unable to operate online applications.

A total of 120 participants were recruited through convenience sampling techniques. The sample was obtained through coordination with the IAC, where the community coordinator helped reach out to members who met the inclusion criteria. Peer supporters in primary healthcare centers around Jakarta also assisted in contacting their members. The participants were asked to fill out a Google Form, providing a convenient and efficient way to gather responses from participants across Jakarta. The study was approved by the Ethics Committee of the Faculty of Medicine and Health Science at Atma Jaya Catholic University (No: 13/03/KEP-FKIKUAJ/2023). Before participating in the study, all participants were briefed about the study objectives and were permitted to proceed only after providing written informed consent. They were not required to provide their names to ensure confidentiality, and all personal information collected from respondents was kept confidential.

The instruments used in this study included a characteristics questionnaire, a family support questionnaire, and the Depression Anxiety Stress Scale 21 (DASS-21). The sociodemographic questionnaire collected information on age, gender, educational level, marital status, monthly income, employment status, domicile, and source of family support. The monthly income was based on the 2023 Jakarta Provincial Minimum Wage of 4,901,798 IDR. Family support was measured using the Family Support Questionnaire developed by Kusuma (2011), which demonstrated reliability with a Cronbach's alpha of 0.883 (Kusuma, 2011). This questionnaire consists of 18 items, and the participants rated the truthfulness of each statement on a four-point Likert scale ranging from (0) "Not at all" to (3) "All the time." The total score was obtained by summing all items, with higher scores indicating greater family support received and lower scores indicating less support.

Depression was assessed using the Indonesian version of DASS-21, which has demonstrated reliability ($\omega \geq 0.785$) (Onie et al., 2020). Although the scale contains 21 items, only the depression items (numbers 3, 5, 10, 13, 16, 17, and 21) were used. The participants rated each statement on a four-point Likert scale from (0)

"Did not apply to me at all" to (3) "Applied to me very much, or most of the time." The total score was calculated by summing all relevant items, with higher scores indicating more severe depression and lower scores indicating less severity. The collected data were further analyzed using univariate and bivariate analyses. Univariate analysis was presented with frequency, percentage, and median ± interquartile range (IQR). Both family support and depression were measured on an ordinal scale, and due to abnormal data distribution (as assessed by Kolmogorov-Smirnof test), the Spearman test was conducted to assess the correlation between family support and depression.

Results

The majority of the respondents were male (62.5%) with a median age of 46 (IQR = 4). All respondents had received formal education, with 55.5% having completed senior high school. More than half of the respondents (78.3%) reported a monthly income below the provincial minimum wage, indicating a predominantly low-income population and 63.3% of the respondents were employed. Approximately 40.8% of respondents were married, and family support

Table 1. Characteristics of Respondents (N = 120)

Characteristics	n (%)
Age, median (IQR) years	46 (IQR = 4)
Gender	
Male	75 (62.5)
Female	43 (35.8)
Transgender	2 (1.7)
Education	
No formal education	0
Primary school	4 (3.3)
Junior high school	5 (4.2)
Senior high school	66 (55.0)
Associate/Bachelor	40 (33.3)
Master/Doctoral	5 (4.2)
Monthly income	
< Provincial minimum wage	94 (78.3)
≥ Provincial minimum wage	26 (21.7)
Employment status	
Unemployed	44 (36.7)
Employed	76 (63.3)
Marital status	
Unmarried	36 (30.0)
Married	49 (40.8)
Divorced	35 (29.2)
Source of family support	
Spouse/partner	35 (29.2)
Parents	21 (17.5)
Children	14 (11.7)
Siblings	40 (33.3)
Other relatives	10 (8.3)
Domicile	
East Jakarta	32 (26.7)
North Jakarta	10 (8.3)
West Jakarta	16 (13.3)
South Jakarta	37 (30.8)
Central Jakarta	23 (19.2)
Seribu Islands Administrative Regency	2 (1.7)

Table 2. Distribution of Family Support and Depression

Variable	Median (IQR)	Range
Family support	25.00 (IQR = 27)	0–54
Depression	8.00 (IQR = 12)	0–34

primarily came from siblings (33.3%) and spouses (29.2%). Refer to Table 1 for detailed sociodemographic characteristics of the respondents.

The respondents reported a median family support score of 25.00 and a median depression score of 8.00, as shown in Table 2. Given that the family support score ranged from 0 to 54, the median score suggests that most respondents experienced a moderate levels of family support. Meanwhile, the median depression score of 8.00, on a scale ranging from 0 to 34, indicates a generally lows level of depression. Correlation analysis between family support and depression revealed a significant moderate negative correlation ($r = -0.344$; p-value < 0.01).

Discussion

Family support plays a crucial role for individuals living with chronic diseases, including HIV infection, as it provides psychological, financial, and social stability to PLWHIV. The sources of family support vary for each person; in this study, support primarily came from siblings and spouses. This may be attributed to the marital status of the majority of the respondents, where family support typically comes from spouses. Another contributing factor is the comfort level of pre-elderly with HIV in disclosing their serostatus. Disclosing serostatus to family is essential for initiating family support (Knight & Schatz, 2022). In this study, pre-elderly with HIV felt more comfortable disclosing their serostatus to siblings or spouses rather than to their children. A study conducted in Tanzania showed similar results, where the majority of adults with HIV disclosed their status to their spouses, with only a few disclosing to their children (John & Chipwaza, 2022).

In this study, the family support reported by the respondents was relatively low, although there was a tendency toward better support. This finding slightly differs from a study conducted at Dr. Cipto Mangunkusumo Hospital in Jakarta, where most of the PLWHIV aged 18–55 reported high family support (Debby et al., 2019). This difference in results is attributable to variations in the measurement tools used and the observed age group. Sources of family support may differ across age groups, leading to variations in the type of support received. However, there is currently no research on this topic; thus, further studies are needed.

Conversely, a study conducted in central Java, more than half of PLWHIV received relatively low family support (Marni et al., 2020), which indicates a family's lack of willingness to assist a member living with HIV (Desalegn et al., 2022). Family support can take various forms, including emotional, instrumental, and informational. Among these, emotional and instrumental support are considered essential for PLWHIV who are over 50 years old (John & Chipwaza, 2022). Emotional support can be expressed through acts of attention, affection, and empathy, fostering a sense of acceptance for PLWHIV (Lin et al., 2015). Additionally, instrumental support, such as meeting the daily needs of pre-elderly with HIV, may be crucial, especially since most respondents reported low economic status.

Several factors may be associated with the low family support observed in this study. First, the low economic status of most respondents could impact the support received, particularly informational support. Economic status is closely linked to knowledge about HIV; when economic status is low, access to HIV-related inform-

ation tends to be limited. This limitation may arise from reduced exposure to information dissemination channels and lower education levels (Chirwa et al., 2019). Informational support, which focuses on providing guidance and knowledge about the disease, may become restricted due to these access barriers (Pachuau et al., 2021).

Stigma and discrimination against PLWHIV are the known barriers to obtaining family support, especially for older individuals (Tavares et al., 2019). In Indonesia, these barriers remain significant challenges for PLWHIV, sometimes originating from family members. Discrimination can manifest as the separation of personal belongings, outright rejection, or neglect. Insufficient family knowledge about HIV contributes to the underlying stigma and discrimination (Fauk et al., 2021). However, further research on the stigma and discrimination faced by pre-elderly with HIV is needed.

Despite depression being a common mental health issue among PLWHIV, with risk increasing with age, this study revealed a unique finding. Depression among pre-elderly with HIV was generally mild and tended to fall within a normal range. While the findings do not indicate a high prevalence of depression in this group, some respondents reported elevated levels of depression. The mild to normal levels of depression observed may be linked to the presence of various protective factors, such as gender, employment status, and family involvement. Depression is more common and severe in females (Aljassem et al., 2016), yet the majority of respondents in this study were male. This may be attributed to differences in coping mechanism between males and females, with females more commonly exhibit a maladaptive coping mechanism such as avoidance (Girgus et al., 2017). The presence of social support, particularly from family, may serve as a protective factor. Family support has been shown to reduce the incidence of depression in males over 40 living with HIV (Liu et al., 2018). Additionally, employment status is associated with lower depression rates in pre-elderly with HIV, with most respondents being employed. Employed males over 50 years old living with HIV have a lower risk of depression (AOR = 0.50) (Tan et al., 2022). Employment can alleviate financial stress and frustration arising from economic insecurity, which is believed to decrease the risk of depression in PLWHIV (Bhatia & Munjal, 2014).

Bivariate analysis indicated that family support has a significant negative correlation with depression in pre-elderly with HIV, suggesting that better family support is associated with lower levels of depression. Although family support reported was relatively low, the data imply that even minimal family support may contribute to reduced depression levels in pre-elderly with HIV. The presence of family support is thought to have a buffering effect when facing negative life events (Roohafza et al., 2014), helping to alleviate psychological stress through various mechanisms and positive changes.

Family support can make PLWHIV feel more valued, boosting their confidence and optimism in managing the disease. For instance, when families are actively involved in HIV treatment, pre-elderly with HIV may feel less alone in their struggle, which can enhance their optimism and resilience (Fang et al., 2015). Resilience is defined as an individual's ability to overcome negative situations. It is influenced by both internal and external factors, with the family environment and social support plays as an external factor. Previous theories highlight the family as an important external factors that significantly influences resilience (Wang et al., 2024). High resilience in people over 50 living with HIV is associated with fewer depressive symptoms (Rooney et al., 2019). Furthermore, family support in the form of encouragement positively correlates with self-efficacy in patients with chronic diseases (Septianingrum et al., 2023).

Self-efficacy, which refers to one's self-perceived ability to act effectively in a situation—such as initiating therapy and maintaining a

sense of control over one's life (Chan, 2021)—can significantly impact depression and overall quality of life. Furthermore, when pre-elderly with HIV receive adequate emotional support, it can enhance communication among family members. This phenomenon is also observed in elderly with chronic diseases, where improved family communication creates a better environment for expressing feelings about their condition, which can reduce the guilt associated with the disease (Luo et al., 2023). When sufficient instrumental support is provided, it can alleviate economic burden and reduce perceived stress (Luo et al., 2023). Conversely, low family support may lead to poor coping mechanisms in the face of illness, resulting in higher levels of depression among PLWHIV (Tavares et al., 2019).

This study also has some limitations. Potential bias due to factors such as duration of infection, socioeconomic status, and other comorbidities could not be controlled. Additionally, this study examined family support solely from the perspective of pre-elderly with HIV, without considering the family's viewpoint. There may also be other protective factors, aside from family support, that could reduce depression in this population. Further research is needed to analyze and control for these contributing factors.

Conclusion

This study confirms that family support serves as a protective factor against depression in pre-elderly with HIV. By alleviating depressive symptoms, it can facilitate better aging for this population. This underscores the importance of involving families in HIV treatment. Clinicians can encourage family members to provide support or conduct awareness campaigns about HIV, ensuring that everyone plays a role in helping pre-elderly with HIV recover and age well. Additionally, families should be educated about the disease to help diminish stigma towards their family members with HIV. Moreover, healthcare systems should adopt a holistic approach by integrating psychosocial interventions and family-based approach into routine HIV care. Policies that foster community and family engagement may further enhance the quality of life of pre-elderly with HIV.

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Determinants Influencing the Readiness of Non-Medical Hospital Personnel to Perform Basic Life Support

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Abstract

All healthcare personnel, including both medical and non-medical staff within hospitals, are expected to possess the capability to administer Basic Life Support (BLS) in order to provide immediate assistance during emergencies. However, many non-medical hospital staff remain unprepared to perform BLS due to a lack of knowledge, willingness, and confidence. This study aims to identify the factors affecting the preparedness of non-medical hospital staff in carrying out BLS at Undata Hospital, a healthcare facility in Central Sulawesi. This research employed quantitative design with a cross-sectional approach. The sample comprised 103 non-medical respondents selected through total sampling. Data were collected through structured interviews and self-administered questionnaires. The variables measured in this study include behavioral beliefs, normative beliefs, control beliefs, intention, and BLS readiness. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results indicated that behavioral beliefs significantly influenced intention (p = 0.040), while normative beliefs did not (p = 0.128). Control beliefs showed no significant influence on intention (p = 0.058), whereas intention had a significant effect on BLS readiness (p = 0.046). The study concludes that behavioral beliefs influence intention, which in turn significantly affects BLS readiness.

Keywords: basic life support, behavioral beliefs, control beliefs, intention, normative beliefs, non-medical personnel

Abstrak

Determinan yang Memengaruhi Kesiapan Tenaga Nonmedis dalam Melaksanakan Bantuan Hidup Dasar di Lingkungan Rumah Sakit. *Seluruh petugas rumah sakit, baik medis maupun nonmedis, diharapkan memiliki kemampuan untuk melakukan Bantuan Hidup Dasar (BHD) guna memberikan pertolongan segera kepada pasien dalam situasi gawat darurat. Permasalahan yang terjadi saat ini adalah masih banyak tenaga nonmedis di rumah sakit yang belum siap melaksanakan BHD dalam kondisi darurat karena keterbatasan pengetahuan, kurangnya kemauan, serta rendahnya rasa percaya diri. Penelitian ini bertujuan untuk mengetahui faktor-faktor yang memengaruhi kesiapan petugas nonmedis rumah sakit dalam pelaksanaan BHD di Rumah Sakit Undata, Provinsi Sulawesi Tengah. Penelitian ini merupakan studi kuantitatif dengan desain potong lintang. Sampel terdiri atas 103 responden nonmedis yang dipilih menggunakan teknik total sampling. Pengumpulan data dilakukan melalui wawancara terstruktur dan pengisian kuesioner berupa daftar pertanyaan yang dijawab langsung oleh responden. Determinan yang diukur meliputi* behavioral beliefs, normative beliefs, control beliefs, intention, *dan kesiapan melakukan BHD. Analisis data menggunakan* Partial Least Squares Structural Equation Modeling (PLS-SEM). *Hasil penelitian menunjukkan bahwa* behavioral beliefs *berpengaruh signifikan terhadap* intention *(p = 0,040),* normative beliefs *tidak berpengaruh signifikan terhadap* intention *(p = 0,128),* control beliefs *berpengaruh signifikan terhadap* intention *(p = 0,058), dan* intention *berpengaruh signifikan terhadap kesiapan melakukan BHD (p = 0,046). Disimpulkan bahwa faktor-faktor yang memengaruhi* intention *adalah* behavioral beliefs *dan* control beliefs*, sedangkan* intention *memengaruhi kesiapan petugas nonmedis dalam melakukan BHD.*

Kata Kunci: *bantuan hidup dasar, keyakinan kontrol, keyakinan normatif, keyakinan perilaku, niat, petugas nonmedis*

Introduction

Basic Life Support (BLS) should be a skill possessed by all healthcare facility workers, including both medical and non-medical personnel. This is essential given that emergency situa-

tions can occur unpredictably and in any location (Olasveengen et al., 2021). The preparedness of non-medical personnel to perform BLS remains a critical concern that may contribute to increased mortality from sudden cardiac arrest (Alsabri et al., 2024). Numerous cases have shown that victims often do not receive timely and effective initial assistance due to a lack of skill and confidence among non-medical staff (Amoako-Mensah et al., 2023).

Key contributing factors include the lack of continuous training, limited exposure to real-life simulations, and the absence of mandatory BLS competency policies within healthcare institutions. Additionally, fear of making mistakes and the lack of adequate supporting facilities further inhibit non-medical personnel from responding effectively to emergencies. Without immediate intervention, these issues may lead to a rise in preventable deaths that could other-wise be mitigated through timely and effective BLS (Mekonnen & Muhye, 2020).

Preliminary observations and interviews with non-medical personnel at Undata Hospital in Palu revealed a low level of preparedness in administering BLS during emergency situations. This is particularly alarming given that the hospital recorded 140 cases of cardiac arrest in 2023, none of which resulted in successful resuscitation. Furthermore, several cardiac arrest incidents that occurred outside care units went undocumented, with patients failing to receive timely BLS due to delays in its administration. As the primary referral hospital in Central Sulawesi, Undata Hospital plays a crucial role in emergency care. Therefore, delays in initial BLS—especially by non-medical personnel, who are often the first responders—can significantly impact patient survival outcomes.

According to the World Health Organization (WHO), cardiac arrest is among the medical emergencies with the highest mortality rates (Nowbar et al., 2019). In Indonesia, the annual incidence of emergency department visits is approximately 10,000 cases. The significant occurrence of cases involving cardiac arrest patients necessitates emergency services to spend considerable time on the initial management of first aid at the scene (Maulidah, 2019). Of these, around 350,000 adults experience out-of-hospital cardiac arrest. However, fewer than 40% receive cardiopulmonary resuscitation (CPR) from bystanders, and less than 12% are defibrillated with an Automated External Defibrillators (AED) before emergency medical services arrive (Albargi, 2023).

Based on the 2018 Basic Health Research (*Riset Kesehatan Dasar* [Riskesdas]), the national prevalence of heart disease in Indonesia stood at 1.5%, with the highest rates found in North Kalimantan (2.2%), Yogyakarta (2.0%), and Gorontalo (2.0%). In addition, eight other provinces exceeded the national average, including Aceh (1.6%), West Sumatra (1.6%), DKI Jakarta (1.9%), West Java (1.6%), Central Java (1.6%), East Kalimantan (1.9%), North Sulawesi (1.8%), and Central Sulawesi (1.9%) (Adisasmito et al., 2020).

Interviews conducted at the research site revealed that non-medical personnel were inadequately prepared to perform BLS, primarily due to limited knowledge and lack of training, as well as fear of failure. The absence of training, skills, and clear intention—coupled with misconceptions about BLS—contributes to reduced life-saving potential for cardiac arrest patients (Nyirenda et al., 2020).

Many non-medical staff members are hesitant to perform BLS due to insufficient knowledge, fear, and limited access to necessary facilities (Qian et al., 2021). A lack of training and understanding of BLS procedures often leads to uncertainty in performing them correctly. Additionally, fear of worsening the victim's condition or facing legal repercussions deters many from taking action (Mekonnen & Muhye, 2020). Low confidence in managing emergencies further affects their readiness to respond. Limited access to essential equipment—such as AEDs in public areas—also discourages non-medical

personnel from providing first aid. Previous studies have shown that BLS training can significantly enhance non-medical personnel's preparedness and confidence. Other influential factors include education level, prior emergency experience, and the existence of legal protections for bystanders (Alsayali et al., 2019).

Thus, it is crucial for personnel to master BLS skills and respond swiftly to cardiac arrest incidents (Husen & Rahman, 2022). This is supported by Riggs et al. (2019), who found that staff readiness—particularly in hospitals—to provide BLS is influenced by prior training, experience, willingness to assist, and a personal drive to develop these capabilities. Based on these findings, this study aims to investigate the factors influencing the readiness of hospital personnel—particularly non-medical staff—in performing BLS.

Methods

This quantitative research used a cross-sectional design and was conducted at Undata Hospital in Central Sulawesi Province. The research was carried out over the course of one month and received ethical approval from the Faculty of Medicine Ethics Committee at Tadulako University, under approval number 6559/UN.28.1.30/KL/2023. The population comprised all non-medical personnel working at Undata Hospital, totaling 103 individuals. The inclusion criteria were: non-medical personnel aged 18 years or older, willingness to participate and provide informed consent, no prior BLS training, and a minimum of six months of work experience. The study employed a total sampling (saturated sampling) technique, meaning all eligible non-medical staff (n = 103) were included in the sample.

The instrument used was a modified version of an existing questionnaire designed to measure the readiness of non-medical personnel in performing BLS. The modifications ensured relevance to the study context and the hospital environment. The instrument included indicators for behavioral beliefs (knowledge and attitudes) (Jarrah et al., 2018), normative beliefs (beliefs and motivation) (Assarroudi et al., 2019), control beliefs (perception and training) (Wahyuningsih, 2019), intention to perform BLS (Setioputro et al., 2023), and readiness to perform BLS (Kose et al., 2019).

Validity testing was conducted using factor analysis, with a cut-off loading factor of ≥ 0.50 for construct validity. Items below this threshold were deemed invalid and excluded. Reliability testing was carried out using Cronbach's Alpha, with a cut-off value of ≥ 0.70, indicating acceptable internal consistency. The validity and reliability results are presented in Table 4 and Table 6.

Data were analyzed using inferential Structural Equation Modeling (SEM) with the licensed SmartPLS 4 application. The independent variables included behavioral beliefs (knowledge and attitude), normative beliefs (beliefs and motivation), control beliefs (perception and training), and intention. The dependent variable was the readiness to perform BLS.

Results

Behavioral beliefs consist of two indicators: knowledge and attitude. As shown in Table 1, 31.3% of respondents demonstrated high knowledge, while 68.7% had moderate knowledge, and none were categorized as having low knowledge. In terms of attitude, only 7.8% of respondents exhibited a high attitude, 23.5% showed a moderate attitude, and the majority—68.7%—displayed a low attitude (Table 1).

The normative belief variable includes the indicators of belief and motivation. Both indicators share the same distribution: 61 (58.8%) of respondents held positive beliefs and were positively motivated, while 61 (41.2%) held negative beliefs and showed low motivation, respectively.

Control beliefs are represented by perception and training. Regarding perception, 72.5% of respon-

Table 1. Descriptive Analysis

Variable	Indicators	Category	n	%
Behavioral Beliefs	Knowledge	High	32	31.3
		Moderate	71	68.7
		Low	0	0
	Attitude	High	8	7.8
		Moderate	24	23.5
		Low	71	68.7
Normative Beliefs	Confidence	Positive	61	58.8
		Negative	42	41.2
	Motivation	Positive	61	58.8
		Negative	42	41.2
Control Beliefs	Perception	Positive	75	72.5
		Negative	28	27.5
	Training	Positive	59	56.8
		Negative	44	43.1
Intention	Intention	High	54	52.9
		Low	49	47.1
BLS Readiness	BLS Readiness	Ready	34	66.6
		Not ready	17	33.3

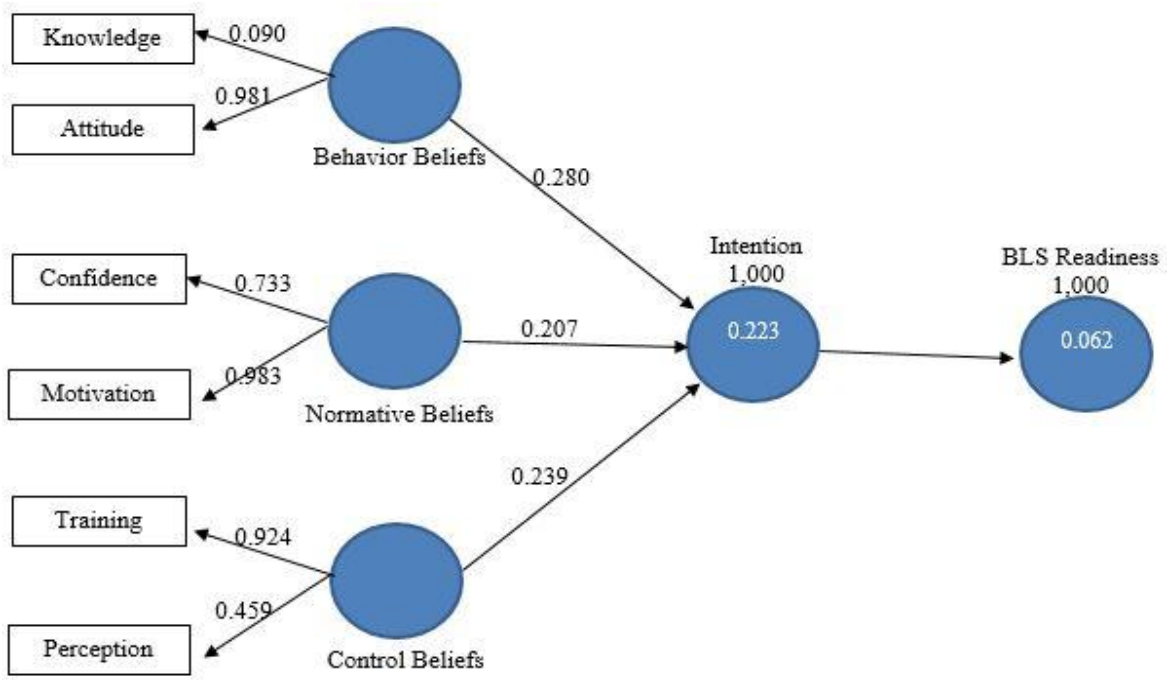

Figure 1. Outer Model Constructs of Factors Influencing the Readiness of Hospital Staff in Implementing BLS at Undata Hospital, Central Sulawesi Province

dents had a positive perception, while 27.5% had a negative perception. In terms of training, 56.8% reported a positive training experience, whereas 43.1% indicated a negative training experience.

The intention to perform BLS was categorized as either high or low. A total of 54 respondents (52.9%) demonstrated high intention, while 49 respondents (47.1%) were categorized as having low intention. Finally, BLS readiness was

grouped into two categories: ready and not ready. Of the total respondents, 66.6% were considered ready to perform BLS, while 33.3% were not ready.

Outer Model Evaluation. The outer model evaluation serves to assess the validity and reliability of constructs, particularly focusing on construct validity and construct reliability. The structure of the outer model is illustrated in Figure 1.

Convergent Validity Test. The convergent validity of each construct is evaluated using loading factor values. An indicator is considered to meet convergent validity if its loading factor exceeds 0.5. The initial test results are presented in Table 2.

Based on the data in Table 2, most indicators achieved the required loading factor threshold of > 0.5. However, the knowledge and perception indicators recorded loading factors below 0.5. As a result, these two indicators were deemed insignificant in measuring the personal factor variables and were therefore excluded from the model.

Following the removal of invalid indicators, the recalculated loading factors in Table 3 confirm that all remaining indicators have values above 0.5, indicating acceptable convergent validity. Thus, each retained indicator is valid in representing its respective construct.

The reduction results also highlight the most influential indicators for each variable. For the behavioral beliefs variable, the attitude indicator makes the strongest contribution. Within the normative beliefs construct, both belief and motivation indicators hold the greatest significance. The most influential indicator in the control beliefs variable is training, while for the intention variable, the intention indicator itself contributes the most.

Discriminant Validity Test. Discriminant validity was assessed using the cross-loading values. This evaluation involved comparing the cross-loading of each indicator on its corresponding construct with its correlations to other constructs. An indicator is considered valid if its loading on the intended construct is higher than its loadings on other constructs. The results of the cross-loading analysis are presented in Table 4.

As shown in Table 4, the loading values (in bold) of each indicator are higher on their respective constructs than on others. Therefore, it can be concluded that the indicators demonstrate adequate discriminant validity, effecttively distinguishing between different latent variables.

Construct Reliability. Construct reliability was assessed using Cronbach's alpha and Composite Reliability (CR) values. A construct is considered reliable if the Cronbach's alpha exceeds

Table 2. Convergent Validity Test of Factors Affecting the Readiness of Hospital Staff in Carrying Out BLS at Undata Hospital, Central Sulawesi

Variable	Indicator	Loading Factor	Cut off	Explanation
Behavioral Beliefs	Knowledge	0.145	0.5	Invalid
	Attitude	0.946	0.5	Valid
Normative Beliefs	Confidence	0.733	0.5	Valid
	Motivation	0.983	0.5	Valid
Control Beliefs	Perception	0.459	0.5	Invalid
	Training	0.924	0.5	Valid
Intention	Intention	1.000	0.5	Valid
BLS Readiness	BLS Readiness	1.000	0.5	Valid

Table 3. Convergent Validity Test After Indicator Reduction for Factors Influencing the Readiness of Hospital Staff in Performing BLS at Undata Hospital, Central Sulawesi

Variable	Indicator	Loading Factor	Cut off	Explanation
Behavioral Beliefs	Attitude	1.000	0.5	Valid
Normative Beliefs	Confidence	0.733	0.5	Valid
	Motivation	0.983	0.5	Valid
Control Beliefs	Training	1.000	0.5	Valid
Intention	Intention	1.000	0.5	Valid
BLS Readiness	BLS Readiness	1.000	0.5	Valid

Table 4. Cross-Loading Values in the Discriminant Validity Test of Factors Influencing Hospital Staff Readiness to Perform BLS at Undata Hospital, Central Sulawesi

Indicator	Behavioral Belief	Normative Belief	Control Belief	Intention	BLS Readiness
Attitude	**1.000**				
Confidence	0.066	**1.000**			
Motivation	0.304	0.289	**1.000**		
Training	-0.190	-0.028	-0.250	**1.000**	
Intention	0.136	0.299	0.299	-0.110	**0.867**

Table 5. Construct Reliability Test of Factors Influencing Hospital Staff Readiness to Perform BLS at Undata Hospital, Central Sulawesi

Variable	Cronbach Alpha	Composite Reliability
Behavioral Beliefs	1.000	1.000
Normative Beliefs	1.000	1.000
Control Beliefs	1.000	1.000
Intention	1.000	1.000
BLS Readiness	1.810	0.856

0.6 and the Composite Reliability exceeds 0.7. The calculation results are presented in Table 5.

As shown in Table 5, all variables exhibit Cronbach's alpha values above 0.6 and Composite Reliability values above 0.7. These results indicate strong internal consistency among the indicators, confirming that each construct is measured reliably. Therefore, the instrument used in this study is considered dependable for assessing the intended variables.

Hypothesis Testing (Inner Model). The purpose of this test is to evaluate whether exogenous variables have a significant effect on endogenous variables. A relationship is considered significant if the T statistic value is greater than or equal to the T-table value (1.97) or if the P-value is less than 0.05. If these conditions are met, it can be concluded that there is a significant effect of the exogenous variables on the endogenous variables. The test results are presented in Figure 2 and Table 6.

Based on the results in Table 6, the findings are as follows:

The Relationship between Behavioral Beliefs and Intention. The relationship between the behavioral beliefs factor (knowledge and attitudes) and intention to perform BLS was tested. The T statistic value is 2.058, and the P-value is 0.040. Since the P-value is less than 0.05, it can be concluded that there is a significant relationship between behavioral beliefs and intention. Therefore, Hypothesis 1 is supported.

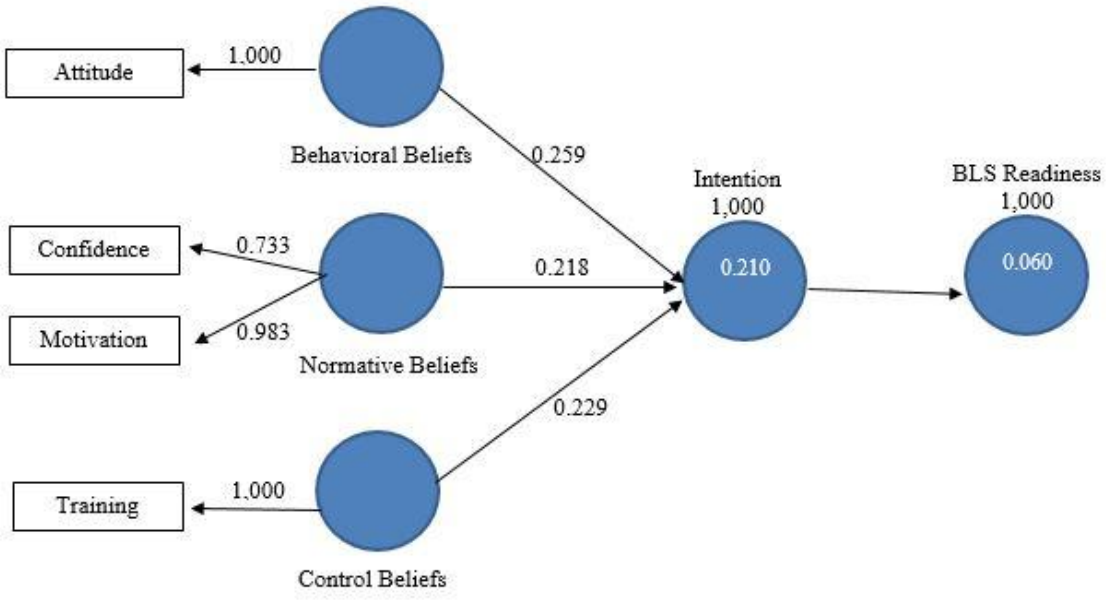

Figure 2. Inner Model Constructs of Factors Influencing the Readiness of Hospital Staff in Implementing BLS at Undata Hospital, Central Sulawesi

Table 6. Hypothesis Testing Results for Factors Influencing the Readiness of Hospital Staff in Performing BLS at Undata Hospital, Central Sulawesi

Relationship	Original Sample (0)	T Statistics (IO/STDEVI)	P Values	Explanation
Behavioral → Beliefs → Intention	0.259	2.058	0.040	Significant
Control Beliefs → Intention	0.229	1.727	0.058	Not Significant
Intention → BLS Readiness	0.250	1.996	0.046	Significant
Normative Beliefs → Intention	0.218	1.523	0.128	Not Significant

The Relationship between Normative Beliefs and Intention. The relationship between normative beliefs (beliefs and motivation) and intention to perform BLS was tested. The T statistic value is 1.523, and the P-value is 0.128. Since the P-value is greater than 0.05, it can be concluded that there is no significant relationship between normative beliefs and intention. Therefore, Hypothesis 2 is not supported.

The Relationship between Control Beliefs and Intention. The relationship between control beliefs (perception and training) and intention to perform BLS was tested. The T statistic value is 1.727, and the P-value is 0.058. Since the P-value is greater than 0.05, it can be concluded that there is no significant relationship between control beliefs and intention. Therefore, Hypothesis 3 is not supported.

The Relationship between Intention and BLS Readiness. The relationship between intention to perform BLS and BLS readiness was tested. The T statistic value is 1.996, and the P-value is 0.046. Since the P-value is less than 0.05, it can be concluded that there is a significant effect of intention on BLS readiness. Therefore, Hypothesis 4 is supported.

Discussion

The Effect of Behavioral Beliefs on Intention. Based on the analysis, it is evident that behavioral beliefs have a significant influence on intention. Behavioral beliefs are indicated by knowledge and attitudes, while intention is ref-

lected through various intention indicators, most of which fall into the high category. Behavioral beliefs—particularly attitudes—play a role in shaping intention, as they are rooted in how individuals view and respond to certain behaviors. If someone holds a favorable attitude toward a behavior, a strong intention to perform that behavior is likely to follow (Badi'ah et al., 2022).

An individual with a positive attitude toward a behavior is also likely to express the intention to engage in that behavior. In this context, improving attitudes toward BLS is expected to foster more positive intentions. Attitudes shape perceptions of specific situations or actions. A positive attitude leads to more optimistic perceptions, which in turn strengthen intention (Ching & Chan, 2020).

This finding aligns with the study by Ulfah (2019), which found that attitude plays a major role in determining intention: the more positive the attitude, the stronger the intention, and vice versa.

The Influence of Normative Beliefs on Intention. The analysis indicates that normative beliefs do not have a significant effect on intention. Normative beliefs are indicated by beliefs and motivation, which represent an individual's perception of expectations from influential people in their life (referents), such as family or peers. While these beliefs and motivations can influence intention, the data in this study suggest that they were insufficient to do so in this context.

According to Zebua (2021), normative beliefs contribute to intention when strong motivations and self-belief are present. However, the assumption in this study is that belief and motivation alone are not enough to drive intention—particularly in the case of non-medical staff, who do not receive regular BLS training like medical personnel. A lack of routine practice and confidence, even in the presence of social motivation, may inhibit the intention to act in emergencies.

The implication of this non-significant result is that external social pressure—such as encouragement from others—is not enough to foster BLS-related intention among non-medical staff. Interventions should not rely solely on social influence but also aim to build internal factors such as confidence, knowledge, and practical skills (Amin & Haswita, 2022).

The Effect of Control Beliefs on Intention. The analysis shows that control beliefs also do not significantly influence the intention to perform BLS. Control beliefs in this study is represented by perception and training. These beliefs affect whether an individual feels capable of performing a behavior, depending on how they perceive the resources or barriers involved (Tversky, 2019).

If individuals perceive that a behavior is easy to perform or that support is available, their intention to act increases. Conversely, if they believe the task is difficult or someone else is more qualified, the intention may not develop (Sánchez-Cañizares et al., 2021). In this study, the lack of significant influence may be due to respondents having inaccurate perceptions or an over-reliance on medical professionals. If they assume help will arrive quickly, they may not feel the need to act themselves.

This suggests that improving perception or offering training alone may not be enough. Future programs should also emphasize personal responsibility and build a sense of urgency. Simulation-based training or empowerment initiatives may strengthen self-efficacy and intention more effectively.

The Effect of Intention on Officer Readiness to Perform BLS. The analysis confirms that intention significantly influences staff readiness to perform BLS. The intention variable is composed of several indicators reflecting commitment to perform BLS-related actions.

Intention is a mental state that embodies a commitment to execute a behavioral action in the

present or future. It signifies a mental state that originates from the planning phase and extends to behavior (Scanlan & Still, 2019). Further, intention is closely linked to behavior, as it is the intention that motivates individuals to engage in behavior. Without a strong intention, individuals may struggle to exhibit positive behavior (Arifin et al., 2022). Positive behavioral outcomes typically stem from strong intentions. As such, the more positive the intention, the more positive the resulting behavior. Intention has a significant influence on behavior in con-ducting BLS because the intention that arises from within a person will identify how strong the individual is in trying to behave (Santi & Indarjo, 2022).

It is assumed that staff with a strong intention to perform BLS are more likely to follow through. Conversely, if the intention is weak or absent, the behavior is unlikely to occur. This finding supports the idea that intention is a key predictor of BLS readiness—consistent with Gieure et al. (2020), who emphasize that good behavior is always preceded by strong intention.

Limitations. Several factors may influence the readiness of non-medical responders that are not directly measurable or were not identified during the study. Variations in experience and educational background among non-medical responders can significantly impact their preparedness to perform BLS, and this study may not have fully captured the effects of these differences.

The findings of this study also carry implications for healthcare services. First, continuous BLS training should be implemented for non-medical staff, with a focus on enhancing their behavioral and control beliefs to improve their preparedness in emergency situations. Second, empowering non-medical staff through practical simulations and confidence-building measures can significantly enhance their readiness to perform BLS, helping them feel more competent when faced with emergencies. Third, fostering an organizational culture that promotes BLS readiness can increase non-medical staff's intention to engage in life-saving actions. Recognition or rewards for active participation may further support this goal. Fourth, regular evaluations should be conducted to monitor staff readiness and ensure the effectiveness of training programs, thereby helping organizations maintain a reliable and responsive emergency team.

Conclusion

Strong behavioral beliefs, such as knowledge and positive attitudes, can foster the intention of non-medical staff to enhance their readiness to perform BLS. Normative beliefs—namely belief and motivation—play a vital role as well. When individuals possess strong internal motivation and belief, their intention to act becomes stronger. Ideally, these positive motivations and beliefs emerge from within and lead to a corresponding positive intention. Control beliefs, including perception and training, also influence the formation of intention.

An individual's perception can either strengthen or weaken their intention, depending on whether the behavior is perceived as beneficial. If the behavior is seen as advantageous, the intention to act will likely increase. Conversely, if the behavior is perceived as irrelevant or unhelpful, intention may weaken. Strong intention ultimately drives readiness and behavior. When non-medical staff have clear and positive intentions, they are more likely to perform BLS effectively. This intention guides their actions, and positive behavior tends to follow. Therefore, fostering intention through enhanced knowledge, attitudes, perception, and motivation is essential for improving readiness and response in emergency situations.

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Effects of An Integrated Nutritional Health Intervention on Energy and Protein Intake in Under Five-Year Malnourished Children

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Abstract

Malnutrition is thought to be the cause of more than one third of all child deaths, despite being rarely cited as a cause. In Indonesia, 19.9% of the population is malnourished, which is a very high prevalence. To prevent and treat malnutrition in children, numerous strategies have been developed, including an integrated nutritional health intervention. This research aimed to determine the effectiveness of an integrated nutritional health intervention for the energy and protein intake of malnourished children under the age of five. This study had a quasi-experimental design with a pre- and post-test control group. The research took place in Padang City, West Sumatra Province, between August 2020 and February 2021. The study data were collected using a standardized questionnaire at baseline and six months after the intervention, utilizing a sample size of 140 people. The data were evaluated using dependent and independent t-tests between the study's baseline and end line. The energy and protein intake variables showed a difference, indicating a significant increase in the score from the baseline to the end line (energy intake: difference-in-differences (DID) = 405.53, 95% confidence interval [CI] = 362.01–449.05, p = .000; protein intake: DID = 4.62, 95% CI = 3.79–5.45, p = .000). This study found that the integrated nutritional health intervention increased the energy and protein intake of malnourished children and had a substantial impact on reducing the prevalence of risk factors when adequate protein and energy intake was provided.

Keywords: energy intake, integrated nutritional health intervention, malnourished, protein intake

Abstrak

Pengaruh Intervensi Terpadu Kesehatan Gizi terhadap Asupan Energi dan Protein pada Anak Balita yang Mengalami Gizi Buruk. *Malnutrisi diperkirakan menjadi penyebab lebih dari sepertiga kematian anak di dunia meskipun jarang dikategorikan sebagai penyebab utama. Di Indonesia, 19,9% anak mengalami malnutrisi. Angka ini merupakan angka prevalensi yang sangat tinggi. Untuk mencegah dan mengatasi malnutrisi pada anak, berbagai strategi telah dikembangkan, termasuk intervensi kesehatan gizi terpadu. Penelitian ini bertujuan untuk mengetahui efektivitas intervensi kesehatan gizi terpadu terhadap asupan energi dan protein pada anak balita yang mengalami malnutrisi. Studi ini menggunakan desain kuasi-eksperimen dengan kelompok kontrol* pre-test *dan* post-test*. Penelitian dilakukan di Kota Padang, Provinsi Sumatera Barat, antara bulan Agustus 2020 hingga Februari 2021. Data penelitian dikumpulkan menggunakan kuesioner standar pada awal dan enam bulan setelah intervensi, dengan jumlah sampel sebanyak 140 orang. Data dianalisis menggunakan* dependent *dan* independent t-test *antara data awal dan akhir penelitian. Variabel asupan energi dan protein menunjukkan adanya perbedaan, yang mengindikasikan peningkatan skor yang signifikan dari awal hingga akhir penelitian (asupan energi: perbedaan selisih* [difference-in-differences/DID]*) = 405,53,* confidence interval [CI] *95% = 362,01–449,05, p = 0,000; asupan protein:* DID *= 4,62,* CI *95% = 3,79–5,45, p = 0,000). Hasil dari penelitian ini menemukan bahwa intervensi kesehatan gizi terpadu meningkatkan asupan energi dan protein pada anak-anak yang mengalami malnutrisi dan memberikan dampak yang signifikan dalam mengurangi prevalensi faktor risiko ketika asupan energi dan protein yang memadai tersedia.*

Kata Kunci: *asupan energi, asupan protein, intervensi kesehatan gizi terpadu, malnutrisi*

Introduction

The problem of malnutrition, especially undernutrition and malnutrition, is still a major nutritional problem that needs more serious attention. Undernutrition and overnutrition occurring simultaneously in the same environment are referred to as the twin burdens of malnutrition. Individuals, households, and even entire populations can be affected by this phenomenon (Das et al., 2019). Global efforts to reduce the prevalence of undernutrition, especially stunting and underweight in children under five, have shown measurable progress over the past two decades. According to the Joint Child Malnutrition Estimates by United Nations International Children's Emergency Fund (UNICEF), World Health Organization (WHO), and the World Bank, the global prevalence of stunting declined from 33% in 2000 to approximately 22.3% in 2022, affecting around 148 million children (UNICEF et al., 2023). Despite these improvements, wasting or acute malnutrition still affected an estimated 45 million children (6.8%) globally in the same year (UNICEF et al., 2021). Furthermore, the prevalence of underweight among children under five decreased from approximately 24.8% in the early 1990s to about 12.8% in 2022 (UNICEF et al., 2023), indicating progress but underscoring the ongoing burden of malnutrition, especially in low- and middle-income countries (Manoochehri et al., 2024; Vijay & Patel, 2024).

Recent studies conducted in Ethiopia and its surrounding regions have consistently demonstrated a significant correlation between adequate intake of high-quality protein and energy with children's linear growth. Moges et al. (2024) reported that the average protein and energy intake among children often falls below the recommended standards, particularly during certain seasons, adversely affecting linear growth outcomes. Their study recommends enhancing local food diversification and the production of animal-based protein sources to improve children's nutritional status. Furthermore, a systematic review of child nutrition interventions in Ethiopia concluded that food-based interventions, such as behaviour change communication (BCC), food vouchers, and the use of quality protein maize can substantially reduce the prevalence of child stunting (Ahmed et al., 2023). Malnutrition is thought to be the cause of over one third children mortality, yet it is rarely cited as the primary cause (UNICEF et al., 2023).

Indonesia continues to face significant challenges in child nutrition. According to the Global Hunger Index in 2024, 26.8 % of children under five years old are stunted, and 7.2 % of the population are undernourished (Concern Worldwide, 2024). The World Food Programme (2023) reported that nearly 31 % of children under five were affected by stunting, and around 8 % of the population was undernourished, with approximately 23 million people were lacking sufficient dietary energy in 2023. Malnourished were mostly found among children under the age of five than toddlers (17.8% and 14.8%, respectively) (Maidelwita, 2019). In West Sumatra specifically, the prevalence of stunting decreased from 31.2 % in 2018 to 23.3 % in 2021, yet remained above the national target of < 20 %, reflecting ongoing regional disparities (Syafrawati et al., 2023).

Malnutrition can be caused by a lack of food, infectious diseases, or both. Malnutrition in children (low weight-for-age) manifests as stunting (low height-for-age), wasting (low weight-for-height), and underweight. Globally in 2022, 149 million children under five were estimated to be stunted (low height-for-age), 45 million were estimated to be wasted (low weight-for-height) (WHO, 2023). Several strategies have been implemented to prevent and to cure malnutrition, such as diet, nutritional supplements, meal delivery services, and health promotion or counseling. Several remedies are available although its reliability is questionable (Young & Argáez, 2019).

In nations with lower income levels, there is limited knowledge of the relationship between

a diet high in quality protein and children's growth in the context of illness and energy deficiency. Children need more protein and vital amino acids when suffering and recovering from acute or chronic ailments. Increased protein quantity and quality, as well as increased energy consumption, may promote more linear growth in young children; longitudinal and interventional research should investigate this possibility further. Protein and energy intakes have been found to be positively correlated with children's linear growth. Mamun et al. (2023) carried out a systematic review and meta-analysis of 15 randomized controlled trials in low and middle-income countries (2000–2022). The study demonstrated that food-based interventions designed to enhance protein and energy intake produced a mean gain of + 0.20 HAZ (95% CI: 0.04–0.35, p = .01) in linear growth among children under five.

This study targeted nutritional health to reduce the prevalence of risk factors for malnutrition at the household/family level (i.e., inadequate access to food and water, inadequate care and feeding practices) (UNICEF, 2020). A nutritional health intervention refers to an effort directed toward an individual or group aimed at evaluating, improving, sustaining, promoting, or altering their health, functioning, or overall health condition (Maidelwita et al., 2023). The integrated nutritional health intervention comprises integrated community-based interventions consisting of positive deviance (PD), micronutrition supplementation, supplementary food, nutrition education, and emotional demonstration (emo demo). PD is a community-based program that aims to reduce malnutrition in children under five years old. It's a behavior change program that helps rehabilitate underweight children and prevent future malnutrition (Triatmaja et al., 2023). The objective of the integrated nutritional health intervention program in this study was to determine if the integrated approach improved the energy and protein intake of children under five.

Methods

This study investigated the impact of integrated nutritional health interventions on under-five malnourished children's energy and protein intake. Data on energy and protein consumption levels were obtained from 3 × 24-hour food recall interviews conducted before and after the intervention.

Study Design. The study used a quasi-experimental design with pre- and post-test control groups. At the control and intervention sites, the household surveys were conducted at baseline in August 2020 and at the end line in February 2021.

Setting. Padang City, West Sumatra Province, is where the study was carried out. The implementers chose Seberang Padang Public Health Center in Padang City because it has a high prevalence of malnutrition. Ranah Parak Rumbio village, Alang Lawas village, Seberang Padang village, and Belakang Pondok village are all part of the Seberang Padang Health Center's work area. As controls, four communities with the right population size, population density, and nutrition indices were chosen because they were similar in terms of health services availability, population, and nutrition indicators.

Sample Size and Sampling. The study participants were mothers of young children under the age of five. The study's target population was children aged 12 to 59 months who lived in the Area of Seberang Padang Health Center. A case group and a control group were included in the study. Cases and controls were collected from the child of Seberang Padang Health Center registrations and nutrition surveillance logbook monthly reports collected from the Seberang Padang Health Center. The sample size needed to respond to the research question was calculated with a power analysis using the G*Power Analysis software version 3.1.9.7. The effect size chosen for this study as an acceptable esti-

mate was based on the findings of previous studies (Kang, 2021).

A sample size of 140 was determined to be appropriate for this kind of research, with a chosen statistical power of 0.80 at an alpha level of 0.05 and a statistical effect size (Cohen's d) of 0.5. A total of 64 people comprised the case group sample, and 64 people formed the control group sample. Estimating the entire sample's dropout rate at 10% (6 participants in each group), the sample size for this study was 70 for the cases group and 70 for the control group, resulting in a total sample size of 140 participants.

Data Collection. Data was collected by researchers and enumerators consisting of one midwife and one nurse as well as two cadres in the area. In this study, the main data collection methods were measurements, interviews, and questionnaires. The mothers were asked to complete a questionnaire after signing an informed consent form in their native language at their integrated nutritional health intervention. Mothers were interviewed about maternal and child characteristics, energy consumption and protein intake entered in the food recall form. The questionnaire was self-administered to identify the practices that influence the incidence of malnutrition. The structured questionnaire contained open and closed questions arranged according to the variables studied. Responses to the 3 x 24-hour recall interviews were used to determine dietary energy (kcal) and protein (g) intake. All study participants performed the 24-hour recall at baseline (August 2020) and again at the end line (February 2021).

Intervention. The integrated nutritional health intervention is a community-based nutritional intervention aimed at nutritional assessment, growth monitoring, health education, food supplementation, nutrition education and communication for behavior change, and micronutrient supplementation (Maidelwita et al., 2023). The intervention group in this study received nutritional assessment interventions to improve the practice of complementary feeding and child hygiene. The integrated nutritional health intervention consists of PD, micronutrition supplementation, supplementary food, nutrition education, and emotional demonstration (emo demo). The following activities are included in the standard package of an integrated nutritional health intervention model provided by Save the Children (Figure 1).

Control Group. The control group did not receive any health nutrition intervention and were given printouts of the nutrition and food supplements program's advantages. These mothers received the standard care of monthly growth monitoring and access to the Indonesian government's supplemental feeding program, which provides energy and protein intake tr children under five years of age, consisting of food with a total calorie content of 1,000 to 1,550 kcal and a protein content of 25 to 39g.

Data Analysis. In this study, univariate and bivariate statistical analyses were carried out using statistical software version 22. Univariate analysis was used to describe the data. Bivariate analysis was used in a t-test to compare the continuous variables of the intervention and control groups. Normality and homogeneity tests were conducted before the intervention. The data were analyzed descriptively, and a homogeneity test was conducted to determine the sample distribution between the intervention group and the control group. The difference-in-differences (DID) analysis was based on the assumption that the intervention-related outcomes did not exhibit a temporal trend. The control group had the same characteristics as the intervention group, but they were not exposed to the intervention.

Ethical Consideration. Ethical approval was obtained from the Komite Etik Penelitian Kesehatan (KEPK) at Universitas Perintis Padang (180/KEPK.F1/ETIK/2020). A letter from the Health Science Faculty of Lincoln University was submitted to Padang's public health office (LUC/MKT/IND/PDG/20190901/001).

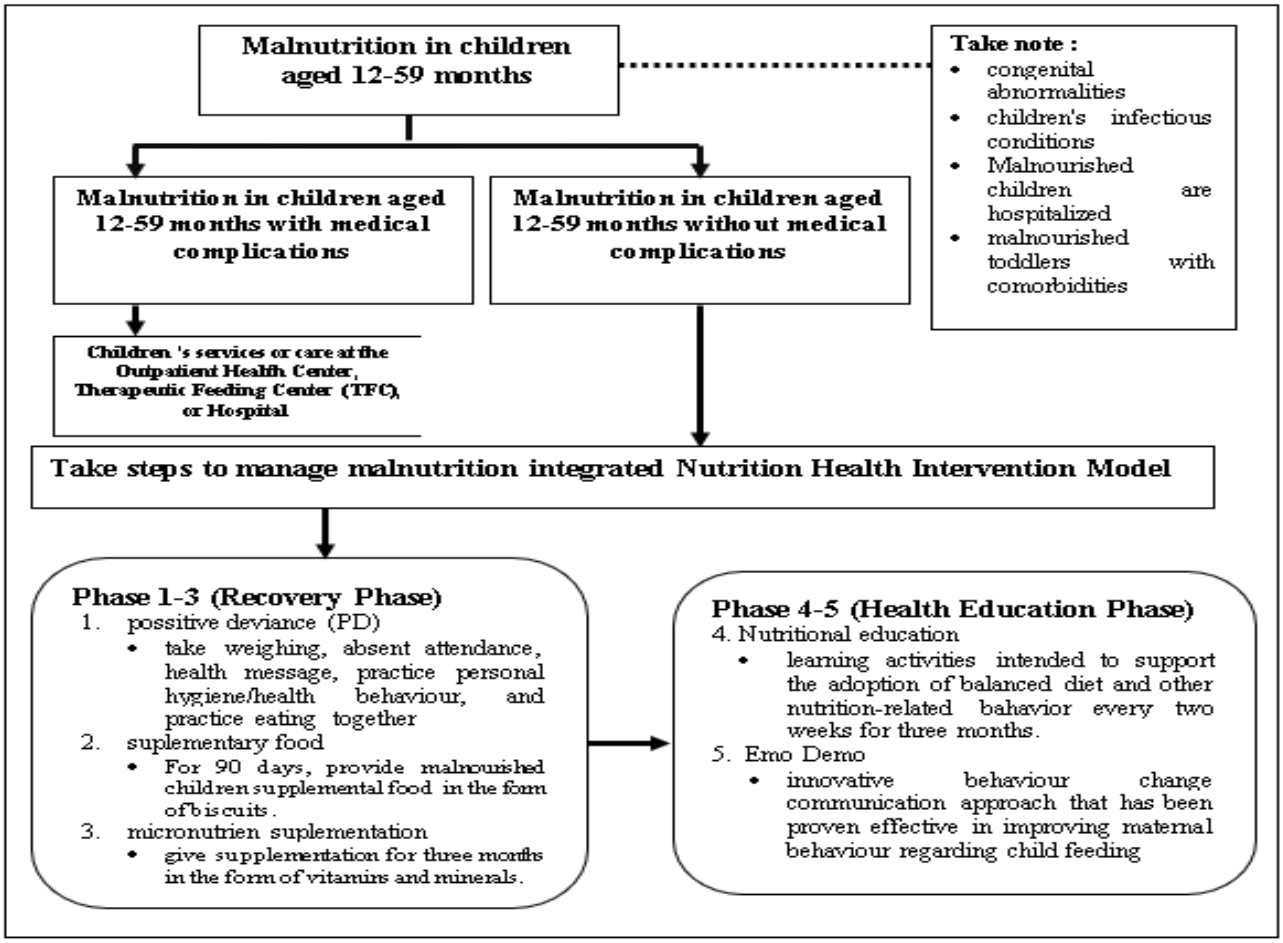

Figure 1. The Integrated Nutritional Health Intervention Model

Permission to conduct the research was obtained from the Padang City Health Office (5/57/SDMK&Jamkes/2019) and the Seberang Padang District (202.13/CPS-Kessos/2019). This research was also registered with the Padang City Government at the National and Political Unity Office (200.09.1916/Kesbangpol/2019).

Results

This study evaluated the effects of an integrated nutritional health intervention on children's energy and protein intake. The study measured energy and protein intake at baseline and at the end line to determine the effects of an integrated nutritional health intervention on energy and protein intake in malnutrition.

Energy and Protein Intake at Baseline. The differences in energy and protein intake of children under five before being given the integrated nutritional health intervention were calculated from the results of the pre-test. Before testing a hypothesis, a prerequisite test is first conducted. This analysis prerequisite test aims to determine the statistical test tool that will be used, namely for parametric or non-parametric statistics. The tests used for the analysis requirements in this study were normality tests and homogeneity tests. The homogeneity test used Levene's test method with the test criterion that if the p-value > .05, then H0 is accepted, meaning that both groups have the same variance, and vice versa, if the p-value < .05, then Ho is rejected and Ha is accepted.

Table 1. Mean Values of Energy and Protein Intake Per Day at Baseline

Variable	Intervention	Control	Overall sample	Min–Max	p
	Mean±SD (n = 70)	Mean±SD (n = 70)	Mean±SD (n = 140)		
Adequate Energy Intake (kcal)	1002.49±102.04	1073.64±115.79	1038.07±114.45	777.46–1503.00	.000*
Adequate Protein Intake (g)	19.96±1.45	21.09±2.11	20.53±1.89	12.67–25.89	.000*

t independent = t-test
*significant p < .05

Table 2. Mean Value for Energy and Protein Intake Per Day at the End Line

Variable	Intervention	Control	Overall sample	Min–Max	p
	Mean±SD (n = 70)	Mean±SD (n = 70)	Mean±SD (n = 140)		
Adequate Energy Intake (kcal)	1371.94±54.47	1037.56±139.31	1204.75±198.14	1200.00–1471.00	.000*
Adequate Protein Intake (g)	24.18±2.32	20.69±1.49	22.44±2.62	17.18–27.89	.000*

t = independent t-test
*significant p < .05

The results of the variance homogeneity test were 0.806, with a p-value of .938. Because the p-value = .371 > .05, then H0 was accepted, which means that the two group variances were the same. The basic assumptions of testing the normality and homogeneity of variance of the sample group data were met so that the data values of the two sample groups were normally distributed with homogeneous variance and were tested using the independent samples t-test to assess differences in adequate energy and protein intake of children under five before being given the integrated nutritional health intervention calculated from the pre-test results. The results can be seen in Table 1.

Table 1 shows that across the intervention and control groups, the recommended energy intake baseline mean and standard deviation were 1038.07 kcal ± 114.45 kcal. The scores ranged from 777.46 kcal to 1503.00 kcal. There was a statistically significant difference between the intervention and control groups for adequate energy intake at baseline (p = .000). The mean ± SD for sufficient protein intake in both the intervention and control groups was 20.53 g ± 1.89 g, ranging between 12.67 g and 25.89 g. The intervention and control groups' values at baseline before the experiment showed a statistically significant difference (p = .000).

Energy and Protein Intake at the End Line. Based on the results of the homogeneity test of the variance of the case and control groups, the significance value obtained = .811 > .05, meaning that H0 was accepted and Ha was rejected, so it can be concluded that the variance of the data values of the two sample classes was the same. The differences in the energy and protein intake of children under five after being given the integrated nutritional health intervention were calculated from the results of the posttest. The independent samples t-test was used. The results are presented in Table 2.

Table 2 shows that at the end of the experiment, the overall mean ± SD for adequate energy intake was 1204.75 kcal ± 198.14 kcal. The range of scores was 120.00 kcal to 1471.00 kcal. The intervention and control groups had statistically

different energy intakes (p = .000). At baseline, the intervention and control groups' mean adequate protein intake was 22.44 g ± 2.62 g, and the scores ranged from 17.18 g to 27.89 g. The intervention group had a significantly higher protein intake than the control group (p = .000).

Effects of Integrated Nutritional Health Intervention on Energy and Protein Intake in Malnutrition. The participants in the intervention and control groups had their protein and energy intake for malnutrition measured at baseline and at the end of the intervention. Table 3 shows the changes in energy and protein intake at the end of the intervention.

Table 3 shows that the energy intake variables in the intervention group had a statistically significant difference (p = .000) both at the baseline and the end line of the study, whereas the energy intake variables in the control group did not have a significant difference (p = .052) at the baseline and end line of the study. The energy intake variables differed, indicating a significant increase in the score between the beginning and the end of the study (DID = 405.53, 95% CI = 362.01–449.05, p = .000).

Table 3 shows that the protein intake variables in the intervention group had a statistically significant difference (p = .000) at the baseline and end line of the study, whereas the protein intake variables in the control group did not have a significant difference (p = .519) at the baseline and end line of the study. The protein intake variables differed, indicating a significant increase in the score from the beginning to the end of the study (DID = 4.62, 95% CI = 3.79–5.45, p = .000).

Discussion

The goal of this study was to investigate whether an integrated nutritional health intervention program was effective in boosting children's energy and protein consumption, as well as if there was a substantial increase in nutrition after the intervention. The findings indicate that there was a statistically significant variation in energy intake between the baseline and the end line (p < .001). These results are consistent with recent studies emphasizing the importance of early nutritional interventions. For instance, Puentes et al. (2022) demonstrated that enhanced protein and energy consumption among children aged 6–24 months in low-income settings contributed substantially to growth outcomes, including height and weight.

Children in the intervention group did not significantly differ from those in the control group in terms of daily total energy intake (kcal) changes

Table 3. Comparison of Energy and Protein Intake Per Day in Malnutrition between the Control Group and the Intervention Group

Variable	Control			Intervention			Program Effect (DID Estimates)	
	Baseline Mean ± SD (n = 70)	End line Mean ± SD (n = 70)	p	Baseline Mean ± SD (n = 70)	End line Mean ± SD (n = 70)	p	DID Mean (95% CI)	p
Adequate Energy Intake (kcal)	1073.64 ± 115.79	1037.56 ± 139.31	.052*	1002.49 ± 102.04	1371.94 ± 54.47	.000*	405.53 (362.01–449.05)	.000**
Adequate Protein Intake (g)	21.09 ± 2.11	20.69 ± 1.49	.519*	19.96 ± 1.45	24.18 ± 2.32	.000*	4.62 (3.79–5.45)	.000**

DID – difference-in-differences
*dependent t-test, significant p < .05
**independent t-test, significant p < .05

($p > .05$) (Table 3). Additionally, the mean increases in calorie intake in the intervention group were significantly greater ($p = .000$). In the comprehensive nutritional health intervention for the under five children, the energy intake of the intervention group was higher than that of the control group. Similar findings were found in Vietnam, where a two-way repeated measures analysis of variance was used to compare groups with and without adequate protein intake before and after the intervention (Nguyen et al., 2020).

Mothers who participated in the integrated nutritional health intervention fed their children more frequently and included a wider variety of foods, leading to reduced malnutrition in the intervention group. Childhood malnutrition often stems from the low energy density and limited nutrient content of staple foods commonly consumed in many low-income settings. Encouraging the combination of staples with diverse, nutrient-rich foods and increasing meal frequency as promoted in the intervention substantially improves dietary adequacy among young children (Terefe et al., 2023). However, numerous barriers prevent the immediate adoption of these interventions in non-participating communities, including insufficient resources, lack of community engagement, and limited knowledge dissemination (Ezezika et al., 2021). These findings highlight the urgent need to enhance implementation strategies such as culturally tailored education, strengthened community support, and resource mobilization to ensure that life-saving nutritional guidance becomes routine practice.

Evidence strongly indicates that inadequate energy intake is a primary barrier to children's linear growth, even when protein is sufficient (Puentes et al., 2022). Moreover, a 2022 meta-analysis of 38 randomized controlled trials established that manipulating dietary energy density can alter energy intake lowering energy density decreased energy intake by roughly 223 kcal/day, indicating that in low-food-access environments, increasing energy density offers a pragmatic solution to meet caloric needs without increasing meal size (Klos et al., 2023).

Additionally, inflammation-linked appetite suppression is a recognized factor in reduced food consumption among young children, underscoring the need to enhance the energy density of complementary foods to support appetite and energy intake (Zhang et al., 2022). Thus, prioritizing the fortification of staple meals with energy-dense ingredients such as healthy fats, proteins, or micronutrient-rich additives emerge as a feasible and effective strategy to mitigate energy deficits and foster growth especially in resource-constrained settings.

The results of this study showed that the integrated nutritional health intervention model improved the participants' adequate protein intake. The effects of malnutrition in children are borne throughout their life cycle and through subsequent generations. Nutritional inadequacy resulting from food insecurity during adolescence poses significant risks to both current and future health outcomes, including impaired physical growth, cognitive development, and disease susceptibility (Food and Agriculture Organization [FAO] et al., 2021).

According to recent global nutrition guidelines, the introduction of complementary feeding should commence at six months of age, ensuring that the foods provided are appropriate in quantity, frequency, energy density, and micronutrient content, while also adhering to safe food preparation and handling practices (WHO, 2003). Evidence indicates that adherence to these complementary feeding practices substantially reduces the risk of undernutrition and related health complications in young children (Bengre et al., 2023).

This study's findings showed a statistically significant difference in appropriate protein intake between the intervention and control groups. Following the integrated nutritional health intervention, there was a statistically significant difference between the baseline and end line in

the intervention group (p = .000). There was also a statistically significant difference between the control group's baseline and end line following nutritional health therapies (p = .000).

In Vietnam, a two-way repeated measures analysis of variance was used to compare differences in recommended protein consumption between groups before and after the intervention Nguyen et al. 2020). Furthermore, Escher et al. (2024).confirmed that targeted nutritional interventions, including protein supplementation and dietary diversity enhancement, significantly improved protein adequacy among children in low- and middle-income countries.

Children in the integrated nutritional health intervention group had the highest mean energy intake (12.67 g at baseline and 20.01 g at the endpoint), which may have contributed to their protein intake. Based on research on malnourished children, the Minister of Health of the Republic of Indonesia issued Regulation No. 28 of 2019 regarding recommended nutritional adequacy for Indonesians, which includes a higher protein intake (for children 1–3 years 20 g and 4–6 years 25 g) (Ministry of Health, Republic of Indonesia, 2019).

Despite the significant differences in these results, both groups' energy intake was appropriate. An energy intake of 80%–100% of the recommended dietary allowance (RDA) is considered good (Pratiwi et al., 2022). Energy sufficiency is critical, particularly during periods of rapid growth. Malnutrition, including a lack of protein energy, iron deficiency anemia, vitamin A insufficiency, and several viral illnesses, is more common in children aged 1–6. When children reach preschool age, they enter a time of slow growth (growth plateau). However, energy sufficiency must still be considered to balance physical activity and balancing mechanisms when infection occurs (Roberts et al., 2022). This study showed that an integrated nutritional health intervention improved the participants' protein intake.

Following the integrated nutritional health intervention, the intervention group achieved a higher mean protein intake (24.18 g/day) compared to the control group (20.69 g/day). While both groups met the RDA, the elevated intake in the intervention group carries implications beyond basic nutritional adequacy. Protein is a critical macronutrient for children under five, vital not only for energy but also for tissue synthesis, repair, immune function, and cognitive development (Zhang et al., 2022). Epidemiological evidence, including the Generation R cohort, shows that greater animal protein intake in early childhood is associated with improved long-term growth metrics specifically height and weight gains suggesting that protein quality and source significantly influence developmental outcomes (Stokes et al., 2021), recent research from Africa confirms that increased consumption of animal-sourced foods (rich in protein and micronutrients) reduced stunting by 6.8 percentage points a finding that underscores the broader impact of higher protein intake on linear growth (Khonje & Qaim, 2024).

Nurses have an important role in supporting procedures for meeting children's nutritional needs and preventing malnutrition. Nurses are expected to always pay attention to the nutritional needs of malnourished children, provide appropriate interventions, and improve the child's quality of life. Nurses have an important responsibility in carrying out these interventions and ensuring that children's nutritional needs are properly met.

Conclusion

An integrated nutritional health intervention enhanced the energy and protein intake of malnourished children, according to this study. Nutritional intervention was found to have a significant impact on the prevalence of risks and energy and protein intake. The importance of nurses in delivering dietary health interventions and assistance should not be overlooked. Malnutrition in children can be reduced using strategies based on accurate nutritional evaluation

and adequate nutrition education.

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Effects of Incremental Shuttle Walk Test on Maximal Oxygen Consumption and Comfort in Patients with Coronary Artery Disease Undergoing Phase 3 Cardiac Rehabilitation

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Abstract

Coronary artery disease (CAD) is a condition characterized by impaired cardiac function due to a reduced blood supply to the myocardial tissue, resulting from narrowing or obstructing of the coronary arteries. This condition can negatively impact the physical, psychological, and social dimensions of the patient's life, often leading to a decline in maximal oxygen consumption (VO2max) and perceived comfort. One solution for increasing the decreased VO2max is cardiac rehabilitation. Cardiac rehabilitation is an effective preventive and recovery intervention that includes assessments of VO2max, and the effects of the incremental shuttle walk test (ISWT) on the VO2max and comfort of CAD patients. This is a quasi-experiment with a pre-post control group design. Consecutive sampling was used to recruit 60 respondents, who were then divided into a control and an intervention group, with 30 respondents in each group. VO2max was measured using the distance achieved in the ISWT, and comfort was assessed using the Shortened General Comfort Questionnaire (SGCQ). Data were analyzed using a paired t test to determine whether the mean pretreatment VO2max and comfort levels significantly changed after the treatment. VO2max and comfort showed significant improvements after the ISWT ($p = 0.001$ for both variables), confirming the effectiveness of ISWT in CAD patients undergoing phase 3 cardiac rehabilitation. Therefore, ISWT should be considered an integral part of cardiac rehabilitation for the management of CAD patients after hospital discharge.

Keywords: comfort, coronary artery disease, incremental shuttle walk test, VO2max

Abstrak

Pengaruh* Incremental Shuttle Walk Test *terhadap Konsumsi Oksigen Maksimal dan Kenyamann Pada Pasien Penyakit Jantung Koroner yang Menjalani Rehabilitasi Jantung Fase 3. *Penyakit Jantung Koroner (PJK) merupakan suatu kondisi yang ditandai dengan gangguan fungsi jantung akibat berkurangnya suplai darah ke jaringan miokardium yang disebabkan oleh penyempitan atau penyumbatan arteri koroner. Kondisi ini dapat berdampak negatif terhadap aspek fisik, psikologis, dan sosial dalam kehidupan pasien, yang sering kali menyebabkan penurunan konsumsi oksigen maksimal* (VO2max) *serta kenyamanan yang dirasakan. Salah satu solusi untuk meningkatkan* VO2max *yang menurun adalah melalui rehabilitasi jantung. Rehabilitasi jantung merupakan intervensi yang efektif dalam pencegahan dan pemulihan, yang mencakup penilaian terhadap* VO2max *serta pengaruh* Incremental Shuttle Walk Test (ISWT) *terhadap* VO2max *dan kenyamanan pasien PJK. Penelitian ini merupakan kuasi-eksperimen dengan desain* pre-post control group. *Pengambilan sampel dilakukan secara* consecutive sampling *terhadap 60 responden yang kemudian dibagi menjadi dua kelompok, yaitu kelompok kontrol dan kelompok intervensi, masing-masing terdiri dari 30 responden.* VO2max *diukur berdasarkan jarak yang dicapai dalam pelaksanaan* ISWT*, sedangkan kenyamanan dinilai* menggunakan Shortened General Comfort Questionnaire (SGCQ)*. Analisis data dilakukan dengan* paired t-test *untuk mengetahui apakah terdapat perubahan yang signifikan pada nilai rata-rata* VO2max *dan tingkat kenyamanan sebelum dan sesudah intervensi. Hasil penelitian menunjukkan adanya peningkatan yang signifikan pada* VO2max *dan kenyamanan setelah intervensi* ISWT *(p = 0,001 untuk kedua variabel), yang menegaskan efektivitas* ISWT *pada pasien PJK yang menjalani rehabilitasi jantung fase 3. Oleh karena itu,* ISWT *sebaiknya dipertimbangkan sebagai bagian integral dalam program rehabilitasi jantung untuk penatalaksanaan pasien PJK pasca perawatan rumah sakit.*

Kata Kunci: incremental shuttle walk test, *kenyamanan, penyakit jantung koroner,* VO2max

Introduction

Coronary artery disease (CAD) refers to impaired heart function caused by reduced blood supply to the myocardial muscle, primarily due to the narrowing or blockage of the coronary arteries (American Heart Association [AHA], 2017). A previous study reported by Hildebrandt et al. (2016) that most CAD patients had a history of risk factors, including obesity (35%), unhealthy lifestyle (30%), hypertension (33%), metabolic syndrome (35%), pre-diabetes mellitus (38%), diabetes mellitus (8.3%), and smoking (20.5%). In addition, most CAD patients exhibited clinical symptoms, such as chest pain, breathlessness, a systolic blood pressure of 100 –150 mmHg, a diastolic pressure > 90 mmHg, a pulse rate of 50–90 beats per minute, an oxy-gen saturation (SpO_2) < 85%, and abnormal levels of high-density lipoprotein, low-density lipoprotein, troponin T, and creatine kinase–myocardial band (Hildebrandt et al., 2016).

CAD and valvular heart disease are major global cardiovascular disorders that significantly impact health-care systems and economic resources, conferring substantial financial burdens to countries worldwide. Cardiovascular diseases remain the leading cause of mortality worldwide. In 2019, they were responsible for approximately 17.9 million deaths, representing 32% of all global deaths. Of the 17 million premature deaths (before the age of 70 years) caused by noncommunicable diseases in the same year, 38% were attributed to cardiovascular diseases (World Health Organization [WHO], 2021). In Saudi Arabia, a national survey reported a prevalence of 5.5% for CAD, which is higher than those observed in India (3%), China (2%), and Europe (5%) (Shafi et al., 2024). In Indonesia, Based on Basic Health Research 2018 reported a 0.5% prevalence of physician-diagnosed coronary heart disease, which affected approximately 83,447 individuals (Badan Penelitian dan Pengembangan Kesehatan, 2019). When based on self-reported symptoms without a physician's diagnosis, the prevalence was 1.5%, or approximately 2,650,340 of all cases. Among the 37 provinces in Indonesia, Jakarta had the second highest prevalence of CAD (0.7%), after Central Sulawesi (0.8%).

A decrease in maximal oxygen consumption (VO2max) is influenced by reduced physical activity capacity, increased dependence on others, and physical strain during activities. VO2max refers to the maximal aerobic capacity, defined as the maximum amount of oxygen consumed per unit of time during progressively intensive exercise up to the point of exhaustion (Lewis et al., 2021). The psychological changes commonly observed in CAD patients include depression, anxiety, suicidal ideation, and feelings of worthlessness. Socially, CAD patients often experience loneliness and isolation, which may hinder their ability to engage in daily activities as desired (Bunevicius et al., 2014).

One cardiac rehabilitation program that has demonstrated numerous positive effects in patients with heart disease is the incremental shuttle walk test (ISWT). This test is considered safe, cost-effective, and practical for assessing cardiac functional capacity, particularly in large groups. In patients with cardiac abnormalities, it not only evaluates VO2max but also provides insights into respiratory, cardiovascular, hematologic, neuromuscular, and muscular metabolic functions, which are factors that collectively influence physical, psychological, and social well-being (Holland et al., 2014).

Several cardiac rehabilitation programs are employed to improve VO2max during the three-phase rehabilitation process, particularly in the maintenance phase. These include the ISWT, cardiopulmonary exercise testing, detection of exercise-induced asthma, and cardiac stress testing (Holland et al., 2014). The ISWT is an externally paced test conducted over a 10-m course, where walking speed is increased every minute until the patient becomes too breathless or fatigued to continue, or is unable to maintain the required pace.

Several studies have demonstrated that the ISWT has positive effects on patients' physical, psychological, and social aspects. The ISWT has been associated with significant improvements in serum lactate level, N-terminal pro–brain natriuretic peptide level, heart rate, resting systolic and diastolic blood pressures, respiretory function, QRS duration, hemoglobin level, urea level, creatinine level, peak SpO_2, and peak VO2max (Hayward et al., 2015; Ingle et al., 2014). Moreover, patients showed an improved ability to perform physical activities independently and enhanced cognitive and emotional functioning. In terms of social impact, the ISWT fostered mutual support among participants during training sessions and contributed to increased self-confidence (Rejeski et al., 2014; Tully et al., 2016). The effects of the ISWT on CAD patients' VO2max and perceived comfort have not been thoroughly investigated. As a result, its potential benefits remain underecognized among CAD patients.

Methods

This study used a quasi-experimental design with a pre-post-test and control group. Sixty (60) participants were selected using random sampling and assigned to either the intervention group (n = 30) or control group (n = 30). The study was conducted from August 21 to September 30, 2023, at the South Jakarta Regional Health Center. The intervention group received the ISWT protocol in addition to standard care, while the control group received only standard care without the ISWT. The ISWT followed the standardized procedure described by Holland et al. (2014), in which participants walk back and forth along a 10-meter course with gradually in-creasing speed guided by audio signals. VO2-max was estimated using a validated prediction formula based on the distance achieved during the ISWT (for the intervention group). Comfort was measured using the Shortened General Comfort Questionnaire (SGCQ), which had been tested for validity and reliability, with a Cronbach alpha value of 0.840 (≥ 0.7), which indicates good internal consistency. The reli-ability coefficient was r = 0.917, which exceed-ed the acceptable range of r = 0.411–0.708.

This study received ethical approval from the Health Polytechnic of Yogyakarta and formal permission from the South Jakarta Regional Health Center. The data used in this study were analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY). A univariate analysis was performed to describe the distribution of each variable. and the bivariate analysis was performed using a paired t-test to examine differences in the dependent variables, VO2max and comfort, before and after the treatment. The level of statistical significance was set at $p < 0.05$, and the normality assumptions were tested using the Shapiro-Wilk test prior to conducting parametric tests.

Results

The aim of this study was to examine the demographic and clinical characteristics of the participants in both the intervention and control groups to ensure comparability before the intervention. These characteristics include sex, age, body mass index (BMI), and smoking status. Understanding these baseline profiles is essential for accurately interpreting the outcomes of the intervention.

Table 1 shows that most participants in the control group were female, accounting for 22 (73.3%) of the 30 participants. In the intervention group, 15 of the 30 participants (50.0%) were female. Regarding age distribution, the largest proportion of the participants in the control group were aged 56–65 years and > 65 years, with each age group consisting of 15 participants (50%) and 11 participants (36.7%) respectively. Of the 30 participants in the intervention group, 8 (26.7%) were aged > 65 years. In terms of BMI status, most participants were classified as obese, with 14 participants (46.7%) in the intervention group and 13 (43.3%) in the control group having an obese BMI status.

Table 1. Patients' Characteristics

Variable	Intervention		Control		Total	
	n	%	n	%	n	%
Sex						
Male	15	50.0	8	25.7	23	38.3
Female	15	50.0	22	73.3	37	61.7
Age (years)						
45–55	15	50.0	4	13.3	19	31.7
56–65	7	23.3	15	50.0	22	36.7
>65	8	26.7	11	36.7	19	31.7
Body mass index						
Under weight	1	3.3	0	0.0	1	1.7
Normal weight	10	33.3	11	36.7	21	35.0
Overweight	5	16.7	6	20.0	11	18.3
Obesity	14	46.7	13	43.3	27	45.0
Smoking						
Yes	7	23.3	9	30.0	16	26.7
No	23	76.7	21	70.0	44	73.3

Table 2. Patients' Distance Traveled, VO_2max, and Comfort Before and After the ISWT

Time	Variable	Group	Mean	Median	SD	Range	95% Confidence Interval
ISWT Early	Mileage	Intervention	225.03	227.00	44.28	53–283	208.50–241.57
		Control	257.47	270.00	45.37	155–343	240.53–274.41
ISWT Final	Mileage	Intervention	332.20	351.00	80.29	96–446	302.22–362.18
		Control	280.07	278.50	52.12	194–414	260.60–299.53
ISWT Early	VO_2max	Intervention	10.73	10.79	1.32	5.57–12.47	10.23–11.22
		Control	11.70	12.08	1.85	8.63–14.27	11.19–12.21
ISWT Final	VO_2max	Intervention	13.94	14.51	2.41	6.86–17.36	13.04–14.84
		Control	12.38	12.33	1.56	9.80–16.40	11.79–12.96
ISWT Early	SpO_2 before ISWT	Intervention	98.23	98.00	0.97	95–99	97.87–98.60
		Control	98.33	99.00	1.06	95–99	97.94–98.73
	SpO_2 after ISWT	Intervention	98.97	99.00	1.00	96–102	98.23–98.97
		Control	98.53	99.00	0.68	97–99	98.28–98.79
ISWT Final	SpO_2 before ISWT	Intervention	98.17	98.00	0.83	97–99	97.86–98.48
		Control	97.27	97.50	0.96	96–99	97.27–97.99
	SpO_2 after ISWT	Intervention	98.27	98.00	0.64	97–99	98.03–98.51
		Control	97.83	98.00	0.74	97–99	97.55–98.11
ISWT Early	Comfort	Intervention	79.70	81.50	5.15	68–87	77.78–81.62
		Control	79.87	80.50	5.33	68–90	77.87–81.86
ISWT Final	Comfort	Intervention	108.63	110.00	9.01	89–130	105.27–112.00
		Control	84.22	84.00	3.15	78–91	83.06–85.41

As presented in Table 2, the mean distance covered by the participants in the intervention group during the initial ISWT was 225.03 m, which increased to 332.20 m after the final ISWT. In the control group, the mean distance improved modestly, from 257.47 m at baseline to 280.07 m post-intervention.

Regarding VO2max, the intervention group demonstrated an increase from a mean of 10.73

mL/kg/min at baseline to 13.94 mL/kg/min after the final ISWT. In comparison, the control group exhibited a smaller improvement, from 11.70 mL/kg/min to 12.38 mL/kg/min.

For oxygen saturation (SpO_2), the intervention group had a pre-ISWT mean of 98.23% and a post-ISWT mean of 98.97% at baseline, and 98.17% before and 98.27% after the final ISWT. The control group showed pre- and post-ISWT saturation levels of 98.23% and 98.53% at baseline, and 97.27% and 97.83% after the final ISWT, respectively. Overall, all the participants maintained normal SpO_2 levels (> 95%) throughout the study.

Comfort levels, as assessed using the SGCQ, increased significantly in the intervention group from a baseline mean score of 79.70 to 108.63 post-intervention. In the control group, the mean comfort score also increased, albeit to a lesser extent, from 79.87 to 84.22.

As shown in Table 3, the bivariate analysis results indicated a notable improvement in VO2max within the intervention group. The mean VO2max increased from 10.73 mL/kg/min before the ISWT to 13.95 mL/kg/min after the intervention. In the control group, VO2max also increased, albeit to a lesser extent, from 11.70 mL/kg/min to 12.38 mL/kg/min. The statistical analysis revealed a significant difference in VO2max both within and between the intervention and control groups before and after the ISWT, with p values < 0.05 (p = 0.001 and p = 0.043, respectively).

Similarly, comfort levels, as assessed using the SGCQ, showed significant improvements in the intervention group, with the mean score increasing from 79.70 at baseline to 108.63 post-intervention. By contrast, the control group experienced a smaller increase in comfort, from 79.87 to 84.23. The difference in comfort scores before and after the ISWT between the two groups was statistically significant, with a p value of 0.001 for both variables.

Table 4 presents the results of the bivariate analysis for comparison of the mean differences before and after the intervention. The mean change in VO2max in the intervention group was 3.21 mL/kg/min, whereas that in the control group was 0.68 mL/kg/min. The statistical analysis confirmed a significant difference in VO2max change between the two groups, with a p value of 0.001 (p < 0.05). Similarly, the mean difference in comfort score, as measured with the SGCQ, was 28.93 points in the intervention group and 4.37 points in the control group. This difference was also statistically significant, with a p value of 0.001 (p < 0.05), indicating a greater improvement in comfort among the participants who underwent the ISWT intervention.

Table 3. Differences in the Patients' VO2max and Comfort Before and After the ISWT

Variable	Group	n	Mean	SD	p
VO2max	Intervention				
	Pre-ISWT	30	10.73	1.3	0.001
	Post-ISWT	30	13.95	2.41	
	Control				
	Pre-ISWT	30	11.70	1.36	0.043
	Post-ISWT	30	12.38	1.56	
Comfort	Intervention				
	Pre-ISWT	30	79.70	5.15	0.001
	Post-ISWT	30	108.63	9.01	
	Control				
	Pre-ISWT	30	79.87	5.34	0.001
	Post-ISWT	30	84.3	3.15	

Table 4. Analysis of the Differences in VO2max and Comfort Between the Control and Intervention Groups Before and After the ISWT

Variable	Group	n	Mean	SD	p value
VO2max	Intervention	30	3.21	1.85	0.001
	Control	30	0.68	1.76	
Comfort	Intervention	30	28.93	7.97	0.001
	Control	30	4.37	3.95	

Discussion

The ages of the participants in this study were relatively similar. Most participants in the control group were between 56 and 65 years old, with a mean age of 64.2 years, while those in the intervention group were between 45 and 55 years old, with a mean age of 55.1 years. These age characteristics are consistent with the findings of Rodrigues et al. (2015), who reported that most individuals who participated in the ISWT were between 60 and 65 years of age. Theoretically, age plays a significant role in the development of arterial diseases, as it is associated with structural and functional changes in the arteries, including reduced lumen diameter, increased arterial wall thickness, greater arterial stiffness, and alterations in endothelial function (Rodrigues et al., 2015).

Most respondents in this study were female, comprising 22 patients (73.3%) in the control group and 15 (50%) in the intervention group. These findings differ from those of So (2015) study, which reported that 80% of the 30 respondents were male (24 males and 6 females). This discrepancy may be attributed to the differences in population characteristics and research contexts between the studies. Owing to the predominance of male participants, So (2015) study might have reflected higher levels of physical activity. By contrast, the present study included more females because the participants were recruited from health-care facilities where the proportion of female patients, particularly among older adults, was higher, as women are more likely to access cardiac rehabilitation services. In addition, gender differences may be influenced by social roles, risk perceptions, and the willingness to participate in intervention programs. So (2015) study found a significant association between sex and VO2max ($p = 0.001$; $\alpha = 0.05$), indicating that sex can affect cardiorespiratory capacity. Therefore, the sex distribution observed in this study should be considered when interpreting the intervention outcomes in terms of VO2max.

Theoretically, females have an approximately 20% lower VO2max capacity than males. This difference is primarily attributed to hormonal variations, which result in lower hemoglobin concentrations and higher body fat percentages in females. In addition, females typically have less muscle mass than males (Wan et al., 2015). VO2max differences between the sexes become evident from around the age of 10 years, with boys exhibiting a 12% higher VO2max than girls. By age 12 years, the gap increases to approximately 20%, and by age 16 years, boys' VO2max is approximately 37% higher than that of females (Wan et al., 2015).

Smoking is one of the most common risk factors of CAD in male patients. However, most respondents in this study were nonsmokers, as all female participants in both the control (70%) and intervention groups (76.7%) were nonsmokers. These findings are consistent with a previous study by Bajaj et al. (2016) in Punjab, North India, where 44% of male respondents were smokers, and none of the female respondents smoked. This pattern may be influenced by sociocultural norms, where smoking among women is less socially acceptable. Despite not smoking, female patients may still develop CAD due to other risk factors, such as hypertension, high cholesterol, hyperlipidemia, dia-

betes mellitus, and a family history of CAD. These findings are consistent with other studies conducted in regions where smoking is uncommon among female populations (Bajaj et al., 2016). In the present study, the statistical analysis revealed a significant correlation between smoking status and VO2max among the CAD patients, with a p value of < 0.001 ($\alpha = 0.05$).

The findings of this study differ from those reported by Nery et al. (2015) that showed that 42% of respondents in the control group and 50% of those in the intervention group were smokers. By contrast, in the present study, only 23.3% of the patients in the intervention group and 30.0% of those in the control group were smokers. Nery et al. (2015) also identified a significant correlation between smoking status and VO2max in CAD patients, with a p value of < 0.001, suggesting that smoking negatively impacts cardiorespiratory fitness. This inconsistency may be explained by demographic and cultural differences, particularly regarding gender-related smoking behaviors. Supporting this, in a study involving 94 smokers, Mohammad et al. (2015) reported that smoking was less prevalent among women, noting that smoking remains relatively uncommon in female populations. In the present study, the higher proportion of female participants might have contributed to the lower overall smoking rates observed. Therefore, the sex composition of the sample likely influenced the prevalence of smoking and should be considered when analyzing the relationship between smoking and VO2max in CAD patients.

The results of this study show that the BMI statuses of the 30 patients in the intervention group and most of the patients in the control group indicated obesity. In particular, 14 patients (46.7%) in the intervention group and 13 (43.3%) in the control group were classified as obese. According to BMI classification, a person is considered obese if their BMI exceeds 30 kg/m2. Obesity is associated with increased blood volume and cardiac output, which result from higher metabolic activity and adipose tissue accumulation. These factors can lead to hemodynamic changes in CAD patients, such as left ventricular remodeling, increased myocardial wall stress, and physical discomfort (Plourde et al., 2014). A study conducted at the University Hospital in Gyeonggi-do, South Korea, from January 2, 2010, to December 31, 2012, found that age and BMI significantly correlated with an increased risk of CAD (Lee et al., 2015).

Effect of ISWT on VO2max. The results of this study show that the mean VO2max measurement in the intervention group was 10.73 ± 1.33 mL/kgBW/min before ISWT and 13.95 ± 2.41 mL/kgBW/min after ISWT. Meanwhile, the mean (±SD) VO2max measurement in the control group was 11.70 ± 1.36 mL/kgBW/min before ISWT and 12.38 ± 1.56 mL/kgBW/min after ISWT. The statistical results indicate significant differences in mean VO2max before and after ISWT in both groups ($p < 0.001$ and $p = 0.043$).

Theoretically, several physiological responses associated with physical activity training occur in the heart, including increased heart rate, changes in stroke volume, alterations in blood flow distribution during exercise, and long-term adaptations resulting from training. Appropriate physical activity can enhance the efficiency of oxygen exchange at the tissue and skeletal muscle levels, thereby increasing VO2-max, improving cardiorespiratory capacity, and optimizing lung expansion. VO2max typically peaks after 3 months of ISWT training, with improvements ranging from 10% to 30% and a mean increase of 20% (Nery et al., 2015). According to the results of a systematic review by Oliveira et al. (2014), the relationship between the ISWT and VO2max is moderate to strong. In another study, the ISWT demonstrated 83% to 91% accuracy in predicting VO2max at distances between 450 and 490m (Tilborg et al., 2014).

The improvement in VO2max observed in this study is in line with the results of Osailan et al. (2023) who investigated myocardial func-

tion and cardiopulmonary responses using the ISWT and a treadmill-based ISWT (ISWT-T). Their study reported no significant differences in cardiopulmonary parameters between the two testing modalities, except for VO2max, which was higher in the ISWT group (25.4 ± 5.8 vs. 23.7 ± 5.1; $p = 0.05$). They also found that age and height were significantly correlated with the distance achieved in both the ISWT and ISWT-T (age: $r = -0.72$ vs. -0.73, $p \leq 0.05$; height: $r = 0.68$ vs. 0.68, $p \leq 0.05$), while leg length was only correlated with the distance achieved in the ISWT-T ($r = 0.59$, $p \leq 0.05$).

The type of intervention and therapy that patients with CAD receive influences their heart functional capacity. For example, Lewis et al. (2021) reported a lower mean heart functional capacity compared to that reported by Osailan et al. (2023). This difference may be attributed to the characteristics of the patient population in Lewis et al. (2021) study, in which participants had anterior and inferior myocardial infarctions and received more intensive treatments, including coronary artery bypass grafts, percutaneous coronary interventions, beta-blockers, Angiotensin-Converting Enzyme (ACE) inhibitors, statins, and anticoagulants. In contrast, the patients in the present study had less severe conditions and received different therapeutic regimens. Additionally, variations in age and clinical history may have contributed to the observed differences in functional capacity outcomes.

Several studies have yielded meaningful results despite variations in the types of exercises and tests used to assess heart functional capacity. In a study on Tai Chi Chuan exercise, Nery et al. (2015) reported a significant increase in VO2-max from 21.6 ± 5.2 mL/kg body weight/min to 24.6 ± 5.2 mL/kg body weight/min in the intervention group, indicating an improvement of 14%. A statistical analysis indicated a significant difference in heart functional capacity between the two groups ($p < 0.001$).

Effect of the ISWT on Comfort. Daily activities are influenced by a person's physical fitness. A person's functional capacity can be assessed using several parameters, such as maximum oxygen uptake, metabolic equivalents of task, and training distance traveled. The training test generally performed is the 6-min walking test (6MWT), while the training test that is now widely used is the ISWT. The advantage of the ISWT is that it is externally paced; thus, it can reflect a person's exercise tolerance better than the 6MWT. Various factors influence cardiorespiratory fitness, including humidity, temperature, hemoglobin level, and blood lactate levels, as well as demographic and Anthropometric characteristics, such as age, sex, height, and weight. This research focuses on demographic and anthropometric factors.

The comfort of CAD patients in the control group was assessed using the SGCQ, and the results were statistically significant. Before the ISWT intervention, the control group had a mean (±SD) score of 54.2 ± 6.4, which increased to 58.0 ± 6.3 after the intervention. In the intervention group, the mean (±SD) score before the ISWT treatment was 53.4 ± 5.6, which increased to 61.6 ± 5.2 after the treatment.

Physical comfort plays a central role in influencing both physiological and psychological aspects of comfort. These three dimensions are strongly correlated. For instance, physical pain can trigger negative emotions such as depression and anxiety, which in turn may worsen physiological responses. Conversely, psychological states such as happiness and relaxation can help reduce physical discomfort. Therefore, improving physical comfort can lead to enhanced physiological and psychological well-being (Krinsky et al., 2014; Pedrazza et al., 2015).

However, this study has several limitations that must be acknowledged, as they could affect the interpretation and generalizability of the findings. First, the sample size of 60 patients (30 in each group) limited the statistical power and

external validity of the results. A larger sample would have provided more robust estimates and allowed for subgroup analyses. Second, the age range and sex distribution of the participants, most of whom were female and middle-aged to elderly, might have limited the generalizability of the findings to younger populations or male-dominant CAD cohorts. Cultural and behavioral differences, such as the low prevalence of smoking among the female participants, also reflect region-specific patterns that may not be applicable to broader or more diverse populations.

In spite of these limitations, the study contributes theoretical insights to nursing practice by supporting the physiological and psychological benefits of structured exercise interventions, particularly the ISWT, in the management of CAD patients. The findings align with the theoretical framework that links improved oxygen uptake, cardiovascular efficiency, and physical comfort to enhanced functional capacity and quality of life in patients with chronic CAD. The increased VO2max and comfort scores in the intervention group confirm that the ISWT can be integrated into cardiac rehabilitation programs, with nursing professionals playing a pivotal role in monitoring progress and ensuring adherence.

In clinical practice, nurses can use the ISWT as a standardized, cost-effective, and easy-to-administer tool for assessing exercise tolerance and guiding individualized care plans. Moreover, understanding the interplay between physical fitness, comfort, and patient demographics enables nurses to deliver more holistic and patient-centered interventions. Future research is recommended to examine the long-term effects of the ISWT in larger, more-heterogeneous samples and to explore psychosocial variables that influence comfort and rehabilitation outcomes in CAD patients.

Conclusion

The results of this study demonstrate that the ISWT can significantly improve cardiac functional capacity and enhance patient comfort. This was evidenced by the statistical analysis results that showed significant differences in the changes in VO2max and comfort levels between the control and intervention groups ($p < 0.05$).

These findings suggest that the ISWT program has a positive impact on improving VO2max and comfort of the CAD patients in this study during cardiac rehabilitation. Thus, it can be effectively integrated into nursing services, particularly in heart health clubs. Future studies should explore alternative or modified rehabilitation programs to further improve VO2max and comfort in CAD patients.

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The Effect of Nursing Process Education on Students' Perceptions of Nursing Diagnoses

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Abstract

The aim of this study is to evaluate the effect of nursing process education on nursing students' perception of nursing diagnoses. This quasi-experimental study was conducted with the second-year students who took the course of internal medicine nursing. One hundred and eleven second-year students (91.72%) who were attending a nursing faculty were included in the pretest. Each of the training sessions given to the students lasted for 60 minutes, and a total of 12 sessions of training were applied as three sessions per week. The online training was given to students by an educator with a presentation and case discussion. Afterwards, the post-test was carried out with a total of 98 (73.68%) students. Data were collected by using a 'Descriptive Characteristics Form' and the 'Perceptions of Nursing Diagnosis Survey'. In the statistical analysis of data, number, percentage, mean score and paired t-test were used. There was no statistical difference between the pretest and posttest total scores of the "Perceptions of Nursing Diagnosis Survey" before and after the online training for the nursing care plan process ($p > 0.05$). Students had a perception of nursing diagnoses at a moderate level. It was concluded that the case-based interventions had limited effects. The learning and use of the nursing diagnosis process by both nursing students and nurses facilitates its applicability in the field and makes it easier for nurses to provide more evidence-based care in the clinic. It is recommended that the teaching techniques used in the study be enriched and developed.

Keywords: education, nursing diagnosis, nursing process, nursing students, perception

Abstrak

Pengaruh Pendidikan Proses Keperawatan terhadap Persepsi Mahasiswa tentang Diagnosis Keperawatan. *Tujuan dari penelitian ini adalah untuk mengevaluasi pengaruh pendidikan proses keperawatan terhadap persepsi mahasiswa keperawatan tentang diagnosis keperawatan. Penelitian kuasi-eksperimental ini dilakukan pada mahasiswa tahun kedua yang mengambil mata kuliah keperawatan penyakit dalam. Seratus sebelas mahasiswa tahun kedua (91,72%) yang mengikuti pendidikan di fakultas keperawatan diikutsertakan dalam* pre-test*. Setiap sesi pelatihan yang diberikan kepada mahasiswa berlangsung selama 60 menit, dan total 12 sesi pelatihan diterapkan sebanyak tiga sesi per minggu. Pelatihan* online *diberikan kepada mahasiswa oleh seorang pendidik dengan presentasi dan diskusi kasus. Setelah itu,* post-test *dilakukan dengan total 98 (73,68%) mahasiswa. Data dikumpulkan dengan menggunakan 'Formulir Karakteristik Deskriptif' dan 'Survei Persepsi Diagnosis Keperawatan'. Dalam analisis statistik data, jumlah, persentase, skor rata-rata dan uji-t berpasangan digunakan. Tidak ada perbedaan statistik antara skor total* pre-test *dan* post-test *dari "Survei Persepsi Diagnosis Keperawatan" sebelum dan sesudah pelatihan* online *untuk proses rencana asuhan keperawatan ($p > 0,05$). Mahasiswa memiliki persepsi tentang diagnosis keperawatan pada tingkat sedang. Disimpulkan bahwa intervensi berbasis kasus memiliki efek yang terbatas. Pembelajaran dan penggunaan proses diagnosis keperawatan oleh mahasiswa keperawatan dan perawat memfasilitasi penerapannya di lapangan dan memudahkan perawat untuk memberikan perawatan yang lebih berbasis bukti di klinik. Disarankan agar teknik pengajaran yang digunakan dalam penelitian ini diperkaya dan dikembangkan.*

Kata Kunci: *diagnosis keperawatan, mahasiswa keperawatan, pendidikan, persepsi, proses keperawatan*

Introduction

Nursing profession is the discipline of care based on providing comprehensive care to the individual, family, and community (Melita-Rodriguez et al., 2021). Nurses are responsible for under-

standing people' status of health or illness, identifying their requirements, planning the necessary practices, and solving their problems from the birth to the death (Köse & Çelik, 2020). Modern nursing needs to show a systematic approach to provide the best care to people through the nursing process. The use of the nursing process by nurses while caring for the patient ensures correct decision making and prevents malpractices (Karaca & Aslan, 2018; Karakurt et al., 2020; Yilmaz et al., 2015).

The nursing process is a widely recognized theoretical model in nursing education and plays a key role in the nurse's competence (Löfgren et al., 2023; Yurtsever & Karagözoğlu, 2020). This process refers to the use of scientific problem-solving method in nursing care (Ardahan et al., 2019; Basit & Korkmaz, 2021; Köse & Çelik, 2020). The process consists of five stages: data collection, diagnosis, planning, implementation, and evaluation. The success of each stage is closely related to whether or not the preceding stage is done correctly. The most important benefit of the nursing process that provides scientific concreteness to nursing practices is to provide individual-centered nursing care (Benedet et al., 2018; Erer et al., 2017).

In addition, the nursing care given within the frame of a plan contributes to time management and communication between team members. Thus, the nursing profession is provided with more professional progress (Melin-Johansson et al., 2017). However, today, the nursing process cannot be applied effectively due to different reasons (Baraki et al., 2017). Nurses acquire the knowledge and skills, which are necessary for using the nursing process, during undergraduate nursing education. Students are expected to use the knowledge and skills, they would gain during their education, in their professional lives.

The nursing process is the most basic and only method that enables nurse educators to teach their students to identify the patients' problems and plan solutions for them. Many nursing schools that provide undergraduate education aim to train professional nurses who can determine the nursing care requirements of a healthy or sick person, and plan, implement, and evaluate these requirements in accordance with the standards (Basit & Korkmaz, 2021; Karakurt et al., 2020). In order to increase the use of the nursing process in the field of practice, it is necessary to train nurses who understand the philosophy of the nursing process and know how to apply it (Löfgren et al., 2023).

Nursing education aims to enable students to acquire professional nurse qualifications by establishing a connection between both theoretical knowledge and clinical practice (Carless-Kane & Nowell, 2023; Pai et al., 2017). Moreover, all student nurses must be clinically competent in order to meet the clinical needs of patients (Shahsavari et al., 2017). Clinical self-efficacy has a very important place in the care behaviors of nursing students (Abdal et al., 2015). Determining the self-efficacy levels of students regarding their clinical performance is an effective approach in identifying their level of transfer of theoretical knowledge to practice. In this sense, evaluating students' self-efficacy perceptions regarding their clinical performance has become more and more important (Pozam & Zaybak, 2016).

Studies have reported that as students' levels of clinical self-efficacy perception increase, they become more clinically competent and their anxiety levels regarding clinical practice lower (Açıksöz et al., 2016; Mohamadirizi et al., 2015). It is thought that nursing students' competence in determining nursing diagnoses will positively affect their self-efficacy in clinical practice and enhance the quality of care provided to individuals. However, studies have shown that students have problems in their knowledge and practices regarding the nursing process (Yilmaz et al., 2015; Yilmaz et al., 2019). Nurses and nursing students could not achieve the desired level of success in their knowledge of the nursing process (Zamanzadeh et al., 2015).

In the literature, it was found that students had problems in making the correct nursing diagnosis. Their ability to determine nursing diagnoses, descriptive characteristics, related factors, outcome criteria, planning/implementation and evaluation rates were at moderate level (Erer et al., 2017; Lotfi et al., 2019; Yilmaz et al., 2015). Also, the students were inadequate in determining the interventions for nursing diagnoses (Ardahan et al., 2019; Lotfi et al., 2019). In this context, the aim of the study is to evaluate the effect of the nursing process training on nursing students' perception of nursing diagnoses.

Methods

The research was designed as a quasi-experimental study with a one-group pretest-posttest design. Second-year students studying at a nursing faculty were included in the study. They had no prior clinical experience. In Türkiye, nursing students complete their education in eight semesters. More than 800 students in total were receiving education in Turkish in the present study. They were Turkish and Turkish Cypriot from the similar cultural background. Students graduate by taking a total of seven applied courses and two main courses (excluding for first year) throughout their education period. According to the content of the course, training is provided in the nursing process.

Three over four of the students studying at the faculty, where the study was conducted, are foreign nationals and come to the Turkish Republic of Northern Cyprus (TRNC) for educational purposes. The international validity of the postgraduate diploma here is considered an important choice. Since the study was carried out especially in the second year of the pandemic, Diluted Hybrid Education Model was decided for preventing students from coming here. This situation has shaped the model of education and indirectly the way of working.

The population of the study was composed of second-year students (N = 133) who were studying in Turkish language and took the course of Internal Medicine Nursing. One hundred and eleven (91.72%) second-year students who studied at a nursing faculty and voluntarily agreed to participate (as pretest) were included in the study. Five of the students had to withdraw from the study due to technical reasons caused by using a phone application and eight students also had to withdraw from the study since they did not want to continue. The post-test was carried out with a total of 98 (73.68%) students. A "Descriptive Characteristics Form" and the "Perceptions of Nursing Diagnosis Survey" were used as data collection tools.

Descriptive Characteristics Form. It was prepared by the researcher upon the literature review (Karaca & Aslan, 2018; Karakurt et al., 2020). This form contains questions about descriptive characteristics nursing students such as age, gender, nationality, marital status, high school they graduated from, status of choosing the profession willingly, and environmental factors affecting their choice of profession.

Perceptions of Nursing Diagnosis Survey. The "Perceptions of Nursing Diagnosis Survey", developed by Frost et al. (1991), consists of a total of 30 items. Cronbach's alpha coefficient was 0.94 and Cronbach's alpha coefficients of the subscales ranged from 0.79 to 0.92. The Turkish validity and reliability study of the scale was conducted by Akın-Korhan et al. (2013) and they determined the Cronbach's alpha value of the study as 0.84. The scale includes four subscales that assess the ease of use of nursing diagnoses and the perceptions of their benefits to the professional care process.

In the scale, there are 9 items in the subscale on the perceptions of the effects of the diagnoses on the definition and promotion of the nursing profession. Moreover, there are eight items in the subscale that assess perceptions of the patient's facilitation in clearly defining his condition. Also, there are 8 items in the subscale that assess perceptions regarding the ease of use of diagnosis and 5 items related to the conceptual

aspect of diagnoses. This is a five-point Likert (strongly agree/strongly disagree) type scale. A low total score indicates that nursing diagnoses are perceived positively by nurses.

The descriptive characteristics form was applied to10 students in order to assess its readability in the pilot study. These students were included in the sample because no question was not revised. Data was collected online via Google-forms. Afterwards, the students received training on nursing diagnoses and the process. The "Perceptions of Nursing Diagnosis Survey" was applied online to the students as a part of the posttest at the end of the training.

Data collection in this study was based on self-report method, which may be associated with response bias. To reduce the possibility of this bias, students were informed that all data will be collected anonymously, and the data would not be associated with their university years, particularly. And also, during the data collection process, the researchers accompanied the students as observers.

SPSS 22.00 software was used to analyze the data. In the data analysis, number, percentage frequency, standard deviation, mean, appropriate parametric or non-parametric tests were used according to the distribution of the data. The Kolmogorov–Smirnov normality assessment test was conducted to determine whether the data were normally distributed. Independent-sample t-test was used to assess differrences with significance level of $p < 0.05$.

Content of the Training. The students took eight hours of theoretical lessons and 16 hours of practical lessons per week, 14 weeks in a semester. However, they continued with distance education due to the COVID-19 pandemic.

Table 1. Training in the Nursing Process of the Cases

Case	Nursing Diagnoses and Process
Case 1: Acute myocardial infarction	Within the scope of the first case, all findings were explained on the patient data collection form. Every diagnostic finding was presented as a nursing diagnosis. While explaining the diagnoses, the researcher explained the basis on which nursing diagnoses are based. She explained in which direction the aim was determined in the problem to be eliminated in nursing diagnoses. Interventions were identified and implementation and evaluation stages were explained.
Case 2: Liver cirrhosis	Within the scope of the second case, all findings were explained on the patient data collection form. During the determination of the nursing diagnosis, the students were brainstormed, and a nursing diagnosis was made with their participation. After the researcher explained the case, the students were assigned tasks in the subject given as the second case so that there would be at least one nursing diagnosis and homework was given. The planning, implementation and evaluation stages of the interventions were explained online by the students using power point materials with the participation of the other students. The researcher corrected wrong and missing matters while the students were giving lectures.
Case 3: Cerebrovascular accident	The researcher explained the presentation of the case. Nursing diagnoses were determined by the students. The attempts of the determined nursing diagnoses were given to different students and their development was supported. The researcher corrected wrong and missing matters while the students were giving lectures.
Case 4: Chronic obstructive pulmonary disease	The researcher explained the presentation of the case. Nursing diagnoses were determined by the students. The attempts of the determined nursing diagnoses were given to different students and their development was supported. The researcher corrected wrong and missing matters while the students were giving lectures.

After the theoretical part of the course, training with case presentations was given to the students for four hours per day, three days a week, totaling 12 hours for one month. The examples chosen for the case discussions aiming for educational purposes were selected from the main topics.

Application Protocol. The students were informed about six important system issues and disease information. The nursing process was explained in detail before the case presentation.

The first author explained the cases and used PPTs to help students understand all the cases in detail. She made eye contact with them and asked questions about the cases to motivate them during the presentations. After the case presentations, she gave them 10 minutes to think about the case. Then, students were encouraged to discuss the cases. They determined nursing diagnoses for the cases and planned the nursing process (Table 1). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline was followed to report this study.

Ethical Consideration. Ethical approval from the University Ethics Committee (Number: YDU/2021/97-1445; Date: November 25, 2021) and institutional permission from the Faculty of Nursing, where the study would be conducted were obtained, in order to conduct the study. In addition, the participants were volunteer students.

Results

The mean age of the students was 20±2.73 years, and more than half of them (60%) were female. 76.5% of the students were citizens of the Republic of Turkey (TR) and 40% of them graduated from a regular high school. The majority of the students chose the profession willingly and their parents were effective in their choice of profession (63.2%) (Table 2).

There was no statistical difference between the pretest and posttest scores in terms of total scale score ($p > 0.05$). However, in the ease-of-use subscale, the difference between the pre-test and posttest scores was statistically signi-ficant ($p < 0.05$) (Table 3).

Discussion

Nursing education consists of a comprehensive four-year process. In this process, all stages of the theoretical preparation of the nursing process

Table 2. Distribution of Data on Socio-demographic Characteristics of Student Nurses (n = 111)

Variables	n	%
Age		
Mean age 20±2.73		
Gender		
Female	67	60
Male	44	40
Nationality		
Republic of Turkey	85	76.5
Turkish Republic of Northern Cyprus	23	20.7
Other	3	2.8
High School from which the student graduated		
Super high school	3	2.8
General high school	45	40.5
Private high school	23	20.7
Health vocational high school	37	33.3
Choosing the profession willingly		
Yes	98	88.2
No	13	11.8

Table 3. Nursing Students' Perceptions of Nursing Diagnoses Before and After Training and Their Effects on Subscales

Scale and its subscales	Before the training X±SD	After the training X±SD	p
Definition and introduction of the nursing profession	3.22±0.43	1±0.42	0.10
A clear description of the patient's condition	3.14±0.44	1.29±0.38	0.05
Ease of use	2.5±0.44	1.17±0.46	0.04
Conceptual aspect	1±0.42	1.2±0.45	0.06
Total scale score	**2.83±0.29**	**1.44±0.32**	**0.08**

are discussed in detail (Yilmaz et al., 2015). The professional field courses and the hospital practices cover the nursing process. The students are asked to create their own nursing processes for the patients they care for. Due to the COVID-19 pandemic, the hours of hospital practices were reduced. During this pandemic, nursing students received distance education and carried out their clinical practices online. This situation caused students to feel inadequate in terms of clinical skills. It is human nature to be hesitant about the unknown. Students initially feel uneasy due to their inadequate knowledge of nursing diagnoses. Then, after the training, it causes them to experience the ease of use of the "nursing process."

As students work through the cases, they soon realize that determining diagnoses is not as difficult as they think. In their study, Kurtgöz and Yılmaz (2023) reported that the students from the upper classes obtained significant results in diagnoses in terms of ease of use. It is seen that the use of the nursing process in the clinical field both by students and after graduation is still at an insufficient level (Cengiz et al., 2022; Mousavizadeh, 2022). In order to eliminate the deficiencies related to the preparation of the process, online case discussions were tried to be supported.

More than half of the students participating in the present study were female. From the past to the present, the nursing profession is a role that has been chosen by society for women. However, the manpower and financial reasons have changed this perception. Although the nursing profession is preferred mostly by women, nursing is becoming more attractive for the male gender every passing day (Olğun & Adıbelli, 2020; Yıkar et al., 2020).

It was determined that the majority of students graduated from general high school. Nursing students in the studies in the literature have been reported to be graduated from different high schools (Kavurmacı et al., 2021). This is because the high school categories vary according to the countries, and the distribution of general high schools may be higher. In other words, these categories vary in Türkiye such as general high school, vocational high school, Anatolian high school, regular high school, super high school and health high school. This can lead to differences in the distribution of the high schools' students graduated from.

In this study, sociodemographic variables such as gender and educational status were investigated due to differences in the desire to learn during the education process. In other words, such variables may affect the level of benefit students receive from the education provided and the level of perception of diagnoses in this case. Contrary to this view, the level of perception of diagnoses by students is not affected by sociodemographic data differences yet from the method and content of education. In this case, the importance of examining the level of moderator effect in literature increases.

The results of the present study indicated that the students preferred the nursing profession willingly. Related studies conducted with nursing students have reported that various reasons play a role in students' choice of profession

such as the opportunity to find a job, the need for the profession, the quota of preference, and the financial return (Dikeç et al., 2017; Olğun & Adıbelli, 2020). It has been found that mostly parents are effective on students' choice of profession. The contribution of the students' acquaintance with nurses in the immediate environment and the effect of this environment on their choice of profession was found to be high at the same rate. In their study, Özdelikara et al. (2016) examined the factors affecting nursing students' career choices and reported that the scale means scores of those who were close to nurses were higher and more effective. The result of the study is compatible with the literature (Köse & Çelik, 2020).

In this study, the nursing students' perception of nursing diagnoses before and after the online training was examined and Students' mean scores on the subscales of the Perceptions of Nursing Diagnosis Survey were lower after the training than pre-training scores. The students gave more positive results with the effect of the training. However, the difference in the subscales of 'a clear description of the patient's condition' and 'ease of use' before and after the training was found to be significant. The nursing process, which is tried to be taught through-out the nursing education process, forces students because it is an abstract concept.

After students learn this process theoretically, they have difficulty in putting it into practice. Especially in hospital practice, different cases are preferred, and frequent repetitions make learning easier. In other words, students make practices in rotations in different clinics, for a longer period of time in the normal process. Therefore, efficiency can be increased by witnessing a wide variety of cases and practicing on them in different clinics for a longer period. However, due to COVID-19 quarantine measures, practices cannot be made in the hospital environment, and this deficiency was tried to be completed online.

In the study of Şahin and Khorshid (2021), in which they examined the effect of nursing process education on perceiving diagnoses, they reported that the students had significant scores after the training compared to the pre-training scores. The pre-training findings of the present study were similar to those of Köse and Çelik's (2020) study. In their study, Olmaz and Karakurt (2019) stated that although nurses felt competent in the use of care plan, they needed training. In general, the results of the present study are compatible with the results in the literature.

The significant result obtained in the ease-of-use sub-dimension of the scale, especially, may be due to the fact that the information is newly learned, especially when measured immediately after theoretical training. In pandemic conditions, being only the listening party, facilitates their perspective on cases. However, it is thought that applying the nursing process in the field may pose a threat to students and increase their anxiety level, unlike learning by imagining. Therefore, it suggests that they will have difficulty in learning and using. It may be thought that the research findings are due to the fact that they are based on a low online education model in some areas. Conducting a similar study model with face-to-face case lessons may create a difference in the results. However, it is thought that the presence of the case discussions in the clinical field may affect the situation here. It is thought that putting the knowledge that students learn in case lessons into practice on patients in the clinic will be significantly instructive.

Limitations. This study has some limitations. The cases were imaginary; therefore, implementation and evaluation stages of the nursing process could not be evaluated. Only one class of second-year students was included in the study. Therefore, the study included only second-year students taking this course and the entire population constituted this group. The fact that

the study was conducted with only second-year students of a nursing faculty and the results could not be adapted to the entire population can be considered an important limitation.

Another important limitation is that interaction could not be prevented and therefore the study was conducted with a single group and the difference between the groups could not be shown. It is thought that interaction was prevented because the individual opinions of the students were collected online. However, online data collection was conducted with the students, and they were told that there was no face-to-face contact, but it is important to fill out the forms in an unbiased manner in order to prevent bias in personal opinions. They were informed that these filled forms were a part of this course, and it was important to participate. It was stated that participation in the forms would contribute to academic success.

Conclusion

The present study revealed that students' perception of nursing diagnoses were at a moderate level. Nursing process education elevated their level of perception of nursing diagnoses. It is suggested that the educational content of nursing process should be included in the curricula for longer hours, as it contributes to the development of professionalism in nursing, providing quality care and the development of students. The findings of the study clearly show us the importance of the nursing process and that it can be improved with training for professional development. It is thought that if the evidence-based care management in the literature is combined with the nursing process, higher quality care will be provided. In addition, it enhances the quality of care within the nursing profession and results in professional satisfaction. It is thought that patient satisfaction will increase as a positive effect in this case.

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The Strategies and Interventions for Interprofessional Collaboration to Improving Patient Safety in Hospitals: A Systematic Review

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Abstract

Interprofessional collaboration strategies and interventions are carried out to improve patient safety in hospitals. This study aimed to analyze the strategies and interventions used in interprofessional collaboration to improve patient safety. Interprofessional collaboration strategies and interventions were searched using five English-language databases, eligible studies were extracted, and the risk of bias was independently evaluated by two authors. The literature search yielded a total of 10,729 registered papers. We conducted an analysis on 3,793 health professionals. The following articles were included: 1) articles that described an intervention interprofessional collaboration to improve patient safety; 2) those focused on interprofessional collaboration in hospitals; and 3) the research sample included of health care professionals (doctors, nurses, nutritionists, and pharmacists). Interventions that combine lectures, skills practice, and discussions are carried out using an online format and case study practice. The strategies and interventions identified inductively were categorized into four items: 1) team acceptance and readiness for interprofessional collaboration; 2) acting as a team and not as individuals; 3) developing protocols or guidelines for health professionals; and 4) integrating elements of interprofessional collaboration by health professionals in providing health services. The principles of interprofessional collaboration include the need to prioritize structures, processes, and tools that enable interprofessional collaboration to be established in hospitals. Interprofessional collaboration strategies and interventions in hospitals are effective in being able to make changes to improve patient safety and the quality of service.

Keywords: hospitals, interprofessional collaboration, patient safety

Abstrak

Strategi dan Intervensi Kolaborasi Interprofesional untuk Meningkatkan Keselamatan Pasien di Rumah Sakit: Suatu Tinjauan Sistematis. *Strategi dan intervensi kolaborasi antarprofesional dilakukan untuk meningkatkan keselamatan pasien di rumah sakit. Penelitian ini bertujuan untuk menganalisis strategi dan intervensi yang digunakan dalam kolaborasi interprofesional untuk meningkatkan keselamatan pasien. Strategi dan intervensi kolaborasi interprofesional dicari menggunakan lima basis data berbahasa Inggris, studi yang memenuhi syarat diekstraksi, dan risiko bias dievaluasi oleh dua penulis secara independen. Pencarian literatur menghasilkan total 10.729 makalah yang telah terdaftar. Kami melakukan analisis pada 3.793 profesional kesehatan. Artikel disertakan jika: 1) menggambarkan kolaborasi interprofesional intervensi untuk meningkatkan keselamatan pasien; 2) berfokus pada kolaborasi antarprofesional di rumah sakit; 3) sampel penelitian termasuk profesional perawatan kesehatan (dokter, perawat, ahli gizi, apoteker). Intervensi yang menggabungkan perkuliahan, praktik keterampilan, dan diskusi dilakukan dengan menggunakan format* online *dan praktik studi kasus. Strategi dan intervensi yang diidentifikasi secara induktif dikategorikan menjadi empat item: 1) penerimaan tim dan kesiapan untuk kolaborasi antarprofesional; 2) bertindak sebagai tim dan bukan sebagai individu; 3) mengembangkan protokol atau pedoman untuk profesional kesehatan; dan 4) mengintegrasikan elemen-elemen kolaborasi antarprofesional oleh profesional kesehatan dalam memberikan layanan kesehatan. Prinsip-prinsip kolaborasi antarprofesional perlu memprioritaskan struktur, proses, dan alat yang memungkinkan kolaborasi interprofesional terjalin di rumah sakit. Strategi kolaborasi dan intervensi interprofesional di rumah sakit efektif dalam dapat melakukan perubahan untuk meningkatkan keselamatan pasien untuk kualitas layanan yang lebih baik.*

Kata Kunci: *keselamatan pasien, kolaborasi interprofesional, rumah sakit*

Introduction

The incidence of patient safety reported by the World Health Organization (WHO) is estimated at 134 million due to unsafe care, and about 2.6 million causing death. These patient safety incidents occur worldwide, not only in the United States, Europe and Asia, but also in Indonesia (WHO, 2021). Indonesia recorded the following patient safety incidents: near miss events (31.67%), adverse events (31.73%), and sentinel events (3.05%), with an average increase of 25% in the number of patient safety incidents every year (Daud, 2020). Patient safety is an important element in health services because it involves human safety. The priority of patient safety is to minimize risks and prevent patient safety incidents caused by errors resulting from carrying out an action or taking actions that should not be taken (WHO, 2021).

Patient safety incidents that occur are events or conditions caused by health workers from various professions, including doctors, nurses, pharmacists, nutritionists, and other health workers. Patient safety incidents that occur include medical errors, diagnosis errors, medication errors, transfusion errors, patient falls, medication administration errors, and patient identification errors (WHO, 2020). As a direct services provider, the interprofessional collaboration of every health professional is really needed through their participation, involvement, and meetings. Rather than just cooperation and communication, efforts are also needed to implement standard protocols, safe medication management, and positive relationships in the implementation of strategic forms and interprofessional collaboration interventions to improve patient safety in hospitals (Ansa et al., 2020; Kartika, 2019). The study of articles in this review shows that the collaboration strategy used for success in health services, especially for patient safety, can be used with various strategies, both through seminars to increase understanding and through training.

Interprofessional collaboration is a relationship in which each party respects the skills of the other party by recognizing and accepting the scope of the activities and responsibilities of each in achieving common goals. Furthermore, in the collaborative process, several indicators must be met, such as 1) interaction by providing information, asking and giving opinions, giving directions or orders, making decisions, educating, and providing support or approval; 2) a practice environment where each profession has a different field of practice with its own regulations, authority, and expertise, but certain tasks can be carried out together the same; 3) common interests, namely working together to provide satisfaction to all parties; and 4) common goals, which are more patient-oriented and can help determine responsibilities according to each individual's expertise (Dinius et al., 2020; Sillero & Buil, 2021).

The collaboration process is an initiative strategy formed by the WHO, together with the governments of England and Northern Ireland in the Global Patient Safety Collaborative (GPSC), which recognizes that patient safety is an important component in providing health care towards universal health coverage (UHC) and sustainable development goals (SDGs). The main goals of the collaboration are to secure and improve global action on patient safety, reduce the risk of avoidable harm, and build a positive attitude toward improving health security systems at the country level. The overall work collaboration is organized into three strategic areas: leadership to prioritize patient safety by involving patients and families; education and training to build competent health workers and interprofessional training in the field of patient safety; and research to support evidence-based policy processes in patient safety (Soko et al., 2021; WHO, 2020).

Interprofessional collaboration is a solution for improving patient safety and as a reference for higher service quality and lower costs (Hlongwa

& Rispel, 2021). According to the WHO (2020), interprofessional collaboration occurs when two or more professions work together to achieve common goals. Chetty et al. (2020) defined it as a partnership between a team of health professionals and a client in a participatory, collaborative, and coordinated approach to shared decision-making around health and social issues. Interprofessional collaboration is also able to have a better impact on care. Fathya et al. (2021) stated that the implementation of interprofessional collaboration in hospitals provided gives good results, with 67.8% partnership domain, 82.2% cooperation, 66.9% coordination, and 73.8% collaboration. However, several hospitals have not implemented this interprofessional collaboration optimally. We performed a systematic review to identify strategies and interventions for interprofessional collaboration and integration to improve patient safety. More specifically, we listed and analysed the existing strategies, interventions, and outcomes without focusing on a specific profession or disease.

Methods

Design. We conducted a systematic review using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2022 and has been registered with PROSPERO (registration number: CDR42024550886). This includes the number of professions involved in the intervention and form of intervention carried out, including various types of research design methods.

Data Sources. A search of five databases was conducted for the completion of this systematic review: Google Scholar, PMC, PubMed, Scopus, and Science Direct. The publication period was limited to 2014–2021. Therefore, the interventions could provide updated knowledge that could be adopted by everyone, and their application could be carried out in hospitals. In addition, we limited the search to 2014 because the research we conducted was sufficient to meet the objectives of our review.

We searched strategy around the following key concepts: interprofessional collaboration, patient safety, strategies and interventions interprofessional collaboration. We combined the keywords presented as "OR", "AND", and "NOT". We used keyword combinations of "interprofessional collaboration OR strategies and interventions interprofessional collaboration", "interprofessional collaboration AND patient safety", "interprofessional collaboration AND hospitals", "interprofessional collaboration OR Teamwork, strategies and interventions interprofessional collaboration AND patient safety, "strategies and interventions interprofessional collaboration AND hospitals, patient safety AND hospitals", "interprofessional collaboration OR element of interprofessional collaboration", and "interprofessional collaboration AND health professionals". The limitations that we used were English articles that were provided in the full text.

Inclusion and Exclusion Criteria. The articles that were included: 1) described an intervention interprofessional collaboration to improve patient safety; 2) focused on interprofessional collaboration in hospitals; 3) consisted of health care professionals (doctors, nurses, nutritionists, and pharmacists); and 4) were published between 2014 and 2021. Articles were excluded when: 1) the focus was on interprofessional education; 2) the research sample comprised students; and 3) the full text was not available.

The data were measured using PICO framework, which includes: 1) Population: health professionals (doctors, nurses, nutritionists, pharmacists, and other health professionals); 2) Interventions: combined lectures, skills practice, and discussions are carried out using an online format and case study practice; 3) Comparison: the principle of interprofessional collaboration need to prioritize structures, processes, and tools that enable interprofessional collaboration to be established in hospitals. Interprofessional collaboration strategies and interventions in hospitals are effective in making changes to im-

prove patient safety for a better-quality service; 4) Outcomes: the strategies and interventions identified inductively were categorized into four items (team acceptance and readiness for interprofessional collaboration, acting as a team and not as individuals, developing protocols or guidelines for health professionals, and integrating elements of interprofessional collaboration by health professionals in providing health services).

Data Extraction. The data extracted for this systematic review included the study location, participant characteristics, intervention description, duration, and research results instruments, as presented in Table 1. We synthesised the results of each study relevant to each of our outcomes. This indicates that systematic reviews with financial conflicts of interest more frequently had statistically favorable results or conclusions and lower methodological quality. When a quantitative synthesis was considered not meaningful, the results from individual studies were summarised qualitatively.

Quality Appraisal. We found that several strategies have had a significant influence on the implementation of this interprofessional collaboration in the hospital environment. Several strategies that we have reviewed are the basis for implementing interprofessional collaboration to improve patient safety. The JBI scale was used to evaluate the quality of this article. In addition, two reviewers provided an objective assessment of our review.

Results

The literature search yielded a total of 10,729 papers, of which 1,860 duplicates were removed. On screening the titles and abstracts of the remaining 5,359 records, only 2,235 were eligi-

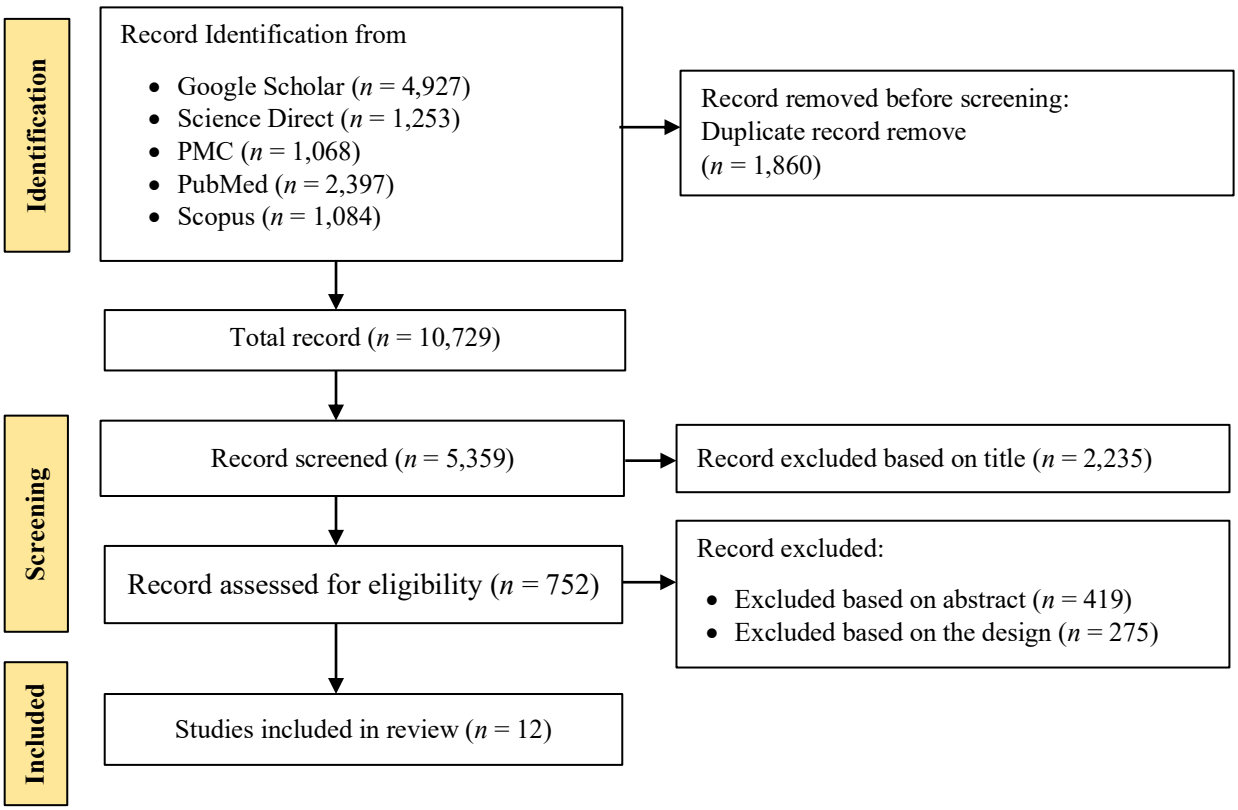

Figure 1. PRISMA 2022 Schematic Selection Process Flowchart for A Systematic Review

Table 1. Description of the Study

Author, Title, Database, Country	Aim	Method	Sample	Results
Ansa et al. (2020) *Attitudes and Behavior Towards Interprofessional Collaboration Among Healthcare Professionals in a Large Academic Medical Center* (Scopus) USA	To examine the attitudes of health professionals in the care of patients and health care teams as well as their behavior and experience in conducting interprofessional collaboration.	Cross-sectional study.	Doctors, residents, nurses, nurse practitioners, respiratory therapists, occupational therapists, physical therapists, social workers, dieticians, pharmacists, and pathologists.	The results showed that health professionals recognized interprofessional collaboration with mutual respect in the health team, decision-making, and interprofessional communication as Interprofessional Education Collaborative (IPEC) most important core competencies. Institutional policies that facilitate interprofessional collaboration provide a conducive working environment based on IPEC's core competencies.
Ballangrud et al. (2017) *"Teamwork in hospitals": A quasi-Experimental Study Protocol Applying a Human Factors Approach* (PubMed) Norway	To determine the impact of interprofessional teamwork interventions in a surgical ward.	Quasi-experimental study.	Doctors, nurses, nursing assistants, midwives, physiotherapists, and occupational therapists.	The results show that the implementation of the Systems Engineering Initiative for Patient Safety (SEIPS) model has an impact on team performance, namely 1) reframing the way of observing and monitoring interprofessional team work, and interpreting aspects of team work performance; 2) digging deeper into what contextual factors affect the performance of the health team; 3) measuring the effect of interprofessional teamwork on patient safety, and 4) providing evidence-based recommendations on the content, duration, and frequency of teamwork training programs.
Dinius et al. (2020) *Inter-Professional Teamwork and Its Association with Patient Safety in German Hospitals-A Cross Sectional Study* (PMC) German	To explore interprofessional teamwork, safety behavior, and patient safety in German hospitals, examining the relationship between interprofessional teamwork and safety behavior as well as the relationship between interprofessional teamwork and patient safety.	Cross-sectional study.	326 teams (doctors and nurses), inpatient.	There was a significant improvement in interprofessional teamwork and patient safety. Then, the impacts obtained are professional groups, work experience, and perceptions of interprofessional teamwork; interprofessional teamwork gives better results.
Hartgerink et al. (2014)	To identify the factors of relational coordination by	Cross-sectional study.	440 professionals involved in	The results showed that participation in multidisciplinary team meetings

Author, Title, Database, Country	Aim	Method	Sample	Results
The Importance of Multidisciplinary Teamwork and Team Climate for Relational Coordination Among Teams Delivering Care to Older Patients (PMC) The Netherlands	professionals in providing care to elderly patients.		providing care to elderly patients. These professionals comprised specialist doctors, nurses, physiotherapists, speech therapists, nutritionists, and social workers.	and team climate are contributors to the development of relational coordination. Multidisciplinary teams improve performance, and work processes are more effective through interdependence in interactions among health professionals.
Hepp et al. (2015) *Using an interprofessional Competency Framework to Examine Collaborative Practice* (Google Scholar) Canada	To analyze collaborative practice in acute care units within the domain of the Canadian Interprofessional Health Collaborative (CIHC) framework.	Qualitative study.	113 health care providers from various professions.	The results showed that the application of the CIHC competency was able to identify gaps in collaborative practice; become a strategy and support for competence in improving collaborative practices that can improve the quality of patient care.
Hlongwa & Rispel (2021) *Interprofessional Collaboration Among Health Professionals in Cleft Lip and Palate (CLP) Treatment and Care in the Public Health Sector of South Africa* (Scopus) South Africa	To design multiprofessional, multidisciplinary collaboration and then provide understanding, practice, and apply these skills through simulation.	Cross-sectional study design.	Health care professionals involved in the delivery of care.	The results showed that the seven categories of interprofessional collaboration could be used as a guide to develop specific strategies to enhance interprofessional collaboration among CLP teams, namely nursing expertise (8 items); shared power (4 items); collaborative leadership (10 items); joint decision-making (2 items); optimizing the professional role and scope (10 items); effective group function (9 items); and communication (8 items). Institutional support and leadership combined with ongoing patient-centered professional development in a multidisciplinary encounter.
Hu & Broome (2019) *Interprofessional Collaborative Team Development in China: A Grounded Theory* (Science Direct) China	To explore interprofessional team development as a necessary strategy to help nurse managers to better design interprofessional teamwork opportunities and provide the necessary support to achieve the effect of interprofessional collaborative practice.	Grounded theory.	Doctors and nurses.	The results of the study indicated that this theory can be useful for health workers to develop a deeper understanding of the interprofessional collaboration process. The central category of this theory is the process for developing an effective interprofessional collaboration team spanning three stages: exploration, integration, and adjustment.

Author, Title, Database, Country	Aim	Method	Sample	Results
Kurniasih et al. (2019) *Interprofessional Collaboration Meningkatkan Pelaksanaan Sasaran Keselamatan Pasien* (Google Scholar) Indonesia	To identify interprofessional collaboration in improving the implementation of patient safety goals in hospitals.	Quasi-experiment in the intervention and control groups.	20 nurses and 10 doctors.	The results showed that there was a significant effect between interprofessional collaboration and increased patient safety goals. Interprofessional collaboration had a positive influence on the implementation of patient safety goals. The better the interprofessional collaboration, the better the implementation of patient safety goals.
Lin et al. (2020) *Developing and Evaluating a One-Stop Patient-Centered Interprofessional Collaboration Platform in Taiwan* (PMC) Taiwan	To develop an interprofessional collaboration platform for effective team collaboration with a hospital information system (HIS). The platform integrates electronic medical records by understanding patient status and transmitting information.	Software development life cycle (SDLC).	Doctors, pharmacists, nurses, lab technicians, and occupational and physical therapists.	The interprofessional collaboration platform was recognized as an effective and convenient tool to help clinical decision-making, improve communication among team members, and develop more functions that will be useful to develop on the platform in the future.
Ma et al. (2018) *Inter- and Intra-Disciplinary Collaboration and Patient Safety Outcomes in U.S. Acute Care Hospital Units: A Cross-Sectional Study* (Science Direct) USA	To identify the extent of interdisciplinary collaboration between nurses and doctors in patient care units with respect to patient safety.	Cross-sectional study.	900 nurses and doctors from five adult care units in 160 US hospitals.	The results showed that nurse-doctor and nurse-nurse collaboration had a significant effect on patient safety.
Manojlovich et al. (2014) *Achieving a Climate for Patient Safety by Focusing on Relationships* (PubMed) Canada	To find out the relationship between health professionals who contribute to the patient safety climate after the implementation of interventions to improve collaboration between professionals.	Quasi-experimental survey study design.	1,896 respondents, including doctors, nurses, physiotherapists, and other health workers.	The results of the study showed that collaboration and respect have a positive influence on the patient safety climate. Through the Interprofessional Model of Patient Care (IPMPC), all health care professionals learned how to collaborate and build a patient safety climate. Efforts to foster good working relationships improved the patient safety climate.
Mulidan et al. (2019) *The Influence of Reinforcing Nurse-Doctor Collaboration Inter-Professional*	To identify the effect of strengthening interprofessional nurse-physician collaboration on patient safety goals.	Quasi-experimental control group, two pre-post-test design.	44 doctors and 44 nurses.	The results showed that there was a significant effect of strengthening interprofessional collaboration on the implementation of patient safety goals in hospital inpatients. This was proven by an increase in

Author, Title, Database, Country	Aim	Method	Sample	Results
Collaboration on Patient Safety Goals at RSUP H. Adam Malik, Medan (Google Scholar) Indonesia				each interprofessional domain of collaboration, namely roles and responsibilities, interprofessional communication, and teamwork.

ble, given the inclusion criteria outlined above. After further reading, the following studies were also excluded: 752 studies lacking intervention, 419 articles that did not focus on interprofessional collaboration, and 275 articles that did not focus on patient safety. Finally, 12 articles that included findings on interventions and strategies for interprofessional collaboration and patient safety (Figure 1), such as discussions, training, skills, and case studies, were included.

The 12 articles included several interventions and strategies for interprofessional collaboration and patient safety, as listed in Table 1, which included cross-sectional research (5), quasi-experimental (4), qualitative study (2), and software development life cycle (SDLC) (1). The countries include Germany, the USA, Indonesia, Norway, Taiwan, Canada, the Netherlands, South Africa, and China, which span the continents of Asia, America, Europe, and Africa.

This literature review used a mixed method synthesis. This method is used to combine quantitative and qualitative data and findings to gain a more comprehensive understanding and to obtain more accurate data results between research using quantitative and qualitative methods.

Study Characteristics. The characteristics of each study show that several applications of interprofessional collaboration need to be carried out and have an effect on health professionals in improving patient safety. For example, studies that were conducted on 3,793 health professionals —including doctors and residents, nurses, nurse practitioners, respiratory therapists, occupational therapists, physical therapists, dietitians, pharmacists, and pathologists in inpatient rooms—showed significant results that can improve patient safety (Ansa et al., 2020; Kurniasih et al., 2019; Ma et al., 2018; Mulidan et al., 2019).

Several studies also suggest that the implementation of interprofessional collaboration requires the support of all parties involved. This support can be fostered through discussions, training, case studies, and the use of specialed platforms designed to improve service quality, which has an effect on patient safety (Ansa et al., 2020; Ballangrud et al., 2017; Hepp et al., 2015; Lin et al., 2020; Mulidan et al., 2019). Furthermore, interprofessional collaboration can improve the attitudes of health professionals towards patient safety by applying collaboration elements such as communication, coordination, role clarification, organizational culture, and conflict resolution (Dinius et al., 2020; Hartgerink et al., 2014; Hlongwa & Rispel, 2021; Hu & Broome, 2019).

Appraisal Assessment Tool. The appraisal assessment tool is presented in Table 2 using the JBI scale. Eleven categories of items were assessed from twelve articles (Ansa et al., 2020; Ballangrud et al., 2017; Dinius et al., 2020; Hartgerink et al., 2014; Hepp et al., 2015; Hlongwa & Rispel, 2021; Hu & Broome, 2019; Lin et al., 2020; Ma et al., 2018; Manojlovich et al., 2014; Mulidan et al., 2019; Kurniasih et al., 2019). From the assessment results, the inclusion categories for the articles are presented in Table 2.

Quality Assessment of Included Studies. We compared these statistical tests in two different

ways. First, we used a *p*-value as a cut-off point for defining the presence of publication bias using Begg's method, Egger's method, or Macaskill's method. Second, we estimated the sensitivities of these tests corresponding to a fixed false positive rate (0.05 or 0.1) to compare their statistical powers. We evaluated five domains: sample selection, deviations from the intended intervention, missing outcome data, outcome measurement, selection of the reported results, and overall bias. The risk of bias assessment is presented in Table 3.

Among the 12 studies, eight studies had concerns due to the sample selection (Ansa et al., 2020; Ballangrud et al., 2017; Dinius et al., 2020; Hartgerink et al., 2014; Hlongwa & Rispel, 2021; Ma et al., 2018; Manojlovich et al., 2014; Mulidan et al., 2019). Two studies were concerned about deviation from the intended intervention domain (Lin et al., 2020; Ma et al., 2018). In contrast, all studies had a low risk of missing outcome data. Five studies reported a low risk of bias in outcome measures (Dinius et al., 2020; Ballangrud et al., 2017; Hlongwa & Rispel, 2021; Hu & Broome, 2019; Mulidan et al., 2019) and selective reporting of outcome domains (Ansa et al., 2020; Hartgerink et al., 2014; Hlongwa & Rispel, 2021; Kurniasih et al., 2019; Manojlovich et al., 2014). In conclusion, in line with overall bias, eleven studies had a low risk (Ansa et al., 2020; Ballangrud et al., 2017; Dinius et al., 2020; Hartgerink et al., 2014; Hepp et al., 2015; Hlongwa & Rispel, 2021; Hu & Broome, 2019; Kurniasih et al., 2019; Ma et al., 2018; Manojlovich et al., 2014; Mulidan et al., 2019) and one study had some concerns about a high risk of bias (Lin et al., 2020).

Interprofessional collaboration strategies and interventions provide changes in the attitudes of health professionals by facilitating teamwork. The process of interprofessional collaboration strategies and interventions is the nature of the interaction between one profession and another to determine service quality. The process is able to solve problems, identify sources, and make agreements to collaborate with other parties, in addition to determining basic rules, preparing agendas, organizing sub-subsgroups, synthesizing information, analyzing options, and raising desired agreements, and implementing agreed-upon collaboration goals (Soko et al., 2021).

Table 2. Description of Included Studies

		Yes	No	Unclear	No Applicable
1	Is the review question clearly and explicitly stated?	I	-	-	-
2	Were the inclusion criteria appropriate for the review question?	I	-	-	-
3	Was the search strategy appropriate?	I	-	-	-
4	Were the sources and resources used to search for studies adequate?	I	-	-	-
5	Were the criteria for appraising studies appropriate?	I	-	-	-
6	Was the critical appraisal conducted by independently by two or more reviewers?	I	-	-	-
7	Were there methods to minimize errors in data extraction?	I	-	-	-
8	Were the methods used to combine studies appropriate?	I	-	-	-
9	Was the likelihood of publication bias assessed?	I	-	-	-
10	Were recommendations for policy or practice supported by the reported data?	I	-	-	-
11	Were the specific directives for new research appropriate?	I	-	-	-

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Table 3. Risk of Bias Assessment

Authors (Years)	Sample Selection	Deviation from Intended Interventions	Missing Outcome Data	Measurement of the Outcome	Selection of the Reported Result	Overall Bias
Ansa et al. (2020)	H	L	L	L	H	L
Ballangrud et al. (2017)	H	L	L	H	L	L
Dinius et al. (2020)	H	L	L	H	L	L
Hartgerink et al. (2014)	H	H	L	L	L	L
Hepp et al. (2015)	L	L	L	L	L	L
Hlongwa and Rispel (2021)	H	L	L	L	H	L
Hu and Broome (2019)	H	L	L	H	H	L
Kurniasih et al. (2019)	L	SC	L	H	L	L
Lin et al. (2020)	SC	H	L	SC	H	H
Ma et al. (2018)	H	L	L	L	L	L
Manojlovich et al. (2014)	SC	SC	L	L	H	L
Mulidan et al. (2019)	H	L	L	H	L	L
	L	L	L	L	L	L

Note: low risk (L); high risk (H); some concern (SC)

Workshops and information sessions, where the advantages of teamwork and finding common ground were explained, were organized to effect changes in the attitudes of health workers. The advantages of interprofessional cooperation are described as being likelier to accept and adopt patient safety principles. Simple and accessible transfer of knowledge appears to be an important characteristic of successful interventions on the attitudes and knowledge of health professionals (Dinius et al., 2020).

Interprofessional collaboration strategies and interventions can increase awareness of collaboration in hospitals. Increased awareness resulted in better acceptance and team readiness for patient safety. Making health professionals aware of their shortcomings and the need for interprofessional collaboration across multiple disciplines appeared to be an effective way to improve patient safety. In addition to awareness, the potential for improvement in service quality, caused by better collaboration, motivated health workers to change their attitudes toward providing health services (Goldman et al., 2018).

Interprofessional collaboration strategies and interventions are structured guidelines, standardized tools, and protocols used to improve communication and coordination between health professionals working in hospitals. These protocols provide more effective communication and an evidence-based approach to patient safety (Zajac et al., 2021).

Furthermore, interprofessional collaboration strategies and interventions is apply the elements of interprofessional collaboration, including teamwork, communication, coordination, role clarification, leadership, organizational culture, and conflict resolution. The elements in this interprofessional collaboration effectively improve the quality of service, reduce the rate of complications and errors, and reduce the mortality rate.

These findings are in accordance with Brock et al. (2020) report that teams that worked collaboratively with the application of interprofessional collaboration elements provided direction in treating patients, yielding optimal results, and delivering patient satisfaction. This also concurs with Ansa et al. (2020), who stated that the use of interprofessional collaboration elements can increase satisfaction. In their research, the use of interprofessional collaboration elements was also carried out as a framework for interprofessional competence to be able to determine professional roles, determine service

directions, and be responsible for the attitudes and behavior of health professionals. These seven elements influenced how the competency framework could be applied in different situations. These elements are also the basis for transforming an ordinary work environment into a collaborative environment to achieve treatment goals and improve patient safety.

Discussion

Interprofessional collaboration is carried out on the basis of professional involvement and working together to solve problems by interacting with each other to provide optimal care. The WHO recommends interprofessional collaboration as important to implement for teams to improve patient safety, not only for individual patients but also for the global population. Implementing startegeis and interventions of interprofessional collaboration improves patient safety so that different profession complement each other in providing health services according to their respective expertise (Busari et al., 2017).

This systematic review identified four interventions and interprofessional collaboration strategies aimed at improving and facilitating patient safety in hospitals The first category is team readiness, which is a prerequisite for enhancing and maintaining efficient interprofessional collaboration. Increasing awareness and confidence in being involved in interprofessional collaboration is also important so that it can change the attitude of professionals to respect each other's team members and actively ask for opinions or receive feedback from other team members (Busari et al., 2017). Making health professionals aware of their shortcomings and the need for collaboration across disciplines is an effective way to facilitate interprofessional collaboration. Additionally, Silva et al. (2021) indicated that experiencing teamwork itself increases awareness of the benefits and importance of collaboration and provides opportunities for health professionals to demonstrate their skills and abilities.

Second, collaborative behavior is required as a form of ease of work between teams. Developing collaborative behavior has a significant impact on patient safety. Collaborative behavior within interprofessional collaboration is able to create staff attention and motivation, reduce carelessness, which risks errors resulting in injury to patients, and increase compliance and responsibility in caring for patients (Alshammari & Dayrit, 2017). To enhance collaborative behavior, the development of shared principles (such as vision, values, ethical norms, and shared goals) is an important prerequisite. Our review found that maintaining safe behavior across teams by making care professionals feel comfortable providing services will improve patient safety (Iedema et al., 2019).

Third, structured guidelines and protocols for care professionals have a positive impact on hierarchy and conflict resolution between team members. Intensive meetings and case studies can also be carried out as a form of joint decision making. The following protocol has three principles that serve as an effective guide: recognize and acknowledge a decision, know and understand the problem that exists, and incorporate the patient's values and preferences into the decision (Ballangrud et al., 2017). Health care services and systems require interprofessional collaboration to be able to adapt to changes in the service system. Apart from that standard operating procedures (SOPs) or structured protocols guarantee the success of services (Mclaney et al., 2022; Zajac et al., 2021).

The fourth element is interprofessional collaboration. For health professionals, at the root of the full implementation of interprofessional collaboration lies teamwork, communication, role clarification, coordination, leadership, organizational culture, and conflict resolution (Bochatay, 2019).

Teamwork. Teamwork forms the basis for implementing interprofessional collaboration because it can influence health professionals as

agents of change in improving patient safety. This is supported by research (Roller-Wirnsberger et al., 2020), which states that interprofessional teamwork provides the basis for building an integrated approach in promoting and maintaining patient health and increasing the effectiveness of health care delivery. Effective teamwork can reduce hospital stays and treatment costs, improve patient safety and health, encourage innovation in patient care, and increase staff motivation and well-being.

Communication. Interprofessional communication is one of the competencies that health professionals require to unite their joint efforts in providing services to patients. Effective communication between health professionals has an important function in improving health care and patient safety. Communication provides clear guidance in interprofessional teamwork by implementing an integrated system of knowledge and information sharing.

This is in accordance with the report by Lindqvist (2015) that communication in interprofessional collaboration provides strategies for health care reform, improves patient service outcomes, decreases drug side effects, reduces morbidity and mortality, optimizes drug dosage, and has been shown to increase job satisfaction. Applying interprofessional communication strategies will create teamwork, encourage open discussions (joint decision-making), recognize and appreciate roles (contributions of each team member), develop relationships of mutual trust (mutual respect with team members) and ensure understanding of treatment decisions.

Role Clarification. Clarifying roles in interprofessional collaboration is understanding and developing the role of each profession by considering the ethics of each profession and using each knowledge and expertise to build relationships in collaboration. Role clarification illustrates that each health professional understands the roles of all other professions involved in setting and achieving common goals, recognizes and respects the diversity of roles and responsibilities, carries out their role by respecting the ethics of other professions, performs consultations to integrate the skills and knowledge of their profession and others, integrating competencies or roles in service delivery.

This is in accordance with Sniffen et al. (2019), who stated that role clarification or clarity is the main determinant of interprofessional collaboration. Therefore, professional roles are able to transform practice and interactions with other professionals in providing services to patients and ensure that the implementation of each professional's role is on target, optimizing the scope of professional practice and more effective patient management.

Coordination. Coordination in interprofessional collaboration is a framework for assessing teamwork that focuses on communication and the existence of good cooperative relationships between health professionals in a team. Coordination in interprofessional collaboration helps evaluate team dynamics, improve quality and efficient performance outcomes, and strengthen systems of care to improve patient safety. This is according to Hustoft et al. (2018), who found that patients treated with a coordinated team have effective outcomes, and that coordination within the team leads to better continuity between health workers. Coordination in care is an integral component of intentional patient care activities between two or more health professionals to facilitate the delivery of appropriate health services as well as the exchange of information between professionals, thereby holding each other accountable for various matters. Coordination in interprofessional collaboration increases job satisfaction and provides social support and resilience in facing stress.

Leadership. Leadership in interprofessional collaboration has become a facility for health professionals to set standards and is integrated into the joint decision-making process. Leadership in interprofessional collaboration illustrates how to work on the provision of services in a holistic and flexible manner with differences between

disciplines, roles, and responsibilities in providing services to patients. Leadership in interprofessional collaboration supports optimal service delivery, enhances interdependent working relationships among all health professionals, makes informed and effective decisions, and creates a climate for shared leadership in service delivery.

This is in line with the report by Rizkia et al. (2022), which states that leadership implemented in collaboration between staff is able to find solutions to meet service needs. Interprofessional collaborative leadership builds trust and relationships with other professionals and the skills to create an environment of respect and appreciation for professionals from various disciplines so that each profession has the opportunity to contribute to effective, stable, quality, and improved decision-making among professionals.

Organizational Culture. Organizational culture in interprofessional collaboration is a prerequisite for teamwork; it is defined as the shared values, beliefs, or perceptions held by staff in an organization. As an organization in health services, organizational culture is needed for an understanding of the values, beliefs, ethics, attitudes, and behaviors that arise through interaction between health workers.

This is in accordance with Morales-Huamán et al. (2023), who stated that organizational culture is able to encourage a patient-centered interprofessional approach as a strategy to help stimulate change, advance, and realign the health care system by paying special attention to team structure. In addition, an organization with a strong culture helps staff to achieve goals and feel satisfied in their roles, improve staff behavior, influence teamwork and treatment outcomes, increase job satisfaction, and improve service quality, which will improve patient safety.

Conflict Resolution. Conflict resolution in interprofessional collaboration is one of the main challenges for health professionals because they are required to manage conflicts in teams, find solutions to each problem from different ideas, and proactively deal with disagreements, and respond effectively to all types of conflicts. According to research Cullati et al. (2019), conflict resolution establishes communication to attract or encourage involvement and attention among team members, encouraging the search for potential solutions to express conflicts, including the development of useful creative compromises to help address complex health problems.

Implications for Nursing and Health Policy. Increasing the effectiveness of interprofessional collaboration affects the sense of trust and respect between nurses, doctors, and other health workers, directly improving the performance and professionalism of the team, decision-making, and interprofessional roles. Interprofessional collaboration has a positive impact on the health team, which is more effective when implementing care for patients, improving the quality of care, increasing the self-efficacy of each health profession, implementing appropriate medication, and reducing mortality and patient safety incidents. This interprofessional collaboration is able to improve the work environment between professions and then becomes a potential strategy to encourage and improve job satisfaction and patient safety. For this reason, support from hospital management must be optimized so that the implementation of interprofessional collaboration is more effective.

Conclusion

This systematic review identified four categories of strategies and interventions for interprofessional collaboration to improve patient safety in hospitals: 1) acceptance and team readiness toward interprofessional collaboration, 2) acting as a team and not as an individual, 3) developing protocols or guidelines for health professionals, and 4) integrating elements of interprofessional collaboration by health professionals. The process of interprofes-

sional collaboration in health services must be improved because the current global climate is not professional enough for health workers to work in, and it is necessary to develop interprofessional efforts to treat patients. According to the principle of interprofessional collaboration, it is necessary to prioritize structures, processes, and tools to enable interprofessional collaboration to be affirmed and committed to in hospitals so that organizational capacity can create awareness and understanding about collaboration between staff, doctors, nurses, and other health workers.

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Introduction (14 point font, boldface, cap in the first letter of headings)

(One blank single space line, 10 point font)

The manuscript is written with Times New Roman font size 12pt, single-spaced, left and right justified, on one-sided pages, paper in one column and on A4 paper (210 mm x 297 mm) with the upper margin of 3.5 cm, lower 2.5 cm, left and right each 2 cm. The manuscript including the graphic contents and tables should be around 3500–4500 words (exclude references). If it far exceeds the prescribed length, it is recommended to break it into two separate manuscripts. Standard English grammar must be observed. The title of the article should be brief and informative and it should not exceed 16 words. The keywords are written after the abstract. (Between paragraphs are spaced one blank, single spaced, without indentation)

The title should contain the main keyword and do not use abbreviations, numbering around 20 words. Authors need to write a short title is also desirable to be written as a page header on each journal page. Authors should not just write words such as study/ relationship/ influence in the title because the title should indicate the results of the study, for example, "Reduction of blood sugar through exercises diabetes in the elderly".

The full name of the author (without academic title) is placed below the manuscript title. The order of the author based on his contribution to the writing process. After the authors name is written with superscript numbers to mark the affiliation author. One author, affiliates can be more than one, for example Ananda Anandita[1], Ahmad Taufik[2], Josephine[3]

AUTHOR GUIDELINES: ORIGINAL RESEARCH

Affiliates and address of the authors. Give the number according to the name of the author, for example 1. Department of Maternal and Women's Health Nursing, Faculty of Nursing, Universitas Indonesia, Prof. Dr. Bahder Djohan Street, Depok, West Java – 16424. Correspondence address is email address of the one of the author, for example anandita12@ui.ac.id.

The use of abbreviations is permitted, but the abbreviation must be written in full and complete when it is mentioned for the first time and it should be written between parentheses. Terms/Foreign words or regional words should be written in italics. Notations should be brief and clear and written according to the standardized writing style. Symbols/signs should be clear and distinguishable, such as the use of number 1 and letter l (also number 0 and letter O). Avoid using parentheses to clarify or explain a definition. The organization of the manuscript includes **Introduction, Methods** or **Experimental, Results, Discussion, Conclusions,** and **References**. **Acknowledgement** (if any) is written after **Conclusion** and before **References** and narratively, not numbered. The use of subheadings is discouraged. Between paragraphs, the distance is one space. Footnote is avoided.

This manuscript uses *American Psychological Association (APA*) manual style as citation. When using APA format, follow the author-date method of in-text citation. This means that the author's last name and the year of publication for the source should appear in the text, for example, (Jones, 1998), and a complete reference should appear in the reference list at the end of the paper. Citation can be put at the beginning of the sentence, for example Johnson (2005) states that … or the source put at the end of a sentence for examples … (Purwanto, 2004). See the complete format on this link https://owl.english.purdue.edu/owl/resource/560/02/

Introduction contains justification of the importance of the study conducted. Novelty generated from this study compared the results of previous studies or the umbrella of existing knowledge needs to be clearly displayed. Complete it with main reference used. State in one sentence question or research problems that need to be answered by all the activities of the study. Indicate the methods used and the purpose or hypothesis of the study. The introduction does not exceed five paragraphs.
(One blank single space line, 12 point font)

Methods (14 point font, boldface, cap in the first letter of headings)

(One blank single space line, 10 point font)

Method contains the design, the size, criteria and method of sampling, instruments used, and procedures collecting, processing, and analysis of the data. When using a questionnaire as instrument, explain the contents briefly and to measure which variables. Validity and reliability of instruments should also be explained. In the experimental or intervention studies need to be explained interventional procedure or treatment is given. In this section it should explain how research ethics approval was obtained and the protection of the rights of the respondents imposed. Analysis of data using computer programs needs not be written details of the software if not original. Place/location of the study is only mentioned when it comes to study. If only as a research location, the location details not worth mentioning, just mentioned vague, for example, "... at a hospital in Tasikmalaya."

For the qualitative study, in this section needs to explain how the study maintain the validity (trustworthiness) data obtained. The methods section written brief in two to three paragraphs.
(One blank single space line, 12 point font)

Results

(One blank single space line, 10 point font)

The findings are sorted by the objectives of the study or the research hypothesis. The results do not display the same data in two forms namely tables/ images /graphics and narration. No citations in the

results section. The average value (mean) must be accompanied by a standard deviation. Writing tables using the following conditions.
Table only uses 3 (three) row lines (do not use a column line), the line heading, and the end of the table (see example). Table is written with Times New Roman size 10pt and placed within a single space below the title table. Table titles is written with font size 9pt bold, capital letters at the beginning of the word and placed on the table with the format as shown in the examples that do not use the column lines. Numbering tables are using Arabic numerals. The table framework is using lines size 1 pt. If the table has many columns, it can use one column format at half or full page. If the title in each table column is long and complex, the columns are numbered and its description given at the bottom of the table. Mean, SD, and t-test values should include value of 95% CI. Significance value is put with not mention P at first. Example: The mean age 25.4 years intervention group (95% CI). Based on the advanced test between intervention and control groups showed significant (example: p= 0.001; CI= ... - ...).

Images are placed symmetrically in columns within a single space of a paragraph. Pictures are numbered and sorted by Arabic numerals. Captions placed below the image and within one single space of the image. Captions are written by using 10pt font size, bold, capital letters at the beginning of the word, and placed as in the example. The distance between the captions and paragraphs are two single spaced.

Images which have been published by other authors should obtain written permission from the author and publisher. Include a printed image with good quality in a full page or scanned with a good resolution in the format {file name}.jpeg or {file name}. tiff. When the images are in the photograph format, include the original photographs. The image will be printed in black and white, unless it needs to be shown in color. The author will be charged extra for color print if more than one page. The font used in the picture or graphic should be commonly owned by each word processor and the operating system such as Symbol, Times New Roman, and Arial with size not less than 9 pt. Image files which are from applications such as Corel Draw, Adobe Illustrator and Aldus Freehand can give better results and can be reduced without changing the resolution.

Table and image are not integrated with the contents of the manuscript, put after reference or at the end of the manuscript.

For the qualitative study, the findings commonly are written in the form of participants quotes. Table format is rarely used except to describe the characteristics of the participants, or recapitulation of the themes or categories. If the quote is not more than 40 words, then use quotation marks (") at the beginning and at the end of a sentence and include participants/ informants which give statements without the need to create separate paragraphs. Ellipsis (...) is only used to change a word that is not shown, instead of a stop sign/pause. See the following example.

Due to the ongoing process, the women experiencing moderate to severe pain in the knees, ankles, legs, back, shoulders, elbows, and/or their fingers, and they are struggling to eliminate the pain. To alleviate pain, they look for the cause of the pain. One participant stated that, "... I decided to visit a doctor to determine the cause of the pain is. Now I'm taking medication from the doctor in an attempt to reduce this pain" (participant 3)
Here is an excerpt example of using block quotations if the sentences are 40 or more. Use indentation 0.3"

As discussed earlier, once the participants had recovered from the shock of the diagnosis of the disease, all participants decided to fight for their life. For most of them, the motivation for life is a function of their love for their children; namely child welfare, which being characteristic the pressure in their world. Here is an example of an expression of one of the participants:

I tried to suicide, but when I think of my children, I cannot do that [crying]. I thought, if I die, no one will take care of my children. Therefore, I decided to fight for my life and my future. They (children) were the hope of my life (participant 2).

Discussion

Describe the discussion by comparing the data obtained at this time with the data obtained in the previous study. No more statistical or other mathematical symbols in the discussion. The discussion is directed at an answer to the research hypothesis. Emphasis was placed on similarities, differences, or the uniqueness of the findings obtained. It is need to discuss the reason of the findings. The implications of the results are written to clarify the impact of the results the advancement of science are studied. The discussion ended with the various limitations of the study.

Conclusion

Conclusions section is written in narrative form. The conclusion is the answer of the hypothesis that leads to the main purpose of the study. In this section is not allowed to write other authors work, as well as information or new terms in the previous section did not exist. Recommendation for further research can be written in this section.

Acknowledgement (if any)

Acknowledgement is given to the funding sources of study (donor agency, the contract number, the year of accepting) and those who support that funding. The names of those who support or assist the study are written clearly. Names that have been mentioned as the authors of the manuscripts are not allowed here.

References (14pt, *boldface*, Capital letter in the beginning of the Word)

Use the most updated references in the last 10 years. Reference is written with Times New Roman font size 11 pt, single space, the distance between the references one enter. The references use the hanging, which is on the second line indented as much as 0.25", right justified. The references only contain articles that have been published, and selected the most relevant to the manuscript. It prefers primary references. The references format follows the "name-years" citation style (APA style 7th edition). All sources in the reference must be referenced in the manuscript and what was in the manuscript should be in this reference. The author should write the family/last name of sources author and year of publication in parentheses use, for example (Potter & Perry, 2006) or Potter and Perry (2006). Write the first author's name and "et al.", if there are three or more authors.

Examples:

Journal

Author, A.A., Author, B.B., & Author, C.C. (year). Article title: Sub-title. *Journal Title*, *volume* (issue number), page numbers.

Wu, S.F.V., Courtney, M., Edward, H., McDowell, J., Shortridge-Baggett, L.M., & Chang, P.J. (2007). Self-efficacy, outcome expectation, and self-care behavior in people with type diabetes in Taiwan. *Journal of Clinical Nursing, 16* (11), 250–257.

References with two or more authors (up to 20 authors) write all author's names. If an article has 21 authors or more, list the first 19 authors, then insert an ellipsis (…) and then the last name and first initials of the last author. Example:

Wolchik, S.A., West, S.G., Sandler, I.N., Tein, J., Coatsworth, D., Lengua, L., Johnson, A., Ito, H., Ramirez, J., Jones, H., Anderson, P., Winkle, S., Short, A., Bergen, W., Wentworth, J., Ramos, P., Woo, L., Martin, B., Josephs, M., … Brown, Z. (2005). *Study of the brain. Psychology Journal, 32* (1), 1–15. doi: 10.1037/1061-4087.45.1.11.

Conference Proceeding

Schnase, J.L., & Cunnius, E.L. (Eds.). (1995). Proceedings from CSCL '95: *The First International Conference on Computer Support for Collaborative Learning*. Erlbaum.

Newspaper (no author's name)

Generic Prozac debuts. (2001, August 3). The Washington Post, pp. E1, E4.

It's subpoena time. (2007, June 8). New York Times. https://www.nytimes.com/2007/06/08/opinion/08fri1.html

Book

Author, A.A. (Year). *Source title: Capital letter in the beginning of the subtitle*. Publisher.

Peterson, S.J., & Bredow, T.S. (2004). *Middle range theories: Application to nursing research*. Lippincott Williams & Wilkins.

Book chapter

Author, A.A. (Year). Chapter title*:* Capital letter in the beginning of the subtitle. In Initial, Surname (Author's name/book editor) (eds), *Book title*. Publisher.

Hybron, D.M. (2008). Philosophy and the science of subjective well-being. In M. Eid & R.J. Larsen (Eds.), *The science of subjective well-being* (pp.17–43). Guilford Press.

Translated book

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Thesis/Dissertation

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Gerena, C. (2015). Positive thinking in dance: The benefits of positive self-talk practice in conjunction with somatic exercises for collegiate dancers [Master's thesis, University of California Irvine]. University of California, Scholarship. https://escholarship.org/uc/item/1t39b6g3

If not published

Last-name, A.A. (year). *Dissertation/thesis title.* (Unpublished doctoral dissertation/master thesis). Institution Name, Location.

Considine, M. (1986). *Australian insurance politics in the 1970s: Two case studies*. (Unpublished doctoral dissertation). University of Melbourne, Melbourne, Australia.

Database Article

Author, A.A., Author, B.B., & Author, C.C. (Year pub). Title of article. *Title of Journal*, Volume (Issue), pp–pp. doi: xx.xxxxxxxx [OR] Retrieved from URL of publication's home page

Borman, W.C., Hanson, M.A., Oppler, S.H., Pulakos, E.D., & White, L.A. (1993). Role of early supervisory experience in supervisor performance. *Journal of Applied Psychology, 78* (8), 443–449. Retrieved from http://www.eric.com/jdlsiejls/ supervisor/early937d

Database article with DOI (Digital Object Identifier)

Brownlie, D. (2007). Toward effective poster presentations: An annotated bibliography. *European Journal of Marketing, 41* (11/12), 1245–1283. doi: 10.1108/03090560710821161.

Other online source

Author, A.A. (year). Title of source. Retrieved from URL of publication's home page

Article from website

Exploring Linguistics. (1999, August 9). Retrieved from http://logos.uoregon.edu/explore/orthography/ chinese.html#tsang

Online article

Becker, E. (2001, August 27). Prairie farmers reap conservation's rewards. *The New York Times*, pp. 12–90. Retrieved from http://www.nytimes.com

Appendices

Appendices are only used when absolutely necessary, placed after the references. If there is more than one attachment/appendix then sorted alphabetically.

Here is an example of a table

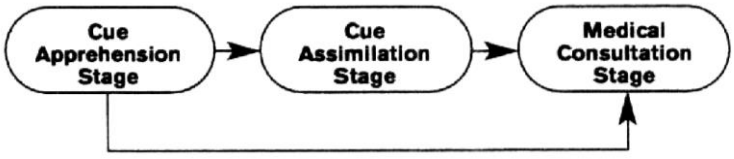
Table 1. The Characteristics of the Respondents (capital letters at the beginning of the word 11 pt, left justify)

(One blank single space line, 10 pt)

Client's Initial	Age	Major Problem
Mr. BN	56	Aggressiveness
Mr. MA	40	Withdrawal
Mr. AS	45	Swing Mood

*table footnotes (if necessary)

Here is an example of an image



(One blank single space line, 10 pt)

Figure 1. The Process of Cardiac Sensitivity Cues (Capital Letters in the Beginning of the Words, 11pt)

AUTHOR GUIDELINES: CASE REPORT

ARTICLE TITLE (all caps, 14-point font, boldface, centered, Maximum 16 words)

(One blank single space line, 14 pt)

Abstract (10-pt, bold, italics)

(One blank single space line, 10 pt)

Article Title. Abstract should be written using Times New Roman font, size 10pt, not-italics, right justify, and one paragraph-unstructured with single spacing, completed with English title written in bold at the beginning of the English abstract. The Abstract should be "short and sweet". It should be around 100–250 words. Abbreviations or references within the Abstract should not be used. The Abstract should include background, case illustration, and conclusion. Background includes an introduction about why this case is important and needs to be reported. Please include information on whether this is the first report of this kind in the literature. Case illustration includes brief details of what the patient(s) presented with, including the patient's age, sex and ethnic background. Conclusions is a brief conclusion of what the reader should learn from the case report and what the clinical impact will be. Is it an original case report of interest to a particular clinical specialty of nursing or will it have a broader clinical impact across nursing? Are any teaching points identified? If manuscripts are not from Indonesia, the Indonesian abstract will be assisted by the editor.

(One blank single space line, 10 pt)

Keywords: This section consists of three to six keywords/phrases representing the main content of the article. It is important for indexing the manuscript and easy online retrieval. It is written in English, alphabetical order (10-point font), and gives commas between words/phrases.

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Abstrak *(10 pt, bold, senter)*

(One blank single space line, 10 pt)

Judul Artikel. Abstrak harus ditulis menggunakan huruf Times New Roman, ukuran 10pt, huruf miring, rata kanan, dan satu paragraf-tidak terstruktur dengan spasi tunggal. Abstrak harus "pendek dan manis". Seharusnya sekitar 100–250 kata. Singkatan atau referensi dalam Abstrak tidak boleh digunakan. Abstrak harus mencakup latar belakang, ilustrasi kasus, dan kesimpulan. Latar belakang mencakup pengantar tentang mengapa kasus ini penting dan perlu dilaporkan. Harap sertakan informasi tentang apakah ini adalah laporan pertama dari jenis ini dalam literatur. Ilustrasi kasus mencakup rincian singkat tentang apa yang pasien sajikan, termasuk usia pasien, jenis kelamin dan latar belakang etnis. Kesimpulan merupakan kesimpulan singkat dari apa yang pembaca harus pelajari dari laporan kasus dan dampak klinisnya. Apakah laporan kasus asli yang menarik bagi area spesialis keperawatan tertentu atau apakah itu berdampak klinis yang lebih luas?

(One blank single space line, 10 pt)

Kata Kunci*: Bagian ini terdiri dari tiga sampai enam kata kunci/frase yang mewakili konten utama artikel. Kata kunci ini penting untuk indeksasi manuskrip dan pencarian daring dengan mudah. Itu ditulis dalam bahasa Inggris, diurutkan berdasarkan abjad (font 10 huruf, huruf miring), memberikan koma di antara kata-kata/frasa.*

(Three blank single space lines, 12-point font)

Introduction (14-point font, boldface, cap in the first letter of headings)

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AUTHOR GUIDELINES: CASE REPORT

The information about the author(s) such as full name (without academic title), affiliates, and address are wrote on the separate file (tittle page). Affiliates and address of the authors. Give the number according to the name of the author, for example 1. Department of Maternal and Women's Health Nursing, Faculty of Nursing, Universitas Indonesia, Prof. Dr. Bahder Djohan Street, Depok, West Java – 16424. Correspondence address is email address of the one of the author, for example anandita12@ui.ac.id.

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The Introduction or Background section should explain the background of the case, including the disorder or nursing problems, usual presentation and progression, and an explanation of the presentation if it is a new disease or disorder. If it is a case discussing an adverse intervention the Introduction should give details of intervention's common use and any previously reported side effects. It should also include a brief literature review. This should introduce to the case report from the stand point of those without specialist knowledge in the area, clearly explaining the background of the topic. It should end with a very brief statement of what is being reported in the article.

The Introduction should be in brief, stating the purpose of the study. Provide background that puts the manuscript into context and allows readers outside the field to understand the significance of the study. Define the problem addressed and why it is important and include a brief review of the key literature. Note any relevant controversies or disagreements in the field. Conclude with a statement of the aim of the work and a comment stating whether that aim was achieved.
(One blank single space line, 12-point font)

Case Illustration (14-point font, boldface, cap in the first letter of headings)

(One blank single space line, 10-point font)

This should present all relevant details concerning the case. This section can be divided into separate sections presented with appropriate subheading, such as history and presenting conditions, intervention, outcome, etc. This should provide concerned details of the case with relevant demographic information of the patient concealing their identification (without adding any details that could lead to the identification of the patient), medical history, observed symptoms and describe any tests or treatments done on the patient. If it is a case series, then details must be included for all patients. Discuss the significance and rarity of findings with referencing to the previous studies.

If it is need to present table(s) and or image(s), some rules should be followed. Table only uses 3 (three) row lines (do not use a column line), the line heading, and the end of the table (see example). Table is written with Times New Roman size 10-pt and placed within a single space below the title table. Table titles is written with font size 9-point bold, capital letters at the beginning of the word and placed on the table with the format as shown in the examples that do not use the column lines.

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Images are using a single space of a paragraph. If the size of the image passes through the column width then the image can be placed with a single column format. Pictures are numbered and sorted by Arabic numerals. Captions placed below the image and within one single space of the image. Captions are written by using 10pt font size, bold, capital letters at the beginning of the word, and placed as in the example. The distance between the captions and paragraphs are two single spaced.

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Table and image are not integrated with the contents of the manuscript, put after reference or at the end of the manuscript.

Discussion

The discussion section should contain major interpretations from the findings and results in comparison to past studies. The significance of the findings and case presentation should be emphasized in this section against previous findings in the subject area.

This section should evaluate the patient case for accuracy, validity, and uniqueness and compare or contrast the case report with the published literature. The authors should briefly summarize the published literature with contemporary references.

Conclusion

Conclusions section is written in narrative form. This section should conclude the Case reports and how it adds value to the available information. Explain the relevance and significance of their findings to the respective field in a summary briefly. This section is not allowed to write other authors work, as well as information or new terms in the previous section did not exist. Recommendation for further study can be written in this section.

Acknowledgements

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Examples:

Journal

Author, A.A., Author, B.B., & Author, C.C. (year). Article title: Sub-title. *Journal Title*, *volume* (issue number), page numbers.

Wu, S.F.V., Courtney, M., Edward, H., McDowell, J., Shortridge-Baggett, L.M., & Chang, P.J. (2007). Self-efficacy, outcome expectation, and self-care behavior in people with type diabetes in Taiwan. *Journal of Clinical Nursing, 16* (11), 250–257.

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Book chapter

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Considine, M. (1986). *Australian insurance politics in the 1970s: Two case studies*. (Unpublished doctoral dissertation). University of Melbourne, Melbourne, Australia.

Database Article

Author, A.A., Author, B.B., & Author, C.C. (Year pub). Title of article. *Title of Journal*, Volume (Issue), pp–pp. doi: xx.xxxxxxxx [OR] Retrieved from URL of publication's home page

Borman, W.C., Hanson, M.A., Oppler, S.H., Pulakos, E.D., & White, L.A. (1993). Role of early supervisory experience in supervisor performance. *Journal of Applied Psychology, 78* (8), 443–449. Retrieved from http://www.eric.com/jdlsiejls/ supervisor/early937d

Database article with DOI (Digital Object Identifier)

Brownlie, D. (2007). Toward effective poster presentations: An annotated bibliography. *European Journal of Marketing, 41* (11/12), 1245–1283. doi: 10.1108/03090560710821161.

Other online source

Author, A.A. (year). Title of source. Retrieved from URL of publication's home page

Article from website

Exploring Linguistics. (1999, August 9). Retrieved from http://logos.uoregon.edu/explore/orthography/ chinese.html#tsang

Online article

Becker, E. (2001, August 27). Prairie farmers reap conservation's rewards. *The New York Times*, pp. 12–90. Retrieved from http://www.nytimes.com

Appendices

Appendices are only used when absolutely necessary, placed after the references. If there is more than one attachment/appendix then sorted alphabetically.

Here is an example of a table

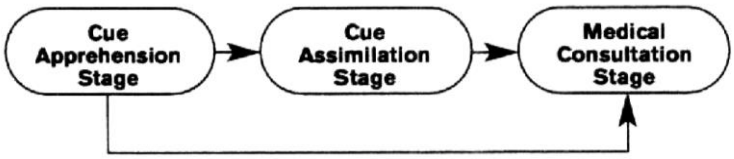
Table 1. The Characteristics of the Respondents (capital letters at the beginning of the word 11 pt, left justify)

(One blank single space line, 10 pt)

Client's Initial	Age	Major Problem
Mr. BN	56	Aggressiveness
Mr. MA	40	Withdrawal
Mr. AS	45	Swing Mood

*table footnotes (if necessary)

Here is an example of an image



(One blank single space line, 10 pt)

Figure 1. The Process of Cardiac Sensitivity Cues (Capital Letters in the Beginning of the Words, 11pt)

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