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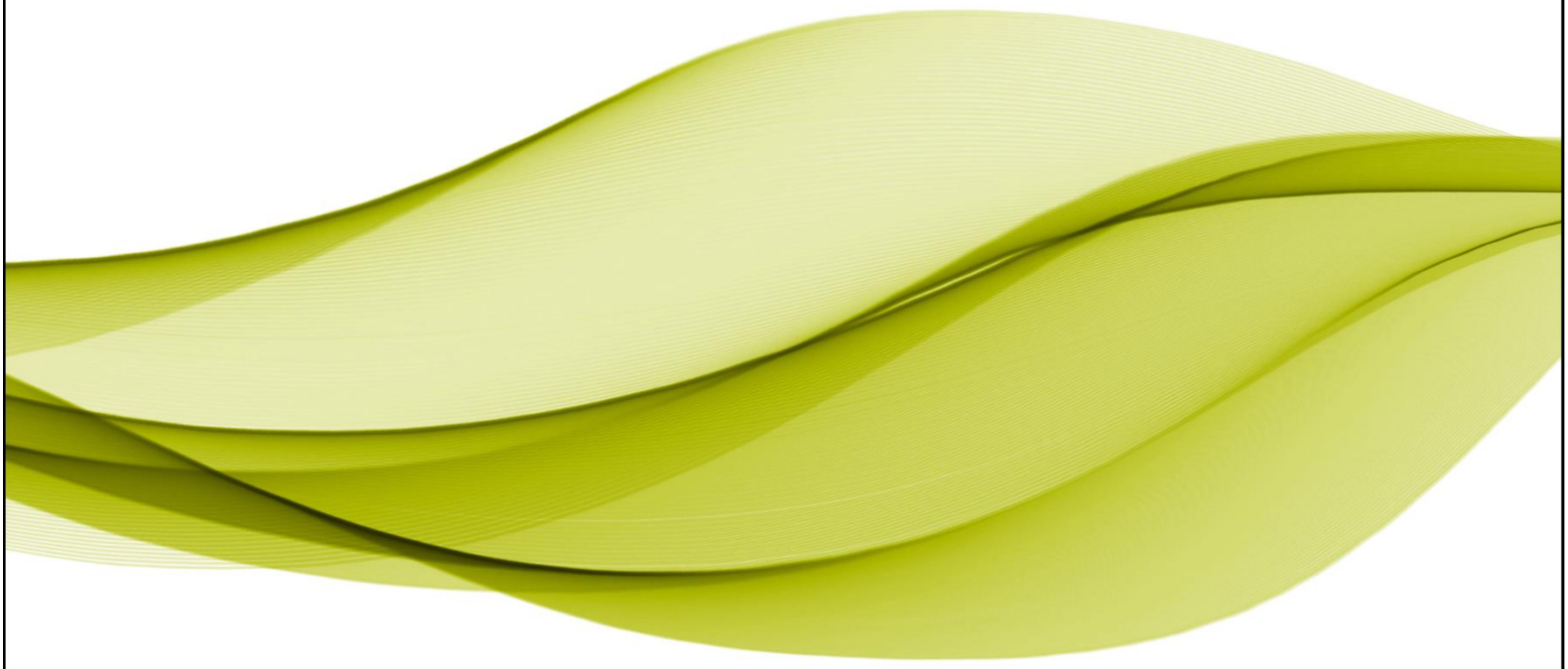

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Perception of Lean Adoption among Emergency Department Personnel in Public Hospitals in Selangor, Malaysia

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Abstract

Background: This research aims to assess the perceptions of the staff working in emergency departments in Selangor, Malaysia, regarding the adoption of lean management and identify the factors that affect their perceptions.

Methods: A cross-sectional study using the Lean in Healthcare Questionnaire was conducted with 251 respondents, which consisted of doctors, nurses and medical assistants employed in three selected hospitals.

Results: One-way analysis of variance (ANOVA) showed a significant difference in every domain score in accordance with the occupation category. For the domain process, a significant negative correlation was found between age and domain score ($r = -0.195$, $p = 0.002$). In particular, nurses had better perceptions of lean adoption compared with others (odds ratio [OR] = 2.44, $p < 0.004$). The odds of having a better perception decreased by 6.3% as the age increased ($p < 0.008$).

Conclusions: The findings revealed that age and occupation appeared to be determinants of lean adoption perceptions among emergency department personnel. Specifically, older employees tend to have negative perceptions, while nurses have more positive perceptions. However, further research is needed to understand perceptions of lean adoption better and develop guidelines for implementing lean principles in healthcare settings.

Keywords: emergency care, health services, hospital, Malaysia

INTRODUCTION

In the late 1950s, Toyota Motor Company began to implement a radical change in its production system, which was the opposite of the traditional mass production concept.[1] Taiichi Ohno, a Japanese industrial engineer, is recognized as the founder of the Toyota Production System, which is designed to produce cars based on specific customers' requirements, thus reducing the number of cars in inventories.[2] This system eventually came to be known as lean manufacturing—a system that focuses on identifying waste sources and then applying methods, tools and techniques to eliminate them.[3] Womack and Jones introduced lean to the rest of the world in the 1990s, by defining the concept of Lean Thinking.[4]

A variety of benefits can be obtained with the implementation of lean methodology in hospitals, including improved service quality and patient care processes.[5] By reducing waste, increasing value-added activities, and meeting patient expectations, lean management effectively improves hospital service quality.[6] In the United States, lean adoption in hospitals also has a positive financial impact, wherein such a practice is significantly associated with lower health insurance spending per beneficiary.[7] Thus, we can conclude that the implementation of lean practices in healthcare organizations has led to enhanced financial performance, improved efficiency, and elevated patient care.[8] A more systemic approach to lean implementation in hospitals may assist in spreading improvement and supporting sustainable reform.[9] The introduction of lean management has generated conflicts between healthcare practitioners and hospital administrators regarding the sociocultural aspects of healthcare labor. Some clinicians have argued that an excessive emphasis is placed on organizational efficiency and productivity at the expense of patient experience and quality of care.[10,11] Meanwhile, some clinicians have also voiced their view that this initiative is targeted to optimize operational costs instead of enhancing the satisfaction of patients and staff.[12] Lean managers also face challenges in materializing lean thinking and redesigning the health care system. It requires patience to endure resistance and skepticism, high-quality leadership, and professionals who are dedicated to the cause.[13]

Meanwhile, the emergency department (ED) has a gatekeeping function in a hospital.[14] Most hospital EDs face issues of delayed service and overcrowding, which are worsened by the continuously increasing cost of care.[15,16] In terms of advocating for the implementation of

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lean principles in healthcare, specifically in the ED, the notable achievements of lean methodologies within health services have generated significant momentum.[17] In particular, the EDs that have implemented lean methodologies generally attained positive outcomes, including reduced length of hospital stay, procedure duration, and waiting time, as well as improved patient flow.[15] Nevertheless, there is a pattern of biased reporting in which only positive results are published, and hospitals that failed to achieve the desired behavioral changes refuse to examine the causes of their failure publicly.[11]

Most of the studies involving lean healthcare discuss the process of care and the outcome of the provision of care.[11] In comparison, limited research has been conducted to investigate the perceptions of healthcare professionals regarding lean implementation, along with their overall well-being and working conditions. A Swedish study found a correlation between positive worker perceptions of lean and positive employee outcomes, including worker well-being.[18] Hence, achieving positive perceptions among the workers during the implementation process is crucial. Factors like age, gender, occupational status, and training, can affect how people perceive lean management adoption.[19–21] Thus, the current study aims to assess the perceptions of personnel employed at EDs in Selangor, Malaysia, regarding the implementation of lean management and to determine the factors influencing their perceptions. Hence, the following hypothesis is proposed: Perceptions of lean adoption are affected by the demographic factors of employees, such as gender, age, occupation, attended training in the last two years, and duration of service.

METHODS

We conducted this cross-sectional study at the EDs of three public hospitals in Selangor. Malaysia. The study was conducted within six months, from October 2019 to January 2020. We chose the hospitals based on their agreement to participate in the study. These hospitals were grouped administratively as cluster hospitals and were specifically selected because they had adopted lean initiatives in their respective EDs. A questionnaire was used to assess healthcare workers' perceptions of lean management adoption in healthcare. The target population of this survey were healthcare staff working at the EDs, including doctors, nurses, and medical assistants. The inclusion criterion was working in the EDs for six months or more (duration of working should exclude long leave taken in between working period), while the exclusion criterion was staff involvement with attachment programs, regardless of the duration.

The study employed the total sampling method, in which 350 questionnaires were distributed to the participants. The hospitals requested that we deliver the questionnaire to subjects in hard copy form to boost the response rate among respondents. The participants were allotted one week to fill out the questionnaire. Taking into consideration their demanding schedules in the EDs, they had the option to complete the questionnaire outside of their working hours. Data collection was conducted in accordance with the ethics approval of the protocol. Ethical approval was obtained from the Medical Research and Ethics Committee, Ministry of Health Malaysia (NMRR-19-1019-47197).

In the present study, we used a validated questionnaire, the Lean in Healthcare Questionnaire (LiHcQ), upon obtaining permission from the author of the questionnaire. LiHcQ was developed to evaluate lean adoption in healthcare services based on instruments from other industries and was originally implemented in European service sector companies. The instrument incorporated the principles of collaborative partnerships and respect for individuals, focusing on person-centered care in which patients are treated as equal partners. The questionnaire consists of questions measuring staff perceptions of lean adoption in healthcare.[22] Items are categorized according to Liker's 14 principles describing lean within four domains: philosophy, processes, people and partners, and problem-solving.[23] There are 16 questions, with each domain having 3 questions, except for the processes domain, which had 7 questions. Upon testing the validity and reliability of the original LiHcQ, confirmatory factor analysis revealed a satisfactory correlation with Liker's definition of lean (χ^2 = 221625, d.f. = 95, $p < 0.001$, relative χ^2: 2.33, root mean square error of approximation (RMSEA) = 0.07, standardized root mean square residual (SRMR) = 0.048 and comparative fit index (CFI) = 0.93) and Cronbach's alpha values ranging from 0.60 to 086. The test–retest reliability, as determined by the intra-class correlation coefficient, varied from 0.77 to 0.88.[22] Prior to the distribution of the questionnaire, we conducted a translation process to Malay and a pilot study. The results of the pilot study revealed face validity index of 0.91, intra-class correlation coefficient ranging between 0.81 and 0.93, and good Cronbach's alpha (0.75 to 0.90).[24]

In the current study, each question had five statements, representing increasing levels of maturity (levels 1–5), and the respondents should choose the statement that best described their organization. The relationships between demographic factors (independent variable: gender, age, occupation, attended training in the last two years, and duration of service) and domain score (dependent variable: philosophy, people and partner, processes, and problem-solving) in the questionnaire were examined. Bivariate analysis was conducted using one-way ANOVA and Pearson correlation. The correlation between each demographic characteristic and the total score of LiHcQ (i.e., the sum of all domains), was initially determined using simple logistic regression analysis, followed by multivariate logistic regression. To classify the total score of LiHcQ as dichotomous, scores exceeding and falling

below the mean were categorized as high and low, respectively. The total score of LiHcQ represents the staff's general perceptions of lean adoption. Statistical Package for the Social Sciences software version 20 was used for data analysis in the current study, wherein a *p*-value less than 0.05 was considered statistically significant. In this case, the null hypothesis would be rejected, and the alternative hypothesis would be accepted.

RESULTS

After one week, 251 respondents returned the forms (response rate: 71.7%). Table 1 describes the demographic status of the respondents. In this study, the majority of the participants were female (61.8%), and the mean age was 31.8 (±5.48). The respondents were well distributed among three categories of staff: nurses (36.7%), medical assistants (29.5%), and doctors (33.9%). In this study, the duration of service was described as the number of months in service with the mean of 83.50 (±60.80). The percentage of staff who attended training in the last two years was 36.4%. Table 2 describes the descriptive data of the study. As can be seen, the highest mean was 3.80 (Item 7: standardization: process), and the lowest mean was 3.22 (Item 16: partner and supplier respect). All items had 4 as the median, except for items 4 (agent of change: people and partner), 8 (patient centered care: processes), and 13 (problem-solving: problem-solving). The percentage of respondents with a score of 5 was highest at 28.3% (item 7: standardization: process), followed by 27.5% (item 10: sign and signal based on patient value). Problem-solving had the lowest domain score compared with the other domains.

The relationship between the demographic factors and each domain score of LiHcQ was tested using one-way ANOVA test and Pearson correlation for the categorical and continuous variables, respectively (Table 3). No significant difference was observed between genders in all domain scores. There was a significant difference of $p < 0.05$ in the occupation category for each domain. In particular, nurses had the highest mean, followed by medical assistants and doctors. Furthermore, age and duration of service had weak negative correlations with all domain scores. However, the correlation was only significant for age in the domain process ($r = –0.195$, $p = 0.002$). Generally, those who attended training within the last 2 years of the study had a higher mean score in all domains, but it was only significant for the domain process.

TABLE 1. The sociodemographic status of respondents

Characteristic	N	%
Gender		
Male	96	38.2
Female	155	61.8
Occupation		
Nurses	92	36.7
Medical assistants	74	29.5
Doctors	85	33.9
Attended training in the last 2 years		
Yes	99	36.4
No	152	60.6

TABLE 2. Descriptive data for each item and domain scores of LiHcQ

Item	Question	Mean ± SD	Median	N (%)				
				1	2	3	4	5
Philosophy		10.71 ± 2.79	11					
1	Employee commitment	3.62 ± 1.04	4	4 (1.6)	34 (13.5)	62 (24.7)	94 (37.5)	57 (22.7)
2	First line manager's commitment	3.68 ± 1.00	4	4 (1.6)	29 (11.6)	55 (21.9)	94 (43.4)	57 (21.5)
3	Time for improvement work	3.42 ± 1.14	4	11 (4.4)	45 (17.9)	64 (25.5)	81 (32.3)	50 (19.9)
People and Partner		10.15 ± 2.85	10					
4	Agent of change	3.31 ± 1.05	3	2 (0.8)	52 (20.7)	85 (33.9)	66 (26.3)	46 (18.3)
5	customer value identification	3.63 ± 1.07	4	5 (2.0)	36 (14.3)	42 (16.7)	115 (45.8)	53 (21.1)
16	Partner and supplier respect	3.22 ± 1.29	3	28 (11.2)	45 (17.9)	51 (20.3)	76 (30.3)	51 (20.3)
Process		24.81 ± 5.84	25					
6	Value stream mapping	3.44 ± 0.96	4	7 (2.8)	38 (15.1)	73 (29.1)	106 (42.2)	27 (10.8)
7	Standardization	3.80 ± 1.01	4	1 (0.4)	35 (13.9)	52 (20.7)	92 (36.7)	71 (28.3)
8	Patient centered care	3.33 ± 0.93	3	8 (3.2)	40 (15.9)	85 (33.9)	100 (39.8)	18 (7.2)
9	Technology for quality control	3.60 ± 1.06	4	8 (3.2)	34 (13.5)	63 (25.1)	92 (36.7)	54 (21.5)
10	Sign and signal based on patient value	3.68 ± 1.10	4	6 (2.4)	37 (14.7)	58 (23.1)	81 (32.3)	69 (27.5)
11	Visualizing improvement	3.57 ± 0.99	4	2 (.8)	43 (17.1)	59 (23.5)	104 (41.4)	43 (17.1)
15	Proactive planning	3.40 ± 1.30	4	29 (11.6)	31 (12.4)	62 (24.7)	67 (26.7)	62 (24.7)
Problem-solving		10.10 ± 3.24	10					
12	Self-evaluation	3.39 ± 1.19	4	10 (4.0)	39 (15.5)	48 (19.1)	96 (38.2)	58 (23.1)
13	Problem-solving	3.29 ± 1.22	3	11 (4.4)	49 (19.5)	2 (20.7)	83 (33.1)	56 (22.3)
14	Staff contribution to decision-making	3.41 ± 1.21	4	7 (2.8)	47 (18.7)	47 (18.7)	92 (36.7)	58 (23.1)
Total Score		55.77 ± 10.84	55					

TABLE 3. Bivariate analysis of between demographic factors and domain scores

Group	Mean Philosophy	Mean People and partner	Mean Process	Mean Problem-solving	Total Score
Gender					
Male	10.76	9.83	24.58	9.64	
Female	10.68	10.34	24.95	10.38	
p	0.833	0.171	0.625	0.076	
Occupation					
Nurse	11.14	10.97	26.15	11.03	59.29
Medical assistant	10.99	9.81	25.12	10.15	56.07
Doctor	10.01	9.55	23.09	9.04	51.69
p	0.016	0.002	0.002	0.001	0.001
Attended training					
Yes	11.13	10.47	26.60	10.38	
No	10.44	9.93	23.65	9.91	
p	0.056	0.143	0.002	0.256	
Age*					
r	-0.1	-0.013	-0.195	-0.067	
p	0.115	0.843	0.002	0.289	
Duration of service*					
r	-0.047	-0.006	-0.107	-0.051	
p	0.459	0.923	0.091	0.422	

*used Pearson Correlation

TABLE 4. Post hoc test between occupation category and total score of LiHcQ

Job		Mean Difference	Standard Error	*p*	95% CI	
					Lower Bound	Upper Bound
Nurse	Medical assistant	3.226	1.624	0.118	–0.60	7.05
	Doctor	7.599*	1.565	0.001	3.91	11.29
Medical assistant	Nurse	–3.226	1.624	0.118	–7.05	0.60
	Doctor	4.373*	1.653	0.074	0.47	8.27
Doctor	Nurse	–7.599*	1.565	0.001	–11.29	–3.91
	Medical assistant	–4.373*	1.653	0.074	–8.27	–0.47

*The mean difference is significant at the 0.05 level

TABLE 5. Simple logistic regression and multivariate logistic regression

Characteristic	Simple			Multivariate		
	UOR	*p*	95% CI	AOR	*p*	95% CI
Age	0.937	0.008	0.894 – 0.983	0.927	0.004	0.881 – 0.976
Duration of Service	0.995	0.022	0.991 – 0.999	Exclude		
Gender						
Male	1			Exclude		
Female	1.236	0.419	0.739 – 2.065			
Occupation						
Doctor	1	0.016		1	0.058	
Nurse	2.444	0.004	1.325 – 4.508	2.229	0.020	1.137 – 4.372
Medical Assistant	1.398	0.294	0.748 – 2.613	1.004	0.991	0.472 – 2.137
Attended training						
No	1			1		
Yes	1.534	0.106	0.913 – 2.577	1.646	0.078	0.945 – 2.866

UOR: Unadjusted odds ratio; AOR: Adjusted odds ratio; CI: Confidence interval

The relationship between the total score of LiHcQ and the occupation category was examined using one-way ANOVA, followed by post hoc test. Tukey's post hoc test results (Table 4) revealed that nurses had a significantly higher total LiHcQ score (mean = 59.29) compared to doctors (mean = 51.69), $p = 0.001$. However, no significant difference was observed between medical assistants and the other staff members.

First, simple logistic regression was done to determine the association of each demographic factor with the total score of LiHcQ, (Table 4). The total score was made

dichotomous, with scores above the mean defined as high. From simple logistic regression, the odds of having higher perceptions decrease by 6.3% (p = 0. 008) for each increase in age. A significant finding was also found for the duration of service, where the OR = 0.995 (p = 0.022). Therefore, for each increase in duration of service, the odds of having better perceptions decrease by 0.5%. In the occupation category, nurses had 2.444 odds of better perceptions compared to the others (p = 0.004). The finding for the OR compared with those who attended training and those who did not attended training was insignificant. Multivariate logistic regression was done using the included factor (Table 5). Two factors were removed: gender and duration of service. Here, duration of service was removed due to its correlation with age, and gender was also removed due to the insignificant finding with a high p-value. The finding for age was significant, where the odds decreased by 7.3% per increase in age. In particular, nurses had a lower adjusted OR than their unadjusted OR, which was 2.229 compared with 2.444. The results of the multivariate logistic regression on the training category were not significant.

DISCUSSION

The ways in which healthcare staff view the adoption of lean practices differ based on various demographic factors. A questionnaire that aligned with Liker's principles of lean could effectively gauge staff perspectives on lean implementation in the healthcare setting.[22] The present study supported the hypotheses that the perception of lean adoption can be affected by the demographic factors of the staff employed in hospital EDs. Furthermore, lean adoption might be affected differently based on different categories of occupation. A previous study revealed that nurses hold more positive views about lean adoption than physicians do.[18] As frontline healthcare professionals, nurses may view lean methodologies as mechanisms that amplify their capacity to effectively and efficiently deliver care, thereby boosting job satisfaction and morale.[10] This study also found that a less favorable perception of lean adoption is associated with increasing age. This finding is in accordance with another study, which found that a negative correlation between lean adoption in manufacturing and leaders' age, where task-orientation style outperformed relation-orientation style.[25] In addition, a study on lean manufacturing in India showed that, on the one hand, older employees tend to be negative towards change but are rich in experience. Younger employees, on the other hand, tend to be more receptive towards change.[26]

The question pertaining to standardization had the highest proportion of respondents who rated it at the highest level. This result aligned with the findings of a previous study among Swedish primary care units.[27] One possible reason for this in the present study could be attributed to the nature of the question, which focuses on developing and following routines. This aspect is important in EDs given that a standard protocol has been developed to help staff conduct tasks, especially during a disaster. In particular, EDs typically have developed protocols for responding to mass casualty incidents that often draw out more resources such as additional personnel to work in such situations.[28,29] However, a study conducted using LiHcQ in a hospital in Indonesia had the lowest standardization acceptance level. Poor documentation and updates of value stream mapping on several services contributed to this problem.[30]

In the current study, those who attended training in the last two years had a higher mean total score. The training includes comprehensive awareness on lean principles, Kaizen workshop, and value stream mapping exercise. However, the finding was not significant. Training is an important factor for consideration as it is one of the main strategies in an organization. An organization must implement a strategic training program to implement lean principles. Continuous training and awareness are very important to ensure sustained lean adoption in an organization.[31,32] Therefore, it is important for staff to have refreshment courses over a period of time, such as every two years. The implementation of lean management can have both positive and negative impacts on employees. Some staff members are willing to adopt the change, while others resist it due to fear of the unknown, uncertainty about the measurement system and conflicting values.[33] A study conducted in Finland revealed that staff members exhibited resistance towards lean practices due to their preference for maintaining established work methods, insufficient access to information, and weariness stemming from project development efforts.[34] Furthermore, implementers must address this issue by providing clear guidance, raising awareness, and guiding staff through the process.

One significant strength of the study is its comprehensive approach to assessing the perceptions of a diverse group of emergency ED personnel, including doctors, nurses and medical assistants. This inclusivity ensures that the findings reflect a wide range of perspectives, which is crucial for understanding the overall sentiment towards lean adoption in a multifaceted healthcare setting. However, this study's findings may not be directly applicable to other healthcare settings or regions and caution should be exercised when applying the results to different contexts. In addition, the study mainly depended on quantitative data and including qualitative data or interviews with employees could have provided more meaningful insights into the reasons behind their perceptions.

CONCLUSIONS

The study's findings suggest that occupation plays a significant role in the perception of lean adoption among

ED personnel, with nurses generally having more positive perceptions. In particular, age also appears to influence perception, specifically the processes domain, where older employees tend to have less favorable perceptions. Further research should be conducted to investigate the perceptions of lean adoption to assist implementers in developing a comprehensive framework and a set of guidelines for the implementation of lean principles in healthcare settings.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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Healthcare Provider Engagement and Its Effects on Patient Rereferral: Insights from Indonesia

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Abstract

Background: In the highly competitive landscape of healthcare, nurturing strong relationships between referring healthcare providers and healthcare facilities is essential for maintaining patient loyalty. This study explores the factors influencing referring health care provider engagement and its subsequent impact on the willingness to rerefer to healthcare facilities.

Methods: A cross-sectional quantitative survey was conducted with 181 healthcare providers who regularly refer patients to a private hospital in Jakarta. Data were collected through an online structured questionnaire consisting of 29 questions. The following dimensions were covered: specialist characteristics, practice characteristics, healthcare provider–specialist interaction, patient–specialist interaction, returning referral, training opportunity, healthcare provider engagement, and willingness to rerefer to hospital.

Results: The study yielded significant findings, with five out of the six antecedents associated with healthcare provider engagement demonstrating statistical significance ($p < 0.05$). The most significant coefficient value pertaining to healthcare provider engagement was observed in patient–specialist interaction ($\beta = 0.287$, $p < 0.05$). Furthermore, the analysis indicated a substantial and positive correlation between health care provider engagement and willingness to rerefer to the healthcare provider ($p < 0.05$).

Conclusions: Healthcare providers who demonstrate engagement with the hospital are likely willing to rerefer their patients to the hospital. Therefore, to increase the willingness to rerefer patients to the hospital, hospital management should prioritize fostering engagement with healthcare providers, particularly by improving patient and specialist interaction experiences.

Keywords: healthcare provider, referral system, Indonesia

INTRODUCTION

Amidst serious challenges in the healthcare sector, the Indonesian government strives to establish a robust health system for all citizens through initiatives such as the Social Security Administrator for Health (Badan Penyelenggara Jaminan Sosial/BPJS) and forming the National Health Insurance (Jaminan Kesehatan Nasional/JKN). As part of this effort, the BPJS also introduced a tiered referral system, facilitating the delegation of health service responsibilities vertically and horizontally among healthcare providers.[1] In Indonesia's tiered referral system, health services are categorized into three tiers. Primary health services, provided by the lowest-level healthcare facilities, such as primary health care clinics, constitute the first tier. Specialist health services, delivered by specialists or dental specialists, comprise the second tier. Subspecialty health services, performed by subspecialist doctors or dentists, represent the highest tier. Compliance with referral systems mandated by applicable laws and regulations is requisite for coverage under JKN.[1,2]

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The referral process entails active involvement from healthcare providers and patients. Therefore, measuring their willingness to recommend to others is crucial. Given that healthcare provider engagement is influenced by their experiences and can affect their willingness to recommend, hospitals should assess all factors or antecedents shaping the experience of referring patients.[3] Establishing engagement between healthcare providers and hospital management is a multifaceted endeavor requiring collaboration across organizational and professional boundaries. Addressing differences in beliefs and values between these parties is crucial to achieving the shared objective of delivering optimal healthcare to patients.[4]

In Indonesia, the tiered referral system operates horizontally and vertically. In the former, referrals are carried out between same-level health services in cases where the referrer faces limitations such as facility or personnel constraints. In the latter, referrals are made between different-level health services, either upward or downward. However, many Indonesians are unaware of BPJS' tiered referral system. Instances of patient and health worker refusal often stem from reluctance to change existing processes by not referring patients. Private healthcare facilities, operating on a fee-for-service model, may prioritize financial considerations, potentially influencing referral practices on the basis of the costs associated with specialist consultations or procedures. By

contrast, public healthcare facilities, subsidized by the government, typically prioritize medical necessity over financial concerns in referral decisions.[1,2,5,6]

This study draws upon antecedents of healthcare provider engagement identified in previous research. These antecedents include specialist characteristics, past interactions between specialists and healthcare providers/patients, returning referrals, and training opportunities.[7–12] This study also investigates how these antecedents influence healthcare providers' willingness to rerefer patients based on their experiences with a hospital.[7]

METHODS

The data for this study were obtained through a cross-sectional quantitative research approach. The study was conducted at a leading private hospital renowned for its excellent service values and international accreditation by the Joint Commission International. With a capacity of 350 patient beds, this hospital is considered a benchmark private hospital group in comparison to others nearby. As a comprehensive hospital, this Hospital receives referrals from other healthcare facilities, including primary healthcare clinics and the private practices of doctors and midwives.

The study collected questionnaires from healthcare practitioners, including general practitioners (GP) and midwives from private practices and clinics who have referred their patients to the hospital within the past year (August 2022–August 2023). A total of 183 healthcare practitioners participated in the study, comprising 30 primary healthcare clinics, 40 GP private practices, and 70 midwife private practices registered as referral healthcare providers to the hospital.

Purposive sampling was employed as the sampling strategy. To determine the minimum required sample size, G*Power (version 3.1.9.4) was utilized, considering a significance level of 0.05, an effect size of 0.15, and a power of 0.95.[13] Consequently, the study determined that a minimum sample size of 160 participants was needed. However, in August 2023, 183 participants completed the structured questionnaires. The questionnaires consisted of 29 questions, encompassing various dimensions: specialist characteristics (SCH) with three questions, practice characteristics (PCH) with three questions, healthcare provider–specialist interaction (HCP) with three questions, patient–specialist interaction (PSI)[12] with four questions, returning referral (RR)[11] with three questions, training opportunity (TOP)[9] with three questions, healthcare provider engagement (HPE)[8] with seven questions, and willingness to rerefer to hospital (WRH) with three questions. The conceptual research framework and hypotheses are depicted in Figure 1. SCH explores the features or characteristics owned by specialists/physicians in the hospital as referral recipients. PCH pertains to the defining features, attributes, or elements of a healthcare provider's practice or facility in primary healthcare settings. HCP focuses on the collaboration and communication between primary healthcare providers and specialists within the referral setting. PSI examines the consultation and engagement between a patient and a specialist for specialized care post referral. RR refers to a situation where a patient referred to a hospital for specialized care is subsequently sent back to the original referring healthcare professional or facility. TOP refers to the opportunity for healthcare providers from a referral clinic to undergo or receive training as part of their professional development. The training is an incentive to refer patients to a certain hospital. HPE assesses the level of involvement, commitment, and active participation of healthcare providers in a referring hospital. WRH gauges healthcare providers' openness or inclination to recommend or refer a patient back to a specific hospital for further medical treatment, services, or care.

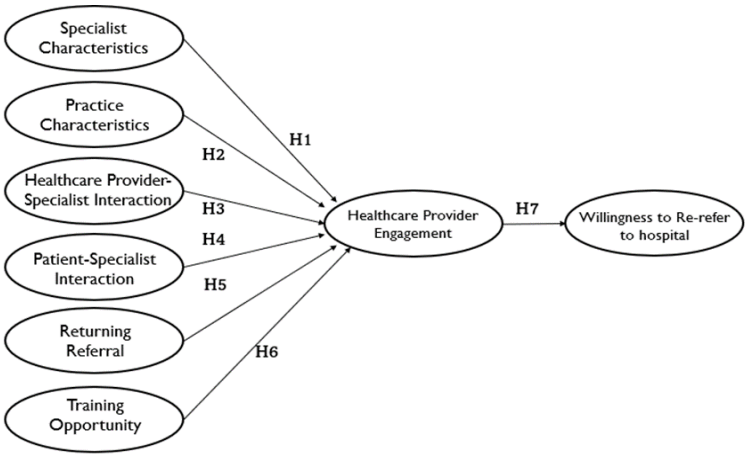

FIGURE 1. Research conceptual framework

This study adhered to a previous recommendation to use a Likert scale of 1–6 for questions related to motive test, attitude test, and satisfaction test, as it offers higher reliability than the Likert scale of 5 points.[14] Given that the majority of healthcare providers referring to the hospital are from Indonesia, the study applied a Likert scale of 1–6 instead of 1–5. Asian cultures, including Indonesia, tend to favor middle-level responses (e.g., selecting 3 on a 1–5 scale) on Likert scales than other cultures.[14,15]

The questionnaire was translated from English to Bahasa Indonesia specifically for the study's purposes. To ensure the comprehensibility of all questions, content validity was evaluated by three experts from hospital management practitioners. These experts were asked to rate their level of agreement with items on a Likert scale ranging from 1 (strongly disagree) to 10 (strongly agree). They critically reviewed the translated questions, assessed the ability of each question to reflect the construct definition, and then provided scores for each item. The relevancy of the items to the translated questions was strengthened with the oral or written comments of the experts. Any comments or suggestions from each expert were duly considered to enhance the quality of the translated questionnaire.

SmartPLS™ version 4.0 was selected for data analysis because of its bootstrapping option, which verifies significance during PLS-SEM analysis.[16] This approach yields two types of output: the outer model or measurement model and the inner model. The former describes the relationship between indicators and their variables to confirm the reliability and validity of each indicator used in the model. The outer model analysis includes assessments of indicator reliability (outer loading), construct reliability (Cronbach's alpha and composite reliability), convergent validity (average variance extracted/AVE), and discriminant validity (Heterotrait-Monotrait ratio) to ensure the accuracy and dependability of every indicator in the research model. Hypothesis testing was also performed.[17–19] This study conducted an inner model analysis incorporating a cross-redundancy validation value of Q^2 to evaluate the model's predictive relevance and determined a coefficient determinant (R^2) to assess prediction accuracy.[16]

In terms of safeguarding human rights and welfare during the study, the Universitas Pelita Harapan Ethics Committee thoroughly reviewed the procedure, including the information provided to potential subjects. The Department of Hospital Administration at Universitas Pelita Harapan (Ref. No. 008/M/EC-AGT/VIII/2023) approved the information provided to prospective participants.

RESULTS

Table 1 presents the demographic data of the 183 eligible participants. Among the respondents, 66% were midwives, and the remaining 34% were GPs from both private practices and clinics who refer their patients to this hospital. The majority of respondents referred patients to the hospital more than once (81%).

The first step of the PLS-SEM analysis involved assessing the reliability indicator (outer loading) of the reflective model. All indicators should possess loading values >0.708.[19] The second step tested internal consistency. Constructs were considered reliable if they exhibited a Cronbach's alpha greater than 0.7 and composite reliability within the range of 0.7–0.95. The third step measured the AVE to assess convergent validity. The result showed that all of the constructs had an AVE ≥0.50, meeting the criteria set by the literature.[19] The four reliability and validity testing criteria for the outer model analysis were successfully met, as described in Tables 2 and 3. The results of the outer model analysis are illustrated in Figure 2.

The inner model analysis, depicted in Figure 3, evaluated Q-squared testing (Q^2 predict). The Q^2 predict result for HPE was 0.608, indicating large predictive relevance. The Q^2 predict result for WRH was 0.365, indicating medium predictive relevance. The closer the value is to 1, the stronger the predictive relevance ability of the related variables to forecast the same research output, irrespective of changes in data parameters.[18,19] The result suggests that 64% of the variation in HPE can be explained by the independent variables within the model. The remaining 36% can be accounted for by other independent variables excluded in this research model. The 41.7% of the variation in WRH can be explained by the model's independent variables. The remaining 58.3% can be attributed to other independent variables not considered in this research model. Figure 3 illustrates the results of the inner model analysis.

TABLE 1. Demographic respondents (N = 183)

Category	N	%
Gender		
Male	24	13
Female	159	87
Occupation		
Midwife	121	66
GP Clinic	24	13
GP Private Practice	38	21
Last time referring		
<1 month	81	44
1–6 months	79	43
6–12 months	23	13
Total frequency of referring		
1 time	35	19
2–5 times	35	19
>5 times	113	62

TABLE 2. Reliability and validity testing

Variable/Indicator	Outer Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
HPE1	0.585			
HPE2	0.532			
HPE3	0.803			
HPE4	0.779	0.872	0.904	0.58
HPE5	0.856			
HPE6	0.862			
HPE7	0.846			
HCP1	0.695			
HCP2	0.818	0.727	0.847	0.65
HCP3	0.894			
PCH1	0.865			
PCH2	0.923	0.831	0.899	0.75
PCH3	0.804			
PSI1	0.872			
PSI2	0.907	0.892	0.926	0.76
PSI3	0.867			
PSI4	0.831			
RRL1	0.733			
RRL2	0.908	0.8	0.884	0.72
RRL3	0.891			
SCH1	0.599			
SCH2	0.891	0.71	0.845	0.65
SCH3	0.896			
TOP1	0.895			
TOP2	0.926	0.899	0.937	0.83
TOP3	0.914			
WRH1	0.902			
WRH2	0.881	0.844	0.906	0.76
WRH3	0.836			

TABLE 3. The Heterotrait-Monotrait ratio results

	HCP	HPE	PSI	PCH	RRL	SCH	TOP
HCP	0.80						
PCH	0.67	0.76					
PSI	0.74	0.77	0.62				
RR	0.77	0.73	0.54	0.72			
SCH	0.59	0.59	0.57	0.49	0.59		
TOP	0.70	0.75	0.75	0.71	0.65	0.57	
WRH	0.58	0.75	0.57	0.67	0.63	0.25	0.64

Abbreviations: Specialist Characteristics (SCH), Practice Characteristics (PCH), Healthcare Provider–Specialist Interaction (HCP), Patient–Specialist Interaction (PSI), Returning Referral (RR), Training Opportunity (TOP), Healthcare Provider Engagement (HPE), Willingness to Rerefer to Hospital (WRH)

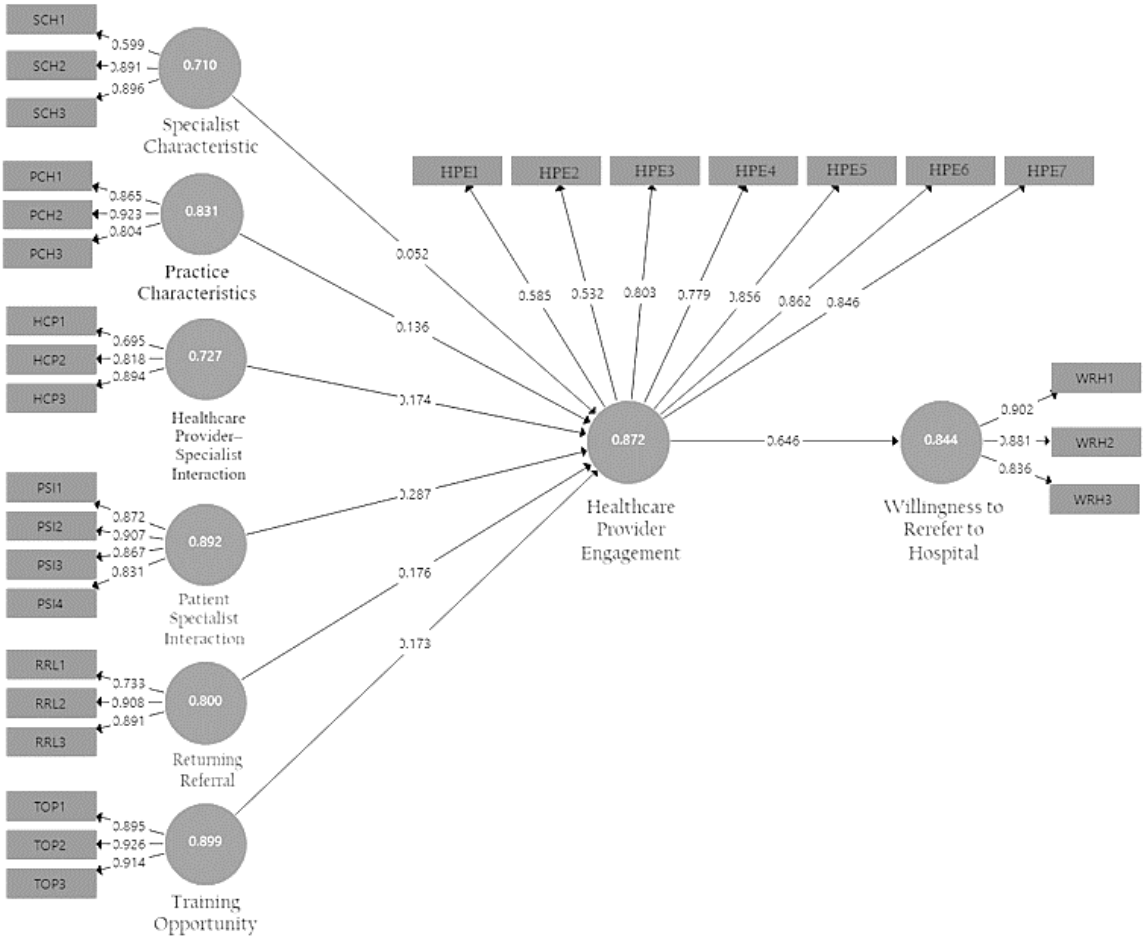

FIGURE 2. Results of the outer model analysis

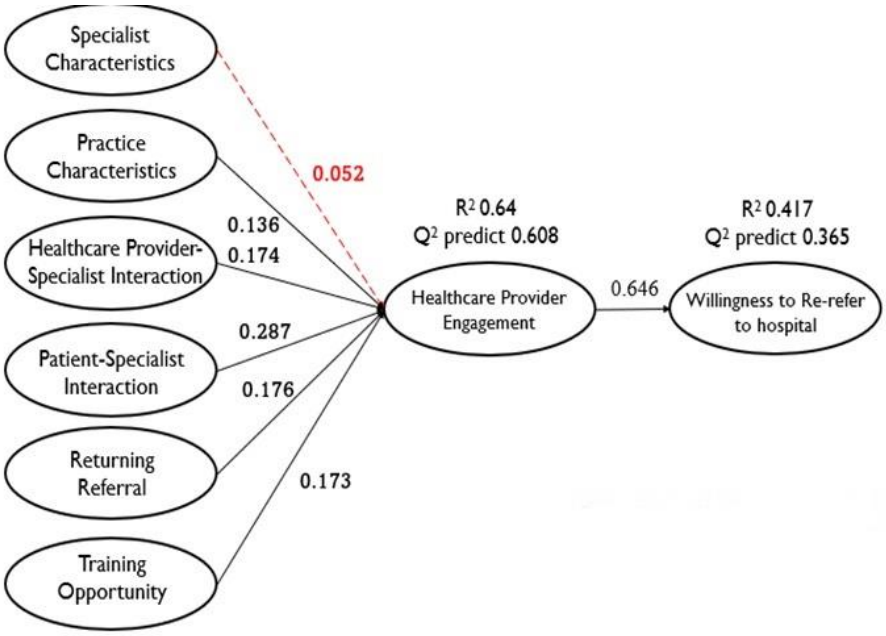

FIGURE 3. Results of the inner model analysis

TABLE 4. Hypothesis testing results

	Hypothesis	Standard Coefficient	95% CI	*p*
H1	Specialist Characteristic → Healthcare Provider Engagement	0.052	−0.021 – 0.125	0.117
H2	Practice Characteristic → Healthcare Provider Engagement	0.136	0.043 – 0.239	0.012
H3	Healthcare Provider–Specialist Interaction → Healthcare Provider Engagement	0.174	0.091 – 0.263	0.000
H4	Patient–Specialist Interaction → Healthcare Provider Engagement	0.287	0.173 – 0.387	0.000
H5	Returning Referral → Healthcare Provider Engagement	0.176	0.081 – 0.272	0.001
H6	Training Opportunity → Healthcare Provider Engagement	0.173	0.080 – 0.279	0.002
H7	Healthcare Provider Engagement → Willingness to Rerefer Patients to Hospital	0.646	0.582 – 0.716	0.000

Hypothesis testing using the bootstrapping procedure was conducted to determine the effect of the variables in the model and confirm whether the seven hypotheses proposed by this study were supported.[16] The results of the hypothesis analysis are described in Table 4. H1 is not supported, but H2–H7 are.

DISCUSSION

This study concentrates on improving patient care quality and the referral system from the perspectives of healthcare providers and hospitals, particularly in developing nations such as Indonesia, where the standard of healthcare must continually be raised.[7–12,20] Of the six antecedents of HPE in this study, five were significantly associated.

One antecedent, SCH, showed an insignificant association with HPE. A previous study in Canada revealed that community type, rather than specialist supply, predicts variations in referrals. Despite the importance of specialist traits such as medical expertise, board certification, or reputation, healthcare professionals making referrals may assume that all specialists already possess these fundamental traits.[21] This finding underscores the importance of establishing a good working relationship and rapport between primary care providers and specialists from the outset of the referral process. BPJS regulations in 2015 specified that the number of patient referrals in the first-level primary health facilities should not exceed 15% of the total monthly visits. Such rule imposes a constraint on the number of patients that can be referred each month.[1,22,23] This limitation introduces a selective approach in identifying cases genuinely requiring specialized care. The restriction ensures that primary healthcare providers prioritize managing cases within their capacity, thus reducing the burden on higher-level healthcare facilities. The 15% referral ratio also acts as a mechanism for cost control and resource allocation. By curbing excessive referrals, healthcare systems can manage their resources efficiently, optimizing the use of primary healthcare services. This approach is often implemented to contain healthcare costs because each referral to a hospital involves additional expenditures.[22–24]

The most significant coefficient value with HPE is PSI (Coeff 0.287, $p < 0.05$). Patient factors play a crucial role in explaining referrals. Referrals considering patient preferences are likely to result in a positive patient experiences and higher satisfaction levels.[25,26] Satisfied patients are engaged and likely to provide positive feedback, enhancing the reputation of both referring providers and specialists.[27,28] In a study in the Middle East, referring patients to higher-level healthcare facilities also increase patients' satisfaction with their primary care physicians because it reflects the physicians' support with regard to their emotional problems.[29] Therefore, specialists must enhance patient interactions to ensure positive experiences while receiving care.

The results of this study indicate that HPE positively affects WRH. With the finding and the assistance of the hospital administration, the level of WRH may be increased.[28] Healthcare providers typically have specific choices of hospitals to which they refer their patients, influenced by past experiences. Primary healthcare providers identified several nonclinical factors to explain the continuation of specialty care when conducting patient referral.[26,30] If past experiences are positive, healthcare providers are inclined to rerefer their patients to the same hospital.[20,21,27]

Several suggestions for hospital leadership for operational implementation on the basis of the analysis conducted include the following: First, hospitals must establish effective feedback mechanisms, which are essential for continuous improvement. Hospitals should actively seek feedback from referring providers regarding their experiences and areas for improvement. Regularly reviewing and acting upon the feedback can strengthen relationships and enhance the overall referral process. Second, hospitals should provide training and education programs to healthcare providers. Hospitals can develop programs to address potential gaps in understanding and perceptions among healthcare professionals involved in the referral process. The training can include orientation sessions, workshops, and educational materials to ensure a clear understanding of expectations and standards. Third, hospitals that receive referrals should prioritize continuous quality improvement initiatives. Quality

improvements can enhance the reputation of the receiving hospital and instill confidence among referring providers. Examples related to rereferral are timeliness of follow-up appointments (target: ensure that at least 90% of referred patients have follow-up appointments scheduled within an acceptable timeframe), reduction in unplanned readmissions (target: achieve a 15% reduction in unplanned readmissions within six months), referral process efficiency (target: decrease the average referral processing time by 20%, promoting a more efficient and streamlined process), and clinical outcomes post rereferral (target may vary depending on each specialty).

The study has two limitations. First, it may be constrained by its exclusive focus on the Indonesian healthcare context. Cultural and regional factors can greatly influence HPE and patient behavior. These findings may not be transferable to healthcare systems in other countries or regions with distinct cultural norms, healthcare practices, and patient expectations. Researchers should be cautious about extrapolating the results to different cultural contexts. Second, the findings may not be applicable to other healthcare settings beyond the use of JKN/BPJS in private hospitals in Indonesia, limiting generalizability to other payment methods.

This study infers that establishing a robust referral system necessitates collaboration between healthcare providers and hospitals through active engagement. This collaborative effort fosters strong relationships between healthcare providers and hospitals, increasing the former's willingness to rerefer their patients, leading to improved patient outcomes and ultimately benefiting the hospital. Hospital management should devote considerable attention to fostering engagement based on all significant antecedents (i.e., practice characteristics, healthcare provider–specialist interaction, patient–specialist interaction, returning referral, and training opportunity) as incentives for referrals.

CONCLUSIONS

This study contributes to the growing body of literature about the effect of HPE on the willingness to rerefer patients to hospitals. The model shows that HPE with hospitals is influenced by their experiences and perceptions following patient referrals. Healthcare providers who actively engage with the hospital are inclined to rerefer their patients. Therefore, to enhance the willingness to rerefer patients to the hospital, hospital management should prioritize building engagement with healthcare providers who refer their patients. This emphasis should particularly focus on improving patient and specialist interactions.

CONFLICT OF INTEREST

None declared.

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Factors Predicting Work Ability among Community Healthcare Providers in Yangon, Myanmar

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Factors Predicting Work Ability among Community Healthcare Providers in Yangon, Myanmar

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Abstract

Background: In healthcare organizations, a high level of work ability is necessary for workers to perform their tasks under different working conditions. This study aimed to describe the quality of work life, work environment, and work ability and examine predictors of the work ability of community healthcare providers.

Methods: A cross-sectional descriptive study was conducted from May 2020 to July 2020. The study enrolled 284 registered nurses and midwives from 38 public health departments in Yangon, Myanmar. Data were collected using the work-related quality of life scale (WRQoL) 2, work environment impact scale (WEIS-SR), and work ability index (WAI). The multiple regression method was used to analyze predictors of work ability.

Results: Overall, 71.13% of the participants were between 26 and 45 years old, and 99.30% were female. High WEIS-SR (61.98 ± 6.38), average WRQoL (106.10 ± 15.63), and good WAI (39.29 ± 4.99) scores were found (p = 0.05). WRQoL was found to be a predictor of the WAI of community healthcare providers (R2 = 0.140, B = 0.124) (p = 0.05).

Conclusions: Improving the quality of work life of community healthcare providers will also motivate them to perform their jobs better and thus satisfy their clients.

Keywords: community healthcare, healthcare providers, Myanmar, working conditions

INTRODUCTION

In healthcare organizations, a high level of work ability is necessary for workers to perform their tasks under different working conditions (e.g., high number of patients, high work pressure, etc.). Community healthcare providers include doctors, nurses, laboratory technicians, physiotherapists, and so on. Among them, nurses have significant and often untouched capability to help individuals and communities access high quality care, particularly in providing care for people in underserved rural and urban areas.[1] Poor work ability increases job stress and diminishes nurses' quality of work life (QWL).[2] Work-related stress can be detrimental to physical and mental health, which is associated with low productivity levels.[3] Work ability was found to be poorer among nurses than among other allied health professionals.[4]

Work ability is multifactorial and is linked to physical, mental, social, and health conditions rather than just a measurement of physical capacity.[5] Work ability was defined as the ability of a worker to perform his/her job, and the specific work demands, individual health condition, mental resources, and work life should also be considered.[6] It included individual, work-related, biological, and environmental factors.[7] Work ability was positively correlated with the QWL; thus, high work ability among nurses could also affect their QWL.[8] In addition, work ability varied among people depending on work-related factors such as shift work.[9]

Nurses have the ability, responsibility, and authority to carry out nursing services/care at various levels, and their lives are influenced by their QWL, which is attributable to dynamic changes in their work environment.[10] A high QWL is essential for healthcare facilities requiring qualified, dedicated, and inspired staff.[11] The QWL covers various factors ranging from work to nonwork life domains.[12] The QWL is a broad multidimensional construct that captures the perception of an individual on work experience, which incorporates work-based satisfaction factors, life satisfaction, and general feelings of well-being.[13]

The work environment can be an unhealthy workplace for nurses, as persistent stress and physical strain can lead to unqualified and unsafe patient care.[14] Work well-being can be abstracted in several ways, such as focusing on the qualitative aspects of work ability.[15] Regarding the work environment, practical nurses' work ability index (WAI) was found to be significantly lower than that of managers and senior officers as the reference group. Some white-collar occupations have work ability problems because of the work environment or physical load.[16] The work environment refers to the environment in which people work.[11] In a previous study, 44.5% of the respondents

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perceived their nursing work environment as positive;[16] 44% of nurses perceived their work environment at an average level, whereas 31% reported a high level of work environment. The needs related to the work environment and job satisfaction for community health nurses (CHNs) are increasing as healthcare reform for the care of people with chronic illness in institutions is shifting to primary care.[17]

In Myanmar, the rural population accounts for 70% of its total population, and its health system currently faces many challenges: failure to meet the Millennium Development Goals; the health status of the general population remains poor, for example, the life expectancy at birth is 67 years old, which is the lowest in the region; disease burdens such as tuberculosis, human immunodeficiency virus, and noncommunicable diseases; and shortage of human resources, with 1.33 health workforce (doctors, nurses and midwives) per 1,000 population, which is far below the WHO minimum recommended threshold of 2.3 to ensure access to quality care.[18] Moreover, the statistical data related to tertiary hospitals showed that the in-hospital death rate (3.2%) is the highest in Yangon, followed by Rakhine (2.3%) and Nay Pyi Taw (1.6%). In addition, there was a shortage of nurses, and nurses at Yangon General Hospital (YGH) experienced a heavy workload.[19]

Human resources are a critical input in the healthcare system to ensure access to quality care.[19] Quality is as important as an available, accessible, and responsible workforce in primary healthcare (PHC) for health system effectiveness and sustainable development.[18] Thus, investing in PHC and workforce-strengthening policies are important for coverage and sustainability of development. Quality PHC enhances self-care of clients, primary care, continuity of care, service utilization, coverage of care for all in the community, and cost-effective institutional care.[20]

Work ability, QWL, and work environments are essential for community healthcare providers given the rising incidence of chronic health problems and the challenging healthcare context. Some studies have examined the QWL and work environments among nurses; however, no study has assessed work ability and its influencing factors among community healthcare providers. Thus, activities in promoting the work ability of community healthcare providers in the health department, their work environment, and QWL must be supported and strengthened. This study aimed to identify the levels of QWL, work environment, and work ability and examine the predictive factors of work ability among community healthcare providers in the Yangon region in Myanmar.

METHODS

The study was conducted after receiving approval from the Research and Ethics Committee of the University of Nursing, Yangon (ID. 33/2020), and permission from the authorities of the Yangon Regional Public Health Department. This cross-sectional descriptive study was conducted in 2020 among community healthcare providers in 38 township public health departments instituted in central, peri-urban, and primary areas of Yangon region in Myanmar, namely, Ahlon, Sanchaung, Kamayut, Hlaing, Pabedan, Dagon, Kyautada, Mayangon, Kyimyindaing, Bahan, Pazundaung, Dawbon, Thaketa, Mingala Taungnyunt, South Okklapa, North Okklapa, Thingangyun, Yankin, Insein, Mingaladon, Hlaingthaya, Shwepyitha, North Dagon, South Dagon, East Dagon, Dagon Seikkan, Dala, Kon Chan Kone, Kyautan, Thonkwa, Kautmu, Thontay, Thanlyin, Seikkyi Kanaungto, Hlegu, Tikekyi, Htanbin, and Hmawbi.

Among the skill mix of community healthcare providers, 1127 registered nurses and midwives are working in the public health sector of Yangon region. The study included a total of 307 registered nurses and midwives according to the following inclusion criteria: at least 1 year of working experience and currently working in the township health public health department. The exclusion criteria were as follows: individuals who were on sick, maternity, or vacation leave during the study period. To obtain a higher representativeness of each level of community healthcare providers and an adequate number of nurses from each township public health department, the stratified random sampling method was used. The sample size was calculated according to Taro Yamane's (1973) formula with a 95% confidence level and p- value of 0.05.[21] Therefore, 14 township health nurses (THNs), 12 staff nurses, 20 trained nurses, 49 lady health visitors (LHVs), and 217 midwives were enrolled as participants.

The research instrument included four parts: (1) The demographic part included sex, age, marital status, educational level, job title, years of experience, and department; (2) The seven-item WAI scale (long version) of Tuomi *et al*. was used to measure work ability. The questionnaire consists of seven items, and each item is evaluated by different number of questions; therefore, the score ranges of items differ from each other. The scores range from 7 to 49, and a high score indicates an excellent level, whereas a low score indicates a poor level;[6] (3) The 15-item work environment impact scale (WEIS-SR) of Wästberg *et al*. was used to assess the work environment. The scores range from 0 to 75, and a high score indicates a high level, whereas a low score indicates a low level;[14] (4) The 32-item work-related quality of life-2 (WRQoL-2) of Van Laar *et al*. was used to measure the QWL.[12] The WRQoL-2 questionnaire assesses seven factors: control at work (CAW), employee engagement (EEG), general well-being (GWB), home–work interface (HWI), job and career

satisfaction (JCS), stress at work (SAW), and working conditions (WCS). Negative items were reversed before calculation. Easton and Van Laar mentioned that the overall WRQoL score and WRQoL 1 should not be included in the scoring. The score ranges from 31 to 155; a high score indicates a high level, whereas a low score indicates a low level.[13]

To obtain content validity, each questionnaire (Myanmar version) was tested by six nursing experts from Myanmar. The reliability of each questionnaire ranged from 0.80 to 0.95 on 20-pretest sample. The questionnaires were forward-translated into the Myanmar language by the researchers and back-translated into English by a bilingual Myanmar expert. To verify the accuracy and consistent meaning of the instruments, the back-translated questionnaires were checked by a native speaker.[22]

Data were collected from May 2020 to July 2020. After the participants received explanations about the study, informed consent was obtained, and the questionnaires were distributed to the participants. The completeness of the returned questionnaires (100%) was checked after 2 weeks. Of the 307 questionnaires, 284 completed questionnaires, gaining a response rate of 93%, were analyzed.

Descriptive statistics was used to analyze the demographic data, levels of WRQoL, work environment (WEIS-SR), and work ability (WAI). SPSS version 15 was used in the data analysis. After testing the assumption, regression analysis was used to analyze predictive factors on work ability. According to Burns and Grove, a correlation coefficient (R) of <0.30 demonstrated a weak linear relationship, 0.30 ≤ R ≤ 0.50 as moderate, and >0.50 as strong. A positive correlation indicated a direct relationship, whereas a negative relationship indicated an inverse relationship.[22]

RESULTS

Among the participants, 99.30% were female, and the remaining 0.70% were men. Of the 284 participants, 9.15% were <25 years old, 71.13% were 26–45 years old, and 19.72% were >45 years old. More than half of the participants were married (65.14%), and the remaining were single (34.86%). By designation, most participants were midwives (64.08%), followed by LHVs (17.61%), trained nurses (6.69%), staff nurses (4.23%), CHNs (1.76%), THNs (1.76%), and ward sisters (1.41%). By academic background, most of the participants (87.63%) received midwifery training: diploma (14.08%) and certificate (57.39%, including LHV certificate,15.90%). The remaining participants received nursing education: baccalaureate in nursing science (2.47%), diploma (9.54%), and others (0.35%). Regarding the duration of working experience, 30.63% of the participants had <5 years, 28.17% had 5–10 years, 20.42% had >10 years, and 20.77% had >20 years. According to the workplace, 77.11% of the participants worked in urban areas township public health department (37.68%), urban health center (UHC, 26.40%) and sub-UHC (13.03%), and the remaining 22.89% worked in the rural area: sub-rural health center (sub-RHC, 13.38%) and RHC (9.51%) (Table 1).

The mean WAI score was 39.29 (±4.99), indicating a good level of work ability. The mean WEIS-SR score was 61.98 (± 6.38), indicating a high level. The mean WRQoL-2 score was 106.10 (±15.63) at average level. The mean score of WRQoL factors were as follows: CAW, 14.16 ± 2.52; EEG, 11.17 ± 2.07; GWB, 21.03 ± 3.77; HWI, 13.51 ± 2.98; JCS, 22.62 ± 3.33; SAW, 9.59 ± 3.33; and WCS, 14.02 ± 2.62 (Table 2). The QWL weakly affected the work ability of the participants (R2 = 0.140, B = 0.124) (p = 0.05). The work environment has no significant effect on work ability (Table 3).

TABLE 1. Sociodemographic data of community healthcare providers in Yangon, Myanmar, from May to July 2020 (N = 1,127)

Variable	N	%
Gender		
Male	2	0.70
Female	282	99.30
Age		
≤25	26	9.15
26–45	202	71.13
>45	56	19.72
Marital status		
Single	99	34.86
Married	185	65.14
Education		
Midwifery certificate	163	57.39
Midwifery diploma	40	14.08
LHV certificate	45	15.85
Nursing diploma	27	9.50
Bachelor's Degree in Nursing Science	7	2.46
Other	2	0.70
Designation		
Midwife	182	64.08
LHV	50	17.61
Trained nurse	19	6.69
Staff nurse	12	4.23
Sister	4	1.41
Community health nurse	5	1.76
Township health nurse	5	1.76
Total services (in years)		
<5	87	30.63
5–10	80	28.17
10–20	58	20.42
>20	59	20.77
Departments		
Urban health center (UHC)	75	26.40
Sub-UHC	37	13.03
Rural health center (RHC)	27	9.51
Sub-RHC	38	13.38
Township public health department	107	37.68

TABLE 2. Levels of the quality of working life of community healthcare providers in Yangon, Myanmar, from May to July 2020

WRQoL-2	Mean	SD	Level
Overall	106.10	15.63	Average
Job and career satisfaction	22.62	3.33	Average
Control at work	14.16	2.52	Average
General well-being	21.03	3.77	Average
Stress at work	9.59	3.13	Average
Home–work interface	13.51	2.98	Average
Working conditions	14.02	2.62	Average
Employee engagement	11.17	2.07	Average

TABLE 3. Regression table

	B	Std. Error	Beta	Sig
(Constant)	28.193	2.837		0.000
Total WE	−0.033	0.047	−0.042	0.484
TWRQoL	0.124	0.019	0.388	0.000

DISCUSSION

The work ability of community healthcare providers in Yangon Region Public Health Department was found to be good; however, their work ability still needs support. The work ability of the healthcare providers can vary in relation to individual factors such as age and work experience.[8] In this study, 71.39% of participants were 26-45 years aged group which enhance the work ability to be good. Moreover, only 30.47% of participants had less than 5 year experiences and the remaining groups have longer work experience, which is important in essential care and can lead to recognition of good WAI for their commitment.[20] In addition, most participants (99.28%) were female, which was similar to the findings of a study on female Israeli nurses who had good WAI level (41.8 ± 5.2),[5] revealing that the good WAI level of the current female community healthcare providers is valuable for accessible quality care.[20] Work ability can vary in different settings, as a moderate level (36.9, range 7–49) was found among nurses in Iran.[8]

The work environment of community healthcare providers in Yangon Region Public Health Department was found to be high. The work environment of nurses and midwives in the PHC setting was found to be more favorable than that in other healthcare settings, where collaboration, community participation, and shared autonomy must be maintained for sustained development.[20] The finding of the study was not consistent with the previous study in Myanmar. Despite their perception of their work environment as nonsupportive, the participants perceived that they were working well with colleagues (81.69%) and recognized the importance of task engagement (73.94%), good communication, and having a certain level of self-esteem, which differed from the nurses in Mandalay General Hospital (MGH), where 53.8% reported satisfactory levels, 25.22% reported burnout, 43.01% expressed job satisfaction, 38.7% had intentions to leave,[23] and the perceived nursing practice environment as poor or non-supportive.[24] In this study, 81.69% of participants answered strongly agree to "I work well together with my colleagues" and 73.94% answered strongly agree to "What I do at work is important". The reason might be that they had good communication with their colleagues and fulfillment of their self-esteem needs while there was non-supportive environment.

The community healthcare providers perceived their QWL as average; nurses in tertiary hospitals, namely, YGH[25] and MGH,[26] reported to have reasonably well QWL, whereas those working in secondary hospitals, i.e., general hospitals in Yangon regions, had low QWL.[27] The levels of QWL vary depending on the context. The QWL levels must be considered regardless of how it relates to the context and culture of tertiary hospitals such as YGH and MGH in central cities, secondary hospitals such as general hospitals, and PHC settings in districts, townships, and urban and rural areas. The QWL in public health must be promoted for commitment toward organizational targets considering its effects on work ability and performance. Most nurses in Portugal had low QWL levels.[28] In addition, PHC nurses are satisfied with their QWL in general. However, some barriers affect the professional quality of life, such as educational status, monthly income, work unit, and the work environment.[11]

In this study, the QWL influences the work ability of community healthcare providers. The QWL positively and weakly affected the work ability of community healthcare providers in Yangon. The result of the present study confirmed previous findings of a correlation between work ability and quality of working life.[8] Improving QWL factors can increase individual performance and quality care in meeting population needs and promoting coverage to attain population health targets, particularly maternal and child health and disease controls.

The study population included community healthcare providers in the PHC setting in Yangon. Therefore, the results should not be generalized to other populations or settings. Further research is needed in other healthcare settings such as secondary and tertiary levels. Based on the findings, healthcare administrators should promote the work ability and QWL of community healthcare providers in PHC settings and maintain their work environment.

CONCLUSIONS

Based on the results of this study, community health and nursing administrators can promote a healthy work environment and QWL. This will improve the work ability of community healthcare providers and, thus, the provision of primary care and primary prevention.

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CONFLICT OF INTEREST

The authors report no conflict of interest.

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Barriers and Facilitators of Pharmacists' Roles During the Pandemic in Malaysia

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Barriers and Facilitators of Pharmacists' Roles During the Pandemic in Malaysia

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Abstract

Background: The coronavirus disease 2019 (COVID-19) left a devastating impact on healthcare systems worldwide. The crisis initially emerged as a supply disruption issue but eventually evolved into a myriad of additional challenges, which were attributed mainly to the extensive scale of the pandemic. This study aimed to explore the barriers to the role of hospital pharmacists and related facilitators encountered during the COVID-19 pandemic.

Methods: Pharmacists in Malaysia participated in a cross-sectional online questionnaire-based survey. The participants were recruited using convenient sampling. Cronbach alpha of the questionnaire was analyzed.

Results: The study successfully enrolled 367 pharmacists. The major barrier in terms of knowledge and skills was the difficulty in investigating the trend and usage pattern of COVID-19 medicines (N = 183; 49.9%). A global shortage of medicines (N = 314; 85.6%) occupied the highest barrier in the supply chain. The clinical barriers cited by most of the respondents comprised conducting clinical trials in the search for effective treatments (N = 282; 76.8%), and the largest departmental barrier was the difficulty of predicting usage based on previous data (N = 262; 71.4%). Almost all respondents agreed that a course or module on COVID-19 treatments (N = 354; 96.5%) served as a facilitator, enhancing their awareness and preparedness to respond to the pandemic.

Conclusions: The empowerment of pharmacists with the crucial resources, skills, and support that will enable them to effectively fulfill their roles and responsibilities can be instrumental in the transformation of our approach to addressing future pandemics.

Keywords: barriers, facilitators, Malaysia, medicine supply, pandemic

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic underscored the importance of accessibility, availability, and timely medical interventions in combating coronavirus and its devastating consequences. This highly contagious viral disease exposed the fragilities involving the emergency preparedness and responses of healthcare systems around the world. During the early days of the pandemic, various challenges emerged, and they included the lack of proper COVID-19 treatment protocols as a result of limited information, inadequate supplies, inability to handle COVID-19 cases due to its novelty and spread of misinformation in the media, and the well-being of healthcare workers.[1] The lockdown, which was implemented in several countries, prevented the procurement of medical supplies, especially COVID-19 medication. The disruption in procurement resulted from the heavy reliance on countries such as China and India for their active pharmaceutical ingredients and complete dosage formulations.[2] Extended lead times occurred due to the restricted cross-country transportation of goods and services and constraints in local manufacturing capacity and capabilities;[3] as a result, eventually a reduced ability to ensure the availability of appropriate medications during emergencies, such as the COVID-19 pandemic, was observed. As such, appropriate processes should be implemented to minimize disruption to the supply of medications in institutions.

The barriers during the pandemic were not only due to the limited importation of medicines but also included increased workload, staff shortages, and rapidly evolving guidelines, as had been observed in Malaysia.[4] Pharmacists faced various hurdles in catering to the urgent demand for COVID-19 medical supplies. Knowledge and skill barriers manifested in unfamiliar territories of COVID-19 management and treatment landscape and limited the ability of pharmacists to provide the best care to patients. Pharmacists demonstrated a strong comprehension of subjects, such as transmission routes, disinfectant utilization, interferon, and quarantine and discharge protocols, although they lacked in areas related to the disease's clinical characteristics.[5] Various drugs were explored for COVID-19 treatment, although a few demonstrated a widespread efficacy and with most being investigational,[6] which led to clinical barriers in navigating the complexities of COVID-19 treatment protocols and monitoring of the safety and efficacy of medications used. Patients undergoing treatment for COVID-19 received 20 types of

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medications on average, with each patient undergoing an average of eight interventions.[7] Community pharmacists also expressed concerns regarding the communication strategies employed by regulatory bodies and professional associations and cited ambiguity and the lack of focused guidance.[8] In addition, the application of traditional approaches to purchase essential drugs that had become severely scarce resulted in the inadequate management of drug shortages,[9] and, as a result, a centralized mode of purchasing in Malaysia. These barriers collectively highlight the need for coordinated and adaptable responses that will support pharmacists in overcoming challenges and guaranteeing the efficient distribution of supplies.

A previous work outlined facilitators that can improve the services rendered during the pandemic.[10,11] A multifaceted approach implemented to avert medicine shortages in Taiwan encompassed inventory checking, identification of alternative sources of raw material, expedited review of raw material applications, introduction to financial stimulus and reimbursement plans, and reinforcement of supply-demand balance ruling to ensure that medications are rationally distributed, allocated, and stockpiled.[10] In China, a pharmacy emergency task force oversaw pharmacy administration activities in a module hospital.[11] These activities entailed the implementation of coordinated plans for resource allocation and the formulation and review of treatment medication plans and the drug formulary, and an assessment of emergency drugs.[11]

Despite the extensive exploration of the challenges encountered by pharmacists, most of these investigations were conducted during the initial phases of the pandemic and predominantly centered on their gaining insights into the disease and issues related to drug shortages. Notably, the literature still suffers from the gap regarding the main barriers encountered by pharmacists when fulfilling their expanded roles in clinical practice and medicine supply during a global pandemic. These specific challenges are not yet fully documented. Therefore, this study aimed to explore the barriers and facilitators encountered by hospital pharmacists during the pandemic.

METHODS

This cross-sectional, online survey was conducted in Malaysia during the second wave of the COVID-19 pandemic. Cochran's sample size formula was used to determine this study's sample size formula ($1.96^2pq/e^2$), where e indicates the margin of error, p refers to the (estimated) proportion of the population, and $q = 1 - p$.[12] With the formula as basis, a population size of 18,578 practicing pharmacists was used,[13] and for the attainment of a margin of error of 5%, a confidence level of 95%, and a 50% response distribution rate, a minimum sample size of 376 was required. The participants were recruited via convenience sampling technique. Invitations to research participation were disseminated through social media platforms and collaboration with government Pharmacy Services Department within each state via email. This study included fully registered pharmacists employed in any private or government hospitals in Malaysia and with at least two years of active working experience during the pandemic.

The questionnaire was designed in English and comprised the following sections adapted based on factors related to barriers and facilitators to COVID-19 medicine supply in previous work and tailored by the study investigators to fit the local pharmacy setting: [2,3,8,14–16] pharmacists' demographic, barriers, and facilitators to COVID-19 medicine supply. The pharmacists' demographic characteristics included age, gender, working sector, responsibilities, work location, service duration, and education. To measure the extent of barriers related to medicine supply during COVID-19 experienced by pharmacists in the country, we divided the questionnaire into four knowledge and skills barrier questions (KS1–KS4),[14] four supply chain barriers questions (SC1–SC9),[2,3] four clinical barriers questions (C1–C4),[15] and six departmental barriers questions (D1–D6).[8] Barrier responses were categorized into "Agree," "Disagree," and "I do not know options." Practical facilitators, which consisted of eight questions (F1–F8), accounted for the final part of the questionnaire.[16] The facilitators' response was categorized into "Agree," "Disagree," and "I do not know options."

The face validity of the questionnaire was determined by six hospital pharmacists with at least two years of practice.[17] The questions included in face validation were as follows: "Are the items in the questionnaire clearly presented without grammatical error?"; "Are the items easy to understand?"; "Is the questionnaire relevant?"; "Are the items sufficient to appropriately describe its purpose?" The panel of experts provided feedback responses of either "Agree" or "Disagree." An "Agree" response meant that the item was organized empirically and in accordance with the classification of thematic categories, whereas responding with "Disagree" meant otherwise.[18] The panel was also requested to share their comments and suggestions regarding strategies for improving the instrument. During validation, all respondents noted the grammatical correctness of all the questions, which were also easy to comprehend, relevant, and sufficiently described the purpose of the study appropriately. A total of 25 pharmacists participated in the pretesting of the questionnaire to evaluate its internal consistency. The participants in this pilot study were excluded from subsequent data collection. Cronbach's alpha reliability analysis, which yields a score in the range 0–1, was utilized in this regard.[19] A score close to 1 indicates a high reliability, and a score close to 0 suggests a low reliability.[19] For the questionnaire, Cronbach's alpha

coefficient ≥0.70 was considered the threshold for acceptable reliability.[19]

The data were entered and analyzed using SPSS version 27 (IBM Corp, Armonk, NY, USA). The demographic characteristics were subjected to descriptive analyses. Categorical variables, such as gender, working sector, responsibilities, and education level, were reported as frequencies and percentages. Continuous variables, such as age and service duration, were expressed as mean and standard deviation. The questionnaire for the measurement of the barriers and facilitators to COVID-19 medicine supply was reported as frequencies and percentages and subjected to descriptive analysis.

All study procedures received ethical approval from the Medical Research and Ethics Committee, Ministry of Health (MOH) Malaysia (NMRR-21-1877-61341 (IIR)) and the Universiti Kebangsaan Malaysia Research Ethics Committee (Ref: JEP–2022-766). All participants gave informed consent before participating in this study.

RESULTS

A total of 402 pharmacists, of which 35 were excluded (4 failed to provide consent, and 31 pharmacists reported less than 2 years of experience or were provisionally registered pharmacists), answered the questionnaire. A total of 367 pharmacists were finally included in the study. The respondents had an average age of 33.3 (±4.5) years old, with the majority being female (N = 300; 81.7%). Most of them worked in government hospitals (N = 359; 97.8%) and located in the urban/city area (N = 275; 74.9%). Ward pharmacists (N = 82; 22.3%) accounted for the highest number of respondents, followed by logistics and outpatient pharmacists. More than two-thirds of the participants had an undergraduate pharmacy degree (N = 305; 83.1%), with a few continuing their studies to obtain a master's degree (N = 58; 15.8%) or are PhD (N = 4; 1.1%) holders, with an average of 8.7 (±4.4) years of experience. Cronbach's alpha coefficients for various sections of the questionnaire were also determined: knowledge and skills barriers, 0.816; supply chain barriers, 0.873; clinical barriers, 0.722; departmental barriers, 0.863; and facilitators, 0.792. Given these results, the questionnaire was considered apt for use in the survey.

Table 1 presents the participants' responses to the various barriers and facilitators encountered by them during the pandemic. Their responses concerning the knowledge and skills barriers encountered during that period reflects a diverse range of perspectives among pharmacists.. A substantial proportion of the respondents reported that keeping up with the latest treatment (N = 173; 47.1%) and studying the trends and patterns of drug usage related to COVID-19 drug treatment (N = 141; 38.4%) were not arduous tasks. Notably, a balanced number of participants agreed and disagreed about the difficulty of coping with an extremely high number of supplementary and urgent indents in the medication supply (N = 161; 43.9% and N = 159; 43.3%, respectively).

According to most of the participants, supply chain barriers hindered their ability to procure medicine during the pandemic. The global drug supply shortage (N = 314; 85.6%) attained the highest agreement among the participants, followed by logistical and transport challenges (N = 296; 80.7%), the lack of locally manufactured drugs (N = 285; 77.7%), and the inability of contract drug suppliers to meet market demand (N = 269; 73.3%). These responses suggest the vulnerability of local supply chains in the pharmaceutical industry, which warrants mitigation.

Table 1 also provides the information reported by the study participants regarding clinical barriers during the COVID-19 pandemic. Most of the respondents concurred with all four statements, expressing the lack of support for pharmacists in this area. The respondents showed the highest agreement for the investigational status of effective COVID-19 treatment via clinical trials (N = 282; 76.8%) and the lack of treatment protocols for recommended off-label use medicines (N = 260; 70.8%).

Moreover, Table 1 presents information implying the departmental barriers encountered during the COVID-19 pandemic. The majority of respondents agreed with the insufficiency of previous procurement data in the estimation of the increase in drug use (N = 262; 71.4%). As responded by more than half of the participants, their department was suffering from the lack of timely reporting of available supply and medicine shortages (N = 210; 57.2%) and lack of early communication with drug suppliers regarding projected demands (N = 203; 55.3%), which implies the presence of underlying issues with communication and information relay.

Several facilitators that may aid pharmacists in overcoming the multitude of barriers present during the COVID-19 pandemic were also identified. Highly positive responses were observed for interventions that focused on the empowerment of pharmacists. These interventions included the implementation of evidence-based patient care through assessment of available therapies and development of drug therapy guides (N = 333; 90.7%), establishment of educational tools and resources that will educate pharmacists on novel therapies and policy updates (N = 349; 95.1%), and organization of educational modules or courses on COVID-19 pharmacological treatment to increase their awareness and preparedness (N = 354; 96.5%).

TABLE 1. Barriers and facilitators during the pandemic (N = 367)

Questions	Agree N (%)	Disagree N (%)	I do not know N (%)
Knowledge and skills barriers			
I find it hard to keep abreast with the latest COVID-19 drug treatment.	155 (42.2)	173 (47.1)	39 (10.6)
I find it hard to study the trends and drug usage patterns of COVID-19 drug treatment.	183 (49.9)	141(38.4)	43 (11.7)
I find it hard to cope with the excessive number of supplementary and urgent indents in medication supply.	161 (43.9)	159 (43.3)	47 (12.8)
I lack knowledge/awareness of my role in COVID-19 drug treatment.	143 (39.0)	171 (46.6)	53 (14.4)
Supply chain barrier			
Logistical and transport challenges caused by national lockdown in drug-manufacturing countries disrupted the medication supply.	296 (80.7)	42 (11.4)	29 (7.9)
The manufacturing capacity of medication decreased due to social distancing measures.	251 (68.4)	45 (12.3)	71 (19.3)
The purchasing costs of active pharmaceutical ingredients/raw materials or finished dosage forms surged.	267 (72.8)	20 (5.4)	80 (21.8)
The drug-purchasing method became restricted.	187 (51.0)	51 (13.9)	129 (35.1)
The budget allocation/funding for purchasing medication was inadequate.	258 (70.3)	44 (12.0)	65 (17.7)
A global shortage of drug supply occurred.	314 (85.6)	13 (3.5)	40 (10.9)
Contract drug suppliers were incapable of meeting market demands.	269 (73.3)	19 (5.2)	79 (21.5)
Heavy reliance on source for raw material/active pharmaceutical ingredients from countries, such as India and China, was observed.	261 (71.1)	7 (1.9)	99 (27.0)
Locally manufactured drugs were inadequate to cope with the market demands.	285 (77.7)	11 (3.0)	71(19.3)
Clinical barriers			
Absence of specific treatments for COVID-19	201 (54.8)	100 (27.2)	66 (18.0)
Emergence of antimicrobial resistance due to the routine use of antibiotics	232 (63.2)	45 (12.3)	90 (24.5)
Lack of treatment protocols for recommended off-label use medicines, such as antiviral drugs, requiring monitoring of their efficacy, safety, interactions, and adverse effects	260 (70.8)	54 (14.7)	53 (14.4)
Ongoing clinical trials in search for effective investigational agents against COVID-19	282 (76.8)	18 (4.9)	67 (18.3)
Departmental barriers			
Unreliable past purchase data for the prediction of the increase in drug usage.	262 (71.4)	23 (6.3)	82 (22.3)
Lack of timely reporting of the available supply and medicine shortages.	210 (57.2)	65 (17.7)	92 (25.1)
Lack of early communication with drug suppliers regarding the projected demand.	203 (55.3)	50 (13.6)	114 (31.1)
Inadequate/irregular review of new evidence and distribution of updated COVID-19 treatment recommendations.	184 (50.1)	87 (23.7)	96 (26.2)
Lack of continuous monitoring of medication use patterns.	187 (51.0)	93 (25.3)	87 (23.7)
Lack of communication with regard to COVID-19 drug needs between clinical and purchasing pharmacists.	133 (36.2)	131 (35.7)	103 (28.1)
Facilitators to COVID-19 treatment			
Leverage on relationships with suppliers for the procurement of essential medicines.	213 (58.0)	28 (7.6)	126 (34.3)
Promotion of the use of drugs with long half-lives, which reduces frequency of administration and is cost effective.	263 (71.7)	43 (11.7)	61 (16.6)
Practice of evidence-based patient care through assessment of available therapies and development of drug therapy guides.	333 (90.7)	2 (0.5)	32 (8.7)
Creation of a pharmacist network or platform for sharing experiences and building of resiliency against burnout.	328 (89.4)	12 (3.3)	27 (7.4)
Provision of educational tools and resources to offer education on novel therapies and policy updates.	349 (95.1)	3 (0.8)	15 (4.1)
Organization of an education module or course for the COVID-19 drug treatment to increase pharmacists' awareness and preparedness.	354 (96.5)	6 (1.6)	7 (1.9)
Creation of a COVID-19 drug–drug interaction database.	345 (94.0)	8 (2.2)	14 (3.8)
Provision of support to local drug manufacturers to meet local needs of essential drugs.	325 (88.6)	9 (2.5)	33 (9.0)

DISCUSSION

COVID-19 caused pharmacists to assume new and expanded roles to provide essential healthcare services while navigating unknown conditions of the pandemic. Despite being their central roles in a multidisciplinary healthcare team during various disasters, disease outbreaks, and pandemics, such as severe acute respiratory syndrome, Ebola, and influenza in the past,[20,21] the novelty of multifaceted challenges that arrived with this pandemic caused hardships of various levels and revealed the gaps present in medicine supply management. In addition, for optimum management, comprehension of the barriers and facilitators of pharmacists determined in the current work can be used to improve the management of future pandemics.

Hospital pharmacists' barriers in knowledge and skills were determined in the present study. In the early days of this global threat, pharmacists were encouraged to acquire knowledge on the novel coronavirus, including its transmission, symptoms, and prevention measures,[22] within a short period. They were forced to grasp quickly the rapidly evolving information and the transitions that must be adopted within their healthcare setting[23,24] to survive the various pandemic waves. In this study, almost half of the participants demonstrated remarkable resilience and adaptability in one of the nation's most difficult periods. Having a mean working experience of 8.7 years means that the participants might have leveraged the skills and knowledge they acquired over time, along with lessons they learned from previous exposure to various disease outbreaks, such as the Middle East Respiratory Syndrome Coronavirus and avian influenza.[25] In addition, Continuous Pharmacy Education sessions were implemented within MOH hospitals and clinics to educate pharmacy staff regarding the treatment and management of COVID-19, particularly during the national immunization program[24] and rollout of paxlovid (ritonavir, nirmatrelvir) treatment. Prior to the sessions, a designated COVID-19 website was developed and updated occasionally by the MOH to serve as an information center for relevant guidelines, infographics, official news, case statistics, etc. On the other hand, a study on pharmacists' satisfaction with their role in the management of COVID-19 patients in Saudi Arabia revealed that most pharmacists skipped participating in the development or assessment of therapeutic plans for patients and did not provide therapeutic mentoring for COVID-19 patients.[26] This failure to participate deprived the pharmacists of the opportunity to apply their knowledge and skills in patient care. Alarmingly, a study across 31 commonwealth countries reported that pharmacists, pharmacy technicians, and dispensers notably lacked prior experience and training in handling international health emergencies.[27] Notably, participation in a webinar organized by the Commonwealth Pharmacists' Association improved their knowledge of COVID-19 resources, treatment updates, and antimicrobial stewardship smartphone app contents, which suggests a positive impact on their comprehension of crucial information related to the pandemic.[28]

Supply chain disruptions, which were especially highlighted during the pandemic, have been occurring for some time now and have been a persistent challenge in the pharmaceutical industry's history. The COVID-19 pandemic amplified disruptions on a global scale, and the participants' responses indicated this as a major barrier. The initial pandemic phases, which involved lockdowns, border closures, and movement restrictions, led to transportation delays, production slowdowns, and customs bottlenecks.[28] This condition aligns with the findings of a study indicating a rise in medication shortages during the initial stages of the pandemic, followed by a decline to prepandemic levels post-May 2020; such outcome was potentially due to the newly implemented policies that granted the United States Food and Drug Administration authority for direct intervention.[29] Factors, such as underreporting, temporary halts in quality assurance, and lack of penalties for nonreporting, were considered potential contributors to a drug shortage.[29] Branded drugs exhibited a higher likelihood of shortages compared with their generic counterparts due to distinct reasons, such as a heightened demand or limitations in manufacturer capacity.[29] Priority should be focused on the initiatives aimed at strengthening of local generic medicine and biopharmaceuticals sector to ensure sustainable access to crucial medications. Such initiatives include the implementation of policies that support domestic pharmaceutical manufacturing, investing in research and development to promote innovation and quality standards, and provision of incentives to attract investments in the sector, as outlined under the 12th Malaysia Plan.[30] In addition, a collaboration among government agencies, industry stakeholders, and academic institutions can facilitate knowledge sharing and capacity building.

The present work unveiled several clinical barriers. Numerous clinical trials were conducted globally during the pandemic to assess the efficacy and safety of potential COVID-19 treatments. The findings of these trials contributed to our comprehension of effective COVID-19 treatments. In the early stages of the pandemic, healthcare providers often made treatment decisions based on limited evidence and expert opinion. The lack of standardized treatment protocols for the off-label administration of drugs, such as hydroxychloroquine and azithromycin, led to varying clinical practices.[31] To the best of the authors' knowledge, despite the availability of vaccines for COVID-19 prevention, the supplies of specific antiviral treatments were limited. Prior to the emergence

of treatment drugs, such as nirmatrelvir/ritonavir, remdesivir, and molnupiravir,[32] no single drug has been hailed as an effective treatment against COVID-19 treatment. Consequently, clinical pharmacists working in a Malaysian infectious disease hospital rapidly realized the salience of the transition from antimicrobial to antiviral stewardship at their facility. This transition facilitated the development of local treatment protocols for repurposed antivirals, which provided practitioners with guidance on recommended doses and treatment regimens.[33] The close collaboration with pharmaceutical resources and information unit and infectious disease physicians, which was aimed at the creation of a localized, rapid, and comprehensive COVID-19 treatment guide that covered novel experimental agents, proved to be useful in streamlining decision-making for all healthcare practitioners.[33] Considering shortages, clinical pharmacists also maintained close contact with inpatient and procurement pharmacists to ensure the continuous supply of COVID-19 medicine. The extension of access to such valuable guidelines can improve the standardization of care practices across institutions, optimize treatment outcomes, promote knowledge sharing among healthcare professionals, and contribute to collective efforts aiming to combat the pandemic.

Barriers within the pharmacy department during the pandemic were also investigated, focusing on medicine inventory management, which may often be overlooked. A conventional strategy employed during a crisis involves forecasting medicine usage based on previous purchasing data.[16] However, this strategy proved insufficient during the COVID-19 period. Swift communication and information relay were inadequate in some areas, such as the reporting of available inventory and shortages; in addition, communication with drug suppliers on the projected numbers[16] possibly hindered the ability of pharmacists' to respond effectively to fluctuating medication demand and secure the essential medicines and resources during the pandemic. During the pandemic peak, a nearly 10-fold rise in the use of intravenous opioid sedatives and vasopressors prompted a multicenter pharmacy in the United States; the pharmacy reported that daily virtual meetings with pharmacy personnel from different hospital sites were instrumental in the identification of medication shortages, redistribution of excess stocks, and efficient coordination of deliveries.[34] This finding illustrates the importance of agile communication and collaboration among pharmacy teams to address medication supply shortages during peak demand periods.

This present work highlighted strategies that can further facilitate the resilience and preparedness of pharmacists when providing services during a pandemic. A clear theme that emerged is empowerment through comprehensive drug therapy guides creates an experienced sharing platform and provides reliable educational materials and resources and continuous education, which serve as exemplary facilitators showing advancement in the post-pandemic era. This condition is in line with that of a previous work that evaluated the use of an online on-the-job training program, specifically the Objective, Activation, Multi-learning, Assessment and Summary teaching model and flipped classroom strategy for the continuing education of community pharmacists, which proved to be effective in current times.[35] This training program is particularly helpful in situations where isolation is required and physical access to training facilities is limited or costly. Not only does this type of continuous education platform offer flexibility and convenience for its participants, but it also allows for a seamless balance between work, home responsibilities, and training requirement. Moreover, pharmacists may receive real-time feedback, track their progress, and revisit materials as needed, which increases the overall efficiency of the training process.[35] In addition, the use of a pharmacy-led system incident management command structure, along with the projection of patient volume and medication needs, alignment of procurement strategies with treatment recommendations, leveraging of data and creation of a system knowledge base, and effective communication with pharmacy staff and other healthcare providers, were determined as facilitators to the management of drug shortages and optimization of patient care.[16] Proactive medication management strategies led by pharmacy teams can potentially streamline processes and reduce red tape in the healthcare system. Pharmacists can also advocate for policy changes to simplify regulatory requirements and reduce unimportant bureaucratic processes. The implementation of continuous quality-improvement initiatives in pharmacies can help in detecting and addressing inefficiencies. Regular evaluations of processes and workflows can result in continuous improvements, which reduces the need for redundant or unnecessary documentation.

The current research encountered certain limitations that warrant acknowledgment. First, this study used a slightly lower sample size than the targeted value and was performed using convenient sampling, which restricted the extent to which the findings could be generalized across various phases of the COVID-19 pandemic. Moreover, the study sample exclusively comprised hospital-based pharmacists in Malaysia, which implies that the results may not be readily extrapolated to other groups of pharmacists in various geographic locations. Regardless, the current work gives insights into possible steps that can help reduce barriers during a pandemic, which may ultimately form a basis for the smooth transition of the medication management process during a pandemic. Future efforts should be directed toward multicenter and multidiscipline collaborations to improve the generalizability and depth of findings and develop comprehensive guidance and resources that will support

pharmacists and the pharmacy workforce during emergencies.

CONCLUSIONS

COVID-19 thrusted pharmacists into an unfamiliar territory, demanding rapid knowledge acquisition, adaptation, and expanded roles. Although challenges persisted, particularly in the management of drug shortages and navigation of evolving clinical practices, ongoing education, clear guidelines, and robust communication are still needed to empower pharmacists during future public health crises. Prioritization of local pharmaceutical production, fostering collaboration, and implementation of proactive medication management strategies can equip healthcare systems better to support pharmacists and boost patient care during pandemics. The present research has several implications for key decision makers, including governments, policy makers, administrators, and pharmacy managers, in the emergence of potentially new outbreaks as aggressive as COVID-19. This research provides an overview of the various barriers encountered during the pandemic and an avenue for introspection of current practices. The empowerment of pharmacists with the requisite resources, skills, and support to perform their roles and responsibilities effectively would serve as a game changer in addressing future health crisis.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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Most Common Symptoms of Prediabetic and Insulin Resistance in Adults in Saudi Arabia

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Most Common Symptoms of Prediabetic and Insulin Resistance in Adults in Saudi Arabia

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Abstract

Background: The prediabetic stage exhibits common symptoms; hence, the risk of developing diabetes can be reduced by identifying these symptoms in the most affected population. This study aimed to examine the prevalence of the main symptoms of insulin resistance in healthy adults aged 18 years and above.

Methods: A cross-sectional study was conducted on 1,514 Saudi adults using an online questionnaire collected from 13th November 2020 to 23rd March 2021. Data on personal, lifestyle, and common symptoms were gathered, and the main symptoms were presented as frequencies with percentages. Association with insulin resistance was evaluated using the Chi-square test and other variables by logistic regression models.

Results: The four most commonly presented symptoms at a frequency of 23% were tiredness after eating, tiredness all day, frequent urination, and thirst even after drinking. When gender and income levels were considered together with insulin resistance levels in the logistic models, only thirst remained a substantial symptom.

Conclusions: In the prediabetic stage, tiredness, urinating more than usual, excessive eating, and thirst were the common symptoms. Implementing public health campaigns and drawing attention to these symptoms for healthcare providers would improve the diagnosis and treatment of diabetes.

Keywords: frequent urination, income levels, insulin resistance, prediabetes symptoms, Saudi Arabia

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is caused by impaired glucose metabolism associated with insulin resistance (IR) and occurs in 18.7% of the Saudi population aged 20–80 years. A recent review indicated diabetes to be the 7th cause of mortality.[1] It is also associated with heart disease, cancer, chronic kidney disease, and high blood pressure.[2]

Symptoms associated with IR could develop due to the toxicity of the accumulated glucose and lipids. Peterson and Shulman explored the alterations in metabolic pathways and showed that obesity leads to insulin receptor defect in adipocytes, which was previously found in human and animal studies.[3] In turn, this phenomenon causes low lipid metabolism and increased glucose synthesis because of glycerol boosting the IR symptoms. Although the symptoms are more linked to diabetes or prediabetes than to IR itself, IR shares the same symptoms with T2DM.[4,5] These symptoms are listed as urinating more often than usual, thirst, tiredness, unexplained weight loss, itchiness around the genital area or regular bouts of thrush, cuts or wounds that heal slowly, and blurred vision caused by the drying of eye lenses.[4] IR could occur with no clear symptoms and develop over a long period.[4–7]

According to the Association of Diabetes, many people do not know or seek proper diagnosis and treatment until they have developed explicit diabetes because of the lack of signs and symptoms.[5,8] In addition, approximately 49% of affected individuals lack symptoms and awareness of being ill, and their condition eventually progressed to T2DM.[9] Thus, diabetes is called a new silent disease.[10] The American Diabetes Association recently released guidelines that emphasize regular screening every 3 years for apparently healthy adults aged 35 years and older.[11] In addition, the high risk of IR and prediabetes receives minimal attention from health practitioners.[12]

Some of these symptoms are very common in apparently healthy individuals and should not be alarming. In fact, six out of ten people show no symptoms when diagnosed with T2DM.[13] Most people do not seek help until late because the symptoms often develop gradually and mildly over many years.[4,5,14] These symptoms are listed as urinating more often than usual, particularly at night; thirst; tiredness; unexplained weight loss; itchiness around the genital area or regular bouts of thrush (a yeast infection); cuts or wounds that heal slowly; and blurred vision caused by dried eye lenses.[14]

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To date, no article has been published with regard to the risk levels of IR and symptoms associated with IR in the Makkah region, Saudi Arabia. Only one study was conducted by Al Khaldi *et al*. in a different region of Saudi Arabia.[15] Thus, this study aimed to identify the risk levels of the respondents to connect IR prevalence to the most common symptoms. Characteristic differences were also examined.

METHODS

A cross-sectional study was carried out for 1,514 people using a Google Forms questionnaire (response rate 88%). Data were collected from 13th November 2020 to 23rd March 2021 during the academic year of 2020–2021. The subjects were selected randomly, and the inclusion criteria were the ability to speak Arabic and being Saudi adults. The sample size was sufficient for this analysis. The sociodemographic of the sample was 60.04% (909) females and 39.96% (605) males. Out of all the participants, 2.44% (37) were 18–20 years old, 13.34% (202) were 21–29 years old, and 27.41% (415) were 30–39 years old.

A validated questionnaire containing several parts, including personal information and T2DM symptoms, was sent online. The first page was a consent form for the participants, asking them to agree to participate in the project and stating that all their data would be confidential. The participants have the right to withdraw from completing the questionnaire and participate in the study as they wish. Ethical approval (number HAPO-02-M-11-2020-12-912) was obtained for the project.

On the basis of previous studies, the IR risk score was developed to estimate the number of individuals at risk.[16,17] A simple risk score was developed to screen for IR prevalence and identify prediabetics among individuals in the Makkah region. The IR risk score includes variables that can be measured routinely, objectively, cheaply, quickly, and noninvasively in any primary clinical setting or even by the general public. This approach was based on a cross-sectional study from the Finnish Diabetes Risk Score. In addition, the Leicester Risk Assessment score developed by the Leicester University and University Hospitals of Leicester NHS Trust was scrutinized by the team.[16] Finally, the Lindstrom and Tuomilehto score was also employed to detect IR prevalence using a simple scoring method.[16]

The Lindstrom and Tuomilehto score provided all participants with a score according to their answers to seven questions: age, BMI, waist circumference, used drugs for high blood pressure, have diabetes or not, physically active or not, and daily consumption of vegetables, fruits, or berries.[16]

Two modifications from the Lindstrom and Tuomilehto score were applied to the risk factors included in this study.[16] First, additional questions on dietary risk factors (three questions instead of one (type of snack, eating breakfast or skipping, and number of meals) were included to focus on nutrition because diet has a considerably substantial effect on IR and diabetes development. Thus, the risk factors were increased to nine instead of seven (Table 1). The cut points to identify people at risk were the same as those stated previously by Lindstrom and Tuomilehto.[16] These cut points were also applied to the three dietary questions. The total score of each participant was computed after all the awarded points were summed up.

Second, the total score in the last study started from zero for the participant as a whole point. Meanwhile, the range of scores in the current study was from 6 to 22. The reason is that every individual gets six points for the 1st three risk factors, namely, age, BMI, and waist circumference, regardless of their risk status. The total score was then separated into three score levels, which differed from that in the study of Lindstrom and Tuomilehto, who divided participants into four risk levels.[16]

TABLE 1. Nine risk factors related to IR in the questionnaire

Risk factors	Not having risk	Having risk
Age (years)	≥54 = 2	55 and more = 3
BMI	Normal and less 30 = 1	More than 30 = 3
Waist Circumference	Below 88 for women and 102 for men = 3	Over 88 for women and 102 for men = 4
Have you ever used drugs for high blood pressure? No/Yes	No = 0	Yes = 2
Having a history of diabetes in the family or being told that you have diabetes	No, or do not know = 0	Yes =5
Physical activity	Yes = 0	No = 2
Diet factor 1 (number of meals)	Four and below = 0	More than four meals = 1
Diet factor 2 (dietary pattern)	Healthy pattern = 0	Unhealthy habit and other related = 1
Diet factors 3 (skipping breakfast)	No-Skipping or sometimes = 0	Skipping = 1
Total score	6	22

The first reason was the difference in the score range between the study of Lindstrom and Tuomilehto and the current work.[16] In particular, the total score was 22 in the current study and 20 in the previous study. In the work of Lindstrom and Tuomilehto, the first level included 0–3 points, and the second included 4–8 points for each participant.[16] In the current study, the lowest score was 6 points, and the maximum was 22. Thus, the two lower levels were mostly not comparable (0–8 points). This approach also predicts the risk level to be higher than actual.For each risk level, the same range of points was provided for the third and fourth risk levels to increase their weight. This step was similar to that in the study of Lindstrom and Tuomilehto, who placed more weight on the last fourth level.[16] Therefore, many risk factors were found among the respondents with an increased risk of developing diabetes.

The questionnaire asked about the following symptoms: feeling tired after eating, feeling tired when waking up or when going to sleep without making an effort, feeling thirsty frequently during the day, noticing an increase in the urge to urinate more often during the night than the usual, feeling difficulty in concentrating when resting and in the absence of pressures, feeling hungry frequently even after eating a meal and eating excessively. Each question can be answered by usually, sometimes, or never.

Minitab version 21 was used to analyze statistical data. Frequencies and percentages were applied to describe the sociodemographic and the prevalence of symptoms. A Chi-square test was employed for categorical data with >5% significance to determine significant associations between IR and symptoms. A regression linear model was used to determine the correlations of symptoms. A dummy binary IR variable was set as a group with no IR risk and compared with all the groups with various levels of risk. Associations with gender or income levels were also determined to identify significant variations.

RESULTS

The sociodemographic data and IR levels were presented in a previous work.[17] This study shows that 22.19% of the subjects had the symptoms of tiredness after eating. At almost the same level, the symptoms of being tired all day, urinating more than usual, and feeling thirsty even after drinking accounted for the same percentage in the sample population (22%). The minimum proportions were recorded for having trouble concentrating, being hungry after meals, and eating in excess at 12%, 11.5%, and 9.5%, respectively.

The number of respondents divided according to IR and symptoms is shown in Table 2. All group variations were statistically significant. Approximately 23% of the subjects had the risk of developing IR and the symptoms of tiredness after eating, tiredness when waking up, and increased urge to urinate more often compared with the no IR risk group. Feeling hungry frequently, even after eating a meal and eating excessively, was the least common symptom for the people at risk of developing IR compared with those not at risk. Approximately 45% of the respondents answered that they never had those symptoms.

The linear model for associations was used to determine the independent factors, namely, IR and gender association with symptoms (Table 3). Four symptoms appeared to be common in the subjects with a high risk of IR with a statistically significant association. On the contrary, all symptoms were not correlated significantly with gender. The respondents with a high risk of having IR experienced being tired all day, feeling thirsty, frequently urinating, and eating in excess.

When all the other terms in the model were held as constant, the occurrence of the symptom of feeling tired all day increased by 1.14 times in the subjects with IR. Therefore, the group with IR had a 14% greater risk of being tried all day. The symptom of feeling thirsty showed 19% greater risk of occurrence in people with IR compared with those not at risk. Urinating more than usual was also a common symptom in the group with high IR risk, which had a 16% higher probability of experiencing this symptom compared with those not at risk. Finally, the probability of eating in excess among the participants with a high risk of developing IR was 18% greater than that among those with no risk.

The linear association model was used to determine the independent factors, namely, IR and total income association with symptom occurrence levels (Table 4). The model showed the following five common symptoms with a statistically significant association of less than 5%. Tiredness all day, urination more frequent, and eating excess were only associated with IR risk levels. The respondents with a high IR risk were usually associated with being tired all day, feeling thirsty, urinating more, and eating in excess.

When the other terms in the model were held constant, the occurrence of the symptom of feeling tired all day increased by 1.14 times for people with IR. Therefore, the group with IR had a 14% greater risk of being tried all day. The symptom of feeling thirsty had a 19% greater risk of occurring in people with IR compared with those not at risk. Urination, more than usual, was 16% more common in people with high IR risk than in those with no risk. Finally, the occurrence of the symptom of eating in excess was 18% greater among those with a high risk of developing IR than among those not at risk. Thirst was associated with both dependent variables, IR risk levels and income groups, for those with income more than 1,500–3,500 SR and more than 10,000 at great risks of 20%, 19, and 27%. The highest occurrence (26%) of being

hungry after a meal was recorded for the group with an income of more than 3,500–5,000 SR.

When all variables were placed in the same model (Table 5), only thirst remained a significant symptom associated with a high IR risk and being on the two sides of the income spectrum (i.e., between 1,500 and 3,500 SR and ≥10,000 SR).

TABLE 2. Symptoms' frequencies divided by dummy binary IR levels for all respondents (N = 1,514)

Symptoms of IR	Responses (N)	No risk of IR (N = 245)		have the risk of IR (N = 1,269)		*p*
		N	%	N	%	
Symptom 1: Feeling tired after eating	Never (183)	42	17.14	141	11.11	16.8 (0.0001)
	Sometimes (995)	170	69.39	825	65.01	
	Often (336)	33	13.47	303	23.88	
Symptom 2: Feeling tired when waking up or when going to sleep without doing an effort	Never (283)	65	26.53	218	17.18	13.2 (0.001)
	Sometimes (904)	139	56.73	765	60.28	
	Often (327)	41	16.73	286	22.54	
Symptom 3: Feeling thirsty frequently during the day.	Never (533)	105	42.86	428	33.73	7.8 (0.020)
	Sometimes (692)	96	39.18	596	46.97	
	Often (289)	44	17.96	245	19.31	
symptom 4: Noticing an increase in your urge to urinate more often during the night	Never (623)	127	51.84	496	39.09	18.8 (0.0001)
	Sometimes (568)	87	35.51	481	37.90	
	Often (323)	31	12.65	292	23.01	
*Symptom 6: Feeling hungry frequently, even after eating a meal	Never (685)	127	51.84	558	43.97	6.0 (0.049)
	Sometimes (654)	89	36.33	565	44.52	
	Often (175)	29	11.84	146	11.51	
Symptom 7: Eating excessively	Never (708)	131	53.47	577	45.47	13.3 (0.001)
	Sometimes (662)	105	42.86	557	43.89	
	Often (144)	9	3.67	135	10.64	

*Symptom no. 5: Difficulty concentrating was not statistically significant, so it was removed from the table

TABLE 3. Occurrence of symptoms classified by having IR risk and gender

Variable	Coefficients (SE)	Odds ratio	*p*
Tired after eating			
Having risk	0.015 (0.049)	1.010	0.765
Male	−0.060 (0.037)	1.060	0.127
Tired all day			
Having risk	0.128 (0.055)	**1.140**	0.020
Male	−0.045 (0.041)	**1.050**	0.277
Feel thirsty			
Having risk	0.170 (0.062)	**1.190**	0.007
Male	0.013 (0.047)	**1.010**	0.784
Urination more			
Having risk	0.150 (0.062)	**1.160**	0.014
Male	0.030 (0.046)	**1.030**	0.475
Difficulty concentration			
Having risk	0.114 (0.064)	**1.121**	0.083
Male		**1.036**	0.481
Eat in excess			
Having risk	0.161 (0.066)	**1.180**	0.014
Male	−0.004 (0.049)	**1.000**	0.934
Hungry after meal			
Having risk	0.092 (0.066)	**1.096**	0.165
Male	0.052 (0.050)	**1.053**	0.294

Standard errors are reported in parentheses. The reference group was was no IR risk, and female.

TABLE 4. Symptoms' occurrence divided by having IR risk and income level

Variable	Coefficients (SE)	Odds ratio	*p*
Tired after eating			
Having risk	0.011 (0.049)	**1.011**	0.816
1,500 to 3,500 SR	0.030 (0.048)	**1.030**	0.524
3,500 to 5,000 SR	−0.065 (0.080)	**1.070**	0.421
5,000 to 10,000 SR	0.041 (0.060)	**1.040**	0.495
> 10,000 SR	0.077 (0.056)	**1.080**	0.169
Tired all day			
Having risk	0.130 (0.055)	**1.140**	0.018
1,500 to 3,500 SR	−0.006 (0.053)	**1.010**	0.911
3,500 to 5,000 SR	0.005 (0.090)	**1.010**	0.955
5,000 to 10,000 SR	−0.010 (0.067)	**1.010**	0.883
> 10,000 SR	0.093 (0.063)	**1.097**	0.141
Feel thirsty			
Having risk	0.180 (0.062)	**1.200**	0.004
1,500 to 3,500 SR	−0.170 (0.060)	**1.190**	0.005
3,500 to 5,000 SR	−0.150 (0.100)	**1.162**	0.142
5,000 to 10,000 SR	−0.010 (0.076)	**1.010**	0.886
> 10,000 SR	−0.240 (0.071)	**1.270**	0.001
Feel thirsty			
Having risk	0.143 (0.062)	**1.154**	0.022
1,500 to 3,500 SR	0.047 (0.060)	**1.076**	0.438
3,500 to 5,000 SR	−0.125 (0.102)	**1.133**	0.220
5,000 to 10,000 SR	0.015 (0.076)	**1.015**	0.841
> 10,000 SR	0.068 (0.071)	**1.070**	0.341

TABLE 4. Continue

Variable	Coefficients (SE)	Odds ratio	*p*
Difficulty concentration			
Having risk	0.120 (0.066)	**1.127**	0.065
1,500 to 3,500 SR	−0.060 (0.064)	**1.060**	0.340
3,500 to 5,000 SR	0.030 (0.110)	**1.030**	0.768
5,000 to 10,000 SR	−0.095 (0.081)	**1.099**	0.239
> 10,000 SR	−0.110 (0.750)	**1.116**	0.129
Hungry after meal			
Having risk	0.100 (0.067)	**1.110**	0.119
1,500 to 3,500 SR	−0.060 (0.065)	**1.060**	0.379
3,500 to 5,000 SR	0.230 (0.110)	**1.260**	0.035
5,000 to 10,000 SR	−0.070 (0.082)	**1.072**	0.377
> 10,000 SR	−0.050 (0.076)	**1.050**	0.552

Standard errors are reported in parentheses. The reference group was no IR risk, and income levels below 1,500 SR.

TABLE 5. Occurrence of thirst symptom divided by IR, income, and gender

Variable	Coefficients (SE)	*p*
Constant	2.06 (0.071)	0.000
Binary risk no or yes (having risk)		
No risk [reference]	0.0	*
Having risk	0.183 (0.062)	0.003
Total income levels		
< 1,500 SR [reference]	0.0	*
1,500 to 3,500 SR	−0.181 (0.061)	0.003
3,500 to 5,000 SR	−0.152 (0.102)	0.135
5,000 to 10,000 SR	−0.009 (0.076)	0.903
> 10,000 SR	−0.249 (0.072)	0.001
Gender		
Female [reference]	0.0	*
Male	0.050 (0.480)	0.321

DISCUSSION

Our previous research showed that the factors associated with a high risk of IR are males, high income, and low education.[17] In the current study, the symptoms were studied in combination with the participants' two characteristics, namely, gender and income association with the symptoms for IR.

The most prevalent symptoms in individuals with IR in the Makkah region of Saudi Arabia were feeling tired after eating, tired all day, frequently urinating, and feeling thirsty even after drinking (23%) compared with those in the no-risk group. According to the logistic model for the seven symptoms and gender with binary IR levels of risk, only the respondents with a high risk of IR were associated with being tired all day, feeling thirsty, urinating more, and eating in excess. No significant correlation with gender was observed.

With regard to the risk level of these symptoms, thirst showed a 19% greater risk of occurring in people with IR compared with those not at risk, followed by eating in excess at 18% and urinating more than usual at 16%. Finally, being tired all day had a 14% greater risk of occurring in people with IR compared with those not at risk. The minimum portions were recorded for difficulty of concentration, hunger after meals, and eating in excess at 12%, 11.5%, and 9.5%, respectively. These results were in agreement with Kumar *et al*., who studied diabetes' most common symptoms and found that frequent urination was the most common symptom (94.6%), followed by increased thirst (86.6%).[18]

All these symptoms lead to being lethargic and losing the energy to be active because the cells are deprived of the energy fuel from glucose, specifically the muscles, liver, and adipose tissues.[3,4,19,20] Fatigue is prominent at this stage and increases as the disease progresses to the full diabetic stage.[20–22]

Akhilesh *et al*. found that being tired with no energy (fatigue) was common in 68% of patients with diabetes.[23] This symptom intensifies when the person has a long disease duration, unregulated glucose level, and obesity. Romadlon *et al*. added to these findings by indicating that half of the respondents with T2DM have suffered from fatigue, which is associated with low physical activity and depression.[22]

Engin *et al*. in Turkey found a different distribution of symptoms' prevalence in the prediabetic stage, where the most common symptom was fatigue, occurring in 88% of the respondents.[5] For the symptom of feeling tired when waking in the morning, only 68% agreed that fatigue increased during the day by 65%. The Turkish study disagreed with our finding regarding excess thirst, as only 45% of their respondents suffered from this symptom. Meanwhile, it agreed with our results that few subjects suffered from difficulty concentrating and excess eating. This phenomenon might be due to the different weather conditions, with Saudi Arabia having a hotter environment than Turkey. In addition, a low proportion of their respondents experienced frequent urination (58%), which is different from our findings.

According to the logistic model for IR, all symptoms, and income levels, only thirst was associated significantly with IR and income levels. The highest relative risk of developing this symptom was high at 27% for the high-income category (more than 10,000) and 19% for those with income in the range of 1,500–3,500 SR. Clark *et al*. also found that the most common symptom of diabetes and prediabetes in the high IR risk group was frequent urination (27%), followed by fatigue (26%). Meanwhile, excessive thirst was at a low level of prevalence (23%), followed by extreme hunger (11%).[24]

A study on newly diagnosed patients with type 1 and 2 diabetes found that 100% of them urinate more than usual, and approximately 80% suffer from thirst.[21] This

finding was explained by the accumulation of glucose in the circulation and the high insulin levels, prompting the kidneys to eliminate the extra glucose and increasing urination more than usual.[4] Furthermore, the occurrence of early-stage bacterial infection in prediabetic individuals would be increased. With the progression of the disease, other symptoms such as polyuria, hematuria, and pain and inflammation of the urinary tract will occur and might increase the urge for frequent urination, especially at night. This phenomenon is due to the rise of osmotic diuresis enhanced by the high, uncontrolled level of blood glucose.[4] Furthermore, the feeling of thirst increases in magnitude with emotional distress and depression.[5]

This study has several limitations. First, the online nature of the questionnaire might cause a bias on data with no control on whom to answer the survey. However, as an early-stage study, this circumstance was not the main concern of the study group. In a future work, other sample collection criteria will be applied. Second, the symptoms were obtained through observation and self-evaluation, and no laboratory tests to confirm IR have been conducted. Finally, the generalization of the results might be limited to only one region of Saudi because most of the respondents live in the same region. Even though the responses rate was good and individuals from all regions contributed to this study, the focus was the Makkah region because of the ease in contacting respondents in this area.

CONCLUSIONS

This study demonstrated the prevalence of some symptoms of prediabetic and IR stages in the Makkah region. Tiredness, greater need to urinate than usual, excessive eating, and thirst are the most common symptoms in the study sample. Understanding these symptoms can help in developing public health campaigns that educate and increase awareness to avoid progression to diabetes.

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CONFLICT OF INTEREST

The author declares no conflict of interest.

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Assessment of Sociodemographic Status, Self-awareness, and Risk Factors Affecting Patients with Prediabetes in Bangladesh: Cross-sectional Study

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Assessment of Sociodemographic Status, Self-awareness, and Risk Factors Affecting Patients with Prediabetes in Bangladesh: Cross-sectional Study

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Abstract

Background: Poor glycemic control and high diabetes and prediabetes incidence are influenced by socioeconomic disparity. Raising awareness and ensuring that people with prediabetes are receiving medication, maintaining their glycemic control, and getting the proper care they need despite their socioeconomic situation are crucial in the fight against diabetes. This study aims to assess the sociodemographic status, self-awareness, and risk factors associated with prediabetes in Bangladesh.

Methods: A cross-sectional survey was carried out among 500 participants aged >18 years to evaluate and summarize their demographic data, socioeconomic status, and responses to various questionnaires about their conditions related to prediabetes and their awareness of this condition.

Results: Analysis of factors revealed that 41% and 39% of the participants had first- and second-degree relatives with diabetes, respectively. Meanwhile, 36% of the participants maintain physical activities, 30% prefer sweetened beverages, and 29% have high blood pressure. The participants were aware of different statements related to diabetes, such as how lifestyle modification and awareness can help people with prediabetes.

Conclusions: This study provided insights into the underlying factors related to prediabetes and enabled us to identify the prediabetes conditions unknown to people in Bangladesh.

Keywords: awareness, Bangladesh, cross-sectional study, prediabetics, risk factors

INTRODUCTION

Diabetes is a noncommunicable, chronic metabolic disorder caused by either insufficient insulin production from the pancreas or the body's inability to regulate blood glucose levels and excessive urine production from the kidneys. Increased blood glucose levels cause severe long-term damage to the nerves that control the heart, blood vessels, and kidneys, resulting in cardiovascular dysfunctions.[1] The most prevalent kind of diabetes is diabetes mellitus or type 2 diabetes mellitus (T2DM), which often affects adults and develops when the body stops producing adequate insulin or becomes resistant to it.[2]

The prevalence of diabetes, including types 1 and 2, is expected to rise by 54%, exceeding 54.9 million Americans by 2030; annual diabetes-related deaths and total medical and societal costs will surge by 38% to 385,800 and 53% to more than $622 billion, respectively.[3] Diabetes affects 90 million people in Southeast Asia and 537 million people worldwide, the majority of whom reside in low and lower-middle-income countries (LMICs). By 2045, this number will continue to increase to 151.5 million.[1] Diabetes is responsible for 1.5 million deaths annually, and this number increases at an alarming rate every year. The substantial rise in diabetes incidence in LMICs is caused by the epidemiological change that has resulted in the consumption of westernized meals, poor lifestyle decisions, less exercise, altered leisure activity patterns, long workdays, and decreased sleep.[2]

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Prediabetes is a condition characterized by blood sugar levels that are higher than normal but not yet high enough to be diagnosed as T2DM.[4,5] According to the Department of Health and Human Services of the USA and the American Diabetes Association, "prediabetes" is a term used for people with conditions who have blood glucose levels that are higher than normal but are not yet diabetic.[6] Several factors, including a combination of genetic, lifestyle, and metabolic influences e.g., insulin resistance, obesity, physical inactivity, poor diet, age, ethnicity, gestational diabetes, hormonal factors, and sleep disorders, contribute to the development of prediabetes.[7]

Addressing the prevalence of prediabetes is globally paramount because it represents a critical opportunity to intervene and prevent the progression to T2DM, thereby mitigating the associated health and economic burdens.[6] In Bangladesh, research on prediabetes becomes crucial because the prevalence of diabetes is soaring gradually due to urbanization, sedentary lifestyles, and dietary changes.[8,9] The findings will help curb the impending diabetes epidemic, improve public health outcomes, and alleviate the strain on the country's healthcare system.[9]

The first step in motivating people with prediabetes to adopt a healthy lifestyle is identifying them and letting them know about their elevated risk for T2DM. Despite its increasing trend, the level of prediabetes knowledge remains low. According to the Centers for Disease Control and Prevention statistics from 2017 to 2020, more than 80% of individuals with the disease are not aware of it.[10] This situation might be a barrier to promoting engagement rates. Patients who are ignorant of their illness could lack the motivation to participate in risk-reduction measures because the willingness to act depends on the perceived necessity for action.[11] Evidence-based lifestyle programs advocate that individuals with prediabetes can prevent the progression to T2DM by making dietary changes, engaging in moderate amounts of physical activity, and losing a substantial amount of weight.[12]

Knowledge of the interplay among genetic, environmental, and lifestyle factors is lacking.[13] The precise molecular mechanisms underlying the transition from prediabetes to overt diabetes are also unknown, impending the development of targeted therapeutic interventions.[14] Further research is needed to explore the cultural and socioeconomic factors influencing prediabetes in diverse populations and to develop tailored strategies for prevention and early intervention.[15]

The prespecified hypotheses of prediabetes include investigating the effect of a structured exercise regimen on improving insulin sensitivity and reducing the progression from prediabetes to diabetes in a diverse population.[16] Scientists hypothesize that dietary interventions focusing on specific nutrient profiles can mitigate metabolic abnormalities associated with prediabetes, potentially providing insights into personalized dietary strategies for at-risk individuals.[17–19] Prediabetes is preventable if efforts are directed to raising consciousness and facilitating its management, mitigation, and monitoring.[20] Although many studies have explored prediabetes prevalence, data are lacking on the knowledge and awareness of prediabetes risk factors to evaluate how much people know about this condition.[18,21] Thus, the present work aims to summarize the demographic data of the participants and their responses to various questionnaires about their situations related to prediabetes and their awareness of this condition.

METHODS

This hospital-based survey was conducted at the Dhaka Medical College Hospital, SIBL Foundation Hospital and three more hospitals in Dhaka, Bangladesh from November 2022 to March 2023. A total of 500 participants were selected by simple random sampling and lottery method.[22] The sample size was calculated using Masood *et al.*'s method[23] and an online calculator (http://www.raosoft.com/samplesize.html), with a confidence interval of 95% and a margin of error 5%. Despite the extremely low chances, bias may occur during sample selection. Using an appropriate sample calculation method can prevent the formation of bias.

Some criteria were carefully followed during the whole study period, such as age >18 years, capability to understand English or Bengali, willingness to participate in this study, and the following symptoms for prediabetes patients: blood sugar level from 140 mg/dl to 199 mg/dl (7.8–11.0 mmol/L), increased thirst, frequent urination, excess hunger, fatigue, and blurred vision.

Some participants were excluded from the study because of their inability to match the above criteria. Prior to the study, a written consent form was obtained from all the participants. The Department of Pharmacy of Atish Dipankar University of Science and Technology approved and coordinated this study under the reference number ADUST-EC/2022/35.

The questionnaire was designed by following previously published articles[23–27] and was composed of four segments: (a) demographic characteristics of respondents, (b) general knowledge of participants regarding prediabetes, (c) awareness and risk factors of prediabetes, and (d) symptoms of prediabetes. It was first prepared in English and then translated to Bengali to facilitate understanding among the participants. The questionnaire was validated by a panel of experts such as endocrinologists, clinical pharmacists, social science graduates, university professors with expertise in relevant fields, and healthcare professionals. A pretest was conducted among a small number of participants to determine whether they face any problems in

understanding the questionnaire, but no such difficulties were observed. Different medical terms were elucidated in face-to-face interviews with the participants.

Five dedicated pharmacy graduates and physicians volunteered to collect data. They underwent a 1-month training course on prediabetes screening and risk assessment and were trained on the research questionnaire. They also took part in various seminars on prediabetes as arranged by different medical institutions. The volunteers maintained the above-mentioned four steps for data collection. First, the participants were asked to complete a questionnaire related to sociodemographic and anthropometric information. The purpose of the research was then explained, and their confidentiality was ensured. Any types of doubts or questions from the participants were clarified by the authors and trained volunteers. Immediately after the completion of the interview, the questionnaires were collected. Statistical data analysis were performed using Statistical Package for Social Sciences (SPSS software, Inc., Chicago, USA) version 22.0, and Cronbach's alpha was analyzed.

RESULTS

A total of 500 respondents were interviewed. Among them, 40% are male (N = 300), and 60% are female (N = 200). The age of respondents ranged from 20–60 years old. The response rate for this study is 100%. Gender, body weight, employment, educational qualification, economic situation, and other sociodemographic variables impact diabetes development. Family history, a genetic component, also plays an essential role.[28]

According to the results, 11.16% of the participants are moderately obese, 22% are overweight, 56.4% are normal weight, 7.6% are underweight, and 2.4% are severely underweight. In addition, 39% of the participants have business backgrounds, 41% are service holders, and 14% have other occupations. With regard to the distribution of economic classes, 12% of the respondents belong to higher class, 18% to higher middle class, 50% to middle class, and 20% to lower middle class. Approximately 41% of the respondents have first-degree relatives with diabetes, 39% have second-degree relatives with diabetes, and 12% have both (Table1).

The analysis of the questionnaire indicated sufficient face validity. Further, the questionnaire also indicated having internal and test-retest reliability. Among the 500 participants, only 150 prefer beverages, which is surprising because of the popularity of these sugary drinks. When asked if fruits, vegetables, and nuts are part of their daily consumption, 42% of the participants said they eat these daily. A significant percentage of respondents, 58%, said they do not eat fruits, vegetables, and nuts. In terms of physical exercise, 320 participants (64%) said that they do not perform any activities, leaving only 180 participants (36%) who physically exercise. People who do not eat fruits and vegetables and do not maintain physical activity are at great risk of developing T2DM.[29] Meanwhile, fewer participants have said that they have high blood pressure, feel stress in their lives, and have gestational diabetes, all of which are T2DM symptoms.[1] Observing the presence of darkened spots in the body, which is common in patients with diabetes, is mandatory for people with prediabetes.[30] According to the analysis, 130 people said they do not observe this condition, and 370 people said this practice is unknown to them, probably because they are unaware of this being a symptom of diabetes (Table 2). The results proved that the majority of individuals in the country do not consume sufficient amounts of healthy food and do not engage in physical exercise, placing them at a high risk of developing diabetes.

Lifestyle, obesity, and other variables all contribute to the development of diabetes, and good awareness and use of information could help in diabetes prevention. Proper awareness of diabetes may assist in preventing diabetes and controlling blood sugar levels in the body.[31]

TABLE 1. Sociodemographic characteristics of the participants

Variables	N (%)
Gender	
Female	300 (60.0)
Male	200 (40.0)
Weight (BMI kg/m^2)	
Very severely underweight (less than 15)	0 (0.0)
Severely underweight (15.0 to 16.0)	12 (2.4)
Underweight (16.0–18.5)	38 (7.6)
Normal weight (18.5–25)	282 (56.4)
Overweight (25–30)	110 (22.0)
Moderately obese (30–35)	58 (11.2)
Family occupation	
Business	195 (39.0)
Service holder	205 (41.0)
Others	70 (14.0)
No comment	30 (6.0)
Educational qualification	
Uneducated	9 (1.8)
Primary (1–5)	161 (32.2)
Higher (6–12, Honors and more)	330 (66.0)
Economic status	
Higher class	60 (12.0)
Higher middle class	90 (18.0)
Middle class	250 (50.0)
Lower middle class	100 (20.0)
Family diabetes history	
The first degree of relatives (parent, sibling)	205 (41.0)
The second degree of relatives (aunt, uncle, grandparents)	195 (39.0)
Both first and second-degree	60 (12.0)
No history	40 (8.0)

According to the analysis, 84% of the participants strongly agree and agree that a healthy lifestyle could help them be free from diabetes. Another misconception about prediabetes is that only obese people will experience diabetes in the future; 42% of people agree with this idea, and 36% do not agree. A significant percentage (66%) of the participants do not agree with the statement that "diabetes can only be treated by taking drugs," showing that people are aware that physical activities and proper diet are needed along with medication. Among the participants, 88% are aware that diagnosing prediabetes is an effective way to increase patient awareness, and 64% strongly agree and agree that lifestyle modification is suitable for the treatment of prediabetes (Table 3). These findings revealed that a considerable proportion of the country's population lack adequate knowledge regarding diabetes development and management. Finally, diabetes warning signs and blood sugar levels should be frequently checked to prevent diabetes.[32]

According to the study, 42% of the participants experience blood sugar level between 140 and 199 mg/dl, and a significant portion of the participants (52%) do not know their blood glucose level. Among the respondents, 76.2% experience frequent urination. Increased thirst and excess hunger are reported by 61.8% and 78.4% of the participants, respectively. Fatigue and blurred vision occur in 70% and 66.8% of the participants, respectively (Table 4). The outcomes are disappointing because most of the respondents are unaware of their blood sugar levels, despite the fact that the majority of them have been warned about their blood sugar levels staying in the danger zone for developing diabetes.

TABLE 2. Response regarding the food habits, lifestyle, and health-related problems of the participants

Statements	Yes N (%)	No N (%)	Do not know N (%)
Do you prefer sweetened beverages?	150 (30.0)	350 (70.0)	
Do you eat fruits, vegetables, and nuts daily?	210 (42.0)	290 (58.0)	
Do you maintain any physical exercise?	180 (36.0)	320 (64.0)	
Do you smoke?	120 (24.0)	380 (76.0)	
Do you have high blood pressure?	145 (29.0)	355 (71.0)	
Do you feel any stress in your life?	143 (28.6)	357 (71.4)	
Do you have gestational diabetes?	20 (4.0)	480 (96.0)	
Do you have sleep apnea?	133 (26.6)	367 (73.4)	
Do you observe darkened skin on specific body parts like the neck, armpits, elbows, knees, and knuckles?		130 (26.0)	370 (74.0)

TABLE 3. Response regarding knowledge about prediabetes

Statements	Strongly agree N (%)	Agree N (%)	Do not know N (%)	Disagree N (%)	Strongly disagree N (%)
Only healthy lifestyle can help us to keep our bodies free from diabetes.	230 (46.0)	190 (38.0)	40 (8.0)	25 (5.0)	15 (3.0)
Only obese people will experience diabetes in future.	90 (18.0)	120 (24.0)	110 (22.0)	140 (28.0)	40 (8.0)
Symptoms of prediabetes can find at any age.	120 (24.0)	210 (42.0)	145 (29.0)	10 (2.0)	15 (3.0)
Diabetes can only be treated by taking drugs.	5 (1.0)	20 (4.0)	145 (29.0)	210 (42.0)	120 (24.0)
Diabetes is a curable condition.	40 (8.0)	60 (12.0)	210 (42.0)	160 (32.0)	30 (22.0)
Prediabetes is a significant public health issue.	220 (44.0)	240 (48.0)	30 (6.0)	6 (1.2%)	4 (0.8.0)
Diagnosing prediabetes is an effective way to increase patient awareness of their need for lifestyle modification.	230 (46.0)	210 (42.0)	30 (6.0)	18 (3.6%)	12 (2.4.0)
Evidence supports the effectiveness of treating prediabetes with lifestyle modification.	130 (26.0)	190 (38.0)	105 (21.0)	50 (10.0)	25 (5.0)
I am confident in my ability to manage prediabetes.	210 (42.0)	220 (44.0)	26 (9.2)	24 (4.8)	20 (4.0)

TABLE 4. Symptoms of prediabetes

Symptoms	Yes N (%)	No N (%)	Do not know N (%)
A blood sugar level from 140 to 199 mg/dl. (7.8–11.0 mmol/L)	210 (42.0)	30 (6.0)	260 (52.0)
Increased thirst	309 (61.8)	31 (6.2)	160 (32.0)
Frequent urination	381 (76.2)	13 (2.6)	106 (21.2)
Excess hunger	392 (78.4)	17 (3.4)	91 (18.2)
Fatigue	350 (70.0)	27 (5.4)	123 (24.6)
Blurred vision	334 (66.8)	85 (17.0)	81 (16.2)

DISCUSSION

Prediabetes, in which the hypoglycemia level lies between normal and diabetic levels, is a risk factor for diabetes. By analyzing the signs of prediabetes, we can estimate a patient's risk of developing diabetes, particularly T2DM.[33] This study aimed to determine the participants' degree of diabetes awareness and risk factors to estimate the general condition of the country's population.

Males continue to be at higher risk of diabetes than females, who accounted for the majority of the participants (60%). The correlation between diabetes and economic status is noteworthy: individuals with low incomes are more susceptible to the disease than those with high incomes.[1] In this study, 50% of the respondents belong to the middle class, and a significant proportion is from the lower middle class. These figures demonstrated that the country's population still has a high risk of developing diabetes.

Heredity is an important factor in diabetes, and genetic materials transfer the disease from one generation to another.[34] This process is a major concern because 80% of the participants have a family history of diabetes in their first and second degrees of relatives, which is a significant risk factor for diabetes. This study demonstrated that the majority of the population continues to be at risk of diabetes due to hereditary factors. Economic status and family history have a stronger influence on the development of prediabetes and diabetes than other sociodemographic factors. Nutrition and physical activity have crucial roles in the development of diabetes. Poor diet and physical inactivity contribute to obesity and diabetes.[35]

According to this study, 30% of the participants like sweetened beverages. Excessive sugar consumption increases the risk of gaining weight and developing T2DM by 26% compared with regular sugar consumption.[36] Fruits, vegetables, and nuts are crucial for maintaining proper physiological function in the body. However, 58% of the respondents do not consume these important foods on a regular basis, and 64% do not engage in regular physical activity, increasing their risk of developing prediabetes and diabetes.

According to the results, a significant number of people smoke and do not maintain normal blood pressure and mental stress. Giving up smoking and maintaining normal blood pressure and mental stress are crucial for preventing prediabetes and diabetes symptoms.[37,38] Most of the individuals have limited knowledge on prediabetes and diabetes. Though the majority believes that only a healthy lifestyle helps maintain our bodies free of diabetes (84%), some disagree with this assertion and 3% strongly disagree with it.

Obesity is an important contributory factor for diabetes, and obese people are likely to acquire the disease; however, it is not the sole risk factor. Approximately 66% of the participants contend that obesity is the only risk factor of diabetes, which is erroneous. Insulin-dependent diabetes may appear at any age, but non-insulin-dependent diabetes may arise when individuals become older. A significant proportion of the population (29%) is uninformed of the age at which prediabetes symptoms appear. This finding was concerning because so many individuals are indifferent about diabetes.

Diabetes may be managed by medications and lifestyle changes to maintain a healthy lifestyle.[34] Approximately 42% of the respondents think that diabetes is curable, and 29% believe it could only be treated with drugs. These findings implied a lack of information regarding diabetes care. Prediabetes is a serious public health concern because it is a precursor of diabetes. An encouraging result revealed that 48% and 44% of the respondents agree and strongly agree with the significant role of prediabetes. Only 21% of participants are uncertain of what they should do after being diagnosed with prediabetes, and 86% feel confident in their capacity to manage this condition.

Blood sugar levels should be checked on a regular basis after a specific length of time to diagnose prediabetes and diabetes. In this study, 52% of the individuals are uninformed of their blood sugar level, even though 42% of them have blood sugar levels ranging from 140 mg/dl to 199 mg/dl, which is indicative of prediabetes. Most of them experience the symptoms of prediabetes, such as increased thirst (61.8%), frequent urination (76.2%), excess hunger (78.4%), fatigue (70%), and blurred vision (66.8%).

This study found that people in the country are continuously at risk of developing diabetes and prediabetes, and the socioeconomic status of people promotes this situation. The risks of prediabetes and diabetes are not well understood by the people of this nation. The disease can be prevented by regularly checking blood sugar levels, leading a healthy lifestyle, and raising awareness of the condition.

This study had several limitations. While the validity and reliability of the questionnaire were acceptable, nonetheless further analysis of the data is suggested. Further, while our study benefits from the high number of samples, the limitation arises from the fact that it may not represent the pre diabetic patients Bangladesh population. The use of self-reported data may lead to reporting and social desirability bias. The cross-sectional limits its ability to establish causation between variables. While the validity and reliability of the questionnaire were acceptable, nonetheless further analysis of the data is suggested.

Further research may be conducted to determine the best strategy to improve people's consciousness and to provide the best guidelines for maintaining a healthy lifestyle while considering the country's socioeconomic status for prediabetes and diabetes prevention. The hospital is a very busy area, so data were rapidly collected in some cases. In addition, some participants responded late, which caused bias in this research.

CONCLUSIONS

Our study focused on the significant burden of prediabetes in Bangladesh, highlighting the urgency for targeted interventions and public health strategies. The findings underscore the need for increased awareness, early detection, and preventive measures to mitigate the progression of prediabetes to overt diabetes. In reducing the rising prevalence of prediabetes, modifiable risk factors such as unhealthy diet patterns and sedentary lifestyles must be addressed. Collaborative efforts among healthcare providers, policymakers, and community stakeholders are essential in implementing effective screening programs and eradicating the future burden of prediabetes and diabetes in Bangladesh.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Determinant of Unintended Pregnancy in Indonesia

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Abstract

Background: Unintended pregnancy is a global health problem. The number of unintended pregnancies globally is still high, accounting for 1 in 4 pregnancies. In Indonesia, it occupies 15% of total pregnancies. However, studies discussing the determinants of unintended pregnancies in Indonesia were conducted on a small scale.

Methods: This cross-sectional research utilized the data of 15,316 respondents of the 2017 Indonesia Demographic and Health Survey.

Results: The prevalence of unintended pregnancies in women with live births in the last 3–5 years was approximately 16%. The highest risk of unintended pregnancies was recorded for those with the youngest age, living in urban, and were grand multipara and for the couples who did not know each other's preferences.

Conclusions: Strengthening communication, information, and education in family planning programs, particularly for young women and grand multipara and promoting men's involvement can help prevent unintended pregnancies.

Keywords: contraception, family planning, Indonesia, pregnancy

INTRODUCTION

Unintended pregnancy threatens public health stability because it forms a cyclical chain of health problems that become a burden to disease management and society. One of these problems is contributing to maternal death.[1] At least 150,000 unintended pregnancies worldwide ended in the mother's death. Indonesia has the highest maternal mortality rate in Southeast Asia.[2] According to the Indonesian Intercensal Survey in 2015, the maternal mortality rate reached 305 per 100,000 live births, half of which were due to abortion.[3,4] Unintended pregnancies can also trigger pregnancy and childbirth complications, such as preeclampsia, postpartum bleeding, and postpartum preeclampsia,[5] and cause emotional stress that provokes psychiatric disorders in mothers.[6] In addition to the mother, an unintended pregnancy interferes with the mother's relationship with her partner and/or family.[7,8] This condition can lead to illness or death of the fetus/baby, including the risk of premature birth, low birth weight, or stillbirth[9]. Its adverse effects can influence the socioeconomic condition of a country.[10]

A country's socioeconomic development is linked to an uncontrolled boom in population growth. Birth control remains a challenge in Indonesia, with the unintended birth rate persisting at 7% since 2012.[11] Therefore, Indonesia's population ranks the highest among all Southeast Asian countries and is projected to increase up to 16% by 2050 based on the World Population Data Sheet 2021. Worldmeter recorded the total fertility rate (TFR) of Indonesia in 2020 at 2.3%, exceeding the National Medium-Term Development Plan target TFR of 2.26%. The 2017 Indonesia Demographic and Health Survey (IDHS) also mentioned that Indonesia's total wanted fertility Rate is 2,1, which is still below the TFR target of 2.4.

Earlier studies found that some factors are associated with unintended pregnancies, such as the mother's age,[12–16] mother's education,[13] economic level,[13,14,17] type of residence,[13,14] marital status,[13] age at the time of first marriage,[12,14] parity and number of children born alive,[12–14,16,18] autonomy,[19] knowledge of family planning,[12,15] history of contraceptive use,[12,14,20] failure of contraception,[21] and unmet needs.[15] Some works also used the same dataset but built a causal model and did not consider precise analysis.[18–20] Although Jauhari conducted a cross-sectional study similar to the present work, they did not consider weighting so their final result was under or overestimated.[16] Meanwhile, other studies used logistic regression, resulting in an overestimated size, and a different sample.[19,20] To the best of the author's knowledge, research on the determinants of unintended pregnancies in Indonesia is relatively small, with only three studies conducted to date. Andini *et al*.[12] used the data before 2017, Lutfiya *et al*.[14] used married women as subjects, and Fadhilla[13] did not account for confounders in her final analysis. Therefore, the authors wanted to investigate the determinants of unintended pregnancies in Indonesia using samples and different types of analysis from previous studies.

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METHODS

This research was an analytical observational study with a cross-sectional design using secondary data from the 2017 Indonesian Intercensal Survey (IDHS). The National Population and Family Planning Board, the Central Statistics Agency, and the Ministry of Health executed this survey in 34 provinces of Indonesia (Aceh, North Sumatera, West Sumatera, Riau, Jambi, South Sumatera, Bengkulu, Lampung, Bangka Belitung, Riau Islands, Jakarta, West Jawa, Central Jawa, Yogyakarta, East Jawa, Banten, Bali, West Nusa Tenggara, East Nusa Tenggara, West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, North Kalimantan, Southeast Kalimantan, Gorontalo, West Sulawesi, Maluku, North Maluku, West Papua, and Papua). For the sampling frame, the 2017 IDHS used the Master Sample of Census Blocks from the 2010 Population Census containing 1,970 census blocks with 49,250 homes.

The 2017 IDHS has a two-stage sampling design. In the first step, several census blocks were picked systematically with probability to size; in the second stage, 25 ordinary households were selected in each census block. The questionnaire incorporated questions from the Demographic and Health Survey (DSH-7) and the IDHS 2012. Additional information on the sampling strategy and survey methods utilized by the IDHS was provided in the final reports.[22]

The inclusion criteria were respondents with live births in the last 3–5 years. Among the 49,627 female respondents of childbearing age 15–49 years, those who never had sexual intercourse (N = 13,781), used contraception in the last 2 years (N = 8,390), had a previous child before the last 3–5 years (N = 4,723), had miscarriage/abortus and stillbirth (N = 4,137), had fertility issues or menopause (N = 3,231), and had missing data (N = 8) were excluded. A total of 15,357 respondents were eligible. After those with missing data were further excluded (N = 1,683), 13,674 women were included in the final analysis.

The outcome of the study was unintended pregnancy. The independent variable consisted of the mother's age, education level, economic status, type of residence, employment status, marital status, parity, pregnancy and childbirth complications, knowledge of contraception, and fertility preferences. Ages were classified into four (15–19 years old, 20–24 years old, 25–35 years old, and >35 years old). Education level was divided into four levels: no education, primary education (elementary school), secondary education (junior high school–high school), and tertiary education if the respondent graduated from college/university. Employment status was labeled as 0 if the respondent had work and 1 if she was unemployed. Economic level was categorized into five quintiles from poorest to richest. Residence types were urban and rural. Marriage status was labeled as married or living together and unmarried, including those who were divorced, widowed, or lived separately. Parity was classified as 0 for primipara, 1 for multipara (2–4 children), and 2 for grand multipara (≥ 5 children). Pregnancy complications and delivery were described as with or without complications. The fertility preference between spouses could be the same or different (females wanted more children than males, males wanted more children than females, or they did not know each other's preference). Contraceptive knowledge was based on the question of whether the respondents had heard about contraceptive methods and answered spontaneously. These answers were then scored using the receiving operator characteristic (ROC). The cut-off score was determined based on sensitivity and specificity: low level if the cut-off <10, and high level if the cut-off ≥ 10.

Univariate analysis was performed to measure the magnitude of proportions or percentages on each categorical variable with a CI of 95%. Bivariate analysis was conducted using the simple Cox regressing method. A variable would be included in the multivariate analysis if a *p*-value ≤0.25 or considered substantially necessary. The modeling was built using backward elimination process, i.e., each variable was extracted one by one from the model, starting from a variable with a prevalence ratio (PR) close to 1 and a *p*-value >0.05 until the most suitable final model was formed. The fit model was determined from the probability F of the model <0,05, and the Wald test on the respective variable showed a *p*-value <0.05.[23,24] The survey data (Stata 14) were analyzed for weighting because the sampling process used cluster samplings.

The 2017 IDHS was reviewed and approved by the Institutional Review Board of the Inner City Fund. The data were issued on March 26, 2023, after a request was sent via https://dhsprogram.com/data/dataset_admin/login_main.cfm. This study has passed an ethical review by the Research and Community Engagement Ethical Committee, Faculty of Public Health, Universitas Indonesia with the reference number Ket-162/UN2.F10.D11/PPM.00.02/2023.

RESULTS

Characteristics of respondents

Table 1 shows the percentage characteristics of respondents based on demographic, socioeconomic, sociocultural, fertility, and family planning program factors. In terms of demographic factors, most respondents were 25–35 years old (55.8%), with adolescents (15–19 years old) accounting for the lowest percentage of 2.5%. Regarding socioeconomic factors, many respondents had a minimum education in junior high/high school (58.3%). The rate of respondents was high among the unemployed (54.4%) and middle class (20.65%). In sociocultural terms, more respondents lived in rural areas than urban areas (51.5% vs. 48.5%). For fertility factors, almost all respondents were married or living together (96.3%), and only approximately 3.7% were

TABLE 1. Characteristics of respondents

Variable	Unweighted		Weighted	95% CI	
	N	%	%	Lower Limit	Upper Limit
Age (years)					
15–19	413	2.70	2.49	2.19	2.84
20–24	2,409	15.73	16. 53	15.76	17.32
25–35	8,569	55.95	55.76	54.78	56.73
≥ 36	3,925	25.63	25.23	24.34	26.14
Education level					
No education	203	1.33	1.00	0.77	1.29
Primary education	3,846	25.11	26.00	24.77	27.27
Secondary education	8,612	56.23	58.31	57.01	59.60
Tertiary education (university)	2,655	17.33	14.69	13.81	15.61
Employment status					
Unemployed	8,034	52.49	54.37	53.21	55.51
Employed	7,271	47.51	45.63	44.49	46.79
missing	11	0.07			
Economic status					
Poorest	4,060	26.51	19.78	18.63	20.99
Poorer	3,023	19.74	20.17	19.21	21.16
Middle	2,886	18.84	20.65	19.71	21.63
Rich	2,757	18.00	20.50	19.53	21.50
Richest	2,590	16.91	18.90	17.71	20.15
Residence type					
Urban	7,553	49.31	48.51	47.38	49.65
Rural	7,763	50.69	51.49	50.35	52.62
Marriage status					
Unmarried	724	4.73	3.68	3.35	4.03
Married	14,592	95.27	96.32	95.97	96.65
Parity					
Primipara	4,745	30.98	33.36	32.44	34.29
Multipara	9,392	61.32	61.28	60.34	62.21
Grand multipara	1,179	7.70	5.36	4.93	5.83
Complication of pregnancy					
Without complication	12,338	82.62	82.20	81.39	82.99
With complication	2,596	17.38	17.79	17.01	18.61
missing	382	2.49			
Complication of delivery					
Without complication	14,315	94.32	94.12	93.58	94.62
With complication	711	4.68	4.99	4.55	5.47
Unknown	151	0.99	0.89	0.69	1.14
missing	139	0.91			
Fertility preference					
Same preference	8,972	63.16	64.95	63.87	66.01
Different preference	3,890	27.38	26,81	25.86	27.79
Do not know each other	1,344	9.46	8.24	7.63	8.89
missing	1,110	7.25			
Contraceptive knowledge					
Low knowledge	5,506	35.95	33.39	32.15	34.66
High knowledge	9,810	64.05	66.61	65.34	67.85

unmarried. The highest parity ratio was among those with two to four children (61.3%), with the second percentage recorded for primipara women (33.4%). Most respondents have no pregnancy (82.2%) or childbirth complications (94.1%). Furthermore, most subjects were married couples with similar fertility preferences (64.9%), and only a few had unknown partner preferences (8.2%). In the family planning programs, more respondents had high contraceptive knowledge (66.6%) than those with low knowledge (33.4%).

Association between several risk factors and unintended pregnancy

In terms of demographic factors, the prevalence of unintended pregnancies was 1.8 times higher (crude PR (cPR) 1.83; 95% CI 1.67–2.0) among women over the age

of 35 years compared with those aged 25–35 years. With regard to socioeconomic factors, the poorest and middle class were 0.8 times more likely to have unintended pregnancies than the richest respondents (cPR 0.83; CI 0.72–0.95 and cPR 0.86; CI 0.75–0.99). Education level and employment status had no statistically significant relationship with unintended pregnancies. In terms of fertility factors, unmarried respondents were 1.4 times more likely (cPR 1.44; 95% CI 1.21–1.73) to have unintended pregnancies compared with the married ones. The risk of unintended pregnancy in grand multipara and multipara women was eight times (cPR 7.8; 95% CI 6.48–9.28) and four times (cPR 4.1; 95% CI 3.64–4.75) higher than that in primipara, respectively. Unintended pregnancies were 1.1 times more likely if they had pregnancy complications (cPR 1.13; 95% CI 1.01–1.27) but were not statistically significantly related to childbirth complications. Most unintended pregnancies happened when the spouses did not know each other's fertility preferences (cPR 1.27 95% CI 1.08–1.49) or when both preferences differed (cPR 1,20, 95% CI 1.09–1.33) compared with the couples having the same preferences. With regard to family planning programs, the respondents who had low contraceptive knowledge were 0.8 times more likely (cPR 0.81; 95% CI 0.73–0.89) to have unintended pregnancies compared with those who had great contraceptive knowledge. Table 2 presents that only the economic status had a *p*-value >0.25. Nevertheless, we decided to include all variables in the multivariate analysis because the financial status would substantially affect the pregnancy status.

As shown in Table 3, the initial model was named Model I and built by excluding the employment status, economic status, knowledge of contraception, pregnancy, and birth complications one by one in a row. Table 3 shows that the determinants of unintended pregnancies are age, educational level, type of residence, parity, and fertility preferences. After controlling for the confounder, the highest risk of unintended pregnancy was for the women at the age of 15–19 years (adjusted PR/aPR 4,27, 95% CI 3.13–5.82; $p < 0.001$), followed by those 20–24 years of age (aPR 1.78, 95% CI 1.52–2.08; $p < 0.001$), compared with the references. In terms of socioeconomic factors, the lowly educated respondents had a 0.7 times higher risk of unintended pregnancy than those with higher education (aPR 0.77, 95% CI 0.70–0.84; $p < 0.001$). With regard to socioeconomic factors, the respondents who lived in urban areas have a 1.2 times greater risk than those who lived in rural areas (aPR 1.23, 95% CI 1.12–1.35, $p < 0.001$). In terms of fertility, the risk of unintended pregnancy was 12 times (aPR 11.7, 95% CI 9.51–15.10; $p < 0.001$) in grand multipara and six times (aPR 6.15, 95% CI 5.09–7.42); $p < 0.001$) in multipara compared with that in primipara. The risk of unintended pregnancy was aPR 1.19 (95% CI 1.02–1.41; $p < 0.05$) when the couple did not know each other's preferences and 1.14 (95% CI 1.07–1.33; $p = 0.002$) when the couple had different preferences compared with the reference.

TABLE 2. Association between several risk factors and unintended pregnancies

Variable	Pregnancy Status		cPR	95% CI	*p*
	Unintended	Intended			
	N (%)	N (%)			
Age (years)					
15–19	66 (17.29)	316 (82.71)	1.24	0.96–1.61	0.102
20–24	266 (10.51)	2,265 (89.49)	0.75	0.65–0.88	<0.001*
25–35	1,190 (13.94)	7,349 (86.06)		1.00	
≥36	987 (25.54)	2,877 (74.46)	1.83	1.67–2.01	<0.001*
Education level					
No education	21 (14.01)	132 (85.99)	0.80	0.50–1.29	0.369
Primary	642 (16.11)	3,341 (83.89)	0.93	0.81–1.06	0.251
Secondary	1,454 (16.28)	7,477 (83.72)	0.93	0.81–1.06	0.255
Tertiary (university)	392 (17.41)	1,858 (82.59)	1.00		
Employment status					
Unemployed	1,324 (15.91)	6,996 (84.09)	0.94	0.86–1.02	0.153
Employed	1,182 (16.93)	5,802 (83.07)		1.00	
Economic status					
Poorest	449 (14.81)	2,581 (85.19)	0.83	0.72–0.95	0.008*
Poorer	529 (17.14)	2,559 (82.86)	0.96	0.83–1.10	0.527
Middle	489 (15.46)	2,674 (84.54)	0.86	0.75–0.99	0.039*
Richer	523 (16.65)	2,617 (83.35)	0.93	0.82–1.06	0.267
Richest	519 (17.92)	2,376 (82.08)		1.00	
Residence type					
Urban	1,381 (18.58)	6,049 (81.42)	1.29	1.19–1.42	<0.001*
Rural	1,128 (14.31)	6,758 (85.69)	1.00		

TABLE 2. *Continue*

Variable	Pregnancy Status		cPR	95% CI	*p*
	Unintended	Unintended			
	N (%)	N (%)			
Marriage status					
Unmarried	113 (23.28)	341 (76.72)	1.44	1.21–1.73	<0.001*
Married	2,396 (16.12)	12,466 (83.88)		1.00	
Parity					
Primipara	259 (5.07)	4,851 (94.93)		1.00	
Multipara	1927 (20.54)	7,458 (79.46)	4.05	3.64–4.75	<0.001*
Grand multipara	323 (39.27)	499 (60.73)	7.75	6.48–9.28	<0.001*
Complication of pregnancy					
Without complication	1954 (15.8)	10,402 (84.2)		1.00	
With complication	479 (17.9)	2,196 (82.1)	1.13	1.01–1.27	0.036*
Complication of delivery					
Without complication	2,304 (16.20)	11,946 (83.8)		1.00	
With complication	147 (19.50)	608 (80.50)	1.20	0.99–1.46	0.064
Unknown	24 (4.7)	111 (82.20)	1.09	0.65–1.85	0.724
Fertility preference					
Same preference	1,303 (14.04)	7,974 (85.96)		1.00	
Different preference	688 (16.89)	3,202 (83.11)	1.20	1.09–1.33	<0.001*
Unknown	209 (17.79)	967 (82.21)	1.27	1.08–1.49	0.004*
Contraceptive knowledge					
Low knowledge	723 (14.13)	4,392 (85.87)	0.81	0.73–0.89	<0.001*
High knowledge	1,786 (17.51)	8,415 (82.49)		1.00	

*statistically significant

TABLE 3. Multivariate analysis

Variable	Model I**	Model II***	Model III****	Model IV*****	Model V******	Model VI*******	Model VII********
	PR	PR	PR	PR	PR	PR	PR
Age (years)							
15–19	4.09*	4.09*	4.15*	4.19*	4.12*	4.10*	4.27*
20–24	1.84*	1.84*	1.85*	1.87*	1.85*	1.84*	1.78*
25–35				*reference*			
≥ 36	1.27*	1.27*	1.26*	1.26*	1.26*	1.25*	1.26*
Education level							
Low education	0.76*	0.77*	0.76*	0.78*	0.76*	0.76*	0.77*
High education				*reference*			
Employment status							
Unemployed	1.02						
Employed				*reference*			
Economic status							
Lower-class	1.08	1.08	1.08				
Upper-class				*reference*			
Type of residence							
Urban	1.23*	1.23*	1.23*	1.20*	1.22*	1.22*	
Rural							
Marriage status							
Unmarried	1.21	1.21					
Married				*reference*			
Parity							
Primipara							
Multipara	6.32*	6.33*	6.34*	6.36*	6.38*	6.46*	
Grand multipara	12.24*	12.29*	12.32*	12.52*	12.45*	12.59*	
Complication of pregnancy							
Without complication	*reference*						
With complication	1.12	1.12	1.11	1.12	1.12	1.13	

TABLE 3. *Continue*

Variable	Model I**	Model II***	Model III****	Model IV*****	Model V******	Model VI*******	Model VII********
	PR	PR	PR	PR	PR	PR	PR
Complication of delivery							
Without complication	*reference*						
With complication	1.20	1.21	1.21	1.21	1.21		
Unknown	0.88	0.88	0.88	0.88	0.88		
Fertility preferences							
Same preference							
Different preference	1.15*	1.15*	1.14*	1.15*	1.15*	1.14*	
Do not know each other	1.22*	1.21*	1.22*	1.22*	1.21*	1.19*	
Contraceptive knowledge							
Low knowledge	0.89	0.90	0.89	0.91			
High knowledge	*reference*						

*Statistically significant
**initial model
***without employment status
****without employment and marriage status
*****without employment, marriage, and economic status
******without employment, marriage, and economic status, as well as contraceptive knowledge
*******without employment, marriage, economic status, contraceptive knowledge, and pregnancy complications
********without employment, marriage, economic status, contraceptive knowledge, pregnancy, and birth complications

DISCUSSION

The proportion of unintended pregnancies in this research was approximately 16%, which is higher than that in the 2018 Performance and Program Accountability Survey (SKAP) and 2018 Basic Health Research (Riskesdas). This finding may be influenced by the sample difference. In this study, the highest risk of unintended pregnancy was recorded for the youngest age group due to the growing number of sexually active teenagers. According to a previous research, 74% of teenagers have been sexually active since the age of 14 years, and 73% of teenage girls claim to have multiple partners.[25] However, increased sexual activity is often not accompanied by a good knowledge of reproduction. Moreover, teachers and parents are often uncomfortable talking about sexuality, so teenagers feel embarrassed, mainly for asking questions about contraception. Therefore, misperceptions arise about the use of contraception among teenagers. Rutgers[10,26] revealed that not up to 50% of Indonesian adolescent respondents have a good understanding of sexuality and contraception, which is consistent with the findings of Sarder *et al*. and Oulman *et al*.[10,27] All these reasons, coupled with the lack of legality for marriage, lead to unintended pregnancy.[28]

Education level is a variable that can be modified. However, when this variable was controlled in the multivariate analysis, the results contradicted the studies in Kenya, which stated that high levels of education are a protection against unintended pregnancies.[29] This finding is linked to the pattern of contraceptive use in Indonesia, where highly educated people prefer to use traditional contraceptive methods.[30] Conversely, highly educated women prefer small families and focus on their careers or education, so they avoid pregnancy.[13] Education level also affects women's autonomy in determining their reproductive rights.[31] When a pregnancy occurs, they tend to maintain it until birth because they feel financially ready to care for the child.[32] The higher the education level, the higher the economic status.[11] By contrast, those with low education are likely to end their pregnancies with illegal abortion. A study from 36 countries with low- and middle-income showed that the higher the level of education, the lower the prevalence of termination of pregnancy.[33]

Women living in urban are more likely to experience unintended pregnancies than those in rural[34] because urban residents are focused on career development and economic activity, so they do not expect pregnancy.[35] They are also likely to use traditional contraceptives[30], thus increasing the likelihood of unintended pregnancy caused by the lower effectiveness of these methods than modern contraception.[36] Owing to ethnic and cultural influence, rural life in Indonesia is appreciative of pregnancy and prefers to have a large number of children, especially when having more than one boy[37], as supported by similar studies in other countries.[38–40] The boys are judged to be an investment in improving the degrees and economy of the family.[41,42]

The type of residence is also related to the socioeconomic level. In general, urban areas are identical to high socioeconomic levels. However, research in Kenya suggested that urban people living in slums may be affected by poverty with insufficient education. Both of these factors, combined with risky sexual behavior,

indicate poor health status.[29,43,44] Indonesia is also not exempted from this phenomenon due to its currently high rate of urbanization. The massive increase in urban population is not accompanied by economic improvement, leading to a rise in depleted areas that initially ranged from 8% in 2017 to almost double by 2020.[45,46] The quantity and quality of healthcare facilities in slum areas are no better than those in the countryside.[45,46] The health disadvantages experienced by poor urban may precede to pregnancy and childbirth complications that lead to unintended pregnancies. Limited access to healthcare also serves as a barrier to access to contraceptive information and family services.[47,48] Another factor is the connection of the type of residence to the marriage. Although the number of child marriages has increased in the last 10 years since 2018, a 6% decrease in child marriage (before the age of 18) has been recorded in rural areas compared with that in urban areas.[28] Mobile family planning services could be an option for the prevention of unintended pregnancies in urban slums.[49]

The highest chance of having an unintended pregnancy rose from eight times in the bivariate analysis to 12 times in the multivariate analysis, similar to previous studies.[49,50] The reason is that the feeling of having enough children and the rarity of sexual intercourse make women feel they have no need for counseling or contraceptives.[50] Another factor is the number of children, causing mothers to arrange extra time so their visits to health facilities are often delayed or neglected.[49] The risk of unintended pregnancies at high parity is increasing with the poor communication about family planning between spouses.[51] The likelihood of unintended pregnancies demonstrates this increase with the parity, accompanied by unequal fertility preferences and not knowing each other's partner's fertility preferences. Couples who do not know each other's preferences are most likely to have an unintended pregnancy with a 1.2 times higher risk than if they had the same preferences.[50,52,53] Communication is essential in the determination of family size. In Indonesia and most developing countries, the husband or the male is the ultimate decision-maker in the family.[54] Family size planning should be communicated from the beginning of marriage, integrated into preconception services, and carried out in pairs.[55,56] In previous studies, the risk of unintended pregnancy was significant when the number of children wanted by the wife differed from that of the husband, indicating that the empowerment level of the woman influences their fertility preferences.[43] An empowered woman will have fewer children than a helpless one. If a husband wants more children with his wife, then the husband will encourage his wife not to use or refuse contraception and then induce pregnancy.[43]

CONCLUSIONS

This study has shown the persisting problem of unintended pregnancy among Indonesian women based on IDHS data. Women's age, parity, fertility preference, and type of residence were found as the significant predictors of unintended pregnancy in Indonesia. The crucial findings highlighted the need for policies and strategies to prevent unintended pregnancy by strengthening family planning programs, especially among young women and grand multipara with five or more children. Further study is needed to investigate the influence of unintended pregnancy on maternal and child health in Indonesia. Difference in fertility preferences must be addressed by improving the information, education, and communication of family planning, individually and in couples. Encouraging male involvement in family planning is also recommended to increase the acceptability and uptake of contraception, thereby preventing unintended pregnancy.

CONFLICT OF INTEREST

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Suicidal Ideation in Malaysian Young Adults: The Role of Depressive Symptoms and Perceived Problem-Solving Ability

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Suicidal Ideation in Malaysian Young Adults: The Role of Depressive Symptoms and Perceived Problem-Solving Ability

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Abstract

Background: The escalating suicide rates among young adults, including those in Malaysia, necessitate a deeper understanding of the factors contributing to suicidal ideation. This study investigates the relationship between depressive symptoms and perceived problem-solving ability, including problem-solving confidence, approach-avoidance style, personal control of emotion, and suicidal ideation among Malaysian young adults.

Methods: A total of 231 Malaysian young adults aged 18 to 25 years (Mean = 21.1; SD = 1.38) participated in a cross-sectional survey study. The sample was primarily composed of participants of Chinese ethnicity. Using an online survey, participants completed measures including the Depression, Anxiety, and Stress Scale (DASS-21) depression subscale, Problem-Solving Inventory, and Yatt Suicide Attitude Scale (YSAS).

Results: Pearson correlation analysis revealed significant relationships between depressive symptoms, perceived problem-solving ability (specifically problem-solving confidence, approach-avoidance style, and personal control of emotion), and suicidal ideation. Further analysis through logistic regression revealed that young adults with suicidal ideation exhibited a higher likelihood of experiencing depressive symptoms and lower confidence in problem-solving compared to those without suicidal ideation.

Conclusions: These findings highlight the importance of addressing depression and promoting effective problem-solving skills as significant strategies to reduce suicidal risk among young adults. Suicide prevention initiatives should prioritize interventions aimed at improving mental well-being and bolstering problem-solving ability in this vulnerable population.

Keywords: depression, problem-solving, Malaysia, suicidal ideation, young adults

INTRODUCTION

Suicide is a major global public health issue, with approximately 703,000 deaths annually, according to the World Health Organization.[1] Low- and middle-income countries account for more than three-quarters of reported suicides.[1] For every recorded suicide, numerous attempted suicides and individuals are grappling with suicidal thoughts. In Malaysia, the incidence of suicide has reached alarming levels, with 981 reported cases in 2022, escalating to 1087 cases in 2023.[2] Moreover, data from the Malaysian Youth Mental Health Index indicates that 1 in 10 youths in Malaysia exhibited suicidal tendencies in 2023.[3] Research by Lew et al. underscores Malaysia's concerning position, ranking fifth in suicide rates among ASEAN countries.[4]

Youth represent a particularly vulnerable population for suicide, often grappling with anxiety disorders and depression.[5] Studies in Malaysia reveal that 6 out of 10 youths experience varying degrees of depressive symptoms, alongside 3 in 10 experiencing moderate to severe anxiety symptoms.[3] Previous studies have consistently linked depression to suicidal ideation.[6,7] The transition to young adulthood brings unique challenges characterized by increased autonomy and reduced parental oversight compared with adolescents.[8] This development phase necessitates effective problem-solving skills to navigate life's complexities and maintain psychological well-being. However, young adults often lack experience in managing daily challenges and setbacks, which contributes to depressive tendencies.[9] Meta-analytical findings demonstrate a clear association between poor problem-solving abilities and higher levels of suicidal ideation, attempts, and fatalities.[10]

Depression symptoms, including a range of emotional and cognitive challenges, indicate a prevalent mental health disorder known as depression.[11] Importantly, depression is closely related to suicidal ideation,[12] with individuals experiencing depression facing an elevated risk of harboring thoughts of self-harm[6] and suicide attempts.[13,14] However, existing literature, especially in the Malaysian context, predominantly focuses on exploring the relationship between depression and suicidal ideation among adolescent populations.[12,15–17]

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Young adulthood signifies a transitional phase bridging late adolescence and early adulthood, characterized by ambiguity and uncertainty.[8] During this transitional period, young adults face various academic, financial, and social stressors, increasing their susceptibility to developing depressive symptoms closely linked with suicidal ideation.[18]

Problem-solving involves the cognitive process of creating and employing mental representations to devise solutions to various challenges encountered in daily life.[19] Previous research has revealed a significant correlation between an individual's problem-solving proficiency and suicidal ideation. Specifically, those with limited problem-solving skills are more likely to attempt suicide[20] and have a higher risk of suicide.[21] Moreover, individuals who have attempted suicide often demonstrate limited problem-solving abilities.[22] This correlation may stem from a sense of hopelessness that develops over time as individuals with limited problem-solving skills experience constant failure in addressing life's challenges, making suicidal ideation a more accessible escape route. On the other hand, active problem-solving acts as a protective factor, mitigating the relationship between depressive symptoms and suicidal ideation among suicide attempters, thereby reducing the risk of suicide.[23]

Consequently, various therapeutic interventions and preventive measures have been designed to enhance problem-solving ability in coping with adverse life events, with the goal of reducing suicide risk.[24,25] Despite this, problem-solving ability, comprising three dimensions: problem-solving confidence, approach-avoidance style, and personal control of emotion,[26] often remains undervalued as a crucial predictor of suicidal ideation, despite its undeniable relevance in the problem-solving process.

Problem-solving confidence is defined as a belief in one's ability to navigate and resolve challenges effectively.[26] This concept aligns conceptually with Bandura's theory of self-efficacy in Social Cognitive Theory.[27] Research has shown that higher levels of problem-solving confidence correlate with improved psychological well-being and life satisfaction. In contrast, lower levels of problem-solving confidence contribute to increased family problems,[28] heightened stress perception,[29] and higher levels of suicidal ideation.[30]

The second dimension of problem-solving ability is the approach-avoidance style, which reflects an individual's tendency to either confront or avoid problem-solving.[26] Generally, those inclined to confront problems tend to exhibit better psychological well-being, whereas those who avoid problem-solving scenarios often experience lower psychological well-being.[31] This divergence arises from the belief systems surrounding control over outcomes: those who avoid problems may view outcomes as beyond their control, predetermined by fate or external forces. Consequently, they adopt a passive stance of "letting the problem resolve itself," leading to a sense of helplessness and a negative impact on mental health and self-esteem stemming from unresolved challenges.[32]

Although a previous study revealed that individuals who tend to avoid problems had higher levels of suicidal ideation,[33] a study conducted by Linda *et al*. found that avoiding problems acted as a protective factor against suicidal thoughts in individuals with a history of suicide attempts.[34] Consequently, the role of the problem approach-avoidance style in predicting suicidal ideation remains unclear.

The third dimension of problem-solving ability, personal control of emotions, refers to the belief in one's capacity to manage emotions and behavior during problem-solving processes.[26] This approach aims to reduce negative emotions rather than directly address problems such as self-blaming, emotional venting, or engaging in mood-improving activities.[26,35] Individuals who perceive greater control over their emotions and behaviors are more likely to experience a higher sense of autonomy and subjective well-being,[36] and lower levels of suicidal ideation when facing challenges.[37] Therefore, it is crucial to study the effect of problem-solving ability on suicidal ideation.

While Malaysia's reported suicide rate appears lower than the global average, standing at 5.8 suicides per 100,000 population in 2019,[4] a significant number of suicidal cases remain unreported due to various factors. First, suicides are only officially recorded if they are medically certified, a process that does not capture many deaths in Malaysia due to the lack of certification protocols.[38] Second, discussing suicide remains sensitive in Malaysia due to religious beliefs. Suicide attempts or completed suicides are often viewed as sinful by various religions such as Islam, Christianity, and Buddhism, adding layers of stigma and reluctance to seek help.[39] Finally, Malaysia's legal stance on suicide as a crime, as outlined in Section 309 of the Penal Code, has historically discouraged individuals from openly addressing suicidal thoughts or actions. However, the positive development of Malaysia decriminalizing suicide on May 22, 2023, is expected to encourage a more open environment for individuals to seek assistance without fear of legal repercussions.[40] These societal and legal factors have contributed to the underreporting of incomplete suicidal attempts or suicides within families.

Furthermore, Malaysia grapples with notably high suicide rates among individuals under 30 years old.[38] This trend not only poses immediate challenges to social and economic development but also raises concerns about the well-being of future generations.[41] In addition, a previous study in Malaysia highlighted that individuals

perceiving themselves as having ineffective problem-solving abilities, characterized by low problem-solving confidence, a tendency toward approach-avoidance style, and limited personal control of emotion, are at a higher risk of experiencing suicidal ideation.[33] However, the dimensions of perceived problem-solving ability that significantly impact suicidal ideation remain uncertain.[20] Moreover, previous studies produced mixed findings, with some studies showing no significant relationship between perceived problem-solving ability and suicidal ideation.[42]

Therefore, this study aimed to explore the effects of depressive symptoms and perceived problem-solving ability on suicidal ideation among young adults in Malaysia. This research endeavor is crucial in collecting essential data on suicidal ideation among Malaysian young adults, providing insights to develop effective intervention and prevention measures.

METHODS

Participants

A total of 250 individuals were recruited using purposive sampling methods. Inclusion criteria comprised Malaysian citizens aged between 18 and 25 years. Conversely, individuals diagnosed with any mental health disorder were excluded from the study. Following the exclusion of participants who did not fulfill the inclusion criteria, a total of 231 individuals were included in the data analysis. The participants were aged between 18 and 25 years (Mean = 21.1; SD = 1.38). Of these participants, 157 were female, and 205 were Chinese. Detailed demographic characteristics of the participants are presented in Table 1.

Depressive symptoms were assessed using the 7-item scale of depression of the Depression, Anxiety, and Stress Scale (DASS-21; Lovibond & Lovibond).[43] This subscale employs a 4-point Likert-type scale, ranging from 0 (Did not apply to me at all) to 3 (Applied to me most of the time), to gauge the extent of participants' depressive symptoms. Sample statements from this scale includes "I felt downhearted and blue." The depression subscale of the DASS-21 demonstrated good reliability in this study, with a Cronbach's alpha value of 0.87.

TABLE 1. Demographic characteristics of participants (N = 231)

Characteristics	N	%
Gender		
Male	74	32.0
Female	157	68.0
Age (in years)		
18	9	3.9
19	18	7.8
20	38	16.5
21	86	37.2
22	47	20.3
23	25	10.8
24	4	1.7
25	4	1.7
Ethnicity		
Chinese	205	88.7
Malay	14	6.1
Indian	9	3.9
Others	3	1.3

The participant's problem-solving ability was evaluated using the Problem-Solving Inventory (PSI; Heppner & Petersen, 1982).[44] This inventory employs a 6-point Likert-type scale, ranging from 1 (Strongly Agree) to 6 (Strongly Disagree), to assess various facets of problem-solving proficiency. The PSI comprises 35 items, including three filler items, categorized into three subscales: problem-solving confidence (11 items), approach-avoidance style (16 items), and personal control of emotion (5 items). The scale includes 15 reverse-scored items. Sample items from the PSI include "I trust my ability to solve new and difficult problems" for the problem-solving confidence subscale, "When I have a problem, I think up as many possible ways to handle it as I can until I can't come up with any more ideas" for the approach-avoidance style subscale, and "I make snap judgments and later regret them" for the personal control of emotion subscale. Higher scores on the problem-solving confidence subscale indicate lower confidence in problem-solving abilities, higher scores on the approach-avoidance style subscale indicate a tendency to avoid rather than approach problems, and higher scores on the personal control of emotion subscale indicate lower control over emotions and behavior when dealing with problems. In this study, the problem-solving confidence subscale, approach-avoidance style subscale, and personal control of emotion subscale demonstrated acceptable levels of reliability, with Cronbach alpha values of 0.84, 0.80, and 0.65, respectively.

The Yatt Suicide Attitude Scale (YSAS; Ibrahim *et al*.),[45] was used to assess participants' attitudes toward suicide, specifically focusing on suicidal ideation. This scale comprises 10 items measuring two constructs: suicidal ideation and suicide attempt. As our study only focuses on suicidal ideation, only the five items from the YSAS that pertain to participants' thoughts of ending their lives were utilized. The YSAS employs a 5-point Likert-type scale, ranging from 1 (Never) to 5 (Very often), to gauge the frequency of suicidal ideation. A higher score indicates a greater frequency of suicidal ideation. An example item from the scale is "I have once thought to end my life." The 5-item suicidal ideation subscale exhibited good reliability, with a Cronbach alpha value of 0.83 in previous research.[45] In this study, the 5-item YSAS also demonstrated good reliability, with a Cronbach's alpha value of 0.89.

Procedure

Ethical approval was obtained from the Department of Psychology Research Ethics Committee (Approval code: 202003015). Data collection was conducted through an online survey platform, with the survey link shared on platforms like Instagram, Facebook, and tertiary education groups. Participants were given an information sheet explaining the study's purpose and their rights before soliciting their consent. Upon agreeing by clicking the "agree" button on the consent form, participants completed a demographic questionnaire and three scales assessing depressive symptoms, perceived problem-solving ability, and suicidal ideation. Upon completion of the questionnaire, participants were provided with a debriefing sheet outlining the study objectives and a list of mental health resources for further assistance. Notably, no form of compensation was provided to the participants for their involvement.

Data analysis

The collected data were analyzed using IBM SPSS software version 27. Pearson correlation analysis was used to determine the relationships between variables, specifically examining the connections among depressive symptoms, problem-solving confidence, approach-avoidance style, personal control of emotions, and suicidal ideation. Binary logistic regression was used to explore the odd ratios of the predictive factors contributing to suicidal ideation. The YSAS was dichotomized for this analysis, with participants who rated "Never" across all YSAS items categorized as "No suicidal ideation," while the rest were classified as "Have suicidal ideation." A significance level of 5% was set to identify the determinant factor associated with suicidal ideation among young adults.

RESULTS

The relationships among depressive symptoms, the three dimensions of perceived problem-solving ability (problem-solving confidence, approach-avoidance style, and personal control of emotion), and suicidal ideation were analyzed using Pearson correlation analysis. Table 2 presents the means, standard deviations, and correlations for all study variables. The results revealed significant positive correlations between depressive symptoms (r = 0.66, p < 0.001), problem-solving confidence (r = 0.45, p < 0.001), approach-avoidance style (r = 0.15, p < 0.05), personal control of emotion (r = 0.39, p < 0.001), and suicidal ideation. These findings indicate that higher levels of depressive symptoms correspond to higher suicidal ideation. Moreover, individuals exhibiting lower confidence in their problem-solving ability, resorting to more avoidance styles in problem resolution, and experiencing less control over their emotions reported elevated levels of suicidal ideation.

Based on the dichotomized YSAS, 83 participants (35.9%) did not report suicidal ideation, whereas 148 participants (64.1%) expressed some degree of suicidal ideation. The binary logistic regression model employed to explore the predictive factors of suicidal ideation yielded significant results, $\chi^2(4) = 72.68$, p < 0.001. This model accounted for 37% of the variance in suicidal ideation (Nagelkerke R^2) and accurately classified 75.3% of cases. The goodness-of-fit test (Hosmer and Lemeshow) indicated a p-value of 0.384, affirming the model's adequacy. Table 3 shows the binary logistic regression analysis of factors predicting suicidal ideation, where depressive symptoms emerged as the strongest predictor of suicidal ideation (*OR* 28.85, 95% *CI* [1.20, 1.47], p < 0.001). This signifies that individuals with suicidal ideation are 28.85 times more likely to experience depressive symptoms than those

TABLE 2. Means, standard deviations, and correlations for all study variables (N = 231)

No.	Variables	Mean ± SD	1	2	3	4	5
1.	Depressive symptoms	5.92 ± 4.31	-				
2.	Problem-solving confidence	30.87 ± 7.05	0.41	-			
3.	Approach-avoidance style	47.87 ± 9.15	0.08	0.45	-		
4.	Personal control of emotion	19.06 ± 4.00	0.28	0.49	0.40	-	
5.	Suicidal ideation	7.73 ± 3.29	0.66	0.45	0.15*	0.39	-

Higher scores in problem-solving confidence and personal control of emotion indicate lower confidence in solving problems and less control over one's emotions, respectively; A higher score in approach-avoidance style indicates higher usage of avoidance coping style
*p < 0.05

TABLE 3. Binary logistic regression analysis of factors predicting suicidal ideation

Variables	*B*	*OR*	95% *CI* for *OR*		*p*
			Lower	Upper	
Depressive symptoms	0.280	28.85	1.20	1.47	< 0.001
Problem-solving confidence	0.070	5.43	1.01	1.15	0.020
Approach-avoidance style	< 0.001	< 0.001	0.96	1.04	0.990
Personal control of emotion	0.040	0.56	0.94	1.14	0.453

B = Unstandardized coefficients; OR = odds ratio; CI = confidence interval

without suicidal thoughts. In addition, individuals experiencing suicidal ideation are 5.43 times more likely to have lower confidence in problem-solving (*OR* 5.43, 95% *CI* [1.01, 1.15], p = 0.020). However, neither approach-avoidance style nor personal control of emotion significantly predicted suicidal ideation in this study.

DISCUSSION

This study aimed to explore the relationships among depressive symptoms, perceived problem-solving ability (including problem-solving confidence, approach-avoidance style, and personal control of emotion), and suicidal ideation among young adults. We discovered significant correlations between depressive symptoms, all dimensions of perceived problem-solving abilities, and suicidal ideation. Our hypothesis indicated that individuals experiencing suicidal ideation would exhibit higher levels of depressive symptoms, use more approach-avoidance styles, have lower problem-solving confidence, and struggle with personal control of emotion. However, our regression model revealed that individuals with suicidal ideation displayed more depressive symptoms and problem-solving confidence, but no significant differences were observed in terms of approach-avoidance style or personal control of emotion. We also found that 64.1% of participants reported some level of suicidal ideation, a figure that might be influenced by the predominant ethnic background of the participants, who were primarily Chinese. In Malaysia, a culturally diverse nation involving ethnicities such as Malay, Chinese, and Indian, the suicide rate tends to be highest among Indian individuals, followed by Chinese.[38]

These findings align with previous research, highlighting the consistent relationships among depressive symptoms, perceived problem-solving ability, and suicidal ideation among young adults.[13,33] Specifically, our study echoes previous findings that young adults experiencing more depressive symptoms are more prone to suicidal ideation. This connection is attributed to the persistent feelings of sadness and helplessness associated with depression, which are key contributors to suicidal ideation.[13,14] Similarly, individuals with limited problem-solving abilities are at an increased risk of developing suicidal thoughts as they struggle to effectively address underlying issues.[10,46] This conclusion resonates with a previous Malaysian study that identified college students with poor problem-solving skills as being more likely to report suicidal ideation.[33]

Additionally, our study revealed that depressive symptoms not only significantly predicted suicidal ideation among young adults but emerged as the strongest predictor among all examined factors, aligning with previous studies.[9,47] Arnett's concept of young adulthood posits that this life stage is marked by increased levels of stress and anxiety as individuals navigate new personal, interpersonal, and societal expectations, often resulting in reduced familial support.[8] This transitional phase, coupled with uncertainties and setbacks in achieving life goals or inadequate coping mechanisms, can contribute to feelings of worthlessness and hopelessness, which are characteristic of depressive symptoms.[9] Consequently, the prevalence of depression among youths in Malaysia is a significant concern,[3] as it increases vulnerability to suicidal ideation as a perceived means of escaping distress.[48]

In addition to depressive symptoms, our findings underscored the importance of problem-solving confidence as a significant predictor of suicidal ideation among young adults. Specifically, individuals with lower problem-solving confidence were more likely to entertain suicidal thoughts, which is consistent with previous studies.[33] Of the three dimensions of perceived problem-solving abilities, only the problem-solving confidence dimension significantly predicted suicidal ideation. Drawing from Bandura's self-efficacy theory, individuals develop confidence in problem-solving through successful experiences or by observing others' successes.[49] However, repeated failures or witnessing peers' struggles can affect this confidence,[50] leading to an increased sense of hopelessness when faced with new challenges. This perception of incompetence in problem-solving amplifies feelings of despair, potentially contributing to increased thoughts of suicide as a perceived solution.[29]

Furthermore, the current study demonstrates that having greater confidence in one's problem-solving ability can serve as a protective factor against suicidal ideation. This can be attributed to the fact that individuals who possess a strong belief in their capability to apply their knowledge and skills toward resolving challenges are more likely to invest greater effort and exhibit higher levels of persistence in addressing challenges. Such attributes significantly contribute to successful problem-solving, as evidenced by previous research.[51] Successful problem-solving, in turn, has been linked to improved psychological well-being[52] and reduced feelings of hopelessness and anxiety.[53] This notion is further supported by Korkmaz *et al*., who discovered that individuals who have attempted suicide often have poorer problem-solving skills.[20] Similarly, Abdollahi *et al*. explained that the use of ineffective problem-solving strategies among Malaysian students is associated with feelings of hopelessness, subsequently amplifying suicidal ideation.[29]

Contrary to the initial hypothesis, this study reveals that the approach-avoidance problem-solving style did not significantly predict suicidal ideation in the logistic regression model. This finding contradicts the results of a study conducted in Malaysia by Abdollahi *et al*., which suggested that individuals with suicidal ideation are more inclined toward avoiding problems.[33] However, this study's findings align with those of Quiñones *et al*., who

also found no predictive effect of the approach-avoidance style on suicidal ideation among individuals who have not attempted suicide.[23] Furthermore, Linda *et al*. highlighted that approach-avoidance style only predicted suicidal ideation among individuals with a history of suicide attempts, as these individuals tended to resort to more passive solutions than non-attempters.[34] This implies that the predictive impact of the approach-avoidance style on suicidal ideation may be more pronounced in individuals with a prior history of suicide attempts.

Additionally, the study found that personal control of emotion did not significantly predict suicidal ideation among young adults. This contrasts with previous studies indicating that lower personal control of emotion correlates with a higher likelihood of suicidal ideation.[30] One possible explanation for this discrepancy is that individuals with less personal control of emotion often resort to strategies aimed at alleviating negative emotions, such as anger and sadness, through activities like self-blame, emotional venting, or other activities to alleviate distress.[26] While these strategies may offer temporary relief from distress, they do not provide lasting solutions,[35] thus explaining why personal control of emotions did not emerge as a significant predictor of suicidal ideation in this study.

One important implication of these findings is the urgent need to raise awareness of depressive symptoms, which were strongly linked to suicidal ideation among young adults. In Malaysian society, depressive symptoms are frequently downplayed as ordinary stressors or transitional changes of adulthood.[54] Depressive symptoms are also often overlooked and considered a common "growing pain" of adulthood. Thus, early identification of individuals displaying depressive symptoms and the provision of suitable interventions is crucial in preventing suicidal ideation in Malaysia. Furthermore, this study highlights the critical role of problem-solving confidence in reducing suicidal ideation. Suicide prevention programs should prioritize building confidence in problem-solving skills among young adults, as demonstrated by this study's findings that higher levels of problem-solving confidence are associated with reduced suicidal ideation. The decriminalization of suicide in Malaysia in 2023 marks a significant shift in mental health approaches, potentially encouraging more individuals to seek help and access appropriate interventions for suicide prevention.[40]

However, this study has a few limitations. First, it did not differentiate between individuals who were merely ideators or those who attempted suicide. A history of having suicidal thoughts and attempts could confound the findings. Thus, it is recommended that future research control for these variables when conducting suicide-related research. Second, our study only focused on depressive symptoms and problem-solving abilities. Given that suicide is a complex issue, other variables or mediators may influence suicidal ideation among young adults. For example, factors such as hopelessness, a history of sexual and physical abuse, and substance abuse may impact the level of suicidal ideation among young adults[55–57] and should be considered in future studies. Lastly, purposive sampling was used for data collection, where the questionnaire link was posted online and on platforms related to tertiary education. This resulted in the over-representation of certain age groups and ethnicities. This study was also unable to identify whether the participants were university students as this information was not collected. To address these limitations, future studies could use a probability sampling method such as cluster sampling to obtain a better representation of participants' backgrounds.

CONCLUSIONS

In conclusion, despite the acknowledged limitations, this study highlights the importance of depressive symptoms and problem-solving confidence as significant predictors of suicidal ideation among young adults. The findings indicate that individuals experiencing suicidal ideation tend to exhibit higher levels of depressive symptoms and lower confidence in their problem-solving abilities. Therefore, mental health professionals should consider implementing suitable interventions and prevention programs to address these factors. By reducing depressive symptoms and enhancing problem-solving confidence among young adults, we can reduce the prevalence of suicidality in this population.

CONFLICT OF INTEREST

The authors declare that they have no competing interests to disclose.

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Disaster Response Self-Efficacy of Students in the Nursing Department: A Cross-Sectional Study

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Disaster Response Self-Efficacy of Students in the Nursing Department: A Cross-Sectional Study

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Abstract

Background: Nurses take on important roles in disasters. In this regard, the disaster response self-efficacy of nursing students must be evaluated. The study aimed to determine the self-efficacy of nursing students in disaster response.

Methods: In this descriptive cross-sectional study, the study sample consisted of 207 nursing students who were in their third or fourth year attending the nursing department of a state university in the Marmara region of Türkiye between October and December 2023. Data were collected using a student description form and the disaster response self-efficacy scale.

Results: The mean age of the study participants was 22.05 ± 2.23 years, 73.4% were female, 50.2% were in their third year of study, 90.3% felt a need for education on disaster nursing, and 76.8% stated that they did not have sufficient knowledge and skills relating to disasters. The students' mean total score on the disaster response self-efficacy scale was 3.23 ± 0.68. In addition, the disaster response self-efficacy levels of students who stated they had sufficient knowledge and skills concerning disaster response were significantly higher than those of other students ($p < 0.05$).

Conclusions: Students demonstrated a medium level of disaster response self-efficacy.

Keywords: disaster response, nursing students, Türkiye

INTRODUCTION

Natural disasters are one of the greatest problems faced by people throughout history. A disaster is an event or situation that causes human suffering, which happens suddenly and unexpectedly, for which local resources are inadequate, necessitating emergency help worldwide, and causes damage and destruction.[1] Disasters can occur at any time in any place. They can severely injure people and damage infrastructure, thereby necessitating prompt emergency care despite insufficient resources.[2] The Emergency Event Database (EM-DAT) divides disasters into natural and technology-related disasters.[3] Between 2000 and 2019, EM-DAT recorded 7,348 disasters, which claimed a total of approximately 1.2 million lives and affected >4.03 billion people. On average, 367 disaster events occur annually, the majority of which were floods and storms (44% and 28%, respectively).[4] Disaster preparedness actions are also needed at the time of the event and various stages before and after the event.[5,6] Türkiye's geography carries a high disaster risk.[7,8] In 2020, 15 disasters were recorded. These disasters affected 76,995 people, leaving 3,022 injured and 349 dead.[9] Effective preparation and response strategies are important in preventing disasters and mitigating associated damage.[10]

The World Health Organization (WHO) recommends that health professionals in all countries be trained to respond to all types of disasters, prioritizing those most likely to occur in each country. Nurses should know about and participate in the management of all stages of a disaster response.[11] Nurses are the largest healthcare workforce, care for people affected by disasters, and play a critical role in community health.[12,13] Disaster nursing aims to respond to the community directly affected by disasters at all stages and provide care at the highest level possible.[14,15] Nurses can perform various roles in disasters such as incident commander, communications coordinator, senior nursing officer, labor pool coordinator, emergency department triage nurse, and staff nurse.[16] Nurses must have the knowledge and skills needed to respond to a disaster,[17] must also acquire essential competencies for disasters because they are expected to show effective disaster preparedness and appropriate response.[18] The International Council of Nurses (ICN) clarifies that disaster preparedness and response should be a part of a nurse's knowledge and skills and that nursing training in disaster management should be required everywhere.[19] Early response to immediate needs can prevent long-term deterioration and save many lives.[6]

Moreover, nursing students should receive adequate education to enable them, after graduation, to fulfill their roles in disasters successfully.[20] Studies have shown that health professionals with a higher knowledge level have a

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greater possibility of responding to disasters.[6,21] The WHO has emphasized the need for forming a global strategy for nursing students competent in disaster nursing and education programs arranged for any disaster.[22] Currently, no clear framework for the inclusion of disaster education into nursing education programs has been established.[15] Efforts to provide nurses and nursing students with disaster nursing competency and in setting up disaster nursing education programs are deficient, and many nursing students graduate without having received education in disaster nursing.[14] This highlights the importance of understanding nursing students' knowledge levels and education needs for disaster and disaster management nursing. When a disaster occurs, nursing students and nurses may take different positions caring for people affected. Thus, nursing students must be prepared for disasters during their education. This preparation includes being prepared to evaluate risks and response capacities.[23] Studies have emphasized the need for education, professional knowledge, and skill in disaster preparedness.[24–26]

Previous studies have shown that nurses and nursing students have low levels of knowledge and skills concerning disaster preparedness and response.[14,23,26–28] Based on the analysis of the results of studies on this subject conducted in Türkiye, nursing students' disaster response self-efficacy was not at the desired level, and a correlation was found between disaster response self-efficacy and personal characteristics.[14,23,28] However, these studies were limited. Thus, in the present study, we thought about determining the disaster response self-efficacy of nursing students in Türkiye and the variables affecting this. Accordingly, this study aimed to evaluate nursing students' self-efficacy in disaster response, examine affecting variables, and contribute to the literature. In light of all of this information, this study was conducted to determine nursing students' self-efficacy in disaster response.

METHODS

This descriptive and cross-sectional study was designed to assess the disaster response self-efficacy of students attending the nursing department of a government university in Türkiye. A questionnaire-based survey was conducted online between October and December 2023. This study was approved by the ethics committee of the university where the study was conducted (October 25, 2023, No. 2023-08).

The students were informed about the topic and content of the research, and they provided consent. The study was performed in accordance with the principles of the Declaration of Helsinki. The link to these online data collection instruments was sent to the students' email addresses. Before the students began filling out the data collection forms, they were assured that the data would be used entirely for scientific research and that their responses would in no way affect their class grades. To prevent students from answering questions more than once, only the relevant section was activated on Google Forms.

The study population consisted of third- and fourth-year nursing students at a state university in the Marmara region of Türkiye (N = 290). No sample selection was made. Data were collected from the 207 students who agreed to participate in the study and filled in the data collection forms completely, and 93.10% of the population were contacted. Only third- and fourth-year nursing students were included because those in lower-year levels were still taking basic professional classes, which do not include disaster nursing topics. Nursing students who did express voluntary participation in the study had a communication problem and could not speak Turkish were excluded.

A student description form and a disaster response self-efficacy scale (DRSES) were used to collect data. The student description form consisted of information on students' age, sex, year of study, need for education on the implementation of disaster nursing, adequacy of knowledge and skill regarding disaster response, and whether they had experienced a disaster.

The DRSES used in the study was developed by Hong-yan Li *et al*.[29] in 2017, and the validity and reliability testing of the Turkish version was performed by Koca *et al*.[30] in 2020. It consists of 19 items on three subdimensions, namely, on-site rescue competency, disaster psychological nursing competency, and disaster role quality and adaptation competency, and the responses are of 5-point Likert type (1 = no confidence at all, 2 = basically no confidence, 3 = little confidence, 4 = basically confident, and 5 = complete confidence). The subdimension of on-site rescue competency has 11 questions, disaster psychological nursing competency has 4, and disaster role quality and adaptation competency also has 4. A high score represents a high disaster response self-efficacy level. Scoring on the scale is classified as high (3.68–5.00), medium (2.34–3.67), or low (1.00–2.33).[29,30] In the previous study, the Cronbach alpha coefficient of the scale was 0.96.[30] In this study, the Cronbach alpha coefficient of the scale was 0.94.

Data collected were analyzed using IBM SPSS Statistics version 28.0 (IBM Corp., Armonk, NY, USA). The significance level of statistical comparison tests was accepted as $p < 0.05$. The conformity of the data to normal distribution was analyzed by the Kolmogorov–Smirnov test ($p > 0.05$). In data evaluation, numerical values, percentages, means, and standard deviations were utilized as descriptive statistical methods. In addition, the independent sample t-test was conducted in independent groups.

RESULTS

The overall response rate was 100%. As shown in Table 1, most participants were female aged 19–38 years, with a mean age of 22.05 years, and 50.2% were in their third year of study. Most participants stated that they had heard of the need for education on disaster nursing, they did not have sufficient knowledge and skill with regard to disaster response, and they had not faced any kind of disaster.

Table 2 shows participants' DRSES subdimension and total score means. Their mean DRSES total score was 3.23 ± 0.68. From this finding, students had a medium level of disaster response self-efficacy.

Table 3 shows the mean DRSES subscale and total scale scores of the participants according to their descriptive information. As shown, the mean total DRSES scale and subscale scores of on-site rescue competency, disaster psychological nursing competency, and disaster role quality and adaptation competency of students who stated that they had adequate knowledge and skills concerning disaster were significantly higher than those of other students (p = 0.003, p = 0.003, p = 0.001, and p = 0.003 respectively). On the contrary, no statistically significant difference was found between students' sex, year of study, need for education on disaster nursing, and experience in some kind of disaster situation in the DRSES subscale and total scale score means (p > 0.05).

TABLE 1. Descriptive information about the nursing students

Variable	N	%
Sex		
Female	152	73.4
Male	55	26.6
Year of study		
Third-year	104	50.2
Fourth-year	103	49.8
Need for education on disaster nursing		
Yes	187	90.3
No	20	9.7
Adequate skill and knowledge of disaster response		
Yes	48	23.2
No	159	76.8
Disaster experience		
Yes	116	44.0
No	91	56.0

TABLE 2. DRSES total and mean subdimension scores

DRSES	Mean ± SD
On-site rescue competency	2.97 ± 0.74
Disaster psychological nursing competency	3.04 ± 0.82
Disaster role quality and adaptation competency	3.69 ± 0.84
Total DRSES	3.23 ± 0.69

DRSES: disaster response self-efficacy scale; SD: standard deviation

TABLE 3. Mean DRSES scores by students' descriptive information

Variable	On-site rescue competency		Disaster psychological nursing competency		Disaster role quality and adaptation competency		Total	
	Mean ± SD	*p*	Mean ± SD	*p*	Mean ± SD	*p*	Mean ± SD	*p*
Sex								
Female	2.93 ± 0.68	0.154	3.05 ± 0.77	0.649	3.74 ± 0.75	0.145	3.24 ± 0.61	0.790
Male	3.09 ± 0.86		3.00 ± 0.96		3.55 ± 1.01		3.21 ± 0.86	
Year of study								
Third-year	2.95 ± 0.76	0.697	3.01 ± 0.86	0.612	3.65 ± 0.86	0.514	3.20 ± 0.70	0.542
Fourth-year	2.99 ± 0.71		3.07 ± 0.78		3.73 ± 0.82			
Need for education on disaster nursing								
Yes	2.96 ± 0.72	0.576	3.01 ± 0.80	0.164	3.71 ± 0.81	0.340	3.23 ± 0.65	0.715
No	3.06 ± 0.89		3.28 ± 0.99		3.52 ± 1.08		3.29 ± 0.92	
Adequate skill and knowledge of disaster response								
Yes	3.25 ± 0.87	**0.003**	3.39 ± 0.78	**0.001**	3.83 ± 0.84	**0.003**	3.49 ± 0.75	**0.003**
No	2.89 ± 0.67		2.93 ± 0.81		3.25 ± 0.84		3.16 ± 0.64	
Disaster experience								
Yes	3.02 ± 0.75	0.285	3.12 ± 0.83	0.128	3.63 ± 0.82	0.258	3.26 ± 0.70	0.598
No	2.91 ± 0.71		2.94 ± 0.80		3.77 ± 0.86		3.21 ± 0.66	

DRSES: disaster response self-efficacy scale; SD: standard deviation; An independent t-test was used

DISCUSSION

Disasters are a significant worldwide public health problem that interrupts community life, seriously increases mortality and morbidity, and causes economic losses.[10] Nurses may

often take on duties in natural disasters, such as earthquakes or tsunamis, and man-made disasters, such as chemical or nuclear accidents or wars.[3] During disasters, nurses must cooperate with other professionals using the resources available to assess and meet care needs.[26,28,31] The ICN, emphasizing the importance of disaster nursing education, has stated that nursing students are members of the future nursing profession and that nurses are among the health professionals providing first response in disaster situations.[32] At present, disaster nursing occupies a steadily greater place in nursing education. University nursing students must have the competency to respond to disasters.[28] A study emphasized that the most important criterion for developing disaster nursing competency was having adequate knowledge and skills on the topic.[33] This study was conducted to determine nursing students' disaster response self-efficacy. The mean DRSES total score of the nursing students analyzed in this study was 3.23. According to the scale score range, students with a score of 3.23 have a medium level of disaster response self-efficacy. Few studies have assessed the disaster response self-efficacy level of nursing students being educated on the topic in different countries and universities. In Türkiye, studies have found that the disaster response self-efficacy of nursing students was at a medium level.[10,23,26,28] The results of the present study support the results of these previous studies and show that for a country like Türkiye, which frequently experiences disasters, nursing students' self-efficacy is not at the desired level. In other countries, a study conducted with nursing students in Australia revealed that the students did not have adequate knowledge and skills regarding disaster response.[34] In a study conducted in Oman, students had a medium level of self-efficacy for disaster response.[35] This suggests potential deficiencies in responses to a possible disaster.

Nearly all (90.3%) study participants stated that they needed education in disaster nursing. In two similar studies conducted in Türkiye, 80.1% and 85.42% of the students stated that they needed education on disaster nursing.[14,23] These results show the urgency of integrating theory and practice in the nursing curriculum in topics such as emergency management, disaster nursing, and disaster management to increase nursing students' self-efficacy levels when they graduate. In many countries with high risk of disasters such as Japan, the USA, China, Britain, and Italy, disaster nursing has been made a separate field of specialization. Disaster nursing was added to the nursing curriculum in the USA at the beginning of the 1970s; however, the education content was limited to basic information on disasters and the role of nurses. Rochester University was the first nursing school to establish a master's program to educate nurses as leaders on disaster response and preparedness for emergencies. However, no education programs at the master's or doctorate level in disaster nursing have been implemented in Türkiye. At the bachelor's level, education on disaster nursing is generally included in the curriculum under public health nursing or, to a lesser extent, in other fields of nursing.[28]

In the present study, students who stated that they had adequate knowledge and skills regarding disaster response had a significantly higher mean DRSES total score. Toraman and Korkmaz[14] reached similar conclusions. However, in the present study, most (76.8%) of the participants thought that they did not have adequate knowledge and skills regarding disaster response, and this may directly negatively affect the disaster response self-efficacy of nursing students in Türkiye, which is prone to disasters.

No significant difference was found between the variables of age, sex, and year of study of the study participants and their disaster response self-efficacy. Other related studies reported no significant difference between the students' disaster response self-efficacy levels and their year of study[26,28] and sex.[14,23,28] The results of the present study support these literature findings. In some related studies, age, year of study,[23] and male sex affected disaster-related preparedness behaviors and self-efficacy.[21,26,36] The differences between the results of these studies and the present study may arise from sociodemographic variables such as participants' age, schools attended, or country of residence.

Moreover, no significant difference was found between having experienced a disaster and disaster response self-efficacy levels. Various other studies have reported similar findings.[23,28] In some studies, it is reported as being a determining factor for disaster response self-efficacy.[26,37] Expectedly, disaster experience will affect the disaster response self-efficacy level, and 44% of the participants stated that they had experienced a disaster. Therefore, the students' self-efficacy may not have been affected by the closeness of the proportions of those who had and had not experienced disaster situations. The result of the study may arise from this.

This study contributes to the literature in determining nursing students' sensitivity, knowledge and skills, self-efficacy, and inadequacies toward disasters. However, this study has some limitations. First, it only enrolled third- and fourth year nursing students at a government university. Thus, the findings can only be generalized to the study population, and replication studies with a larger sample are needed. Second, although the students were given information on the topic and the importance of the research before the study started, their responses to the questionnaires depended on self-reports. This may cause prejudice concerning objective disaster response self-efficacy. Therefore, further studies objectively assessing nursing students' self-efficacy in disasters using methods such as simulations are warranted.

CONCLUSIONS

In this study, the nursing students demonstrated a medium level of disaster response self-efficacy, and certain independent variables affected this finding. From these results, students' disaster response competency was not at the desired level. Moreover, students thought preparedness for disasters was important; however, they were not prepared for disasters. Thus, in Türkiye, where disasters occur frequently and are a significant problem for society, disaster awareness must be increased, theoretical and practical lessons on disasters should be added to nursing education curricula, lesson hours should be increased, and practical lessons should be improved with exercises. Finally, replication studies with a broader sample evaluating the effect of disaster education on disaster response competency are warranted.

CONFLICT OF INTEREST

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Investigating Nursing Students' Levels of Knowledge about Alzheimer's Disease

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Investigating Nursing Students' Levels of Knowledge about Alzheimer's Disease

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Abstract

Background: Given that Alzheimer's disease (AD) has become a major public health problem, this study aimed to investigate the AD knowledge level of nursing students who are health professional candidates.

Methods: The population of this cross-sectional study consisted of 346 nursing students taking up a 4-year program. They were asked to fill out a sociodemographic information form and answer questions from the Alzheimer's Disease Knowledge Scale (ADKS).

Results: Among the participants, 67.6% were female and 98.8% were single. The mean age of the students was 20.55 ± 2.05 years. Their general knowledge about AD was low, with a mean ADKS score of 17.6 ± 2.85. The scores of the 4th year students (p = 0.035) and those who received education about the disease beforehand (p = 0.015) were statistically significantly higher than those of the other participants (p < 0.05). No significant relationship with ADKS score was observed for the factors of gender, whether they had elderly relatives, and whether they visited nursing homes.

Conclusions: The participating students had a low level of knowledge about AD. Increasing disease-specific education and practices for nursing students and including discussions on AD in compulsory courses is necessary to fill in the knowledge gaps.

Keywords: Alzheimer's disease, knowledge, nursing students, Türkiye

INTRODUCTION

The global elderly population is rapidly increasing.[1,2] In 2012, dementia was recognized as a common and important public health problem.[3] According to the World Health Organization (WHO), dementia ranks 7th among the leading causes of death and affects around 55 million people worldwide.[4] By 2050, this number is expected to reach 82 million.[5] Owing to the rapid global increase in its incidence, a global action plan for 2017–2025 against dementia was established by the WHO in 2017[6] and primarily aimed to prevent Alzheimer's disease (AD) and improve the quality of life of patients by providing supportive care.[5]

In Türkiye, the elderly are rapidly occupying an increasing percentage of the total population. According to population projections from the Turkish Statistical Institute, this rate rose to 10.2% in 2023 and is projected to reach 12.9% in 2030.[7] According to the Turkish Alzheimer's Association, 600,000 families in Türkiye struggle with AD.[8]

Nurses play an important role in the care of patients and offer support for their caregivers and relatives. Providing optimal care requires the integration of hospital, community, and long-term services to help, support, and meet the needs of people diagnosed with AD and their caregivers.[9] During the clinical practice that is part of their education, nursing students frequently encounter patients with dementia. Therefore, their level of knowledge about dementia mainly influences how they provide holistic care to the elderly population.[10]

Although the global elderly population is increasing, the willingness to work with geriatric patients is decreasing. A review reported that nursing students have insufficient knowledge about the care of older adults.[11] Therefore, understanding the factors that influence nursing students' willingness to work with elderly patients with dementia is of great importance.[5,9]

Students who will become healthcare personnel significantly lack knowledge about AD.[2,12] Studies in Türkiye have shown a lack of knowledge about AD among society members and healthcare professionals.[13,14] Two different studies recommended that geriatric nursing course hours should be increased in schools where nursing education is given, and students must be subjected to practices where they can observe patients with dementia and gain experience.[15,16] In our country, a geriatric nursing course is generally included as an elective course in the curriculum of undergraduate level education and is a compulsory course in some universities. In the Trakya University Kesan Hakki Yoruk School of Health, where this study was conducted, the geriatric

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nursing course is given as an elective course in the 4th grade (7th semester). Prior studies on the knowledge and attitude of healthcare professionals and health sciences students toward AD are limited. Therefore, the present work aimed to investigate the level of knowledge about AD among nursing students who are health professional candidates.

METHODS

This cross-sectional study was carried out at a government university. Approval for this study was obtained from the Ege University Medical Research Ethics Committee (Date 12.03.2021 and Decision number: 21-3T/21) and the institution where this study was conducted. Permission was acquired for the use of the scale as a data collection tool. The participating students were informed about the study, and their voluntary consent was obtained.

The study population consisted of students (N = 501) enrolled in the nursing department of a healthcare college in the fall semester of the 2021–2022 academic year. The study population was 501, the expected frequency was 50% unknown, the margin of error was 5%, and the minimum sample size to be taken at 95% confidence level was calculated as 218. The study sample consisted of 346 students who volunteered to participate in this study.

Data were collected face-to-face by the researcher during meetings that lasted 20–25 minutes. A descriptive information form was prepared in accordance with a literature review and the Alzheimer's Disease Knowledge Scale (ADKS).

This form consists of 19 questions about the socio-demographic characteristics (age, class in the nursing program, and gender) of the participants and their experiences related to AD (their families' region of residence and housing status, their experiences related to AD, their sources of information about the disease, whether they live with elderly relatives or have a family member with AD, life impact, and specific education on AD, and whether they have had an internship in an elderly nursing home).

The ADKS scale is designed to assess the knowledge about AD of different groups of people, including health professionals, other professionals, caregivers, and the general public.[17] The validity and reliability of the Turkish adaptation of this scale were tested by Yılmaz and Yavuz Çolak.[13] ADKS consists of 30 true/false items evaluating the level of knowledge about AD.[13,17,18] The scale questions assess knowledge about the seven aspects of AD as follows: impact of the disease on life (items 1, 11, and 28), risk factors (items 2, 13, 18, 25, 26, and 27), symptoms (items 19, 22, 23, and 30), treatment and management (items 9, 12, 24, and 29), assessment and diagnosis (items 4, 10, 20, and 21), caregiving (items 5, 6, 7, 15, and 16) and prognosis (items 3, 8, 14, and 17). Each correct answer is scored as 1 point. The maximum score is 30.[17,18]

Tabachnick and Fidell accepted that the distribution is normal when the skewness and kurtosis values are between +1.5 and −1.5. AD knowledge level skewness (−0.175) and kurtosis (−0.105), the participants' own score for AD knowledge skewness (0.203) and kurtosis (−0.075), and the variables were all found to be normally distributed.[19] The scales used showed a normal distribution. Nonparametric studies must be conducted when the sample volume is smaller than 30 and normality cannot be assumed for the population distribution.[20] Selection of parametric and nonparametric tests: if the number of samples in the groups is above 30, then parametric tests can be used under the assumption that the data are normally distributed; if the number of samples is below 30, then nonparametric tests can be used.[21,22] In this study, nonparametric tests were used for statistical evaluations because the sample size was less than 30. Mann–Whitney U test and independent sample t test were used to determine significant differences between the scores obtained from two unrelated samples of our quantitative variables. Kruskal–Wallis H test, analysis of variance (ANOVA) (F) test, and Bonferroni test were applied to identify significant differences between the mean scores of more than two unrelated samples. A statistical significance of $p < 0.05$ was considered significant.

RESULTS

Table 1 presents the distribution of participants according to their sociodemographic characteristics and experiences related to AD. A total of 346 nursing students participated in this study, and their mean age was 20.55 ± 2.05 (min = 17, max = 38) years. The majority were female (67.6%), and 44.2% and 43.6% lived in subprovinces and provinces, respectively. The participants were predominantly in the 3rd (28.9%) and 1st (26.6%) years of their nursing program. Most of them spent the majority of their lives in provinces (49.4%) and resided in apartments (58.7%).

Among the students, 91.6% lived with their families and 55.5% lived with elderly people at some point in their lives. Most of them did not have an internship in a nursing home during their education (97.4%). The mean self-scored level of knowledge about AD was 5.23 ± 1.8 (1–10) among the students. In terms of their relationships, 22.0% of the students had a relative diagnosed with AD, and 55.3% of those were second degree relationships. Meanwhile, 43.4% of the students did not know the duration of their relative's illness, and 34.2% knew that the illness duration was 25 months or more. In addition, 85.5% of the relatives were diagnosed by a neurologist.

TABLE 1. Distribution of sociodemographic characteristics and experiences related to AD of the sample population (N = 346)

Sociodemographic characteristics	N	%
Age (years)		
< 19	87	25.1
20	81	23.4
21	99	28.6
> 22	79	22.8
Gender		
Female	234	67.6
Male	112	32.4
Place of residence		
Province	151	43.6
Subprovince	153	44.2
Village	42	12.1
Year in nursing program		
1	92	26.6
2	75	21.7
3	100	28.9
4	79	22.8
Majority of life spent in		
Province	171	49.4
Subprovince	126	36.4
Village	49	14.2
Type of housing		
Apartment building	203	58.7
Detached dwelling	127	36.7
Other	16	4.6
Living together with		
Family	317	91.6
Other	29	8.4
Living with elderly		
Yes	192	55.5
No	154	44.5
Affinity with elderly		
No	154	44.5
Grandmother and grandfather	87	25.1
Grandmother	82	23.7
Grandfather	19	5.5
Other	4	1.2
Time spent living with elderly		
0	154	44.5
2 years and less	77	22.3
3–5 years	32	9.2
6 years and longer	83	24.0
Internship at elderly nursing home		
Yes	9	2.6
No	337	97.4
Having a relative with AD		
Yes	76	22.0
No	270	78.0
Affinity to relative with AD*		
First degree	34	44.7
Second degree	42	55.3
Duration of AD*		
Unknown	33	43.4
6–12 months	8	10.5
13–24 months	9	11.8
25 months and above	26	34.2
Diagnosing physician*		
Neurologist	65	85.5
Psychiatrist	5	6.6
Primary care physician	3	3.9
Geriatrics specialist	3	3.9
Degree of impact on life		
None	17	4.9
Partial	173	50.0
Severe	156	45.1
Participation in an AD education program		
Yes	23	6.6
No	323	93.4
Participation in an NGO		
Yes	9	2.6
No	337	97.4

*Only includes participants who have relatives with an AD diagnosis (N < 346); AD: Alzheimer's Diseases

TABLE 2. Levels of knowledge about AD based on students' sociodemographic characteristics and experiences related to AD

Characteristics	ADKS	
	Mean ± SD	*p*
Age (years)		
< 19	17.45 ± 2.56	0.023*
20	16.88 ± 3.17	
21	17.91 ± 2.84	
> 22	18.14 ± 2.72	
Gender		
Female	17.79 ± 2.62	0.072
Male	17.21 ± 3.26	
Place of residence		
Province	17.76 ± 2.79	0.548
Subprovince	17.55 ± 2.83	
Village	17.24 ± 3.19	
Year in nursing program		
1	17.50 ± 2.67	0.035*
2	16.96 ± 2.84	
3	17.64 ± 2.88	
4	18.29 ± 2.94	
Participation in an AD education program		
Yes	19.00 ± 2.88	0.029*
No	17.50 ± 2.83	
Participation in an NGO		
Yes	15.44 ± 2.07	0.013*
No	17.66 ± 2.85	

*$p < 0.05$; AD: Alzheimer's Diseases; NGO: Nongovernmental Organization

Half (50.0%) of the participants thought that caring for a patient with AD would partially affect their work/social life, and 45.1% thought that the effect would be severe. Almost all (93.4%) of the students had neither participated in a training program about AD nor volunteered for a nongovernmental organization related to AD (97.4%). Under half (48.0%) of the students accessed information

about AD through popular media tools, and 27.2% accessed information through trainings.

Table 2 lists the levels of knowledge about AD among the students according to their sociodemographic characteristics and experiences related to AD. For the comparison of the ADKS scores of the students according to their sociodemographic characteristics, an independent samples t-test was used for the pairs of independent groups, and a one-way ANOVA was used for more than two independent groups. A Bonferroni test was also conducted to determine which characteristics caused a difference. In terms of student age, a significant difference in ADKS score was observed ($p < 0.05$). The group aged 22 years and older had a significantly higher mean ADKS score than the other groups. The ADKS scores of the students also differed significantly according to their year in the nursing program ($p < 0.05$). In particular, 4th-year students had higher ADKS scores than other students, and 4th-grade students had a higher ADKS score than 2nd-grade participants. Significant difference in ADKS score was also observed according to participation in an AD training program ($p < 0.05$); those who participated in a training program had higher ADKS scores than those who did not.

The AKDS score also significantly differed according to whether the participant had previously participated in an NGO related to AD ($p < 0.05$). The participants who have never joined an NGO related to AD had higher ADKS scores than those who participated. Table 3 shows the distribution of students' responses to the scale items. The participants knew the 4th, 9th, and 14th items the most. The items that they knew the least were the 6th, 16th, and 24th. Pearson correlation analysis revealed no significant relationship between the self-scored level of knowledge about AD and the ADKS score among the students (r = 0.019, $p > 0.05$).

Univariate analyses were conducted using ANOVA for total ADKS score and within independent sample t test, Mann–Whitney U test, and Bonferroni test to explore whether demographic characteristics are associated with perceptions on AD. A significant correlation was found between age and symptom subscale ($p = 0.003$) and AD knowledge scale scores ($p = 0.023$). Gender was significantly associated with the impact of the disease on life ($p = 0.003$), treatment and management ($p = 0.022$), caregiving ($p = 0.000$), and course of the disease ($p = 0.001$) subscales. A significant correlation was also found between class and symptom ($p = 0.001$) subscale and AD scale scores ($p = 0.035$). Significant correlations were found among income level and risk factors ($p = 0.001$), long-term residence and assessment and diagnosis ($p = 0.001$), living with family and caregiving ($p = 0.045$), living with the elderly and the effect of the disease on life ($p = 0.001$), living with the elderly and treatment and management ($p = 0.029$), and nursing home internship and assessment and diagnosis ($p = 0.000$). A correlation was detected between the impact of the disease on life ($p = 0.017$) and caregiving ($p = 0.036$) subgroups and the impact of the disease on the work/social life of the caregiver. A relationship was found between participation in the program and risk factors ($p = 0.032$) and ADKS scale ($p = 0.029$) score. A relationship was also observed among civil society volunteerism and the impact of the disease on life ($p = 0.010$), assessment and diagnosis ($p = 0.012$), caregiving ($p = 0.001$), prognosis of the disease ($p = 0.001$), and level of knowledge about AD ($p = 0.013$) (Table 4).

DISCUSSION

This study aimed to determine the level of knowledge about AD among nursing students. Knowledge gaps on AD were discovered among nursing students. Evaluation of the responses to the ADKS scale for assessing knowledge levels revealed that the students are familiar with AD symptoms. However, they have less ideas about AD care and management. Focus must be directed to increasing students' knowledge about these topics in educational programs and course contents. Similar results also showed that nursing students' lack of knowledge is a common problem worldwide.[12]

The mean ADKS score of the nursing students was 17.6 ± 2.85 (min = 10, max = 25), showing that they had a low knowledge about AD. Some studies using the ADKS to measure AD knowledge reported high scores,[3,5,12,23] and others reported low scores.[24–26] Our results are similar to those of some studies conducted using the ADKS.[12,25] Previous investigations using the ADKS in Israel, Nepal, and Türkiye reported the mean scale scores of 22.3 ± 3.34, 19.6 ± 3.36, and 18.00 ± 2.70, respectively, among nursing students.[5,26,27]

Our findings revealed that the ADKS scores of the 4th year students were higher than those of the other students. The 4th year participants were taking a geriatrics course during this study. Earlier reports also revealed that senior students have better scores than junior students because the former have taken gerontology/geriatric nursing courses and attended internships in different settings.[9,28] Students in higher classes are highly educated about AD. High scores were also obtained in the subgroups of symptoms, treatment management, assessment diagnosis, and course of the disease. The students who participated in training programs about AD and voluntary activities for the elderly showed high ADKS scores. Similar studies also emphasized the importance of education and clinical training.[15,29]

Having a relative with AD, doing an internship in a nursing home, and participating in NGO activities related to the elderly all had a positive effect on the nursing students' level of knowledge about AD. Some (22%) of the participating students our study had a relative diagnosed with AD. In a study conducted in Nepal, 22% of the participants had work

TABLE 3. Distribution of students according to the response status of the Alzheimer's Disease Knowledge Scale (ADKS) (n = 346)

Item no	Scale items	Correct Answers N (%)	Wrong Answers N (%)
1	People with Alzheimer's disease are particularly prone to depression	257 (74.3)	89 (25.7)
2	It has been scientifically proven that mental exercise can prevent a person from getting Alzheimer's disease	57 (16.5)	289 (83.5)
3	After symptoms of Alzheimer's disease appear, the average life expectancy is 6 to 12 years	151 (43.6)	195 (56.4)
4	When a person with Alzheimer's disease becomes agitated, a medical examination might reveal other health problems that caused the agitation	307 (88.7)	39 (11.3)
5	People with Alzheimer's disease do best with simple instructions giving one step at a time	130 (37.6)	216 (62.4)
6	When people with Alzheimer's disease begin to have difficulty taking care of themselves, caregivers should take over right away	20 (5.8)	326 (94.2)
7	If a person with Alzheimer's disease becomes alert and agitated at night, a good strategy is to try to make sure that the person gets plenty of physical activity during the day	292 (84.4)	54 (15.6)
8	In rare cases, people have recovered from Alzheimer's disease	193 (55.8)	153 (44.2)
9	People whose Alzheimer's disease is not yet severe can benefit from psychotherapy for depression and anxiety	307 (88.7)	39 (11.3)
10	If trouble with memory and confused thinking appears suddenly, it is likely due to Alzheimer's disease	186 (53.8)	160 (46.2)
11	Most people with Alzheimer's disease live in nursing homes	275 (79.5)	71 (20.5)
12	Poor nutrition can make the symptoms of Alzheimer's disease worse	277 (80.1)	69 (19.9)
13	People in their 30s can have Alzheimer's disease	233 (67.3)	113 (32.7)
14	A person with Alzheimer's disease becomes increasingly likely to fall down as the disease gets worse	307 (88.7)	39 (11.3)
15	When people with Alzheimer's disease repeat the same question or story several times, it is helpful to Remind them that they are repeating themselves	123 (35.5)	223 (64.5)
16	Once people have Alzheimer's disease, they are no longer capable of making informed decisions about their own care.	67 (19.4)	279 (80.6)
17	Eventually, a person with Alzheimer's disease will need 24-hour supervision	287 (82.9)	59 (17.1)
18	Having high cholesterol may increase a person's risk of developing Alzheimer's disease	186 (53.8)	160 (46.2)
19	Tremor or shaking of the hands or arms is a common symptom in people with Alzheimer's disease	175 (50.6)	171 (49.4)
20	Symptoms of severe depression can be mistaken for symptoms of Alzheimer's disease	238 (68.8)	108 (31.2)
21	Alzheimer's disease is one type of dementia	273 (78.9)	73 (21.1)
22	Trouble handling money or paying bills is a common early symptom of Alzheimer's disease	180 (52.0)	166 (48.0)
23	One symptom that can occur with Alzheimer's disease is believing that other people are stealing one's things	162 (46.8)	184 (53.2)
24	When a person has Alzheimer's disease, using reminder notes is a crutch that can contribute to decline	80 (23.1)	266 (76.9)
25	Prescription drugs that prevent Alzheimer's disease are available	197 (56.9)	149 (43.1)
26	Having high blood pressure may increase a person's risk of developing Alzheimer's disease	149 (43.1)	197 (56.9)
27	Genes can only partially account for the development of Alzheimer's disease	287 (82.9)	59 (17.1)
28	It is safe for people with Alzheimer's disease to drive, as long as they have a companion in the car at all times	281 (81.2)	65 (18.8)
29	Alzheimer's disease cannot be cured	207 (59.8)	139 (40.2)
30	Most people with Alzheimer's disease remember recent events better than things that happened in the past	207 (59.8)	139 (40.2)

TABLE 4. AKDS total and subgroup analyses (N = 346)

Items	Life impact (3 Items)	Risk factor (6 Items)	Symptoms (4 Items)	Assessment and diagnosis (4 Items)	Treatment and management (4 Items)	Caregiving (5 Items)	Course of the disease (4 Items)	AKDS (30 Items)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Age (years)								
19 and younger	2.34 ± 0.68	3.48 ± 1.16	1.92 ± 0.93	2.53 ± 0.79	2.83 ± 1.00	1.74 ± 0.80	2.61 ± 0.92	17.45 ± 2.56
20	2.38 ± 0.75	2.99 ± 1.28	1.85 ± 1.05	2.37 ± 0.89	2.86 ± 0.88	1.85 ± 0.98	2.57 ± 0.95	16.88 ± 3.17
21	2.38 ± 0.65	3.20 ± 1.20	2.23 ± 1.08	2.51 ± 0.75	2.88 ± 0.88	1.84 ± 1.00	2.87 ± 0.89	17.91 ± 2.84
22 and older	2.28 ± 0.75	3.13 ± 1.43	2.35 ± 0.97	2.67 ± 0.78	3.05 ± 0.80	1.89 ± 1.00	2.77 ± 0.95	18.14 ± 2.72
p	0.748	0.077	0.003*	0.130	0.395	0.756	0.103	0.023*
Gender								
Female	2.43 ± 0.67	3.21 ± 1.23	2.09 ± 1.00	2.59 ± 0.76	2.95 ± 0.88	1.71 ± 0.88	2.82 ± 0.89	17.79 ± 2.62
Male	2.19 ± 0.74	3.21 ± 1.35	2.09 ± 1.09	2.38 ± 0.87	2.79 ± 0.93	2.08 ± 1.02	2.47 ± 0.96	17.21 ± 3.26
p	0.003*	0.999	0.968	0.022*	0.124	0.000*	0.001*	0.072
Class								
1	2.36 ± 0.64	3.45 ± 1.09	1.80 ± 0.96	2.57 ± 0.87	2.85 ± 0.96	1.90 ± 0.98	2.58 ± 0.84	17.50 ± 2.67
2	2.36 ± 0.76	3.00 ± 1.37	2.01 ± 0.94	2.33 ± 0.79	2.89 ± 0.86	1.73 ± 0.83	2.63 ± 0.97	16.96 ± 2.84
3	2.43 ± 0.67	3.04 ± 1.25	2.15 ± 1.08	2.51 ± 0.80	2.93 ± 0.91	1.82 ± 0.93	2.76 ± 0.98	17.64 ± 2.88
4	2.23 ± 0.75	3.33 ± 1.36	2.43 ± 1.03	2.65 ± 0.72	2.94 ± 0.84	1.84 ± 1.03	2.89 ± 0.91	18.29 ± 2.94
p	0.296	0.052	0.001*	0.098	0.906	0.723	0.129	0.035*
Majority of life spent in								
Province	2.35 ± 0.67	3.20 ± 1.29	2.16 ± 1.02	2.51 ± 0.83	2.85 ± 0.85	1.88 ± 0.95	2.75 ± 0.92	17.70 ± 2.84
Subprovince	2.33 ± 0.74	3.20 ± 1.23	1.97 ± 1.00	2.52 ± 0.76	3.06 ± 0.90	1.75 ± 0.98	2.71 ± 0.91	17.52 ± 2.80
Village	2.41 ± 0.73	3.24 ± 1.35	2.16 ± 1.12	2.55 ± 0.84	2.67 ± 0.99	1.84 ± 0.83	2.59 ± 1.00	17.47 ± 3.08
p	0.784	0.973	0.236	0.949	0.024*	0.539	0.581	0.816
Living together with								
Family	2.36 ± 0.71	3.20 ± 1.28	2.10 ± 1.01	2.51 ± 0.81	2.91 ± 0.89	1.79 ± 0.94	2.73 ± 0.92	17.59 ± 2.86
Other	2.28 ± 0.65	3.24 ± 1.15	2.03 ± 1.24	2.62 ± 0.78	2.86 ± 0.95	2.17 ± 0.97	2.52 ± 1.02	17.72 ± 2.85
p	0.417	0.974	0.493	0.449	0.840	0.045*	0.324	0.953
Living with elderly								
Yes	2.28 ± 0.72	3.21 ± 1.30	2.05 ± 1.00	2.52 ± 0.87	2.84 ± 0.94	1.84 ± 0.93	2.71 ± 0.96	17.45 ± 2.99
No	2.44 ± 0.68	3.20 ± 1.23	2.14 ± 1.06	2.52 ± 0.71	2.97 ± 0.83	1.81 ± 0.96	2.71 ± 0.89	17.80 ± 2.67
p	0.029*	0.959	0.415	0.964	0.173	0.793	0.954	0.256

TABLE 4. Continue

Items	Life impact (3 Items)	Risk factor (6 Items)	Symptoms (4 Items)	Assessment and diagnosis (4 Items)	Treatment and management (4 Items)	Caregiving (5 Items)	Course of the disease (4 Items)	AKDS (30 Items)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Time spent living with elderly								
0	2.44 ± 0.68	3.20 ± 1.23	2.14 ± 1.06	2.52 ± 0.71	2.97 ± 0.83	1.81 ± 0.96	2.71 ± 0.89	17.80 ± 2.67
2 years and less	2.19 ± 0.73	3.39 ± 1.22	2.14 ± 1.04	2.82 ± 0.81	2.94 ± 0.88	1.87 ± 0.94	2.69 ± 1.00	18.04 ± 3.05
3–5 years	2.28 ± 0.73	3.00 ± 1.24	2.06 ± 1.01	2.09 ± 0.86	2.91 ± 0.96	2.09 ± 1.06	2.56 ± 1.05	17.00 ± 2.84
6 years and long	2.35 ± 0.71	3.12 ± 1.39	1.96 ± 0.97	2.40 ± 0.85	2.73 ± 0.99	1.71 ± 0.86	2.80 ± 0.89	17.07 ± 2.93
p	0.083	0.420	0.600	0.000*	0.263	0.261	0.672	0.077
Internship at elderly nursing home								
Yes	2.33 ± 0.71	3.00 ± 1.50	2.11 ± 1.05	2.33 ± 0.71	2.33 ± 0.87	2.11 ± 1.54	2.22 ± 0.83	16.44 ± 3.24
No	2.35 ± 0.70	3.21 ± 1.27	2.09 ± 1.03	2.52 ± 0.81	2.92 ± 0.89	1.82 ± 0.93	2.72 ± 0.93	17.64 ± 2.84
p	0.896	0.661	0.965	0.512	0.035*	0.702	0.100	0.343
Degree of impact on life								
None	2.12 ± 0.78	3.53 ± 0.72	2.06 ± 1.25	2.71 ± 0.92	2.88 ± 0.93	2.35 ± 1.11	2.24 ± 1.25	17.88 ± 3.30
Partial	2.27 ± 0.73	3.17 ± 1.22	2.00 ± 0.98	2.49 ± 0.79	2.87 ± 0.87	1.87 ± 0.91	2.67 ± 0.94	17.34 ± 2.73
Severe	2.47 ± 0.65	3.21 ± 1.37	2.20 ± 1.06	2.53 ± 0.81	2.94 ± 0.92	1.72 ± 0.94	2.81 ± 0.86	17.87 ± 2.93
p	0.017*	0.495	0.191	0.518	0.736	0.036*	0.099	0.279
Participation in an AD education program								
Yes	2.26 ± 0.81	3.74 ± 1.21	2.26 ± 0.92	2.70 ± 0.82	3.22 ± 0.80	1.91 ± 1.04	2.91 ± 0.90	19.00 ± 2.88
No	2.36 ± 0.70	3.17 ± 1.27	2.08 ± 1.04	2.50 ± 0.80	2.88 ± 0.90	1.82 ± 0.94	2.70 ± 0.93	17.50 ± 2.83
p	0.652	0.032*	0.367	0.227	0.090	0.695	0.266	0.029*
Participation in an NGO								
Yes	1.67 ± 0.87	3.22 ± 1.09	1.67 ± 1.41	2.11 ± 0.78	2.22 ± 0.83	2.89 ± 0.78	1.67 ± 1.00	15.44 ± 2.07
No	2.37 ± 0.69	3.20 ± 1.28	2.10 ± 1.02	2.53 ± 0.80	2.92 ± 0.89	1.80 ± 0.93	2.74 ± 0.91	17.66 ± 2.85
p	0.010*	0.985	0.253	0.143	0.012*	0.001*	0.001*	0.013*

*$p < 0.05$; AD: Alzheimer's Diseases; NGO: Nongovernmental Organization

experience and 13.6% had an acquaintance (relative, friend, neighbor) with AD.[27] In a study conducted in Saudi Arabia, 22.7% of the students had a relative with AD.[24] Kada's study emphasized that a nursing home internship had a positive effect.[30] In nursing undergraduate programs, educators must create programs ensuring that future nurses are aware of the needs of the increasingly frail elderly population.

In a study conducted among healthcare workers in a tertiary hospital in India, the mean self-assessed score of the participants was 4.89 ± 1.7.[23] Babiker *et al*.[31] reported the self-assessed knowledge score of 5.3 ± 2.1 among four different groups. In the current work, the mean self-scored level of knowledge about AD was 5.23 ± 1.8. These results suggested that the participants were aware of their lack of knowledge about AD.

Kafadar *et al*. found gender to be significantly associated with the course of the disease knowledge area.[32] Ma *et al*. reported that gender, risk factors, and symptoms were statistically significant, with male participants having higher scores in this regard.[33] In our study, statistically significant difference in the scores of AD knowledge level was observed in relation to the subdimensions of the effect of the disease on life, treatment and management, caregiving, and disease course according to the students' gender. Compared with men, women have higher scores on the impact of the disease on life, treatment and management, and disease course. Meanwhile, the caregiving score of men is higher than that of women. Significance was found among different subgroups in the studies. Further studies are needed to determine the reason for this situation.

The main limitation of this study is its limited ability to explain the cause-and-effect relationship due to its cross-sectional nature. In addition, its findings cannot be generalized to all nursing students because this study was conducted in a single school. Further longitudinal and multischool studies are warranted. As one of the studies with small populations conducted in Türkiye about AD knowledge, the present research provides important insights into the current circumstances.

CONCLUSIONS

The participating students had a low level of knowledge about AD. The undergraduate nursing curriculum plays an important role in preparing individuals who will care for the globally increasing elderly population in the future, including those with AD. Therefore, the disease-specific education and practices in undergraduate nursing education must be improved to raise disease awareness, and AD must be included in the curriculum of compulsory courses. This study may shed light on the changes to be made in the undergraduate nursing curriculum.

CONFLICT OF INTEREST

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