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Original Article

From the Editor

Science is not only the pursuit of knowledge, but a shared responsibility toward public welfare, social justice, and a sustainable future. Yet it is crucial to recognize that among the many fields of scientific inquiry, health and public health are particularly vulnerable to politicization. Decisions about healthcare access, emergency preparedness, preventive measures, and public communication are often shaped not only by evidence but by shifting political agendas. The COVID-19 pandemic and the devastating earthquakes experienced in recent years in Türkiye have laid bare the human costs of inadequate, delayed, or ideologically driven public health responses. These crises have reminded us that health is not only a biomedical issue—it is inherently social and political.

In this context, a recent global declaration by the scientific community serves as a timely and necessary reminder: defending scientific freedom is not an abstract ideal—it is a moral and civic imperative, especially in matters that directly concern human health. The declaration calls for solidarity in preserving the integrity of science and insists on the need for informed, evidence-based public policies that prioritize well-being over politics. 1

As we begin a new publishing year with this April 2025 issue, we bring together a wide range of contributions that reflect the scope and complexity of public health practice. From an investigation into the relationship between public health system resilience and psychological resilience in post-pandemic Türkiye to an international analysis of AI tools like ChatGPT in medical education, the papers in this volume show both the local relevance and global interconnectivity of public health research. Studies on vaccine hesitancy among Iraqi healthcare professionals, cervical cancer screening in India, and poverty among elderly women in Türkiye further illustrate the diverse social contexts in which public health challenges unfold—and the role of science in addressing them.

Finally, we extend our sincere gratitude to all the authors who contributed to this issue, to our editorial board, especially to the peer reviewers who generously offered their time and expertise, and to our readers who continue to engage critically and constructively with the journal. Your support sustains our shared commitment to public health and scientific integrity.

We wish you a pleasant reading.

Yucel Demiral

Editor in Chief

1.Declaration of the Global Scientific Community: Defending Science, Knowledge and Public Interest in the Face of Political Suppression. SPHERA Research Consortium. Available at: https://spheraresearch.org/declaration-of-the-global-scientific-community-defending-science-knowledge-and-public-interest-in-the-face-of-political-suppression/

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ORIGINAL ARTICLE

The relationship between public health system resilience and psychological resilience: multilevel regression study

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Abstract

Objective: This study aims to explore the effect of Public Health System Resilience (PHSR) on the psychological resilience of individuals. To demonstrate this interaction, the study investigated psychological resilience levels of individuals negatively affected by the recently experienced COVID-19 pandemic as a disaster period in the province of Çanakkale.

Method: This study was conducted in two stages in April and September 2022. In the first stage, the PHSR Scorecard prepared by the United Nations Office for Disaster Risk Reduction was used to obtain the scores from the Merkez province of Çanakkale and the Bayramiç and Ayvacık districts. In the second stage, a questionnaire for demographic data and the Psychological Resistance Scale was administered to 510 people, including those over 65 years, small business owners, and students (high-school grades 2 and 3). The results were analyzed at two levels and with three different models using the Multilevel Regression analysis.

Results: Based on the multilevel regression model formulated for the factors affecting Psychological Resilience, it was found that PHSR was an explanatory or predictor variable for psychological resilience, and a high public health system resilience was associated with a high psychological resilience (Model 1 ß:0,29, p<0,05), (Model 2 ß:0,26, p<0,01) (Model 3 ß:1,05, p<0,01). It was also found that in PHSR interactions, small business owner groups (β = -0,77, t=-2,35, p<0,05) and student groups (β = -1,56, t=4,72, p<0,01) were affected more negatively than the group aged over 65 years.

Conclusion: Our study has demonstrated that PHSR effectively enhances individuals' psychological resilience.

Keywords: COVID-19, Psychological Resilience, Health Systems, community, Resilience, Regression analysis, Risk groups

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INTRODUCTION

The word resilience denotes a person's positive adaptation to the difficulties experienced and maintaining and reclaiming their mental health[1]. Community resilience is defined as the presence, development, and participation of community members and resources that enable the community to flourish in an environment characterized by change, uncertainty, unpredictability, and surprises[2]. The UNDRR (United Nations Office for Disaster Risk Reduction) describes social resilience as "*the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner*"[3]. Disasters, pandemics, wars, and other public health-threatening catastrophes burden the public health system with significant needs and can affect social resilience. For this reason, past tragedies enhance the learning capacity for future protection and improvement of risk reduction measures.

As stated on the data page published and daily updated by the Republic of Turkey Ministry of Health, the first COVID-19 case in Turkey was discovered on March 11, 2020. From the discovery of the first case until November 27, 2022, there were 17,042,722 cases in total, and 101,492 people have died due to the COVID-19 disease[4]. In the COVID-19 pandemic, both the characteristics of the virus and the measures taken by the authorities to prevent its spread affected some groups in several ways. In Turkey, those over 65 years of age were banned from going out of their homes on March 22, 2020, with the circular "Curfew for Those Aged 65 and Over and Those with Chronic Disease"[5]. On March 16, 2020, just after the emergence of the first cases, schools were shut down for a week and then closed to face-to-face education from March 23, 2020, to September 21, 2020, and a transition was made to an online education system[6]. A complete lockdown was imposed between April 29 and May 19, 2020, and freelance small business owners were banned from going out[7]. While the measures taken to prevent the spread of the disease affected the whole society, older people aged over 65, freelance small business owners, and young people of school age were affected most[8-10].

The older population was the most vulnerable group to the disease in the COVID-19 pandemic. Not only the disease itself but also the isolation measures taken could lead to the aggravation of some disorders already present in the older population, such as phobia, anxiety problems, and obsessive-compulsive disorder[11]. In addition to older adults, the COVID-19 pandemic was also reported to have had alarming effects on mental health in student groups[12]. Suspending face-to-face education and adopting online education to prevent the spread of the pandemic had a psychological impact such as anxiety, fear, and worries[13]. The imposition of curfews and people's avoidance of physical contact during the fast-spreading period of COVID-19 forced people to shop on the Internet instead of buying goods from shops[14]. This caused small businesses such as barbers, restaurants, and other local small business owners to incur significant losses. A qualitative study of the challenges experienced by small business owners during the COVID-19 pandemic has stressed that small business owners experienced both economic and psychological adversities[10].

This study aims to examine the impact of Public Health System Resilience (PHSR) on psychological resilience at the individual level. Using multilevel regression analysis, we explore how PHSR scores influence psychological resilience among high-risk groups (elderly, small business owners, and students) during the COVID-19 pandemic in Çanakkale. The study seeks to provide empirical evidence on the role of public health resilience in mitigating psychological distress in crisis situations.

METHODS

Population; Over 65, small business owner and students, who are thought to be more negatively affected due to the measures taken during the pandemic process

Exsposure; Correlation between public health systems resilience and the individual resilience of some individuals.

Comparison; With vs. without the correlates

Outcome PHSR effectively increases individuals' psychological resilience

This research that tries to predict the variability of psychological resilience with data from different level variables (e.g. level 1 district, level 2 occupation, age).

The field data of the study were collected in the Merkez, Ayvacık and Bayramiç districts between March and August 2022. small business owners were included through small business owner's union, elderly people were included through municipality officers, and students were included from permitted schools. Focus group interviews were held in September 2022.The characteristics of the districts chosen are summarized in Table 1.

Table 1. Characteristics of chosen districts

Town	Population	F/M	Healthcare Institution	Characteristic
Merkez	197,841	49.6% M 50.4% F	University Hospital State Hospital Oral Health Center Private Hospital	University campus and students are present
Bayramiç	28,952	49.5% M 50.5% F	State Hospital	In a mountainous area away from the center, Agricultural region
Ayvacık	34,549	50.8% M 49.2% F	State Hospital	Touristic region

Model;

Multilevel regression performs multiple modeling to combine variables from different levels. It is expected that the total explanatory power in the initial model will be low and the intercepts or slopes will overlap. While the total explanatoryness is low in the initial model, increases as different level variables are added to the model. This was exactly the case in the multilevel regression performed in this research.

The study model using a Hierarchical Linear Model (Multilevel Regression) analysis is summarized in Figure 1. The characteristics, effects are intended to be explored in the study, have been individually analyzed using the hierarchical linear model. In Model 1, only the impact of the public health system resilience score was considered to explain psychological

resilience. Model 2 considered the effect of being an older person over 65,being a small business owner, or being a student. In Model 3, the impact of being in different groups was considered as an interaction with the public health system resilience score. In group interactions, as the COVID-19 disease primarily affected individuals in the older population, the most urgent and rigid measures were taken for this group. For this reason, the group of people over 65 was taken as a reference when assessing intergroup differences in the model.

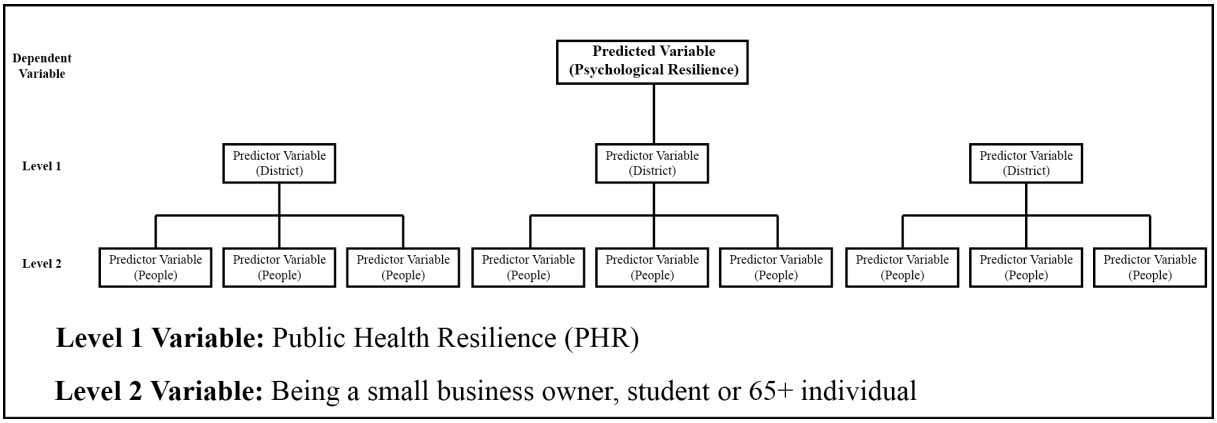

Figure 1. The HLM model, where the effect of public health system resilience and the effect of being in different district groups on psychological resilience were explored

Stages;

To apply these models, data were collected in several stages. For the levels specified in the modeling, the 1st stage involved focal group interviews held with the representatives of the Governor's Office of Çanakkale, Central Municipality of Çanakkale, Provincial Health Directorate of Çanakkale, Public Health Directorate of Çanakkale, and Provincial Disaster and First Aid Directorate of Çanakkale to find the PHR scores. Expert opinion was obtained based on the information and documents from the interviews with the agency representatives, from an independent academic group based on the information and documents from the interviews with the agency representatives. The points on the scorecard corresponding to each question were marked, and the scores obtained from these interviews were used as the Public Health System Resilience Score. In the second stage, a questionnaire and the Connor-Davidson Resilience Scale (CD-RISC) were administered to the small business owners, individuals over 65 years of age, and students in the districts from which Public Health System Resilience scores were obtained (Merkez, Ayvacık, and Yenice-Bayramiç) to assess psychological resilience.

Tools;

For Public Health System Resilience, the Disaster Resilience Report Card for Urban Areas was used in this study along and the Public Health System Resilience Addendum Scorecard Essentials, which was developed by UNDRR. The scorecard has ten essentials for assessing public health resilience[15] (Table 2).

The scorecard has a total of 23 items. Each item is scored between 0 and 5. The maximum

score obtainable is 115, and the minimum is 0. Since each of the ten essentials on the scorecard has a different number of questions, the minimum and maximum scores obtainable from each essential can be different[15]. None of the districts obtained a "0" from any essential. The scoring was made by getting opinions of the stakeholders attending the expert view meetings.

Table 2. Public Health System Resilience Addendum Scorecard Essentials

Items	Score card Essentials	Min-Max
1	Integration of public health and governance (Essential 1)	0-5
2	Integration of public health and disaster scenarios (Essential 2)	0-15
3	Integration of public health and finances (Essential 3)	0-5
4	Integration of public health and land use/building codes (Essential 4)	0-5
5	Management of ecosystem services that affect public health (Essential 5)	0-5
6	Integration of public health and institutional capacity (Essential 6)	0-20
7	Integration of public health and societal capacity (Essential 7)	0-15
8	Integration of public health and infrastructure resilience (Essential 8)	0-15
9	Integration of public health and disaster response (Essential 9)	0-20
10	Integration of public health and recovery/building back better (Essential 10)	0-10

Developed by Connor and Davidson (2003), the Connor-Davidson Resilience Scale/ CD-RISC was used to determine the psychological resilience levels of adult individuals[16]. The investigators made the payment required for the use of the scale and subsequently, the permission for use was obtained. Consisting of 25 items in total, the scale has a 5-point Likert-type scoring. The scale is scored using (0) for 'not true at all, (1) for 'rarely true,' (2) for 'sometimes true,' (3) for 'often true', and (4) for 'true all the time.' The lowest score obtainable from the scale is 0, and the highest is 100. It is stated that the 25 items of the scale can be taken as a whole, and a single total score obtained from the whole ranking can be used for analysis. Higher scores obtained from the scale show higher psychological resilience. The scale's Cronbach Alpha coefficient was 0.91 [16]. Its Turkish validity and reliability study was performed by Karaırmak (2010). The scale's Cronbach's Alpha internal consistency coefficient is 0.92[17].

Sampling;

It is stated inIn Mass and Hox regression, it is stated that to calculate the sample size, the independent variables intended to be used to calculate the sample size need more than 50 people for each group[18]. Accordingly, it was planned to contact up to a total of 180 people through the improbable (non-probabilistic) sampling method up to a total of 180 people for the Merkez province, 180 for the Ayvacık district, and 180 for the Bayramiç and Yenice districts. This sampling is composed of 60 people, with a 20% excess for each group (students, older people over 65, and small business owners). The number of people to be included in the study was planned to bewas to be 540. A total of 510 people could be contacted in the survey. Non-random participation consistent with the sample was achieved from all districts and groups. There was no missing data.

Variable and Statistical analysis;

The variables of our study are the Public Health System Resilience Score, which was developed by UNDRR, and the psychological resilience levels obtained with the Connor-Davidson Resilience Scale/CD-RISC.

In statistical analysis, numbers and

percentages were used to present definitional data. Multilevel regression modelling was used to study the factors affecting individual psychological resilience on the Jamovi 2.3 application.

Permission was obtained for the study from Çanakkale University Clinical Trials Ethics Committee with their decision numbered 2022-05 and dated 22/03/2022.

RESULTS

For this study, 510 people were interviewed in the Merkez province of Çanakkale and Bayramiç and Ayvacık districts.

After the structured meetings to obtain public health system resilience scores, the Merkez province received 96 points, Bayramiç 85 points, and Ayvacık 86 points. These scores were included as public health resilience scores in the multilevel regression models used to explain psychological resilience. The genders and samples included in the study are shown in Table 3.

Table 3. Genders and COVID Knowledge of Participants by their Groups, Çanakkale 2022

	Groups							
Characteristic	**Older People over 65**		**Small Business Owners**		**Students**		**Total**	
	n	**(%)**	**n**	**(%)**	**n**	**(%)**	**n**	**(%)**
Gender n=510								
Female	85	(51.8)	60	(35.1)	117	(66.9)	262	(51.4)
Male	79	(48.2)	111	(64.9)	58	(33.1)	248	(48.6)
Region								
Merkez	60	(36.6)	61	(35.7)	59	(33.7)	180	(35.3)
Bayramiç	53	(32.3)	50	(29.2)	57	(32.6)	160	(31.4)
Ayvacık	51	(31.1)	60	(35.1)	59	(33.7)	170	(33.3)

n: number %: column percentage

It was seen in Model 1 that the Public Health System Resilience Score was a significant explanatory or predictor variable in explaining psychological resilience (F:4,07 p<0,05). As the PHR score increased, the Psychological resilience score also increased (β=0.29, t=2,02, p<0,05). The explanatoriness of the PHR score in explaining psychological resilience alone was 0.7% (Table 4). In Model 2, the model set up with the group variable to explain psychological resilience was found to fit (F:32,18 p<0.01). The general explanatoriness of Model 2, which was set up with the group variable, was found to be 11.9%. The explanatoriness (explanatory or predictor variable) of being over 65 years of age in psychological resilience was found statistically significant compared to being a small business owner (β= 0,25, t=0,148, p>0,05). Being in the student group was associated with a lower psychological resilience score than being in the over 65 years of age group (β= -11,53, t=-6,80, p<0.01) (Table 4).

In Model 3, the effect of the Public Health System Resilience score and group interactions on the psychological resilience scores of individuals were analyzed. The goodness of fit tests of Model 3 showed that the model was appropriate (F:11,18, p<0,01). The explanatoriness of Model 3 in the

psychological resilience of individuals went up to 15.6%. As Public Health System Resilience score increased, the Psychological resilience score also increased (β=1.05, t=4,48, p<0,01). Students had a lower psychological resilience score than those in the over 65 years of age group (β= -11,54, t=-6,94, p<0,01). There was no significant difference between the psychological resilience scores of small business owners and those of the over 65 (β=0,37, t=0,22, p=0,82) (Table 4).

In the interaction of the Public Health System Resilience score, the psychological resilience score of small business owners was lower than that of the older people over 65 (β= -0,77, t=-2,35, p<0,05). Similarly, in the interaction of the PHR score, students had a lower psychological resilience score than those over 65 (β= -1,56, t=4,72, p<0,01). The level of students' being affected negatively seemed to decrease in Public Health System Resilience interaction (β= -11,54, β =-1,56) (Table 4).

Table 4. Multilevel Regression Analysis in Explaining Psychological Resilience, Çanakkale*, 2022

Predictor variable	Model 1	Model 2	Model 3
Public Health Resilience Score (PHR) β	0.29	0.26	1.05
Group 1 (65 +[1]-Small Business Owners) β		0.25	0.37
Group 2 (65 +[1]-Students) β		-11.53**	-11.54**
PHRS*Group-1 (65 +[1]-Small Business Owners)			-0.77*
PHRS*Group 2 (65 +[1]-Students)			-1.56**
R^2	0.007	0.119	0.156
ANOVA values (F) for model fit for the models set up	4.07*	32.18**	11.18**

**p<0.05; *** p<0.01 [1]: reference group

* Table 4 presents the results of the multilevel regression analysis. In Model 1, only the Public Health System Resilience Score is included as a predictor of psychological resilience, revealing a significant positive effect. Model 2 introduces the group membership variable, showing that students and small business owners exhibit lower psychological resilience scores compared to the reference group (65+ individuals). Model 3 incorporates interaction effects, demonstrating that the negative impact on psychological resilience is more pronounced for students and small business owners when public health system resilience is considered. These findings suggest that different risk groups respond differently to public health system resilience, highlighting the need for targeted intervention

DISCUSSION

There is no definite evidence in the literature regarding what type of interaction exists between the Public Health System Resilience Essentials and psychological resilience. The data suggest that psychological strength increases community resilience[19,20]. The psychological resilience of individuals is evaluated within the framework of social capital, which is a part of social resilience. However, no studies demonstrate the effect of social resilience on the psychological resilience of individuals. This represents a novel aspect of the study we have conducted.

The Public Health System Resilience score is evaluated with some essential questions. How these evaluation principles reflect on society has not been evaluated in this study. The Public Health System Resilience score of the city was obtained with the opinions of representatives of institutions that are influential in the provincial administration, and the relationship between this score and the resilience of individuals was examined.

The Public Health System Resilience score positively affected psychological resilience in the Multilevel Regression analysis model, which included all the data (Table 4). In their meta-analysis in 2013 on the factors affecting psychological resilience, Lee et al. concluded that the factors affecting psychological resilience most were self-sufficiency, self-

confidence, positive mood, optimism, and social support[21]. The CD-RISC 25 Psychological Resilience Scale used in our study consists of items measuring various aspects of psychological resilience, namely, hardiness, adaptability/flexibility, meaningfulness/purpose, optimism, regulation of emotions and cognition, and self-efficacy.

Community resources that will reduce the impact of disasters are dependent on individual resources[22,23]. According to the protection of resources theory[23], threats to or loss of important objects (e.g., home, property), energies (e.g., income, access to economic resources), personal resources (e.g., security, hope, meaning), and social resources (e.g., friends, family, non-governmental organizations) are the most robust precursors of psychosocial difficulties[24,25]. It is thought that a portion of the above-mentioned social resources has been significantly affected during the COVID-19 pandemic.

Abramson et al. described the components affecting the activation of resilience and its conceptual framework in their 2015 study [22]. The proposed conceptual framework is based on the ability to activate better the resilience aspects of social resources, which is essential for sustaining psychological vitality, stability, cognitive health, as well as satisfactory physical health and well-being. Under the definition of urban resilience of communities a high level of Public Health System Resilience contributes to the communities in cities by having more resources, incurring less damage, and achieving faster recovery in chaotic circumstances caused by disasters or pandemics.

According to the multilevel regression analysis results, small business owners and students were affected more negatively than those older than 65 years (Table 3, Model 2). In Model 3, being older than 65 years was associated with a higher Psychological Resilience score in PHR interaction compared to the student and small business owner groups (Table 4, Model 3). A complete lockdown was imposed in Turkey between April 29 and May 19 as part of COVID-19 pandemic measures, and going out was forbidden except for the personnel who carried out essential work[11]. Isolation measures are known to considerably increase the risk of general psychological disorders, anxiety, and low morale[26]. Again, due to the actions taken for the pandemic, schools stopped face-to-face education between March 16 and September 21 and adopted a distance education system. The closure of schools to moderate the effects of the pandemic resulted in the loss of a large portion of daily living activities for the students. Restrictions on going out alongside school closures may explain why students had a lower Psychological Resilience score than the other groups.

Although some of the effects reflected on people's public health resilience during the COVID-19 pandemic, presented in the evaluation on the essentials, were decisions made countrywide, they are felt in society as the strength and resilience of the central administration.

CONCLUSION

Unlike the existing studies showing that psychological resilience increases social resilience, this study demonstrated that public health system resilience was effective in Psychological Resilience using the example of the COVID-19 pandemic that was experienced recently. However, it does not explain how Public

Health System Resilience reflects on society and how it increases psychological resilience. Since the study was planned to demonstrate the relationship between social and individual resilience, a representative sample of the society was not targeted. The results of this study cannot be generalized due to fact that the sample is not representative of the society. There is a need for detailed and in-depth studies on this subject.

It can be said in our study that both the measures taken and the process itself went favorably for individuals aged over 65. However, the psychological resilience of the student and small business owner groups was affected more negatively than that of those over 65. Since both the suspension of education and impairment of the social atmosphere may have produced these results for the students and economic interactions for the small business owners, it will be appropriate to consider these points when taking measures in possible future pandemics.

The results obtained will serve as a guideline for decision-makers by defining the role of public health resilience in improving the psychological resilience of individuals in groups susceptible to potential problems in future disaster.

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ORIGINAL ARTICLE

Assessing ChatGPT's accuracy and reliability in medical education: a cross-sectional study

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Abstract

Objective: Artificial intelligence (AI), specifically ChatGPT, developed by Open AI provides human-like understanding and answers to a variety of domain questions and has the potential to transform medical education. However, its reliability in providing accurate clinical information is highly uncertain. This study is aimed at evaluating the accuracy and reliability of ChatGPT in answering multiple-choice questions (MCQs) and protocol-based questions in the field of medicine.

Methods: This cross-sectional study was conducted using mixed methods at MVJ Medical College and Research Hospital (April 2024), Hoskote, India, i.e. MCQs (n=228) and protocol-based questions (n=10) from all 19 MBBS Subjects from standard medical literature were used to test ChatGPT. Subject experts checked the responses for accuracy. Statistical analysis, by chi-square test, was performed using IBM SPSS Version 20.0 for Windows.

Results: The study findings stated that ChatGPT in easy and simple MCQs, had good accuracy, but its performance lowered with more complex questions, and overall answered about 57.02% of MCQs correctly. Protocol-based questions were given average scores, i.e. 6.35/10 for textbook accurate knowledge and 5.75/10 for real-life application.

Conclusion: ChatGPT shows potential as a tool for medical education, especially in recalling basic facts but, it should not be relied upon as a sole source of information, instead used in conjunction with traditional methods to ensure a comprehensive understanding of medical concepts.

Keywords: Application, ChatGPT, Knowledge, MCQS, Reliability

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INTRODUCTION

Artificial Intelligence (AI) emerged in 1955, with John McCarthy coining the term[1]. Since then, great progress has been made in AI, because of advances in machine learning (ML) and its subdisciplines. AI in healthcare is transforming diagnostic approaches and clinical decision-making, expanding its reach across all medical specialties [2,3].

Despite the growing interest in the application of AI in medical education, there is a notable gap in understanding the reliability of AI models, especially ChatGPT, i.e. Chat Generative Pre-trained Transformer[4] in this context although there is a considerable discourse about the potential of AI's ability to enhance the learning experience and limited empirical evidence of its effectiveness and accuracy for delivering educational content[5,6]. Given the growing use of AI models such as ChatGPT in the medical field, it is essential to investigate and systematically review their reliability to address the existing knowledge gap.

As medical research and study increase, the knowledge and database also increase over a wide area[7]. ChatGPT offers an opportunity to access all this data and give guidance immediately[8]. But, before such technology is embraced, it is important to ensure its accuracy and suitability for medical education[9].

AI-generated educational content risks misinformation due to probabilistic text generation, leading to occasional inaccuracies[13]. Over-reliance of AI can affect clinical reasoning and impair critical thinking. Complex medical issues are difficult for AI to handle, which emphasises the necessity of thorough testing before broad use in medical education.

The main objective of this study is to evaluate the accuracy and reliability of ChatGPT (GPT-3.5, free version, accessed via OpenAI's web interface, April 2024) in handling both multiple-choice questions (MCQs) and Protocol-based questions from standard medical literature on a variety of topics, and also to make recommendations on integrating ChatGPT and similar AI technologies in medical education. Prior studies, such as Jin et al[10]. and Han et al[11]., examined AI performance on USMLE-style MCQs. This study expands on their findings by including protocol-based questions, assessing ChatGPT's accuracy, reliability, and error patterns across medical domains. It also addresses a key gap by recommending optimizations for medical education, an underexplored area.

METHOD

The cross-sectional study was conducted at MVJ Medical College and Research Hospital, Hoskote, Bangalore, focusing on evaluating the reliability of the ChatGPT to answer medically relevant questions. Before doing the study, ethical clearance was obtained from the institutional ethical committee.

The study used a mixed-methods approach, including multiple-choice questions (MCQs) and protocol-based questions to assess the general reliability of the ChatGPT.

ChatGPT (GPT-3.5, free version, accessed via OpenAI's web interface, April 2024) was used in this study. As the free version does not allow user-controlled parameter adjustments (such as temperature or penalty settings), responses were generated under default system settings. All responses were recorded in a controlled academic environment to

maintain consistency across multiple runs.

A total of 228 MCQs were made, with 12 questions for each of the 19 subjects of the Bachelor of Medicine, Bachelor of Surgery syllabus, and were classified equally according to difficulty, i.e. 4 easy, 4 medium, and 4 hard questions in each subject, from recognized medical literature, such as standard medical textbooks (e.g., Harrison's Internal Medicine[14], Bailey & Love's Surgery[15]), reputed journals ensuring that it had a diverse and representative set of questions. The MCQs were and reviewed by subject matter experts of their respective disciplines for validity. This sample size was chosen to balance statistical robustness and feasibility while covering a wide range of medical topics for a comprehensive analysis of the performance of ChatGPT in various contexts, increasing the generality of the findings.

In addition, 10 protocol-based questions were developed to assess understanding of ChatGPT theoretically and as applied to practical matters and define grading criteria for subject matter experts to evaluate responses provided by ChatGPT.

These questions were designed to evaluate real-world application, and while a larger sample could improve reliability, this number was determined based on expert feasibility and the complexity of evaluating long-form responses. Future studies may expand this dataset for greater generalizability.

A standardized interaction protocol was followed to maintain consistency. ChatGPT was given each question without additional context beyond what a student would receive. Each question was presented as a standalone prompt to ChatGPT with no additional contextual information. For MCQs, ChatGPT was instructed: 'Select only one correct answer and provide no explanation', then a MCQ question with four options A, B, C, D. The response was noted, compared with the premade key and graded subject-wise and difficulty-wise. For protocol-based questions, prompts were structured as: 'Provide a detailed response based on standard clinical guidelines', then the problem statement was given and the response was noted. Each protocol-based response was graded by two independent subject matter experts (Professors/Associate Professors in relevant medical disciplines) using a structured rubric. The rubric assessed two aspects: (i) 'Textbook Knowledge Accuracy' (factual correctness, alignment with standard medical texts). (ii) 'Real-Life Applicability' (practicality of response, alignment with clinical guidelines). Scores were assigned on a 10-point scale, and inter-expert discrepancies were resolved through discussion.

Ensuring reproducibility in studies involving large language models is crucial, as AI-generated responses can vary due to updates and underlying model parameters. Prior research has proposed structured benchmarking frameworks to improve the reliability of AI assessments in public health and medical applications[16].

Statistical analysis was performed using IBM SPSS Version 20.0 for Windows. A chi-square test was used to determine statistical significance in MCQ accuracy across difficulty levels and subjects. For protocol-based questions, mean scores and standard deviations were calculated to assess variability in responses. Confidence intervals (CI) for ChatGPT's accuracy were not explicitly

calculated in this study but should be explored in future research.

RESULTS

The study findings indicate ChatGPT's performance levels in various aspects of medical education. In Table I, when tested with multiple-choice questions, ChatGPT proved to be relatively more accurate on easy questions (n=54/76; 71.05%), and less on hard questions (n=29/76; 38.16%). Overall ChatGPT answered about 57.02% of all MCQs correctly (p: 0.0004), this shows that there is a statistically significant relationship between difficulty level and the agreement between standard reference books and ChatGPT responses.

Table 1. Performance of ChatGPT on Multiple-Choice Questions (MCQs) of Varying Difficulty Levels

Difficulty	No of Questions	No. of Correct Responses
Easy	76	54 (71.1%)
Medium	76	47 (61.8%)
Hard	76	29 (38.2%)
Total	228	130 (57.0%)

Chi-Square Value: 17.86, DF: 2, P Value: 0.0004

In Table II, MCQ responses vary across medical disciplines, where high accuracy is observed in Radiology, Surgery, Anatomy, Pathology. Subjects like Dermatology (41.67%) and Community Medicine (41.67%) had lower accuracy, possibly due to the complexity of diagnostic reasoning required and the variability in treatment guidelines across different geographic regions, which may not be well-represented in ChatGPT's training data.

In Table III ChatGPT's responsiveness to protocol-based questionnaires was examined and graded in categories of textbook accurate knowledge and real-life applicability of that knowledge out of a score of 10 each by experts in the concerned topic. The average score for all questions was 6.35/10 for knowledge and 5.75/10 for application, i.e. there wasn't much difference in the scores of knowledge and application (P Value: 0.7837). While ChatGPT performed well on structured management protocols (e.g., CPR steps: 80% accuracy), its accuracy declined in decision-heavy scenarios (e.g., triage: 60%, hospital waste management: 35%). This suggests that AI performs better in well-defined protocols but struggles with contextual decision-making, possibly due to a lack of real-world clinical experience.

Table 2. Distribution of Multiple Choice Question (MCQ) Response Accuracy Across Medical Disciplines

Subject	No of Questions	No. of Correct Responses
Anaesthesia	12	8 (66.7%)
Dermatology	12	5 (41.7%)
ENT	12	6 (50.0%)
Medicine	12	5 (41. 7%)
Ob&G	12	8 (66.7%)
Ophthalmology	12	6 (50.0%)
Orthopaedics	12	6 (50.0%)
Paediatrics	12	6 (50.0%)
Psychiatry	12	7 (58.3%)
Radiology	12	10 (83.3%)
Surgery	12	9 (75.0%)
Anatomy	12	9 (75.0%)
Biochemistry	12	8 (66.7%)
Physiology	12	6 (50.0%)
Microbiology	12	4 (33.3%)
Pathology	12	9 (75.0%)
Pharmacology	12	6 (50.0%)
Community Medicine	12	5 (41.7%)
Forensic Medicine	12	7 (58.3%)
Total	228	130 (57.0%)

Chi-Square Value: 17.18, DF: 18, P Value: 0.5107

Table 3. Expert Evaluation of ChatGPT's Responsiveness to Protocol-Based Questionnaires

Sl No	Question	Knowledge	Application	P Value
1	Management of Organophosphate Poisoning	08.0	07.0	0.6056
2	Management of Snake Bite	06.0	06.0	1.0000
3	Steps of CPR	08.0	08.0	1.0000
4	Triage in Disaster Management	09.0	06.0	0.1213
5	Treatment of Diarrhoea (Plan B)	07.0	05.0	0.3613
6	Hospital Waste Management	03.5	03.5	1.0000
7	Management of Heat Stroke	05.0	07.0	0.6594
8	Treatment of Haemorrhagic Shock	06.5	06.5	1.0000
9	Treatment of Anaphylactic Shock	03.5	03.5	1.0000
10	Management of Myocardial Infarction	07.0	05.0	0.3613
Average		06.35	05.75	0.7837

DISCUSSION

In this study, the reliability of the ChatGPT was assessed by answering multiple-choice medical questions (MCQs) and protocol-based questions. For MCQs, ChatGPT gave high accuracy for easy questions, but lowered accuracy for medium and hard questions, just over half of the MCQs were answered correctly. The questions performed well in subjects such as radiology, surgery, pathology, anatomy, etc while their accuracy was lower in dermatology, medicine, and community medicine. Although its performance on the MCQs was moderate, its ability to answer protocol-based questions accurately and appropriately was not consistent where ChatGPT got only an average score. This suggests that although ChatGPT may be useful in some tasks, such as recalling basic facts, it may not be reliable in more complex clinical situations that require clinical consideration.

A similar study done by Jin et al [10] used 12723 MCQ questions and got 36.7% correct responses, while another by Han et al [11], got 29% on using 454 USMLE MCQ questions. Our study found a higher MCQ accuracy (57.02%), which may be due to differences in question complexity and dataset selection. Unlike these studies, our work also includes protocol-based questions, providing insights into ChatGPT's clinical reasoning abilities beyond factual recall.

The strength of this study is its methodical technique used in this study to evaluate the performance of the ChatGPT across a range of clinical topics and questions. Comprehensive assessment across all 19 MBBS subjects, unlike previous studies focusing only on USMLE MCQs. Mixed-methods approach, incorporating both MCQs and protocol-based questions. Use of standardized grading rubrics for protocol-based questions to enhance consistency.

Limitations of the study include the small sample of protocol-based questions of only 10 cases limit generalizability. Given the complexity of protocol-based questions, a larger sample size was not feasible for detailed expert grading. Future studies should expand this dataset for greater generalizability. Increasing the sample size would enhance statistical robustness. And reliance on subjective grading by subject matter experts may introduce a potential bias. Future studies should use inter-rater reliability scores. Moreover, the study of the performance of

ChatGPT was examined only in a controlled setting and did not assess its usefulness in a real-world clinical setting. Since ChatGPT is continuously updated, responses may vary over time. This study represents a snapshot of its performance and highlights the need for ongoing validation as AI models evolve.

CONCLUSION

Based on the findings, it can be concluded that although ChatGPT shows potential as a complementary tool for medical education, it should not be relied upon as the sole source of information. AI tools such as ChatGPT should be approached with a lot of caution by medical students and professionals and used along with traditional teaching methods to ensure a proper understanding of correct medical concepts.

Further research is required to further investigate the validity and reliability of ChatGPT, and its limitations in medical education, and to explore the integration of other AI tools into existing medical curricula and clinical practice to determine its practical benefits and impact on patient care. AI tools should be used as supplementary aids, not as standalone sources of medical knowledge. Institutions could incorporate AI-generated MCQs for self-assessment, with faculty moderation to correct misinformation. Future studies should compare ChatGPT's performance with other LLMs (e.g., GPT-4, Claude, Med-PaLM) using a standardized evaluation framework.

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ORIGINAL ARTICLE

Screening of cervical cancer using Smart scope at a Rural Health Training Centre, Pune, India: A cross-sectional study

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Abstract

Objective: To screen women for cervical cancer using Smart scope at a Rural Health Training Center, Pune, India.

Methods: The present study analyzed available screening data using a cross-sectional design. A private medical college's rural health training center provides screening services to women above 30 years of age as per the Government of India's guidelines. The guidelines include visual inspection after applying acetic acid (VIA). The study included data from June 2019 to January 2020, when a principal investigator was posted in a rural health training center. The study participants were married women. We screened all women giving consent. The authors used a Smart scope (image capturing and transmitting device), Cusco's speculum, and acetic acid. The images were immediately transmitted to faculty from the Obstetrics and Gynecology department for prompt opinion.

Results: Out of 1,232 women, 179 consented. The mean age was 37.7 years. (SD=8.62). Eighty-three women showed cervical pathologies, and 14 were VIA positive. The majority of the women had vaginal discharge. The most common pathological lesion was cervical erosion (32.12%). The study found no association between age and parity with cervical pathological findings.

Conclusion: Smart scope helps prompt diagnosis of the condition of the cervix. Visualizing the photo of cervical pathology by the women enhances the patient's health care seeking. It is a feasible and cost-effective process that overcomes the limitations of VIA.

Keywords: Cervical Screening, Smart Scope, Cervical Cancer, Cervical Pathologies

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INTRODUCTION

Cervical cancer is an important cause of mortality among women and is an increasing health problem across the globe. Worldwide, cervical cancer is the fourth most frequent cancer in women with an estimated 660,000 new cases and 350,000 deaths in 2022. Out of total deaths 94% occur in low- and middle-income countries.[1] In developed countries the incidence has decreased after using Papanicolaou smear (Pap smear). [2]

Cervical cancer ranks as the 2nd most frequent cancer among women in India and third number among causes of cancer deaths. About 5.0% of women in the general population are estimated to harbor cervical HPV-16/18 infection at a given time, and 83.2% of invasive cervical cancers are attributed to HPVs 16 or 18. [3]

There is a difference in the incidence of cervical cancer in developing and developed countries. This is because of the better screening facility and knowledge in the developed countries due to which the cases have been significantly reduced while the developing countries like India, which lacks the screening facility and knowledge, the burden of cervical cancer is still high. According to the World Cancer statistics, >80% of all cervical cancer cases are found in developing and low-income countries, because of a lack of awareness and difficulty in running cytology-based screening programs.[4] India's National Cancer Control Program emphasizes the importance of early detection and treatment, but the country has no organized screening program, and many Indian women lack both awareness about the disease and access to prevention and treatment facilities.[5] Even if women from rural settings can reach distant clinics to get their Pap smear, the test takes four to five days to be processed. As a result, many women do not return for follow-up because they cannot afford to take another day off from work.[6] In India, the guidelines for community-based cervical screening programs based on visual inspection by acetic acid (VIA) were formulated in the year 2005.[7] Sensitivity and specificity of VIA were reported to be in the range of 67% to 79% and 49% to 86% respectively and those for Visual Inspection after Lugol Iodine were 77.8% to 98%, and 73% to 91.3%, respectively.[8] Government of India has advised screening of all women above 30 years using VIA. However, visual screening tests have limitations like extreme subjectivity in interpreting tests, lack of permanent records, low reproducibility, overestimation, and overtreatment.[9] Hence telemedicine (image transmission) component was started in Rural Health Training Center. With the help of Smart scope and visual inspection by VIA pathological assessment can be conducted. It saves images that may be transmitted for the opinion of gynecologists.[10] Early detection and appropriate treatment are possible if robust screening is implemented. Therefore, the use of Smart scope in the rural area serves the purpose of screening cervical pathology as the process is easy, feasible, and cost-effective. Smart scope aids in visual screening methods for the detection of various cervical lesions. This study aimed at the Screening of cervical cancer using Smart scope at a Rural Health Training Centre, Pune, India.

Objectives

To identify the types of cervical pathologies using Smart scope

To estimate the prevalence of cervical pathologies

To assess the association of age with cervical pathologies

To assess the association of parity with cervical pathologies

METHODS

It was a cross-sectional study conducted in the rural field practice area of a private medical college in 2019-20. Field practice area of the center consists of 23 villages having a population of about 52,000. The population and services are comparable to a primary health center. Study participants were women, attending the outpatient department. The inclusion criteria were any woman above the age of 18 years, married and who were sexually active. The exclusion criteria were woman having diagnoses cancer cervix or history of treatment of cervical cancer. All women fulfilling the inclusion and exclusion criteria and agreeing to the cervical screening were included. They were counseled first before actual the screening test. Research tools used for detection of cervical pathologies were a Smart scope (A probe with the camera, tablet, and internet connection), Cusco's speculum, and Acetic acid. Apart from the device, disposables and cleaning agent is required for smooth functioning. The total cost per year was about $4,000. The cost It facilitates close examination and magnified visualization of the cervix thereby enables identification of abnormalities or precancerous changes at an early stage. It helps keep track of the cervical health of an individual patient over many years.[11] The females coming to general outpatient department (OPD) or outreach camps of Rural Health and Training Center, of a private Medical College were counselled to go for cervical screening. Consent was taken from the study participant before the examination. After taking the consent, females were examined maintaining full privacy. The vagina and cervix were examined with the help of Cusco's speculum and Smart scope. The photographs were clicked. Then visual inspection was done after one minute of application of 5% acetic acid and again we took photographs.

The photographs from the tab were taken post application of 5% acetic acid. The images were also shown to women. The photographs were immediately sent by the app to the senior faculty of the Obstetrics and Gynecology Department of the Medical College Hospital. If any pre-cancerous lesions/cancer/ any pathology was suspected by the specialist, then the participants were referred for further investigations. The pictures of cervical pathologies were shown to the participant women. Data were entered into an excel sheet and analyzed using SPSS version 28. The authors applied one-way ANOVA test to assess significance between means.

RESULTS

We counseled 1232 women; only 179 consented and had undergone cervical screening. The mean age of screened women was 37.7 years (SD=8.62). The mean parity was 2.34. Most of the women attended OPD as they were having some symptoms. Many women complained having more than one symptom. Figure 1 gives the proportion of women having symptoms. Majority women had vaginal discharge. Only five percent women came for routine check-up. Many women were having multiple symptoms.

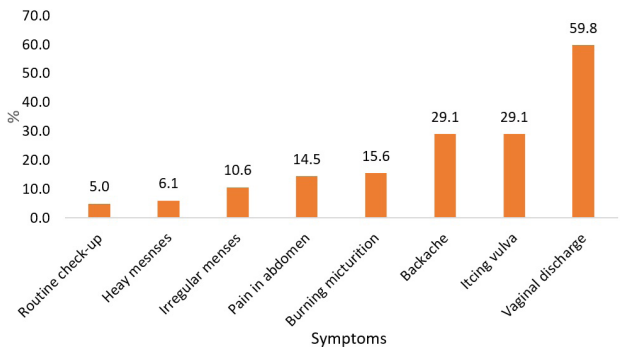

Figure 1. Distribution of women according to symptoms

Figure 2 gives details of women enrolled, consented for screening, VIA and cervical pathologies confirmed by Smart scope.

The majority of the women i.e. 53.63% displayed healthy cervix. Commonest pathological lesion was cervical erosion (32.12%). Table 1 provides information about all pathologies observed as well association of age and parity according to the cervical pathology.

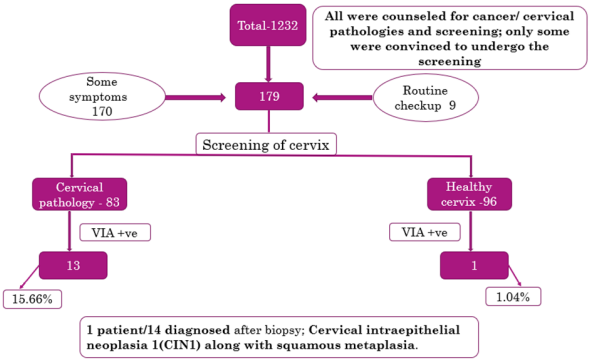

Figure 2. Classification of visual inspection after acetic acid application

Table 1. Association of age and parity with cervical pathologies

Pathology	Frequency(%)	Mean age (SD)	Mean parity (SD)
Healthy	96 (53.6)	38.50 (9.3)	2.33 (0.1)
Erosion	62 (34.6)	37.27 (7.2)	2.37 (0.1)
Mixed infection	15 (8.4)	38.57 (6.6)	2.17 (0.2)
Polyp	6 (3.4)	41.33 (6.8)	2.67 (0.5)
Total	179	37.77 (8.6)	2.34 (0.5)
		p=0.57	p=0.77

The examples of the typical appearance and clarity of transferred images of cervix and which were shown to the participants are shown in Figure 3.

Figure 3. Images of cervical pathologies

DISCUSSION

In the present study after counseling 1232 females, very few women agreed upon the screening of cervical cancer. Alyse et al. observed that only 14.3% participants had at least one-lifetime pelvic exam and 7.1% had undergone cervical screening.[12] The less acceptance for screening has origin in lack of knowledge about cancer cervix and screening procedure. Married young women from a higher socioeconomic status were more likely to be screened. Concerning knowledge of cervical cancer, 84.6% of women had poor knowledge, 10.3% had moderate knowledge, and 5.1% had good knowledge.[12] Charity Binka et al. also mentioned in their study that low level of knowledge about the disease and screening services, personal or psychological convictions, and cost of screening and treatment coupled

with a low level of income were the barriers at the individual level.[13] A number of studies have come out with similar findings. For instance, it was established that in the low and middle-income countries, especially in rural areas, knowledge and awareness of cervical cancer screening are very low, and this is one of the main factors that constrain women's uptake of cervical cancer screening initiatives.[14-16] In the present study maximum women presented with vaginal discharge as one of the symptoms. Similar findings were revealed by Magdi et. al.[17] Amos et al. observed in their study that the majority of participants attributed initial symptoms of vaginal discharge and itching to Sexually Transmitted Diseases including syphilis and/or gonorrhea.[18] A study conducted on diagnosis and management of cancer of cervix presented abnormal vaginal bleeding, vaginal discharge and lower abdominal pain as the most common first symptoms reported by participants.19 A study conducted on diagnosis and management of cancer of cervix presented abnormal vaginal bleeding, vaginal discharge and lower abdominal pain as the most common first symptoms reported by participants.[19] A study conducted in population of Goa among women aged 18-50 years, observed that 53% of their study population were found to have infections causing their discharges, the figure is considerably higher than the 14.5%.[20]particularly among women in Asia. Although presumed to be caused by reproductive tract infections (RTIs Present study showed that there is no association of age and parity with cervical outcomes. The results are supported by another study by Acharya et al. who mentioned that age, parity, perceived susceptibility, perceived benefits, and perceived barriers had no significant association with cervical cancer whereas, in contrast.[21] A study by Nubia et al. found a direct association between the number of full-term pregnancies and squamous-cell cancer risk: the odds ratio for seven full-term pregnancies or more was 3·8 (95% Cl 2·7–5·5) compared with nulliparous women, and 2·3 (1·6–3·2) compared with women who had one or two full-term pregnancies. There was no significant association between the risk of adenocarcinoma or adeno-squamous carcinoma and the number of full-term pregnancies.[22] A comparative study between age and parity with cervical cancer reported that there is no relation between squamous intraepithelial lesions incidence and increasing age but a correlation with increasing parity. There is the rise in squamous intraepithelial lesions incidence was seen with increasing parity in adult women between 21-40 years.[23] Multiparity as risk factor of cervical cancer has also been stressed in their rural findings by Rajput et al, Das Gupta et al. [24,25] Green et al. in their study have correlated early age at the first sexual intercourse and subsequent child birth with risk of carcinoma cervix.[26] The greatest advantage of the study was the participant women seen photos of their cervical lesion which improve their compliance to referral. In some areas of outreach camps including our institution, the real-time transmission was not possible due to poor connectivity.

CONCLUSION

The study concluded that the positivity among symptomatic was about 16% whereas, among non-symptomatic, it was about 1 %, indicating mandatory screening among symptomatic. The use of Smart scope may play a promising role in combating all the barriers and help in detection of the condition

of the cervix, providing prompt diagnosis and advice to the patient. With marginal one time increase in resources; it can be used by private practitioners and health centers.

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ORIGINAL ARTICLE

Effect of green tea and wheat bran on professional drivers with metabolic syndrome: A controlled clinical trial

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Abstract

Objective: The present study aims to investigate the effect of Green Tea (GT) and Wheat Bran (WB) on Metabolic Syndrome in male drivers.

Methods: A controlled clinical trial was conducted with two intervention groups (GT and WB) and a control group on ninety male drivers with metabolic syndrome. Random allocation was done using permuted block randomization. Before the intervention, parametric measurements (height, weight, systolic and diastolic blood pressure, and abdominal circumference) and blood tests (fasting blood sugar (FBS), triglycerides (TG), high-density lipoprotein (HDL)) were checked. The GT group consumed three cups of GT tea bags (1gr) daily, and the WB group received 3.5 grams of WB powder daily. After two months, measurements and tests were repeated.

Results: There were no significant differences in blood pressure among the groups ($p>0.05$). The GT group showed a decrease in weight, FBS, and TG, as well as an increase in HDL. The WB group also exhibited a decrease in FBS and TG and an increase in HDL. A significant increase was found in the HDL level in the GT group before and after the intervention ($p<0.05$).

Conclusion: Consumption of green tea has been effective in reducing the number of patients with metabolic syndrome, and consumption of green tea and wheat bran can positively increase HDL. Also, green tea can be effective in reducing weight, FBS, and TG in male drivers suffering from metabolic syndrome.

Keywords: Metabolic Syndrome, Clinical Trial, Green Tea, Wheat Bran

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INTRODUCTION

Metabolic Syndrome (MetS) is a multifactorial metabolic disorder characterized by hypertension, insulin resistance, dyslipidemia, and impaired glucose homeostasis [1]. MetS is a set of physiological and biochemical abnormalities that affects about 20-25% of adults in developing countries [2]. MetS and its components are the most important health problems in the 21st century and have a growing trend in developed and developing countries [3]. MetS is estimated to affect 27.46% to 33.7% of Iranian adults [4]. This syndrome directly increases atherosclerotic cardiovascular diseases [5]. Based on the ATP III definition, cardiovascular diseases are the first consequence of MetS [3].

MetS based on the ATP III and IDF definitions is shown in the following table.

Table 1. Definitions of metabolic syndrome

	Modified NCEP ATP III [27, 28, 29]	IDF [26]
Absolutely required	None	Central obesity (waist circumference) ≥ 94 cm
Criteria	Any three of the five criteria below	Obesity, plus two of the four criteria below
Obesity	Waist circumference: >40 inches (102 cm)	Central obesity already required
Hyperglycemia	Fasting glucose≥ 100 mg/dl or Rx*	Fasting glucose≥ 100 mg/dl or Rx
Plasma triglycerides	TG ≥150 mg/dl or Rx	TG ≥150 mg/dl or Rx
HDL cholesterol	<40 mg/dl or Rx	<40 mg/dl or Rx
Hypertension	>130 mmHg systolic or >85 mmHg diastolic or Rx	>130 mmHg systolic or >85 mmHg diastolic or Rx

NCEP: ATP III: National Cholesterol Education Program's Adult Treatment Panel III.

IDF: International Diabetes Federation.

* Rx, pharmacologic treatment.

Most people with MetS are elderly, inactive, obese, and have some degree of insulin resistance. The most important risk factors include genetic history, obesity, especially abdominal obesity, lifestyle, inactivity, stress, smoking, etc. [3].

Obesity is one of the factors that can cause MetS and is rapidly becoming a major threat in developing countries [6]. In the cohort study of 10,086 people aged 35 to 65 in western Iran, Najafi et al. (2018) reported that 26.7% of the study population was obese [7] Also, in a study of 2818 citizens of East Azerbaijan, Tabrizi et al. (2018) reported the prevalence of overweight, obesity, and abdominal obesity at 39.6%, 24%, and 76.4%, respectively [8].

Green tea (GT) (Camellia sinensis) is one of the oldest beverages in the world and also one of the most studied beverages, especially its role in the prevention of coronary heart disease. Clinical and epidemiological evidence shows that GT consumption is associated with an improved lipid profile and body weight loss [9, 10, 11]. Due to the presence of its catechins, GT is effective in breaking down fats into triglycerides, suppressing adipogenesis, increasing metabolism through thermogenesis, and excreting fecal lipids [12].

Wheat bran (WB) (residue of milled wheat grain[13]) is also associated with improved gastrointestinal health and reduced risk of colorectal cancer, cardiovascular disease, and metabolic disorders.

These benefits are likely mediated by a combination of mechanisms, including colonic fermentation of WB fiber, stool

bulking, and prevention of oxidative damage due to its antioxidant capacities [14]. Short-term consumption of breakfasts containing insoluble WB improves health, digestive feeling status, and intestinal function [15]. The distribution of WB components as measured by dry matter is 55-60% non-starch carbohydrates, 14-25% starch, 13-18% protein, 3-8% minerals, and 3-4% fat [16].

WB and GT are two accessible substances with different beneficial effects on body systems, which can be a suitable choice for research on metabolic syndrome. Today, considering the effects of MetS on the cardiovascular system, the high prevalence of this syndrome, and the importance of the health of drivers on the individual and society, as well as the few studies of the effects of consuming GT and WB to control it, researchers decided to investigate impacts of GT and WB in controlling this MetS in drivers based on the ATP III definition due to the nature of the driving job.

METHODS

The current study is a controlled clinical trial with two intervention groups of GT, WT, and one control group, implemented from March to November 2023. Of all the male professional drivers with MetS in Shahroud who had electronic health records at Kasra Specialized Center for Occupational Medicine, 90 patients in the age group of 40-50 years old due to the higher probability of onset of MetS in middle age, higher cooperation and the possibility of better education were selected. A total of 30 participants were allocated to each of the three groups (intervention group 1, intervention group 2, and control group), resulting in 90 participants in total. This sample size was chosen to ensure adequate statistical power (80%) to detect meaningful differences between groups, considering an alpha level of 0.05 and a medium effect size. The sample size for each group (considering three groups in total) was calculated using appropriate statistical software, such as G*Power.

Drivers who had 3 out of 5 indicators for MetS based on the ATP III definition were considered to have metabolic syndrome. The total number of drivers was 948, and based on this definition of metabolic syndrome, 392 drivers were affected. A total of 90 people from all patients were selected to participate in the study using convenience sampling. Inclusion criteria included age 40-50 years, good cooperation, and easy accessibility. Exclusion criteria also included drivers with a history of gastrointestinal disease, a history of gastrointestinal liver disease, being treated with corticosteroid drugs (which causes excess weight due to peripheral edema), and unwillingness to continue participation in the study.

Then, the random allocation was carried out using permuted block randomization, and the participants were entered into two intervention groups; GT and WB (n=30, in each group) and one control group (n=30).

Before the study, written informed consent was obtained from participants. The study objectives and methodology were clarified for each participant, and they were assured that if they requested, they would be accepted to withdraw from the research project. After explaining the contents of the informed consent and obtaining it, the active participation of the participants during the study was requested. All participants were assured that all the information provided by them would be kept confidential by

the researcher. The participants were also reminded that participation in the study is completely voluntary and they are allowed to decide whether to continue or stop cooperating with the researcher at any stage of the study.

To participate in the study, the participants completed the demographic information questionnaire. Before the intervention, parametric measurements (height, weight, systolic, diastolic blood pressure, and abdominal circumference) and blood tests (FBS, TG, HDL) were checked by two nurses.

A calibrated digital weighing scale (10-gram precision) and a wall-mounted height rod were used. Also, blood pressure measurements for all participants were conducted on the right arm using a validated oscillometric sphygmomanometer (Brisk Model PG-800B16, Germany). Each participant's blood pressure was recorded at least twice, with a minimum five-minute interval between measurements, while seated and after a rest period of at least five minutes. To ensure accurate readings, the procedure followed the American Heart Association guidelines, which recommend that participants remain seated and relaxed for at least five minutes before measurement, avoid smoking, coffee, or tea consumption, use a cuff that fits the arm circumference properly, and refrain from speaking during the measurement process. The tests were performed using the microplate ELISA reader and the kits of Parsazmun company and with the specificity, and sensitivity values specified in the table below.

Table 2. Specifications of blood tests and laboratory kits

Test	Unit	Sensitivity	Normal range	company	Year	Method
HDL-C	mg/dL	1 mg/dL	≥35 mg/dL	Parsazmun kit	2023	600 nm
TG	mg/dL	1 mg/dL	<200 mg/dL	Parsazmun kit	2023	546 nm
FBS	mg/dL	5 mg/dL	70-115 mg/dL	Parsazmun kit	2023	546 nm

The GT group received three cups of sugar-free or milk-free GT bags (1gr) daily [17], and the WB group also received 3.5 grams of WB powder [15] daily orally and according to the individual's taste in combination with yogurt or rice with hygienic packaging and standard logo. Daily consumption of 3 cups of water was suggested for the control group. The literature review showed no side effects for these two substances at these two suggested amounts. There were also two similar articles suggesting 3 cups and 4 cups of GT, which due to the prevention of possible harmful effects, the lower amount (3 cups) was chosen [17]. The control group received their previous dietary regimen but without both green tea and wheat bran, allowing for a clearer comparison of the specific effects of each intervention. Also, it was mentioned to all the participants that if any new dietary or treatment regimens started, it should be informed to the researchers.

To ensure participants' adherence to the study protocol or monitor probability digestive problems, they were called every two weeks.

After the completion of the present study (two months), tests and parametric measurements were repeated. Throughout the study period, all samples were monitored and followed up by the project executive. Then, the changes in the definition items of MetS based on ATP were measured again.

Before the study, the code of ethics was

received from Semnan University of Medical Sciences (IR.SEMUMS.REC.1398.274) and the present research project was registered in the Iranian Registry of Clinical Trials with the code IRCT20200217046524N1. Then permission to conduct the study was obtained from Semnan University of Medical Sciences. Finally, the collected data were analyzed using descriptive statistics (mean, standard deviation) and inferential statistical tests (correlation, t-student, ANOVA, and regression) in SPSS ver. 23. Values of $p < 0.05$ were considered statistically significant.

RESULTS

There were 25 individuals in the GT group, 23 in the WB group, and 26 in the control group. Dropout reasons were participants' withdrawal and digestive problems during the study. The mean ± SD age of each group was 49.04 ±7.62, 48.52 ± 7.72, and 47.26 ± 8.36, respectively, and the overall age range was 48.25 ± 7.85 years.

Initially, all the participants in all three groups had metabolic syndrome, but after the intervention, this syndrome was not reported in 7 cases from the GT group and 3 from the WB group based on the ATP III definition, and this reduction in the GT group was statistically significant ($p<0.05$).

The mean ± SD of metabolic syndrome variables before and after the intervention in all groups is shown in Table 3.

Table 3. Mean ±SD of Metabolic syndrome variables before and after the intervention in three groups

Variable	Group	Mean ±SD	
		Before the intervention	After the intervention
Systolic blood pressure (mmHg)	Green tea	131.64±10.72	129.20±10.91
	Wheat bran	135.34±11.89	136.78±16.56
	Control	138.42±16.68	133.84±16.31
Diastolic blood pressure (mmHg)	Green tea	82.68±7.56	80.60±7.68
	Wheat bran	81.17±9.06	85.17±12.61
	Control	84.19±10.29	83.50±7.42
FBS (mg/dL)	Green tea	113.20±41.01	116.28±42.64
	Wheat bran	118.56±40.56	116.56±39.13
	Control	117.38±42.51	116.03±37.04
TG (mg/dL)	Green tea	243.60±69.43	233.24±122.16
	Wheat bran	237.04±108.78	204.30±62.00
	Control	219.38±66.36	199.46±63.75
HDL (mg/dL)	Green tea	35.84±2.85	37.84±5.01
	Wheat bran	36.82±2.05	38.13±2.78
	Control	36.00±2.48	37.11±3.43
Abdominal circumference (cm)	Green tea	105.08±11.20	105.24±9.72
	Wheat bran	103.73±10.01	101.82±10.34
	Control	104.26±12.13	102.50±12.42

It was found that there was no significant difference between the interventions in terms of their effectiveness on the Systolic and Diastolic blood pressure, FBS, TG, HDL, and abdominal circumference of the participants in all three groups (p>0.05) (Table 4).

Table 4. Comparison of mean variables (after the interventions) across three groups

Variable		Sum of Squares	df	Mean Square	F	p-value
Systolic blood pressure (mmHg)	Between Groups	706.05	2	353.02	1.61	0.20
	Within Groups	15555.29	71	219.08		
	Total	16261.35	73			
Diastolic blood pressure (mmHg)	Between Groups	259.07	2	129.53	1.46	0.23
	Within Groups	6297.80	71	88.70		
	Total	6556.87	73			
FBS (mg/dL)	Between Groups	3.38	2	1.69	0.01	0.99
	Within Groups	111653.65	71	1572.58		
	Total	111657.04	73			
TG (mg/dL)	Between Groups	16717.51	2	8358.75	1.09	0.34
	Within Groups	544421.89	71	7667.91		
	Total	561139.40	73			
HDL (mg/dL)	Between Groups	13.59	2	6.79	0.45	0.63
	Within Groups	1068.62	71	15.05		
	Total	1082.21	73			
Abdominal circumference (cm)	Between Groups	160.17	2	80.08	0.67	0.51
	Within Groups	8480.36	71	119.44		
	Total	8640.54	73			

The comparisons of variables in the green tea group before and after the interventions are shown in the table below. The results revealed significant changes in the HDL levels of the participants in the GT group before and after the intervention (p<0.05).

Table 5. Comparison of variables in the green tea group after vs before the intervention

Paired variables	Paired Differences					t	df	p-value
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
HDL (mg/dL)	2.00	4.28	0.85	0.23	3.76	2.33	24	0.02
Diastolic blood pressure (mmHg)	-2.08	10.02	2.00	-6.21	2.05	-1.03	24	0.31
Systolic blood pressure (mmHg)	-2.44	10.54	2.10	-6.79	1.91	-1.15	24	0.25
FBS (mg/dL)	3.08	41.93	8.38	-14.22	20.38	0.36	24	0.71
TG (mg/dL)	-10.36	103.23	20.64	-52.97	32.25	-0.50	24	0.62
Abdominal circumference (cm)	0.16	5.30	1.06	-2.02	2.34	0.15	24	0.88

Also, the comparisons of variables in the wheat bran group before and after the interventions are shown in the table below. The results revealed no significant changes (p>0.05).

Table 6. Comparison of variables in the wheat bran group before and after the intervention

Paired variables	Paired Differences					t	df	p-value
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
HDL (mg/dL)	1.30	3.21	0.66	-0.08	2.69	1.94	22	0.06
Diastolic blood pressure (mmHg)	4.00	12.42	2.59	-1.37	9.37	1.54	22	0.13
Systolic blood pressure (mmHg)	1.43	14.89	3.10	-5.00	7.87	0.46	22	0.64
FBS (mg/dL)	-2.00	28.30	5.90	-14.24	10.24	-0.33	22	0.73
TG (mg/dL)	-32.73	85.79	17.88	-69.83	4.36	-1.83	22	0.08
Abdominal circumference (cm)	-1.91	5.17	1.07	-4.15	0.32	-1.77	22	0.09

Based on the regression analysis, HDL level Changes have a significant effect on being affected by Metabolic Syndrome (β=0.33, p<0.05).

Table 7. Relationship between changes in Metabolic Syndrome variables and post-intervention Metabolic Syndrome

Variable	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	β		
Systolic blood pressure.Changes	-0.006	0.003	-0.23	-1.85	0.06
Diastolic blood pressure.Changes	-0.003	0.004	-0.09	-0.78	0.43
FBS.Changes	<0.001	0.001	0.03	0.36	0.72
TG.Changes	-0.001	0.000	-0.21	-1.93	0.05
Abdominal.circumference.Changes	0.01	0.008	0.13	1.24	0.21
HDL.Changes	0.02	0.009	0.33	3.18	<0.01

DISCUSSION

There was no significant difference between WB and GT interventions in terms of their effect on the systolic and diastolic blood pressure of the participants in all three groups. Also, in a randomized controlled trial (RCT) by Rasmus Fuglsang-Nielsen et al. (2020), it was found that WB dietary fiber did not affect 24-hour blood pressure (BP) compared to low dietary fiber [18], which may require higher WB level or a longer intervention.

A decrease in FBS and TG and an increase in HDL were observed in the GT and WB groups. In this regard, Li et al. (2023) performed a systematic review and meta-analysis of randomized controlled trials regarding the effect of green tea on the lipid profile of obese women. It was concluded that GT reduces the concentration of LDL-C and total cholesterol. The decrease in TG level was significant especially in overweight patients with hypertriglyceridemia at baseline beginning. Besides, a significant increase in HDL-C was observed in obese subjects following GT consumption [19]. In a review study by Budhwar et al. (2020), it was stated that wheat bran and rice can be used to control chronic diseases, especially diabetes [20].

A reduction in body weight was observed in the GT group with metabolic syndrome. Similarly, a series of RCTs on GT (4 cups/day)

and GTE (2 capsules/day) drinks for 8 weeks in 35 obese subjects with MetS, serum plasma amyloid alpha (an independent risk factor for cardiovascular diseases), BW, BMI, and lipid peroxidation were significantly reduced [21, 22, 23]. In another interventional study, Sanger et al. concluded that a 60-day consumption of three cups of GT (as 1-gram bags) reduced weight, BMI, and waist circumference in 45 elderly people with metabolic syndrome. However, it did not change their lipid profile and glycemia [17].

Overall, GT had a significant effect on the reduction of people with metabolic syndrome, and it was also effective on four variables of metabolic syndrome, including body weight, FBS, TG, and HDL, which can indicate a favorable effect on these people. Similarly, in an epidemiological study of 15,568 Korean population aged 19–65, Kim et al. (2016) showed that regular GT consumption was inversely associated with metabolic syndrome [24]. Also, in another RCT of 70 women with a confirmed MetS, Mortazavi et al. (2019) found a significant improvement in anthropometric indices, i.e., BP, BG, and lipid profile after drinking 200 ml of GT 3 times a day for eight weeks [25].

Study Strengths

The present study is a clinical trial on participants with Metabolic syndrome which is a common problem. Also, two intervention groups consumed wheat bran and green tea which are two accessible substances. The objective, inclusion, and exclusion criteria were clearly stated. The authors stated that there was no conflict of interest.

Study limitations

During the implementation phase, green tea and wheat bran produce some digestive problems, leading to the participants dropping out. Also, the potential effects of concomitant medications and comorbidities cannot be excluded. In addition, blood pressure was measured in an occupational medicine clinic, where anxiety could have led to an increase in the readings.

CONCLUSION

Consumption of green tea has effectively reduced the number of patients with metabolic syndrome, and consumption of green tea and wheat bran can positively increase HDL. Also, green tea can be effective in reducing weight, FBS, and TG in male drivers suffering from metabolic syndrome. Considering their impact on HDL and some variables of metabolic syndrome, green tea can replace black tea as a drink during the day, especially in these groups, and wheat bran can also be added to their diet, which of course requires more information about MetS and to make changes in lifestyle and benefit from the beneficial effects of green tea and wheat bran on the cardiovascular system.

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Data availability statement

The datasets generated during and analyzed during the current study are available from the corresponding author upon reasonable request.

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ORIGINAL ARTICLE

Medical students' awareness and infodemic management capacity: A descriptive study from Türkiye

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Abstract

Objective: The aim of the study is to determine the awareness and infodemic management capacity of medical students at three different medical faculties in Türkiye.

Method: Conducted as a descriptive study, an online survey via Google Forms® was distributed to students from three medical faculties throughout 2023-2024 academic year. The survey aimed to evaluate students' knowledge, attitudes, and perceived readiness concerning infodemic management.

Results: The participants were predominantly female (58.2%) with a mean age of 21.2 years, and all were single. Notably, 67.9% of the students had not previously heard of infodemic. However, a significant majority recognized the infodemic as a global threat (92.5%), beyond Coronavirus Disease-2019 (99.3%), with negative health impacts (93.3%), including fatalities (70.9%). Despite this, only 55.9% believed that infodemics are preventable. Importantly, 94.8% acknowledged the role of doctors in managing infodemics.

Conclusion: The study highlights a gap in the medical curriculum regarding infodemic management training, as transparency and the importance of managing infodemics are not fully appreciated by all students. These findings suggest the necessity of integrating infodemic management training into medical education to better equip future healthcare professionals. This research adds to the limited scientific literature on infodemic management and underscores the need for enhanced proficiency among medical students in this emerging field.

Keywords: Infodemic, Education, Medical, Students, Medical, Türkiye

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INTRODUCTION

An infodemic is defined as an abundance of information with a wide range of manifestations, such as misinformation, disinformation, rumor, information voids, and conspiracy theory, that prevents individuals from turning to the right health behaviors in times of crisis, such as outbreaks, disasters, etc. Due to infodemics, individuals are unable to adopt the correct behaviors and are therefore negatively affected.[1,2,3]

The onset of the Coronavirus Disease-2019 (COVID-19) pandemic in early 2020 starkly illuminated the global scale and profound impact of infodemics. As the virus rapidly spread across continents, so too did a deluge of misinformation, disinformation and conspiracy theories, complicating public understanding and response efforts.[3] Director-General of the World Health Organization (WHO) highlighted the criticality of addressing this infodemic alongside the pandemic itself, emphasizing the need for a cohesive global strategy to counteract the rampant dissemination of false and misleading information.[4]

Infodemic occurs at mainly four different levels including science, policy and practice, news media, and social media according to Eyesenbach's "*the wedding cake model*"[5]. Information is generated and flows withing these four levels. Although all levels have the potential to produce infodemic, the largest segment of the model "social media" represents the vast amount in the model.[5]

The possible consequences of an infodemic include the misunderstanding of health information, a tendency towards risk-taking behavior, and increased anxiety, stress, and depression. At both individual and societal levels, this can lead to distrust in health authorities, science, experts, public health professionals, and public institutions. Additionally, it can result in longer and more difficult crisis management, hate speech, social segregation, labeling, and stigmatization.[2,6,7]

Infodemics affect communities and health systems, as well as individuals. Therefore, infodemic management should be done at the right time and with the right methods. Infodemic management (IM) is the systematic use of risk (and evidence-based) analysis and approaches to reduce the adverse effects of infodemic on health behaviors during health emergencies. Infodemic management involves four main actions: listening to community concerns and questions, improving understanding of risks and recommendations from health professionals, building resilience against misinformation, and engaging and empowering communities for positive action.[1,2] This capacity needs to be developed among relevant professionals. Health professionals are among the professionals who need capacity building on IM. However, there are gaps between healthcare professionals' basic knowledge of infodemic and their capacity in IM, and therefore, it would be appropriate to address these gaps. Among health professionals, physicians are particularly important as a source of accurate information for both individuals and society.[8] They have a critical role in communication and building trust.[9] Such missions and roles should be given to physicians from the very beginning, as they start medical education. Research on the issue might be helpful to understand and develop the competencies of future healthcare professionals in dealing with infodemic scenarios effectively.

Based on all these background information, the aim of this study is determining the awareness and IM capacity of the students studying at three different medical faculties located in Ankara-Türkiye.

METHOD

Participants

Participants of the study were medical students from three faculties in Ankara, Türkiye. These faculties were selected based on their offering of both Turkish and English programs, catering to a diverse student population including international enrollees. Total students in three faculties were 3912 [(2938 in HU University (H), 235 in TOBB-ETU University (TE), 739 in YIU University (YIU)]. Despite multiple reminders, a total of 134 students participated in (YIU)). the study across the three faculties.

Data collection and the questionnaire

In this descriptive study, an online survey using Google Forms® was used. The questionnaire was developed by the research team in five sections. Section I included 4 multiple choice questions about faculty and phase information. Section II included 5 multiple choice questions about socio-demographic characteristics. Section III included 6 multiple choice and open-ended questions about health/disease profiles. Section IV included 3 questions about awareness on infodemic and IM capacity. To understand the awareness on the term "infodemics", participants were asked if they know the term or not. After this question, definition of the term "infodemic" was given in the questionnaire. The students were not allowed to move forward without reading the definition in the questionnaire. The following questions included views of the students on infodemic-related statements and their routines on selected IM competencies. Five-level Likert questions starting from "completely agree" to "completely disagree" was used. Ten level self-assessment questions were used to understand the students' self-assessment IM capacity and the importance of medical education in improving IM capacity (from 1 to 10; 1 worst and 10 best). Section V included 3 questions defining the students' motivation on contributing the IM studies at the faculties. To enhance data standardization, the questionnaire underwent pilot testing among a small group of students to refine question clarity and relevance.

The questionnaire was administered to students between the 2023 and 2024 academic years.

Statistical analysis

Data analysis was performed using SPSS version 23.0. Frequency distributions are displayed using the frequency tables.

Ethics and permissions

Ethical approval for the study was obtained from the relevant ethical board at each of the three universities involved in this study. Additionally, official permissions from the faculty administrations were secured prior to distributing the survey to ensure compliance with institutional guidelines and regulations regarding research involving human subjects.

RESULTS

The majority of the students were females (n = 78, 58.2%); all were single (n = 134, 100%). The mean age of the students was 21.2 years (SD = 2.0). Half of the participants stayed in dormitories (n = 67, 50.0%) (Table 1).

Table 1. Socio-demographic features of the students

Feature	n	%
Age (year) (n=132)		
18-24	123	93.2
25 and over	9	6.8
Mean (SD)	21.2 (2.0)	
Median	21	
Gender (n=134)		
Male	56	41.8
Female	78	58.2
Marital status (n=134)		
Not married	134	100.0
Live in (n=134)		
Dormitory	67	50.0
House	67	50.0

In Table 2, the health and disease profiles of the students are presented. The majority of the students perceived their health status as "healthy" (n = 116, 86.5%). Thirty-eight students had a self-reported diagnosed disease (28.4%), and twenty-one students used medicine prescribed by a doctor (16.5%). Most of the students stated that they had no diagnosed COVID-19 history (60.4%). Seven students did not receive COVID-19 vaccines (5.2%).

Table 2. Self-perceived health status and medical history of participating students (n=134).

Feature	n	%
Health status		
Healthy	116	86.5
Do not have an idea	13	9.7
Unhealthy	5	3.8
Disease diagnosed by doctor		
No	96	71.6
Yes	38	28.4
Use medicine prescribed by a doctor (n=133)*		
No	112	83.5
Yes	21	16.5
Diagnosed COVID-19 disease history (self-reported)		
No	81	60.4
Yes	53	39.6
COVID-19 vaccination		
No	7	5.2
Yes	127	94.8

*One student used medicine without a doctor's prescription.

In Table 3, students' awareness on the term "infodemic" is presented. Most of the students stated that they had heard "infodemic" for the first time (n=91, 67.9%).

Table 3. Awareness of the term "infodemic" among participating students (n=134)

Awareness of the term "infodemic"	n	%
Did not hear the term before	91	67.9
Know the term	43	32.1
Total	**134**	**100.0**

In Table 4, the students' views on a number of infodemic-related statements are presented. Before collecting students' views, the definition of "infodemic" was provided to them.

The majority of the students agreed that "infodemic is a global threat (92.5%)", "infodemic is a national threat (87.3%)", "infodemic is not limited to COVID-19 (99.3%)", "infodemic is not limited to health consequences (98.5%)", "people have been affected by the negative health consequences of infodemic (93.3%)", "people have died because of infodemic (70.9%)", "infodemic is preventable (55.9%)", transparency is essential for infodemic management (88.8%)", "health workers have roles in infodemic management (94.8%)", "doctors have roles in infodemic management (94.8%)", "teachers have roles in infodemic management (94.8%)", and "journalists have roles in infodemic management (97.1%)". Students majorly disagreed that "infodemic is only experienced online (92.5%)", and "infodemic does not affect trust (91.0%).

Table 4. Views of the students on infodemic-related statements (%)

Statement	Strongly agree	Agree	Undecided	Do not agree	Strongly disagree
Infodemic is a global threat.	60.4	32.1	6.0	0.7	0.7
Infodemic is a national threat.	56.0	31.3	9.7	2.2	0.7
Infodemic is only experienced online.	2.2	2.2	3.0	52.2	40.3
Infodemic is not limited to COVID-19.	73.9	25.4	0.7	-	-
Infodemic is not limited to health consequences.	69.4	29.1	0.7	0.7	-
People have been affected by the negative health consequences of infodemic.	56.7	36.6	4.5	0.7	1.5
People have died because of infodemic.	40.3	30.6	25.4	3.0	0.7
Infodemic does not affect trust.	1.5	1.5	6.0	38.8	52.2
Infodemic is preventable.	14.9	41.0	28.4	14.2	1.5
Transparency is essential for IM.	42.5	46.3	6.7	3.0	1.5
Health workers have roles in IM.	47.8	47.0	5.2	-	-
Doctors have roles in IM.	47.8	47.0	4.5	0.7	-
Teachers have roles IM.	47.8	47.0	3.7	1.5	-
Journalists have roles in IM.	57.5	39.6	3.0	-	-

In Table 5, routines of the students on selected IM competencies are presented. Definition of IM is given to the students before taking their routines.

The majority of the students agreed with the personal experiences as "I confirm the health-related information I access through online (digital) media from the scientific literature (79.8%)", "I verify the health-related information I access through physical environments from the scientific literature (79.9%)", "I verify the health-related information I access through online (digital) media from scientific literature before sharing it with others (78.4%)", "I verify the health-related information I access through physical media from scientific literature before sharing it with others (77.7%)", "I prefer to use information on digital platforms with .edu extension (71.7%)", "websites of well-established international organizations such as the World Health Organization are among the information sources I use to be informed about health-related issues (78.2%)", "the website of the Ministry of Health is a source of information that I use to update my knowledge on health-related issues (57.4%)", "I use the websites of health professional organizations to update my knowledge on health-related issues (65.7%)". Almost half of the students could not decide on using information on digital platforms with .com extension (47.8%). Students largely disagreed on the given experiences; "the extensions of digital platforms do not affect my intention to read the content (53.8%)", and "the extensions of digital platforms do not affect my intention to share the content with others (53.7%)".

Table 5. Routines of the students on selected IM competencies (%)

Experience	Strongly agree	Agree	Undecided	Do not agree	Strongly disagree
I confirm the health-related information I access through online (digital) media from scientific literature.	24.6	55.2	11.9	7.5	0.7
I verify the health-related information I access through physical environments from scientific literature.	23.9	56.0	10.4	9.0	0.7
I verify the health-related information I access through online (digital) media from scientific literature before sharing it with others.	29.9	48.5	16.4	4.5	0.7
I verify the health-related information I access through physical media from scientific literature before sharing it with others.	29.9	47.8	15.7	6.0	0.7
I prefer to use information on digital platforms with .edu extension.	26.9	44.8	20.9	6.7	0.7
I prefer to use information on digital platforms with .com extension.	3.7	22.4	47.8	19.4	6.7
The extensions of digital platforms do not affect my intention to read the content.	8.2	23.1	14.9	46.3	7.5
The extensions of digital platforms do not affect my intention to share the content with others.	6.0	20.9	19.4	41.8	11.9
Websites of well-established international organizations such as the World Health Organization are among the information sources I use to be informed about health-related issues.	31.2	47.0	9.0	9.0	3.0
The website of the Ministry of Health is a source of information that I use to update my knowledge on health-related issues.	20.1	37.3	19.4	14.2	9.0
I use the websites of health professional organizations to update my knowledge on health-related issues.	15.7	50.0	17.9	10.4	6.0

Table 6 shows the students' self-assessment on IM capacity and the importance of medical education in improving IM capacity. Students' scores for the importance of medical education to improve IM capacity were higher than their scores given for their current IM capacity.

Table 6. Students' self-assessment of IM capacity and the importance of medical education in improving IM capacity (%)

Students' self-assessment	Score (1 worst and 10 best)									
	1	2	3	4	5	6	7	8	9	10
IM capacity	1.5	1.5	6.7	8.2	11.9	14.2	26.9	20.1	6.7	2.2
Mean (SD)	6.3 (1.9)									
Median	7									
Importance of medical education in improvement of IM capacity	0.7	1.5	0.7	0.7	6.0	2.2	14.9	23.9	20.9	28.4
Mean (SD)	8.2 (1.8)									
Median	8									

DISCUSSION

Medical students are expected to gain competencies to prevent and manage global health challenges.[10] They should react to protect individuals and communities in emerging and re-emerging crises, as well as their routine competencies. Although infodemics are an ongoing threat, their

burden peaks during times of crisis. The COVID-19 pandemic is a recent devastating example that the world has experienced. As medical professionals, including students, are among the most important and accurate information sources in the community, their IM capacity is expected to be improved.[11] In the same way, medical education is a good opportunity to improve IM capacity. Capacity development needs to be aware of the content. Nevertheless, students' awareness about infodemic is limited. In the research group, the majority of the students stated that they had heard of "infodemic" for the first time (n = 91, 67.9%). To fulfill this missed opportunity, faculties are recommended to integrate IM into their curricula. One of the faculties has already integrated the IM theme into its first-year curriculum in 2024 following the analysis of the data in this study.[12]

In the research questionnaire prepared for the students, after taking their response on their level of information about infodemics, the official "infodemic" definition of WHO[1] was given to them. Learning the definition of the term seems to help the students to make theory-based connections between the issues. For example, the majority of the students agreed that "infodemic is a global threat (92.5%)", "infodemic is a national threat (87.3%)", "infodemic is not limited to COVID-19 (99.3%)", "infodemic is not limited to health consequences (98.5%)", and "people have been affected by the negative health consequences of infodemics (93.3%)" (Table 4). The awareness of health professionals is thought to be helpful in taking relevant action in infodemic management.

Students agree that "transparency is essential for infodemic management (88.8%)". Transparency is among the requirements of IM.[13] Although the majority of the students thought similarly, there are students who do not agree with the importance of transparency for IM. In the same way, it is unfortunate that only 55.9% of the students believe in the preventable feature of infodemics. However, infodemic management strategies are built to prevent infodemics.[14]

Potential for the spread of infodemic through online and offline channels[16, 17] and health workers' crucial role in IM as the first point of contact in health systems[15] are confirmed by the students.

The participants of our research have gaps in using evidence-based scientific literature, selecting the correct information sources, sharing accurate information sources with others, etc. Medical education might be a good opportunity to meet and strengthen the students in this regard.

Our study has strengths and limitations. First, our results are thought to reflect the situation of medical students in a "new" study field, as there is limited scientific literature on the issue. Although participation numbers are limited, efforts to gather data from three different faculties have been important. The results of our study are expected to give faculties the opportunity to integrate IM activities into their curricula. There are limitations to our study. In the first place, the number of participants does not give us the opportunity to conduct detailed statistical analysis or generalize the results to university students. Secondly, the answers are self-reported by the students. Self-reported data on knowledge, attitudes, and behaviors might be influenced by recall or social desirability bias, potentially leading to overestimating

participants' capacities or the perceived importance attributed to medical education. Thirdly, students who responded might have had a particular interest or greater awareness of infodemic issues than non-respondents. Lastly, although pilot testing of the survey was conducted, the questionnaire was specifically developed for this research and may require further validation to confirm its reliability and generalizability across different contexts or populations.

CONCLUSION

Our study has emphasized the possible lacking points in IM among medical students. Medical education curriculum assessment from the IM perspective might give us the opportunity to think on the issue and plan further detailed studies to be prepared for the possible future crises in health.

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Ethical Statement: Ethical approval for the study was obtained from the relevant ethical board at each of the three universities involved in this study. Additionally, official permissions from the faculty administrations were secured prior to distributing the survey to ensure compliance with institutional guidelines and regulations regarding research involving human subjects.

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ORIGINAL ARTICLE

Feminization of poverty among the elderly: based on national data in Türkiye

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Abstract

Objective: The number and proportion of people aged 65 and older in the world is increasing. The impoverishment of elderly women in Türkiye is becoming more visible, particularly due to gender inequalities.

This study aims to examine the effect of gender on sociodemographic characteristics and poverty among individuals aged 65 and over in Türkiye.

Method: This descriptive study, which is a secondary analysis of the 2018 Türkiye Demographic and Health Survey data, includes 4,263 Turkish citizens aged 65 and older.

Results: Elderly women have a higher median age (M=71; F=72), are less likely to be married/living together (M=85.0%; F=48.2%), and more likely to live alone (M=6.6%; F=17.0%) compared to men ($p<0.05$). They also have lower educational levels (no education/less than primary: M=29.6%; F=68.3%) and a higher proportion have no monthly income (M=8.7%; F=42.1%). However, there was no difference in welfare level between elderly women and men.

Conclusion: The low educational attainment, income insecurity, and living alone of elderly women in Türkiye, associated with gender inequalities, indicate that the impoverishment of women in old age is a significant problem that is likely to increase in the future. Ensuring nationwide gender equality and developing social policies and services to prevent the impoverishment of elderly women are crucial.

Keywords: Elderly, Women, Poverty, Gender Inequity

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INTRODUCTION

There has been an increase in the number and proportion of elderly people in almost every country in the world [1]. It is projected that the proportion of people aged 65 and over, which was 10% in 2022, will reach 16% globally by 2050 [2]. According to the Address-Based Population Registration System Results announced by the Turkish Statistical Institute (TURKSTAT), the proportion of the population aged 65 and over in Türkiye increased from 7.1% in 2007 to 10.2% in 2023 [3].

Following the first presentation of the world's aging trend at the 1994 International Conference on Population and Development, the Vienna Plan was adopted at the first World Assembly held in 1982, focusing on welfare-oriented policies on aging. The key problem areas identified in this plan were employment and income security, health, housing, education, and social welfare[4]. Poverty can be defined as the lack of opportunity for people to meet their basic needs and the absence of a minimum standard of living they can enjoy. According to the United Nations Development Program (UNDP), poverty encompasses not only lack of income but also a range of factors that prevent people from living a life of human dignity, such as lack of education, lack of access to healthcare services, unemployment, social exclusion, political powerlessness, and various other social and economic constraints [5].

The first of the Sustainable Development Goals (SDGs) determined by the UNDP in 2015, "ending poverty in all its forms everywhere," aimed to overcome the biggest global challenge [6]. As the target year of 2030 approaches, a series of challenges faced globally, such as widespread inequality, political instability and conflict, climate crisis, the COVID-19 pandemic process, and the rising cost of living, are hindering the fight against poverty [6].

Türkiye's aging population and the accompanying demographic changes have also brought new problems. According to TURKSTAT data, in 2023, 44.5% of the elderly population was male and 55.5% was female[3]. Elderly women face various challenges in areas such as retirement, access to healthcare services, care, and family support [7]. Especially the loss of their economic independence makes them more vulnerable, making it difficult for elderly women to meet their basic needs such as food, housing, and healthcare services [8].

In our country, the late establishment of the social security system compared to other countries and the delay in ensuring its effectiveness have resulted in the income security of the elderly population not being provided, which has led to an increase in the poverty rate [9].

The effects of poverty in old age are multidimensional. During this period, the capacity to cope with problems due to higher morbidity, living alone, and lower income is reduced. Particularly due to the lack of income security and health insurance, difficulties in accessing health services may be experienced. Old age can lead to the impoverishment of individuals or the chronicity of existing poverty [10].

According to the 2023 TURKSTAT data, the poverty rate calculated based on 60% of the median equivalent household disposable income, as determined by the Income and Living Conditions Survey, is 30.7% in the

general population, 23.1% in the elderly population, 21.5% in elderly men, and 24.3% in elderly women [11].

Although poverty is addressed today with its multifaceted dimensions, it is difficult to clearly define its conceptual boundaries. The difficulties in defining and measuring poverty become more apparent when it comes to women's poverty. Women experience poverty differently from men in the context of gender norms. The unequal access of women to education, health services, and employment shows the importance of the gender perspective in understanding poverty [12].

Women's labor force participation rates in Türkiye have historically been low. Women either do not work at all or are employed as unpaid family workers in agriculture sector. With the migration from rural to urban areas in the last 40 years, women who could not find jobs in the formal sector in the cities due to their lack of qualifications have had to work under irregular and insecure conditions [13].

The concept of the "feminization of poverty" emerged in the late 1970s in the United States with the increase in the number of female household heads and gained prominence at the 1995 Beijing Women's Conference, becoming an important agenda item for international organizations [14,15]. This concept shows that women are poorer than men, but the reasons are complex. Women's poverty is related to gender inequalities, intra-household inequalities, economic crises, and structural adjustment policies [14].

In this study, it is aimed to examine the effect of gender on sociodemographic characteristics and poverty among the elderly in Türkiye by re-analyzing the data from the 2018 Türkiye Demographic and Health Survey (TDHS).

METHODS

This study is a secondary analysis of the 2018 TDHS which is a cross-sectional nationwide study primarily focused on maternal and child health in Türkiye. In the TDHS household survey, all variables related to individuals aged 65 and older included in the database have been incorporated into the study.

Participants

The study analyzed 4,263 individuals aged 65 and above who were part of the TDHS survey. The participants were Turkish citizens.

Measurements

The independent variables included in this study were age, marital status(never married, married or cohabiting, widowed, separated, and unknown), living alone(living alone or not living alone), birthplace(Türkiye and other countries), region of residence(west, south, central, north, and east), rural or urban residence, education level(no education/ less than primary, primary, secondary, high school and above, and unknown), receipt of a monthly income(receiving a monthly income or not receiving a monthly income), wealth index(richest, richer, middle, poorer, and poorest), type of home heating (modern and traditional heating methods), source of drinking water(improved and unimproved sources), and location of the toilet.

A wealth index score was assigned to each household based on the number and variety of durable consumer goods owned, as well as household characteristics such as source of drinking water, toilet facilities, and floor material [16]. The household scores were then assigned to household members, who were

ranked within the household population. Five equal wealth categories were created - richest, richer, middle, poorer, and poorest - with 20% of the population in each category [16].

Types of home heating were examined in two categories: modern and traditional heating methods (stoves). Central heating (natural gas, oil, coal), floor heating, natural gas, diesel/gas, electric heaters, and air conditioning were considered modern heating methods. The toilet was categorized as inside the dwelling and outside the dwelling.

The sources of drinking water were examined in two categories: improved and unimproved sources. Piped water, public tap, boreholes, protected well or spring, and bottled or delivered water were considered improved sources, while unprotected wells, unprotected spring, surface water, and other sources were categorized as unimproved.

Data Source

The 2018 TDHS is a nationally representative survey conducted by the Hacettepe University Institute of Population Studies (HIPS) as part of a global research Project [16]. This study is repeated every five years. The data, which focuses on maternal and child health, is used by the Ministry of Health and many other major public institutions for healthcare service planning and resource allocation. The TDHS is a national data that can provide a reliable analysis of the living conditions of the elderly population. A weighted, multi-stage, stratified cluster sampling method was used to determine the survey sample. Clusters were selected from each stratum as the primary sampling units, and the total number of clusters was found to be 754. In the second stage, 21 households were selected from each cluster using systematic random sampling, resulting in a total of 15,775 households. With a response rate of 79.2%, data was collected from 11,056 households and 38,628 individuals [16]. For the purpose of this study, the data of 4,263 individuals aged 65 and above who participated in the survey were analyzed.

Ethical and Official Considerations

The 2018 TDHS was reviewed and approved by the Hacettepe University Ethics Committee. A data usage request was made through the Hacettepe University website, and approval was received via email. All methods in the study were carried out in accordance with the relevant directives and regulations.

Data Analysis

The research data was evaluated using the SPSS 25.0 statistical software program. Descriptive findings for categorical variables are presented as frequency and percentage distributions, and for continuous variables as mean±standard deviation (min-max). To determine if there were differences between categorical variables, the Chi-Square Test was used. For the comparison of continuous data, normality analyses were first performed, and since the data did not conform to a normal distribution, group comparisons were carried out using the Mann-Whitney U Test. The type I error level (alpha) was set at 0.05.

RESULTS

The 2018 TDHS had a total of 37,897 participants. Among the 11,056 households included in the study, 4,263 (11.2%) individuals aged 65 and above were identified.

The mean age of the elderly population was 73.45 ± 7.19 (65-95), and 53.8% were female.

86.6% of the elderly had primary education or less, and 12.2% were living alone. Table-1 shows the sociodemographic characteristics of the participants.

Table 1. Sociodemographic Characteristics of the Participants

Sociodemographic Characteristics of the Participants		Total	
		n	%
Gender	Female	2,292	53.8
	Male	1,971	46.2
Marital Status	Never Married	29	0.7
	Married or Cohabiting	2,781	65.2
	Widowed	1,380	32.4
	Separated	19	0.4
	Unknown	1	0.02
Living Alone	Lives Alone	521	12.2
	Doesn't Live Alone	3,742	87.8
Birthplace	Türkiye	4,144	97.2
	Other Countries	119	2.8
Region of Residence	West	1,351	31.7
	South	503	11.8
	Central	868	20.4
	North	886	20.8
	East	655	15.4
Rural/Urban	Rural	1,932	45.3
	Urban	2,331	54.7
Education Level	No Education/Less than Primary	2,130	50.0
	Primary Graduate	1,561	36.6
	Secondary Graduate	335	7.9
	High School and Above	194	4.6
	Unknown	43	1.0
Receiving Monthly Income	Receives Monthly Income	3,128	73.4
	No Monthly Income	1,135	26.6
Wealth Index	Richest	398	9.3
	Richer	594	13.9
	Middle	786	18.4
	Poorer	942	22.1
	Poorest	1,543	36.2
Home Heating	Modern Heating Methods	1,736	40.7
	Traditional Heating Methods	2,527	59.3
Drinking Water Source	Improved Source	4,161	97.6
	Unimproved Source	102	2.4
Toilet	Inside the Dwelling	3,795	89.0
	Outside the Dwelling	461	10.8
	Unknown	7	0.2

The sociodemographic and housing characteristics of the elderly by gender are presented in Table 2. According to these results, the median age of elderly women was higher than that of men (M=71; F=72), a lower proportion of women were married

or cohabiting (M=85.0%; F=48.2%), a higher proportion of women lived alone (M=6.6%; F=17.0%), the education level was lower (No Education/Less than Primary rate M=29.6%; F=68.3%), and a higher proportion of women did not receive a monthly income (M=8.7%; F=42.1%).

Table 2. Sociodemographic and Housing Characteristics of the Elderly by Gender

		Women (N=2292)		Men (N=1971)		X^2 or Z	p
		n	(%)	n	(%)		
Age [Median (min-max)]		72	(65-95)	71	(65-95)	-2.090	**0.037**
Marital Status	Married or Cohabiting	1,105	(%48.2)	1,676	(%85.0)	632.824	**<0.001**
	Other (Widowed)	1,186	(%51.8)	295	(%15.0)		
Living Alone	Lives Alone	390	(%17.0)	131	(%6.6)	106.213	**<0.001**
	Doesn't Live Alone	1,902	(%83.0)	1,840	(%93.4)		
Birthplace	Türkiye	2,219	(%96.8)	1,925	(%97.7)	2.829	0.093
	Other Countries	73	(%3.2)	46	(%2.3)		
Region of Residence	West	731	(%31.9)	620	(%31.5)	5.316	0.256
	South	278	(%12.1)	225	(%11.4)		
	Central	449	(%20.4)	419	(%21.3)		
	North	497	(%21.7)	389	(%19.7)		
	East	337	(%14.7)	318	(%16.1)		
Rural/Urban	Rural	1,030	(%44.9)	902	(%45.8)	0.291	0.590
	Urban	1,262	(%55.1)	1,069	(%54.2)		
Education Level	No Education/Less than Primary	1,555	(%68.3)	575	(%29.6)	642.617	**<0.001**
	Primary Graduate	582	(%25.5)	979	(%50.4)		
	Secondary Graduate	91	(%4.0)	244	(%12.6)		
	High School and Above	50	(%2.2)	144	(%7.4)		
Receiving Monthly Income	Receives Monthly Income	1,328	(%57.9)	1,800	(%91.3)	604.531	**<0.001**
	No Monthly Income	964	(%42.1)	171	(%8.7)		
Wealth Index	Richest	209	(%9.1)	189	(%9.6)	1,877	0,758
	Richer	326	(%14.2)	268	(%13.6)		
	Middle	413	(%18,0)	373	(%18.9)		
	Poorer	499	(%21.8)	443	(%22.5)		
	Poorest	845	(%36.9)	698	(%35.4)		
Home Heating	Modern Heating Methods	936	(%40.8)	800	(%40.6)	0.027	0.869
	Traditional Heating Methods	1,356	(%59.2)	1,171	(%59.4)		
Drinking Water Source	Improved Source	2,237	(%97.6)	1,924	(%97.6)	0.001	0.974
	Unimproved Source	55	(%2.4)	47	(%2.4)		
Toilet	Inside the Dwelling	2,042	(%89.2)	1,753	(%89.1)	0.033	0.856
	Outside the Dwelling	246	(%10.8)	215	(%10.9)		

The percentage distribution of elderly women and men living alone by region is shown in Figure 1. It was found that a higher percentage of women lived alone compared to men in all regions of Türkiye (p<0.05).

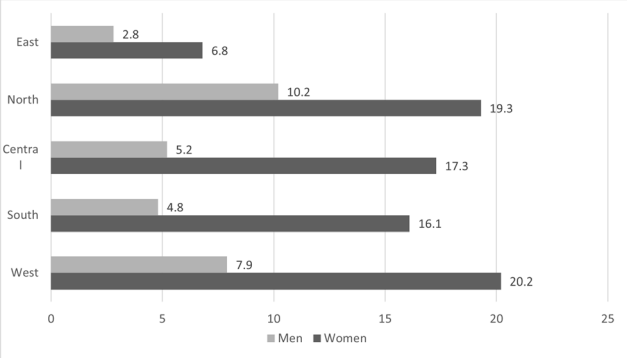

Figure 1. Distribution of Elderly Women and Men Living Alone by Region (%)

The percentage distribution of elderly women and men receiving monthly income by region is shown in Figure 2. It was found that a lower percentage of women received monthly income compared to men in all regions of Türkiye (p<0.05).

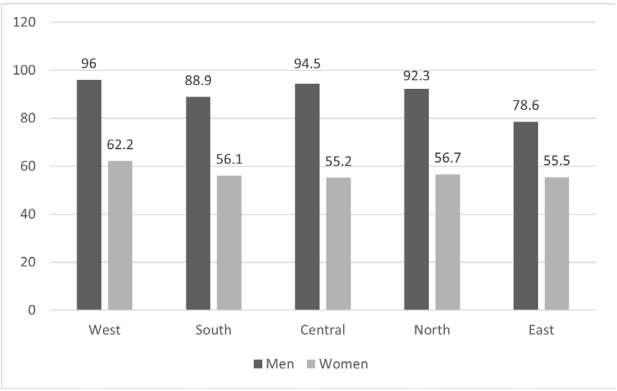

Figure 2. Distribution of Elderly Women and Men Receiving Monthly Income by Region (%)

In Türkiye, the percentage of men classified as poor and poorest according to the wealth index is 57.9%, while this rate for women is 58.6% (p=0.621). The percentage distribution of elderly women and men categorized as poor and poorest by region according to the wealth index is shown in Figure 3.

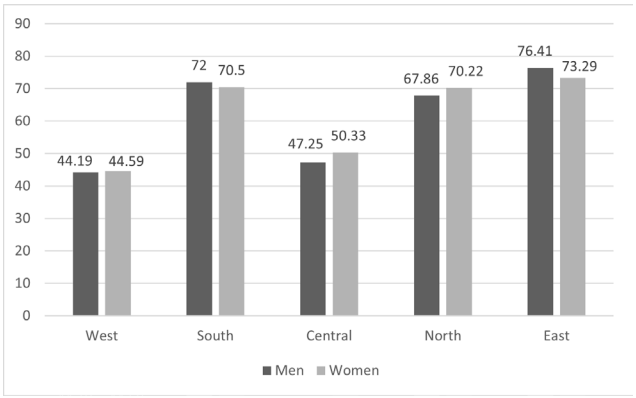

Figure 3. Distribution of the Percentages of Elderly Women and Men by Wealth Index: Poorer and Poorest by Region (%)

DISCUSSION

This study found that among the elderly in Türkiye, women had a higher age compared to men, lived alone more often, had a lower rate of marriage, had a higher rate of being uneducated, and had a lack of monthly income. According to TurkStat data, the life expectancy at birth is 77.5 years for the overall population, 74.8 years for men, and 80.3 years for women [3]. Since women have a 5.5-year longer life expectancy than men, it is expected that the average age of elderly women would be higher in our study.

According to the TDHS study, a significantly lower proportion of elderly women (48.2% married or cohabiting) were married/ cohabiting compared to elderly men (85.0% married or cohabiting). TurkStat 2023 data also shows that 1.4% of the elderly male population has never married, 83.7% are officially married, 3.9% are divorced, and 11.1% are widowed, while 2.8% of the elderly female population has never married, 46.4% are officially married, 4.4% are divorced, and 46.4% are widowed [3].

In this study, 42.1% of women had not a monthly income, while this rate was 8.7% for men. This situation is important in terms of

showing the extent of the income insecurity among elderly women. A study examining the relationship between gender inequalities in old age and marital status indicates that women who have lost their spouses or divorced, and lack regular income, are at an increased risk of poverty [8].

Historically, before the elderly period, women have consistently faced higher unemployment rates than men. The disparity in female and male unemployment is highest in the cultural pattern of Middle East and North Africa region[9]. In terms of economic participation and opportunities, Türkiye ranks 129th out of 146 countries indicating a significant gender gap[17]. In our country, looking at the labor force participation data by gender for November 2024, the participation rate for men is 67.4%, while for women it is 32.8% [18]. This situation places women at a greater disadvantage in terms of poverty during the elderly period.

Women and men experience poverty differently, and the process of poverty affects them in different ways. One of the distinguishing features of women's poverty is inequalities in the labor market. Parallel to the low participation in the labor force and the inability to benefit from educational opportunities, the condition of being a woman shaped by gender roles, being raised with the traditional female role model, and the lack of time for women to generate income bring about the situation. Discriminatory attitudes of the labor market towards women also increase women's poverty.

The United Nations Women report states that in 51% of countries, there is at least one restriction preventing women from doing the same jobs as men. Globally, women spend 2.5 times as many hours a day on unpaid care and domestic work as men, including 3.1 times in sub-Saharan Africa and 4.9 times in Northern Africa and Western Asia [19]. In Türkiye, the proportion of time spent on unpaid domestic and care work is 19.2% for women and 3.7 % for men [17].

The strategy to reduce women's poverty envisages focusing more on eliminating gender inequalities rather than just poverty [9].

In the study by Karadeniz and Öztepe in 2013 [13], it was emphasized that the inability of women to be involved in working life, the interruption of their working lives, and receiving less compensation in their retirement period; the fact that women have less access to education, land, and property brings economic inequalities; and the unpaid work of women in the agricultural sector, the obstacles faced by migrant women from rural to urban areas, and the low-paid, insecure jobs of women who have to work and have a low level of education can be the reasons for poverty in old age [13]. Similarly, in this study, the education level of elderly women was found to be lower. While 68.3% of women have not received education or have dropped out of primary school, this rate is 29.6% for men.

In the 2009 article by Gillen and Kim [20], the reasons for poverty among elderly women living in the USA were examined, and the emphasis was placed on the decrease in income sources, especially for widowed elderly women [20]. Elderly women with a low level of education receive monthly income at a lower rate and live alone or together at a lower rate. Elderly women with all these disadvantages are actually in a poorer situation.

Although the welfare level criterion used

in our study consists of a score based on the number and variety of many durable consumer goods owned, from television to cars, as well as housing characteristics such as the source of drinking water, toilet facilities, and floor material, the distinctiveness of the groups formed should be discussed. No statistically significant difference in distribution between genders was found in the five-class classification from the richest to the poorest. Since TDHS data was used in the study, some evaluations can be made based on the collected data. It is unknown whether the elderly have sufficient self-reliance under the social security umbrella, or whether the stated welfare level opportunities are provided within their own means or with the support of a spouse, children, etc.

The strength of the study is that the research was conducted using data from a nationwide, community-based survey.

The limitation is that the findings are based solely on the data collected in the TDHS. Since the TDHS focuses specifically on the health of women aged 15-49, the data related to the elderly in this study is quite limited. Various criteria can be used to determine impoverishment. In this study, poverty determination has been evaluated only in terms of having or not having a monthly income and wealth index. We do not know if there are other sources of income entering the household besides these two parameters. Women's spouses may have passed away and they may be indirectly receiving spousal income. Alternatively, they may be receiving financial support from their close circle. All these uncertainties may represent a limitation of the study.

CONCLUSION

As the population in Türkiye ages over the years and the life expectancy at birth is longer for women, elderly women have become more visible in society. The fact that elderly women have lower education levels, live alone at a higher rate, and have higher economic dependency puts them in a more vulnerable position. The impoverishment of elderly women in Türkiye has now become an important social problem, and the development of social policies and services for elderly women is of critical importance.

Policy recommendations based on these findings:

1. Education and Awareness Programs: Developing specialized programs to increase the education levels of girls/women can help enhance their economic independence.

2. Income Security: Social protection policies for elderly women can be developed such as regular minimum income and other benefits. Making the pension system more inclusive could play a critical role in preventing poverty.

3. Gender Equality: Ensuring gender equality in general will also improve the quality of life for elderly women. It is essential to implement policies that promote gender equality.

These recommendations can contribute to the combat against poverty for elderly women in Türkiye and help elevate their living standards. It is crucial for policymakers to consider these findings and develop strategies to alleviate the challenges faced by elderly women.

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Ethical Statement: This is a cross-sectional study that involves the secondary analysis of the 2018 Türkiye Demographic and Health Survey (TDHS) national data. The 2018 TDHS was reviewed and approved by the Hacettepe University Ethics Committee. Permission to use the TDHS data was obtained from HÜNEE. All methods in the study were carried out in accordance with the relevant directives and regulations.

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ORIGINAL ARTICLE

Knowledge, attitude and practice on nutrition and dietary habits among nursing students

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Abstract

Objective: This study aimed to assess the knowledge, attitudes, and practices regarding nutrition and dietary habits among nursing students.

Method: A quantitative cross-sectional survey was conducted between August 2023 and November 2023. The study included 180 nursing students from various academic levels. Data were collected using structured questionnaires and analyzed using descriptive and inferential statistics.

Results: The findings revealed that the overall knowledge level of the participants on nutrition was moderate, with a mean score of 3.152±0.297 on a five-point Likert scale. Attitudes towards nutrition varied, with distinct dietary patterns identified among participants. Principal component analysis revealed four dietary patterns, each associated with different food consumption habits. While some dietary patterns were associated with healthier attitudes, others showed mixed correlations. Dietary practices among nursing students indicated varying levels of adherence to healthy behaviours. For example, approximately half of the participants reported regular exercise, while less than half consumed breakfast daily. Additionally, only 46.1% of participants reported daily vegetable consumption, while 28.3% reported daily fruit consumption.

Conclusion: This study highlights the importance of targeted interventions to improve nutrition knowledge and promote healthier dietary behaviours among nursing students.

Keywords: Nursing Students, Nutrition Education, Diet

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INRODUCTION

Nutrition is a fundamental component of healthcare, influencing individuals' overall health and well-being. Adequate nutrition supports optimal growth and development, strengthens immune function, and reduces the risk of chronic diseases.[1] Conversely, poor dietary habits characterized by inadequate nutrient intake, excessive consumption of unhealthy foods, and erratic eating patterns contribute to the burden of malnutrition and diet-related NCDs globally. Ghana, like many sub-Saharan African countries, grapples with the double burden of malnutrition, with persisting issues of undernutrition coexisting with the rising prevalence of obesity and diet-related NCDs.[2] Nursing education plays a pivotal role in shaping the knowledge, attitudes, and practices of future nurses regarding nutrition, thereby influencing their ability to address nutritional needs effectively. Optimal nutrition can aid in the management and prevention of various health conditions, improve patient recovery and rehabilitation, and enhance quality of life.[3] Moreover, nutrition interventions have been shown to reduce healthcare costs and alleviate the strain on healthcare systems by preventing and managing diet-related chronic diseases.[4] Nurses are uniquely positioned to play a central role in promoting nutrition and healthy dietary habits among individuals, families, and communities.

In the context of nursing education, the knowledge, attitudes, and practices (KAP) regarding nutrition and dietary habits among nursing students play a pivotal role in shaping their competence as future healthcare professionals.[5] Moreover, nurses serve as advocates for nutrition-related policies and programs, working collaboratively with interdisciplinary teams to promote evidence-based nutrition practices and address systemic barriers to healthy eating.[6] Nutrition education equips nursing students with the knowledge, skills, and attitudes necessary to address the nutritional needs of diverse populations effectively. It encompasses a wide range of topics, including basic nutrition principles, dietary assessment techniques, nutritional interventions for various health conditions, and strategies for promoting behaviour change.[7] Within the curriculum of nursing programs, nutrition education plays a vital role in preparing students to integrate nutritional assessment, counselling, and intervention into their clinical practice.[8] However, the effectiveness of nutrition education efforts hinges on nursing students' KAP regarding nutrition and dietary habits. A conceptual framework is shown in Figure 1.

Understanding the nutrition-related KAP of nursing students at All Nations University in Koforidua, Ghana, is particularly relevant due to the country's unique health challenges and cultural context. Despite the importance of nutrition education in nursing, little is known about the knowledge, attitudes, and practices (KAP) regarding nutrition and dietary habits among nursing students in Ghana and especially, Koforidua. The extent of nutrition knowledge among nursing students remains unclear, raising concerns about their preparedness to provide effective nutritional counselling. This study aimed to address these gaps by assessing KAP regarding nutrition and dietary habits among nursing students, informing targeted interventions to promote healthier lifestyles.

METHOD

Study design

The study was a descriptive cross-sectional survey.

Study population and sample

The study involved university nursing students enrolled at the Nursing Department, All Nations University, situated in Koforidua, Ghana as participants. At the time of the study, the Nursing Department had a student population of 328 individuals. This diverse cohort comprised students from various educational backgrounds, including holders of West African Senior School Certificate (WASSC), certificate holders with designations such as Registered Nurse Assistant Clinical (RNAC), Registered Health Assistant Clinical (RHAC), and Registered Nurse Assistant Preventive (RNAP), as well as diploma holders recognized as Registered General Nurses (RGN). Notably, a significant proportion of the student body consisted of weekend students who concurrently worked in healthcare roles, serving either as registered general nurses or enrolled nurses.

The sample size (n) was determined to be 180, using Yamane's formula for calculating samples with a known population (328) as follows:

$n= N/1+(N \times e^2)=328/1+(328 \times 0.05^2)$

The calculation was based on a 95% confidence level and a 5% margin of error (e). To account for potential variations in knowledge, attitudes, and practices attributed to different stages of nursing education, the population was stratified based on academic year cohorts, including first year, second year, third year, and fourth year students. The final sample consisted 55% of each year group. A summary of the sampling procedure is demonstrated in Figure 2.

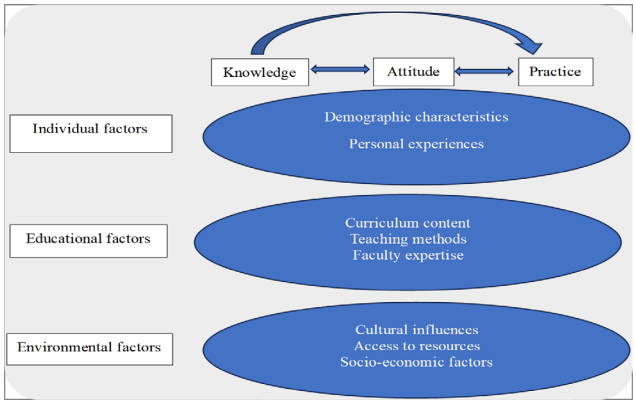

Figure 1. Conceptual framework on KAP on nutrition and dietary habits

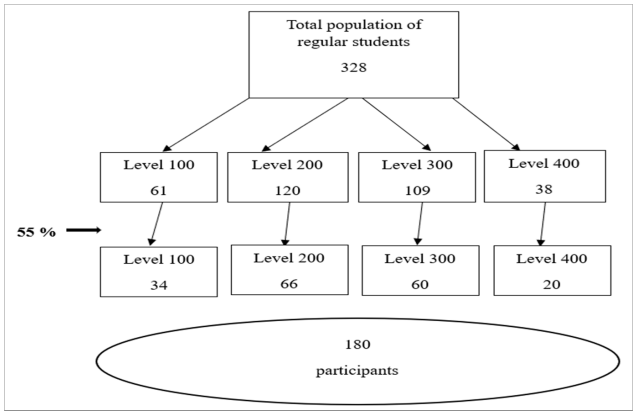

Figure 2. Sampling history and procedure

Data collection instrument

The data collection process involved a self-administered structured questionnaire. The first section collected biodata/socio-economic characteristics of the study participants such as age, gender, admission type, economic status, ailments from chronic diseases, and lifestyle (exercise, cigarette smoking and alcohol drinking). The second section was a food frequency questionnaire consisting of one closed question having fourteen sub questions with "Daily", "3-5 times Per week", "Weekly (1-2 times)", "Monthly", "Occasionally", and "Never", as alternative answers. The fourteen sub questions are

made of food groups and the section assessed frequency of intakes of the food groups. The third section of the questionnaire assessed the knowledge of respondents on twenty nutrition-related statements with a 5-point Likert scale – "Strongly disagree", "Disagree", "Neither or disagree", "Agree", and "Strongly agree".

The questionnaire was pretested among fifteen (15) student nurses in All Nations University. The second section (food frequency questionnaire) was pretested in a focus group discussion that involved seven (7) persons: five student nurses, the researcher, and a recorder. The draft questionnaire was reviewed by a nutritionist and a nurse.

The participants were assisted to take their anthropometric (weight and height) measurements. The weight and height were used to calculate body mass index (BMI) in kilograms per squared meter. The BMI measurements were used as health outcome measures since they have implications for nutrition.

Data Processing and Analysis

Data was analysed by the Statistical Package for Social Sciences (SPSS) version 20.0 software. Descriptive statistics, such as means, frequencies, and percentages, were used to summarize demographic characteristics and key variables related to KAP on nutrition and dietary habits among nursing students. Means and standard deviations for continuous variables were computed and compared by one-way ANOVA. Nutritional knowledge was analysed using a Likert scale where a ratio scale numbered, 1 – 5, was formulated. For true nutrition statements, "1 = Strongly disagree", "2 = Disagree", "3 = Neither or disagree", "4 = Agree", and "5= Strongly agree". For false nutrition statements, "1 = Strongly agree", "2 = Agree", "3 = Neither or disagree", "4 = Disagree", and "5= Strongly disagree". These coding allowed for the computation of the overall mean response as well as mean responses for the individual statements. The means derived from the Likert scale calculations were used to evaluate the level of knowledge on nutrition of the participants. For the purposes of this research, means from the Likert scale less/equal to 3 (≤ 3) was interpreted as "bad" nutrition knowledge, means 3.1 to 3.6 were interpreted as "satisfactory", means 3.6 to 4.0 were interpreted as "good", means 4.1 to 4.5 were interpreted as "very good", and means 4.6 to 5.0 were interpreted as "excellent". Means of 3.05 were approximated to 3.1 and means of 3.55 were approximated to 3.6, for easy interpretation. Chi-square (X2) was used to assess demographic data. Principal Component Analysis (PCA) was used to find the dietary patterns from the food frequency questionnaire by coded input variables, "1 = Daily", "2 = 3-5 times per week", "3 = Weekly (1-2 times)", "4 = Monthly", "5 = Occasionally", "6 = Never". Factor loadings were obtained for each of the foods in correlations with the components which were identified as dietary patterns. The foods within a pattern, with the highest factor loadings were used to characterize the dietary pattern. Pearson correlation (r) was used to determine the relationship between nutritional knowledge level and dietary patterns. The level of significance was at 0.05.

RESULTS

Demographic and other characteristics of participants by gender

The study involved a total of 180 participants, comprising 156 (86.9 %) females and 24 (13.1 %) males. The mean age of the participants was 29.78±5.51, mean BMI 27.35±5.30, mean SBP 113.69±8.63, and mean DBP 72.32±8.82. Table 1 presents the demographic data of participants.

More than half (111; 61.7 %) of the participants were certificate nurses (enrolled nurses). Most of the respondents (129; 71.7 %) got their nutrition information from either a health practitioner or nutrition lecturer.

Table 1. Demographic and other characteristics of participants by gender

Variable	Participants N=180	Female (n=156)		Male (n=24)		p-value
		n	%	n	%	
Educational level						0.756
Diploma Nursing	22	19	12.2	3	12.5	
Diploma/Degree other than Nursing	3	2	1.3	1	4.2	
HAC/NAC/NAP	111	99	63.5	12	50.0	
WASSCE	44	36	23.1	8	33.3	
Academic level						0.011*
Level 100	34	26	16.7	8	33.3	
Level 200	66	59	37.8	7	29.2	
Level 300	60	54	34.6	6	25.0	
Level 400	20	17	10.9	3	12.1	
Economic status (self-reported)						0.139
Bad	8	7	4.5	1	4.2	
Good	38	37	23.7	1	4.2	
Moderate	134	112	71.8	22	91.7	
Chronic disease in self						0.335
No	170	148	94.9	22	91.7	
Yes	10	8	5.1	2	8.3	
Regular exercise						0.349
No	90	81	51.9	9	37.5	
Yes	90	75	48.1	15	62.5	
Smoking						
No	180	156	100	24	100	
Yes	0	0	0.0	0	0.0	
Alcohol drinking						0.171
Ex-drinker	2	2	1.3	0	0.0	
No	172	150	96.2	22	91.7	
Yes	6	4	2.6	2	8.3	

Table 1. (continued). Demographic and other characteristics of participants by gender

Variable	Participants N=180	Female (n=156) n(%)		Male (n=24) n(%)		p-value
		n	%	n	%	
Nutrition knowledge source						0.024*
Blogs, internet forum, discussion	11	11	7.1	0	0.0	
Family and friends	23	20	12.8	3	12.5	
Nutritionist/nutrition tutor/ physician/nurse	129	111	71.2	18	75.0	
Press and news website	2	2	1.3	0	0.0	
Radio and television	6	3	1.9	3	12.5	
Social media e.g. Facebook	9	9	5.8	0	0.0	
Breakfast						0.578
Always	70	61	39.1	9	37.5	
Never	3	2	1.3	1	4.2	
Sometimes	107	93	59.6	14	58.3	
Meals usually taken per day						0.658
Four or more	9	8	5.1	1	4.2	
One	2	2	1.3	0	0.0	
Three	96	85	54.5	11	45.8	
Two	73	61	39.1	12	50.0	
Ever received professional diet advice due to health						0.637
No	111	98	62.8	13	54.2	
Yes	69	58	37.2	11	45.8	
What informs food choice						0.025*
Advertisement	7	5	3.2	2	8.3	
Excitement to eat	28	28	17.9	0	0.0	
Financial status	38	34	21.8	4	16.7	
Friends and family	9	5	3.2	4	16.7	
Nutrient content/Nutrition label	98	84	53.8	14	58.3	

N is total number of participants; n is the number of males or females in a category; percentages are in parentheses; *significant difference between variables at $p<0.05$

Knowledge on nutrition and dietary habits among nursing students

The overall knowledge of the participants on nutrition as estimated by the mean of the responses on the nutrition knowledge was 3.152±0.297. Sixty-eight participants (37.5 %) had score ≤3.0, ninety-two participants (51.3 %) had scores 3.1 to 3.5, nineteen participants (10.6 %) had scores 3.6 to 4.0, and only one participant (0.6 %) had scores between 4.1 to 4.5. None of the participants had scores between 4.6 to 5.0. The levels of nutrition knowledge on the various test items are presented in Table 2.

Table 2. Knowledge level of nutrition and dietary habits among participants

S/No	Nutrition knowledge test items	Mean response
	Fat is always bad for your health; you should therefore avoid it as much as possible	3.14
	If you have eaten high-fat foods, you can reverse the effects by eating apples	3.31
	A balanced diet implies eating all foods in the same amounts	3.33
	For a healthy nutrition, dairy products should be consumed in the same amounts as fruit and vegetables	3.19
	Brown sugar is much healthier than white sugar	2.69
	To eat healthily, you should eat less fat. Whether you also eat more fruit and vegetables does not matter	3.38
	Oily fish (salmon, mackerel) contain healthier fats than red meat	3.55
	Meat sausage contains more salt than cream cheese	2.99
	Skimmed milk (low fat) contains fewer minerals than full-fat milk	3.00
	The health benefit of fruit and vegetables lies alone in the supply of vitamins and minerals	2.86
	Dairy products contain more saturated fats (fatty acids) than vegetable oils	3.32
	If cream is whipped (to solid) it contains less calories than in its liquid form	3.13
	Fat contains fewer calories than the same amount of fiber	3.26
	The same amount of sugar and fat contains equally many calories	3.11
	Malnutrition can be reversed at any point with appropriate diets	2.26
	When a pregnant woman is undernourished, she is at risk of having a low-birth-weight baby	3.84
	When taken during meals, Vitamin-C-rich foods such as fresh citrus fruits, help the body absorb and use iron.	3.74
	Palm oil does not contain unsaturated fats	3.01
	Whole-grain bread has a higher vitamin and mineral content	3.30
	Plantain is a major source of iron	2.63

For the statements, “When a pregnant woman is undernourished, she is at risk of having a low-birth-weight baby” and “When taken during meals, Vitamin-C-rich foods such as fresh citrus fruits, help the body absorb and use iron”, participants had good knowledge level with scores of 3.84 and 3.74 respectively. Bad level of knowledge was recorded for the statements, “The health benefit of fruit and vegetables lies alone in the supply of vitamins and minerals” (2.86), “Brown sugar is much healthier than white sugar” (2.69), “Plantain is a major source of iron” (2.63), and “Malnutrition can be reversed at any point with appropriate diets” (2.26). Table 3 illustrates the prevalence of participants’ knowledge according to their academic level.

Attitudes on nutrition and dietary habits among Nursing students

Four components were derived from the principal component analysis with Eigenvalues of 4.285, 1.910, 1.302, and 1.084 for Pattern I, Pattern II, Pattern III, and Pattern IV respectively (Table 3). The percentage of variance for the identified patterns were respectively 30.608 %, 13.645 %, 9.300 %, and 7.743 %.

Table 3. Factor loadings of extracted components

Foods	Dietary patterns			
	I	II	III	IV
Cereals & Grains and their products	0.374	0.166	0.481	0.072
Starchy Roots and Tubers and their products	0.389	0.304	-0.305	0.587
Legumes and Legume Products	0.508	0.421	-0.381	0.168
Nuts & Seeds and their products	0.642	0.369	-0.352	-0.066
Meat, Eggs & Game and their products	0.587	-0.025	0.404	0.141
Sea Foods/Freshwater fishes and their products	0.482	0.309	0.258	0.139
Milk and Milk Products	0.694	-0.240	0.196	-0.120
Fats and Oils (e.g. cooking oils, fried foods)	0.526	-0.382	0.384	0.335
Processed Foods and fast foods	0.625	-0.416	-0.128	0.174
Salty Foods (e.g. momoni, koobi)	0.619	-0.295	-0.315	0.076
Fruits (e.g. orange, pawpaw. Mango)	0.591	0.527	-0.045	-0.301
Vegetables (e.g. garden eggs, leafy vegetables)	0.538	0.420	0.315	-0.347
Beverages and Non-Sugar Alcohols (e.g. tea, coffee, cocoa beverages)	0.510	-0.288	-0.206	-0.525
Sugary drinks	0.562	-0.615	-0.184	-0.115

Values are factor loadings or correlations of each food with components identified. A positive factor loading indicates the food sample is positively associated with the dietary pattern, while a negative factor loading indicates an inverse association with the dietary pattern.

Pattern I is characterized by more frequent intakes of nuts & seeds, milk and milk products, processed foods and fast foods, and salty foods. Pattern II was characterized by more frequent intakes of legumes and legume products, fruits and vegetables and less frequent intakes of sugary drinks, processed foods and fast foods. Pattern III is characterized by more frequent intakes of cereals & Grains and meat, eggs & game. Pattern IV is characterized by more frequent intakes of starchy roots and tubers and less frequent intakes of beverages and non-sugar alcohols.

The overall level of nutrition of participants was negatively correlated with Dietary pattern II ($p<0.05$) and Dietary patten III ($p<0.01$) (Table 4).

Table 4. Relation of the dietary pattern to the overall knowledge of the participants

Variable	Dietary patterns			
	PATTERN I	PATTERN II	PATTERN III	PATTERN IV
Overall nutrition knowledge	0.040	-0.148*	-0.196**	-0.028

*Correlation is significant at the 0.05 level (1-tailed). **Correlation is significant at the 0.01 level (1-tailed).

Practices on nutrition and dietary habits among Nursing students

About half (46.1 %) of the participants took vegetables daily and another 27.2 % consumed vegetables 3-5 times per week (Table 5). Only 28.3 % took fruits daily and another 28.9 %, 3-5 times per week. Occasionally, 8.3 % had intakes of fruits. About one-third of the participants (32.8 %) took processed foods 1-2 times per week. Only 7 % and 8.9 % of the participants claimed never to have consumed beverages (such as coffee) and sugary drinks respectively (Table 5).

Table 5. Frequency of consumption of various food groups and types

Food group/type	Frequency of consumption											
	Daily		3-5 times per week		1-2 times per week		Monthly		Occasionally		Never	
	n	%	n	%	n	%	n	%	n	%	n	%
Cereals & Grains	66	36.7	84	46.7	24	13.3	1	0.6	5	2.7	0	0.0
Starchy Roots and Tubers	39	21.7	63	35.0	66	36.7	2	1.1	8	4.4	2	1.1
Legumes	25	13.9	68	37.7	53	29.4	18	10.0	16	8.9	0	0.0
Nuts & Seeds	23	12.8	41	22.8	62	34.4	21	11.7	31	17.2	2	1.1
Meat, Eggs & Game	73	40.6	56	31.1	34	18.9	11	6.1	5	2.7	1	0.6
Sea Foods/Freshwater fishes	64	35.6	51	28.3	42	23.3	9	5.0	13	7.2	1	0.6
Milk	47	26.1	59	32.8	48	26.7	9	5.0	16	8.9	1	0.6
Fats and Oils (e.g. cooking oils, fried foods)	71	39.4	59	32.8	34	18.8	8	4.4	8	4.4	0	0.0
Processed Foods and fast foods	16	8.8	47	26.1	59	32.8	19	10.6	36	20.0	3	1.7
Salty Foods	15	8.3	29	16.1	75	41.7	21	11.7	30	16.7	8	4.4
Fruits	51	28.3	52	28.9	45	25.0	17	9.4	15	8.3	0	0.0
Vegetables	83	46.1	49	27.2	37	20.5	7	3.9	4	2.2	0	0.0
Beverages and Non-Sugar Alcohols	34	18.9	44	24.4	62	34.4	9	5.0	24	13.3	7	3.9
Sugary drinks	19	10.5	33	18.3	53	29.4	16	8.9	43	23.9	16	8.9

DISCUSSION

The study sought to assess knowledge, attitude, and practice on nutrition and dietary habits among nursing students of All Nations University, Koforidua. In recent times, the significant rise in non-communicable diseases (NCDs) related to diet has been associated with environments that encourage the overconsumption of unhealthy foods and restrict opportunities for physical activity.[9,10] For this purpose, it is crucially essential to educate the public about nutrition and to execute intervention tactics aimed at elevating the degree of nutritional literacy.[11] It is crucial to provide training to nurses, who play a significant role in executing public health enhancement strategies and decision-making, to enhance their understanding of nutrition and nutrition literacy. A previous study proposed that this training should commence during their undergraduate education.[8] Consequently, nursing students with a robust grasp of nutrition and nutrition literacy will be equipped to effectively advise society as future nurses before completing their studies.

The level of knowledge of the participants was low (with the score of 3.15) but 'satisfactory'

based on the rating used in the study. In a similar study by Chepulis & Mearns,[5] the level nutritional knowledge scores of nursing students were low. Unfortunately, about 38 % had bad knowledge of nutrition (≤ 3). And another 51.3 % of the participants only had satisfactory scores (3.1 to 3.5). Interestingly, only 10.6 % of the participants had 'good' (scores 3.6 to 4.0) level of knowledge on nutrition. A study in Turkey, however, found about half of the students had good level of nutrition knowledge.[7] The highest scores, 3.84 and 3.74, were respectively recorded for the knowledge on the statements, "When a pregnant woman is undernourished, she is at risk of having a low-birth-weight baby" and "When taken during meals, Vitamin-C-rich foods such as fresh citrus fruits, help the body absorb and use iron". These scores represent 'good' level of knowledge. Participants displayed good level of knowledge (scores between 3.6 to 4.0) for the test items, "When a pregnant woman is undernourished, she is at risk of having a low-birth-weight baby" and "When taken during meals, Vitamin-C-rich foods such as fresh citrus fruits, help the body absorb and use iron". Apparently, the highest score was elicited by the former followed by the latter test item. Most of the participants were females and may be conscious of the outcomes of their present and future pregnancies. Vitamin C is one of the commonest vitamins and it is not surprising that the participants had a good score on the test item concerning the vitamin.

'Bad' levels of knowledge were demonstrated for the statements, "The health benefit of fruit and vegetables lies alone in the supply of vitamins and minerals" (2.86), "Brown sugar is much healthier than white sugar" (2.69), "Plantain is a major source of iron" (2.63), and "Malnutrition can be reversed at any point with appropriate diets" (2.26). Participants asserted that the only health benefits that can be obtained from fruits and vegetables is the provision of vitamins and minerals. Fruits and vegetables contain fibres for prevention of constipation and colon cancer, they also contain considerable amount of water. Brown sugar was seen as being healthier than white sugar. These two sugars same; the difference only lies in the colouration. Participants also agreed that malnutrition can be reversed at any point with appropriate diets. This statement certainly is false. When malnutrition reaches chronic levels, it becomes almost impossible to reverse it. Plantain is still seen as a major source of iron. Plantain is a source of iron but not a major source; it mainly supplies carbohydrate. Nurses, as the primary cohort of healthcare professionals, are strategically positioned to oversee and assist in fulfilling patients' fundamental nutritional needs within diverse work settings and cultures. In hospital settings, this responsibility may encompass addressing issues such as eating problems, dehydration, and/or malnutrition,[12] contributing to prolonged hospital stays and an elevated risk of mortality if untreated. Thus, enhancing patients' health outcomes stands as a crucial duty for nurses. Nevertheless, as indicated by Chao et al., student nurses exhibit limited knowledge in this domain.[13] Insufficient nutrition literacy emerges as a significant obstacle to delivering comprehensive, high-quality nutritional care to patients. It becomes imperative to plan post-undergraduate education training sessions to enhance the confidence and motivation of nursing students in providing effective nutritional care.[13] Consequently, augmenting nutrition literacy among nursing students

becomes pivotal for enhancing public health outcomes and the quality of life for patients. Though the mean SBP and DBP are low and in normal range, the mean BMI was within the overweight range. Half of the participants did not engage in regular exercise (Table 1).[14] Yamamoto et al. suggests that skipping meals results in additional eating throughout the day, which can lead to weight gain.[15] Though most of the participants reported a healthy nutrition behaviour, more than half took regular meals and less than half took breakfast daily (Table 1).

University students commonly exhibit a low consumption of daily fruits and vegetables, coupled with a heightened intake of fried foods.[14] Despite some reported unhealthy eating habits, most students possess a sound understanding of the food pyramid and balanced nutrition. The challenges may arise from factors such as stress, a heavy workload, and time constraints, leading university students to make suboptimal food choices. Consequently, adhering to healthy eating patterns becomes challenging for these university students.[14]

Most of the participants in the present study were already working, giving them a good socio-economic status (Table 1). This may account for the types of varied and complex dietary patterns in the study. A study in Australia identified three dietary patterns the healthy pattern composed of fruit, vegetables, and legumes, the Western pattern compose of high fat, sugar, and salt, and the unbalanced pattern.[19] Though Williams et al. associated the dietary patterns with socio-demographic factors, it was apparent that most nursing students adopt unhealthy dietary patterns similar to those of their counterparts in other university academic programmes.[19]

The overall level of nutrition of participants was negatively associated with Dietary pattern II ($p<0.05$) and Dietary patten III ($p<0.01$) (Table 4). Participants with high score and high nutrition knowledge are less likely to adhere with Dietary pattern II and dietary pattern III. Assessing nutritional knowledge solely with a general score may not fully capture its influence on dietary preferences. Considering factors such as socioeconomic status, lifestyle, and cultural habits could reveal variations in the relationship between dietary patterns and knowledge levels. The observed negative correlations suggest that a tendency toward healthy eating does not always align with conscious nutritional knowledge. This highlights the need for health education initiatives to bridge these gaps. The knowledge may not have direct correlation with blood pressure and anthropometric measurements. An earlier study indicated a positive correlation between the dietary attitudes of nursing students and their nutrition knowledge.[20] The earlier study suggested that to enhance the dietary perspectives of nursing students, educators in nursing should create educational intervention initiatives focused on nutrition. These programs aim to boost understanding of nutrition and pinpoint issues related to food habits. Liao et al. reported that nutrition literacy accounted for 17.2% of the overall variance in healthy-eating behaviours among college students.[21] The results of Liao et al. indicated suboptimal levels of nutrition literacy among college students and a positive correlation was observed between elevated levels of nutrition literacy and the adoption of healthier dietary behaviours.[21] Consequently,

it is thus imperative to devise strategies for enhancing nutrition literacy in college students as a means to encourage healthier eating habits.[21] In a study that involved students in nursing, law, and Islamic sciences, Uysal et al. reported a correlation between health literacy and nutrition knowledge.[22] Consistent with existing literature, it can be argued that elevating nursing students' nutrition knowledge by nurse educators would lead to an increase in students' nutrition literacy. The current nutrition education provided to undergraduate nursing students is insufficient to meet the demands placed on future nurses as healthcare professionals, especially in delivering nutritional care aligned with patient needs. Adequate preparation for training is essential to support the long-term health of nurses themselves while enhancing their professional competence to address contemporary nutritional challenges.[22] Consequently, there is a critical need to enhance nursing students' capacity to acquire, process, and comprehend nutrition information, along with the skills necessary for making informed nutritional decisions. A study reiterates that improvement should start from the undergraduate level, and nutrition lessons should be incorporated into the nursing curriculum.[7] Interestingly, participants in the current study have benefitted from a nursing curriculum that includes a nutrition course. It is obvious the two to three-hour course is not enough to elicit a high level of nutrition knowledge and behaviour. Interventions should be created to enhance the dietary behaviours of nursing students through health-promoting activities[4] and the accessibility of online health resources.[19]

The findings (Table 1) suggest a high level of awareness among participants regarding the detrimental health effects associated with alcohol and tobacco use, aligning with global efforts to promote healthy lifestyle behaviours.[23] Regarding dietary habits, less than half of the participants reported consuming breakfast regularly (38.9%), while the majority reported consuming three meals daily (53.3%). Interestingly, a higher proportion of males than females reported consuming three meals daily, suggesting potential differences in meal patterns between genders. Moreover, a significant proportion of participants (40.6%) reported consuming only two meals daily, with a higher percentage of males (50.0%) than females (35.6%) adopting this dietary pattern. This finding raises concerns about the adequacy of nutrition intake among participants, particularly those consuming fewer meals per day, as it may impact their overall nutrient intake and energy levels.[24] Additionally, a small percentage of participants reported regularly purchasing already cooked food, with a higher proportion of males (16.7%) than females (less than 5%) engaging in this behaviour. This highlights potential differences in dietary preferences and convenience-seeking behaviours between genders. Overall, the findings underscore the importance of promoting regular exercise and healthy dietary behaviours among participants, with targeted interventions needed to address gender disparities and encourage healthier lifestyle choices.

Research conducted by Alzaben et al. affirmed that a nutrition awareness program heightened pupils' nutritional knowledge but did not significantly impact their dietary habits.[25] Riley et al. highlighted gaps in nursing and healthcare curricula, emphasizing the

need for training in healthy dietary habits and food insecurity screening.[26] Nonetheless, Zaghamir & Ibrahim suggested that the young age of the student nurses and the above-average percentage of parents without college degrees may contribute to their lack of knowledge regarding nutrition and eating habits.[4] Factors such as neglecting ward duties, disinterest in attending seminars or lectures, and an unwillingness to educate themselves on nutrition and eating habits may contribute to their inadequacy in nutrition knowledge.

The study established a positive correlation between higher knowledge scores and higher education levels, underscoring the potential importance of education in fostering understanding and awareness of nutrition and dietary practices. These findings resonate with previous research indicating that a higher level of education predicts a greater understanding of healthy nutrition and dietary habits.[27] Patients are anticipated to receive nutritional advice from nurses and other healthcare professionals. Nurses are frontliners in patient care and it is important to assess their level of knowledge in nutrition. Nursing students had a high prevalence of overweight and obesity, poor eating habits, and insufficient knowledge on key nutrition issues.[28] Young adult nursing students and nurses are the future of the nursing fraternity; knowledge of nutrition will be essential to their personal health and the health of their patients. According to studies, doctors and nurses who have a normal BMI are more likely to discuss weight, diet, and lifestyle issues with their patients and use strategies to prevent obesity in patients.[29] Nutrition transition has caused a drastic change in diet as processed foods and animal-based foods predominate meals. The young adults are caught up in this transition as they wean from parental control. Furthermore, students, especially those in nursing schools, often face busy schedules and the need to balance various activities. Many succumb to unhealthy eating habits during this period, engaging in practices such as skipping meals, dieting, consuming fast food, and reducing physical activities. Their increased independence, marked by leaving their parents' home, intensive study sessions, occasional part-time jobs, and limited attention to the quality and quantity of their meals, further contribute to these unhealthy behaviours.[30] Moreover, students frequently resort to high-energy, low-nutrient foods like candy bars, cookies, and fast foods, opting for convenience over nutritional value. Academic pressures also impact their dietary choices, resulting in inadequate consumption of vegetables, fruits, and fiber, while increasing intake of fats, sodium, and sugars. Consequently, these habits lead to unhealthy dietary patterns and undesirable behaviours.

CONCLUSION

Overall, the findings highlight moderate levels of knowledge, varying attitudes, and mixed dietary practices among nursing students regarding nutrition and dietary habits. These results underscore the importance of targeted interventions to improve nutrition knowledge and promote healthier dietary behaviours among nursing students.

The study is not without limitations typical of descriptive cross-sectional studies. It relied on memories of participants. There was absence of data on potential confounders (educational and environmental factors as stipulated in Figure 1) and bias sources, and an inability to capture the full complexity of data. As a quantitative study, it did not capture

the context and subjective experiences of individuals.

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Ethical Declaration: Prior to commencing the study, permission was sought from the Nursing Department, All Nations University and the study was approved by the All Nations Ethics Review Committee. Furthermore, the principle of informed consent was meticulously upheld, as all potential participants were provided with comprehensive information regarding the purpose, procedures, and potential risks and benefits of the study. Written consent was obtained from each participant, reaffirming their voluntary participation and understanding of their rights as research subjects. Stringent measures were implemented to safeguard confidentiality and anonymity of participants.

Author Contrubition: Concept: PC; Design: PC, IGA; Supervising: PC; Data collection and entry: PC, IGA; Analysis and interpretation: PC; Literature search: PC, IGA; Writing: PC, IGA; Critical review: PC.

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ORIGINAL ARTICLE

Predictors of addiction to smartphone social networks in Iranian first-year medical sciences students

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Abstract

Objective: Social media addiction (SMA) among male and female students is different and influenced by different factors. This study was conducted to investigate the predictors of SMA in male and female first-year medical sciences students of Ilam-Iran.

Method: In this descriptive cross-sectional study, 286 male and female first-year students living in dormitories entered the study in 2022 by cluster random sampling method. The data collection tools included demographic characteristics, activity in social medias, and smartphone addiction based on social media usage. The data were analyzed using SPSS software. Independent t-test and the general linear model were used.

Results: The mean ± SD of the overall score of SMA in females was lower than males, but there was no statistical difference (59.4 ± 18.8 vs. 63.3 ± 16.3, P=0.063). Both groups were in the range of normal users of social media. Females and males had statistically significant differences in subdomains of individual performance and social communication (P ≤ 0.001). Instagram was the most commonly used social media and female used Instagram less than male (45% vs. 48%, P>0.001). In both groups, use of social media in clinical settings, also in male amount of daily activity in social media were predictors of SMA.

Conclusion: Students were in the range of normal users of social media, but they were active in social media in clinical settings and Instagram was the most commonly used social media. Education authorities should have appropriate planning to correct use of , social media in clinical settings.

Keywords: Addiction, Smartphone, Social media, Students

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INTRODUCTION

About 85% of Iranian students use smartphone social media [1], with Telegram being the most commonly [1, 2]. When the use of social media is poorly managed, social media addiction (SMA) is one of the negative consequences for users who use social media excessively [3]. Addiction to social media is a type of behavioral addiction [4].

The prevalence of SMA among students is increasing, and according to a meta-analysis conducted in 2018, one-third of Iranian students are addicted to social media [5]. The results of studies, gender may have an effect of SMA, some studies show more addiction among female students [3, 6], and some show more addiction in male students [2, 7]. Also, SMA is influenced by various social, cultural [3], and economic factors [8]; Longer duration of use, use of social media for entertainment [2] and marital status [9] are all risk factors for SMA [10]. In addition, entering the university, being away from home and family, and staying in a dormitory bring new opportunities for a person, but they also bring challenges and stress factors that are inevitably associated with such a transition, the feeling of homesickness, loneliness, and lack of support from those around in the dormitory, economic problems, and a lack of recreational and welfare facilities are among the problems of living in the dormitory [11], and living in the dormitory is one of the risk factors for SMA [2].

SMA in the university has negative effects on the social, academic performance, physical, and mental health and leads to a drop in grade point average [12], anxiety and obsession with social media [6], depression, addiction to food and shopping [13] and sleep disorder [9].

Students, as a fundamental element of the educational system, have a special role and position in achieving the goals of the educational system, and improving the quality of their mental and physical health will lead to the further development of this segment of society. Therefore, identifying and resolving students' problems has been at the forefront of educational programs. Recent studies have shown that students are exposed to the risks and complications of these technologies [14, 15]. One of the educational problems of the increased use of social networks and SMA is their negative impact on students' academic performance and grade point average [12]. Considering the ever-increasing expansion of SMA and their excessive use, the few studies in the field of predictive factors of SMA in male and female first-year students of medical sciences living in dormitories, and the presence of different results in the field of SMA in male and female students were done. The present study aims to investigate the predictors of SMA in male and female first-year students living in the dormitories of Ilam University of Medical Sciences (Ilam-Iran) and the comparison of male and female was done, so that the results of this study can be used to identify and eliminate risk factor for SMA and reinforcement protective factors for SMA and lead to the identification of deficiencies in educational rules and time management skills in the use of social medias in clinical setting and the classroom. Also, the current study examines the use of VPNs and proxies to access social media, in this way, it is possible to identify students' desire to access restricted content and various facilities of social media.

METHOD

Study design and participants

This cross-sectional, descriptive-analytical study was conducted on first-year female and male Medical Sciences students living in Ilam-Iran dormitories from January to March 2022. The inclusion criteria include being a first-year student, having a phone with internet connectivity, membership in smartphone social media, staying in the dormitories during the past semester, studying at the undergraduate level and exclusion criteria included leaving the dormitory during the study and students who had previously stayed in the dormitory, were suffering from depression, anxiety, were taking sedatives.

Sample size

Sample size was calculated as 143 given the prevalence of social media addiction equal with 22.8 % [16], precision (d)= 0.1 and 99% confidence interval. The sample size was calculated as 286 given the cluster sampling and design effect equal with two. In this study, 143 students selected from females' dormitories and 143 students from males' dormitories were studied.

Data collection

Cluster sampling was carried out in the dormitories. Dormitory students were accommodated in three dormitories for girls and three dormitories for boys. Two dormitories were randomly selected from each of the female and male dormitories. Students were examined in terms of entry and exit criteria. All students in that dormitory who met the entry criteria for the study were included based on the sample size, and the researcher provided questionnaires to the students.

Data collection tools

The data collection tools included two questionnaires which were completed in a self-report manner. The socio-demographic and characteristics activity in social media questionnaire were prepared based on a literature review and included questions on age, field of study, economic status, use of VPNs and proxies, etc.

Addiction to mobile based on social networks questionnaire was consisted of 23 questions and 4 subdomains of individual performance (questions 1 to 9), time management (questions 10 to 15), self-control (questions 16 to 19), and social communication (questions 20 to 23); each question had 5 options from completely disagree (score one), somewhat disagree (score two), no opinion (score three), somewhat agree (score 4), and to completely agree (score 5). The score range of the questionnaire was 23-115. The level of SMA was divided into 4 levels: lower than usual (score 23–46), regular user (score 46–69), on the verge of addiction (score 69–92), and addiction (score 92–115). The internal reliability of the questionnaire was calculated with a Cronbach's alpha of 91% [17].

In this study, the reliability of the addiction to mobile based on social networks questionnaire was determined by the test-retest in the two dimensions of repeatability (ICC = Intra Class Correlation) and internal consistency (Cronbach's alpha coefficient = Consistency). First, 15 students completed the questionnaire and 10 days later, the same people completed the questionnaire. Reproducibility (ICC) was 90% and Cronbach's alpha (Consistency) was 88%. Face validity

was used to determine the validity of the tools. Sociodemographic and characteristics activity in social media questionnaire were given to 10 faculty members of Ilam University of Medical Sciences, and necessary amendments were made in the questionnaires.

Statistical analysis

Data analysis was done with SPSS version 21 statistical software. Descriptive statistics including mean (Standard Deviation) and frequency (percentage) were used to describe sociodemographic questionnaire, characteristics activity in social media and SMA. Normality of quantitative data was checked with Skewness and Kurtosis. Sociodemographic questionnaires and social media activity characteristics of the groups (females and males) were compared with independent t-test, trend chi-square, Fisher's exact and chi-square. The overall score of SMA had a normal distribution, and independent t-test was used to compare the groups in terms of the overall score of SMA and subdomains. The general linear model was used to determine the predictor variables of SMA. In each group socio-demographic and characteristics activity in social media variables were entered in the univariate general linear model, then the variables that had P< 0.05 were entered in the multivariate general linear model. For all variables, the group of variables with the lowest or highest frequency was selected as a reference to make it easier to interpret the changes in other variables in comparison. The significance level in all tests was considered P< 0.05.

RESULTS

The mean ± SD age of female students was 21.3 ± 2.0 and that of male students was 21.9 ± 2.1. Female students used social media less than male students in classrooms (40% vs. 62%, P<0.001), and female students used social media less than male students in clinical and practical settings (33% vs. 54%, P<0.001). The most common time of activity in the social media of male and female students was at night before going to bed, and it was more common in female than males (66% vs. 52%, P = 0.033). The most commonly social media used by female and male students was Instagram, and females used it less than males (45% vs. 48%, P<0.001). The socio-demographic and characteristics activity in social media of the participants in this study are given in Table 1.

Table 1. Demographic characteristics of activities in social media of female (n=143) and male (n=143) students

Characteristics	Female		Male		p	Characteristics	Female		Male		p
	n	%	n	%			n	%	n	%	
Medicine	11	7.7	20	14		**The most common time of activity in social media**					0.033**
Nursing	21	14.7	42	29.4		**Morning before starting activities**	14	9.8	4	2.8	
Midwifery	18	12.6	-	-		**Night before sleep**	75	52.4	94	65.7	
Surgical technologist	19	13.3	14	9.8		**In classroom**	8	5.6	5	3.5	
Laboratory science	4	2.8	9	6.3		**In clinical settings**	-	-	1	0.7	
Health	43	30.1	20	14		**Rest time**	37	25.9	35	24.5	
Anesthesiology	11	7.7	7	4.9		**In vehicle**	9	6.3	4	2.8	
Biology	14	9.8	5	3.5		**The amount of daily activity in social media**					0.058****
Emergency medical technicians	-	-	22	15.4		**<30 minutes**	3	2.1	4	2.8	
Dentistry	2	1.4	4	2.8		**60 minutes**	8	5.6	12	8.4	

Economy status					0.067***	**120 minutes**	27	18.9	41	28.7	
Income = spent	96	67.1	78	54.4		**180 minutes**	39	27.3	29	20.3	
Income < spent	21	14.7	24	16.8		**>180 minutes**	52	36.4	71	49.7	
Income > spent	26	18.2	41	28.7		**Activity in Iranian social media**	61	42.7	50	35	0.225**
The cause of activity in social media					0.002**	**Used social media**					0.001****
Entertainment	74	51.7	53	37.1		**Telegram**	14	9.8	26	18.2	
Scientific study	11	7.7	28	19.6		**Instagram**	69	48.3	65	45.5	
Following news	17	11.9	19	13.3		**WhatsApp**	26	18.2	43	30.1	
Communication	37	25.9	30	21		**YouTube**	1	0.7	5	3.5	
Feeling lonely	4	2.8	13	9.1		**Facebook**	1	0.7	2	1.4	
Social media activity in classroom						**Google plus**	1	0.7			
	57	39.9	89	62.2		**LinkedIn**	-	-	1	0.7	
	47	32.6	77	53.8	<0.001**	**Line**	1	0.7	-	-	
						Bale	2	1.4	-	-	
						Using VPN or proxy	8	5.6	129	90.2	0.064***
							137	95.8			

The data indicate number (percent), unless otherwise specified. Mean (standard deviation).
*Independent t-test
**Chi square test
***Chi square for trend
****Fisher's exact

The mean (SD) of the overall score of SMA in females was 59.4 (18.8) less than that in males (63.3 (16.3), but there was no statistical difference between them (P = 0.063). Both groups were in the range of normal users of social media (score 46–69). Females and males had statistically significant differences in two SMA subdomain of individual performance and social communication (P<0.001) (Table 2).

Table 2. Comparing the overall score of social media addiction and its subdomain in female and male students

Social media addiction	Female (n=143)		Male (n= 143)		CI 95%*	P**
	Mean	**SD**	**Mean**	**SD**		
Individual performance (9 to 45)	20.6	8.4	24.02	7.7	-5.3 to -1.6	**<0.001**
Time management (6 to 30)	15.6	6.3	16.7	5.05	-2.4 to -0.2	0.104
Self-control (4 to 20)	11.1	3.4	11.4	3.5	-1.2 to 0.5	0.470
Social communication (4 to 20)	12.1	3.4	11.1	3.3	0.2 to 1.8	**0.013**
Overall score (23 to 115)	59.4	18.8	63.3	16.3	-8.0 to 0.2	0.063

*Confidence interval 95%

**Independent t-test

The multivariate general linear model showed that in female, the use of social media in clinical settings (P = 0.024, 95% CI: 1.1, 14.9, B = 8.0) was a predictor of SMA (adjusted R squared = 20 %). In male, the use of social media in clinical settings (P = 0.011, 95%CI: 2.0, 15.3, B = 8.6) and the amount of activity in social media during 24 hours, (P = 0.042, 95%CI: -37.1, -0.7, B =-18.9) were predictive factors of SMA (adjusted R squared = 16%) (Table 3).

Table 3. The relationship between socio demographic characteristics and overall score of addiction to social media addiction base on the multivariate general linear model in female and male students

Variable	Female		Male	
	B (95% CI) *	P value **	B (95% CI) *	P value **
Fields (Reference: dentistry)				
Medicine	15.1 (-11.6 to 41.8)	0.265	3.0 (-13.7 to 19.8)	0.718
Nursing	11.5 (-14.2 to 37.2)	0.377	-3.6 (-19.7 to 12.4)	0.655
Midwifery	9.2 (-16.1 to 34.4)	0.470	-	-
Surgical technologist	18.6 (-6.6 to 43.9)	0.147	-8.6 (-26.0 to 8.7)	0.325
Laboratory science	25.7 (-4.1 to 55.5)	0.091	-11.3 (-29.5 to 7.0)	0.225
Health	18.1 (-6.5 to 42.9)	0.148	-5.6 (-22.2 to 11.0)	0.508
Anesthesiology	-0.5 (-26.9 to 25.9)	0.971	1.3 (-18.0 to 20.6)	0.894
Biology	22.2 (-4.1 to 48.5)	0.096	-16.0 (32.7 to 0.6)	0.059
Emergency medical technicians	-	-	-8.9 (-29.1 to 11.2)	0.383
Economy status (Reference: income > spent)				
Income = spent	-6.2 (-13.9 to 1.5)	0.116	-4.2 (-10.5 to 1.9)	0.177
Income < spent	-3.2 (-13.7 to 7.1)	0.535	-2.1 (-10.8 to 6.6)	0.636
The amount of activity in social media (Reference: >180 min)				
< 30 minutes	6.4 (-11.9 to 24.7)	0.488	-18.9 (-37.1 to 0.7)	**0.042**
60 minutes	-11.8 (-23.9 to 0.3)	0.056	-5.6 (-17.5 to 6.3)	0.357
120 minutes	-8.0 (-15.9 to -0.1)	0.048	-4.7 (-11.7 to 2.3)	0.188
180 minutes	-2.9 (-10.5 to 4.8)	0.458	3.6 (-3.2 to 10.4)	0.297
Using social media at clinical setting (Reference: no)				
Yes	8.0 (1.1 to 14.9)	**0.024**	8.6 (2.0 to 15.3)	**0.011**
Using social media at classroom (Reference: no)				
Yes	3.7 (-3.2 to 10.6)	0.290	-1.1 (-7.8 to 5.6)	0.749

* Confidence interval 95% ** Multivariate general linear model test Female students: Adjust R squared= 0.208 Male students: adjust R squared= 0.167

DISCUSSION

In the current study, the majority of students spent a significant amount of time on social media, but within the range of use for normal users. Instagram was the most used social media. In both groups, use of social media in clinical settings, also in male students amount of daily activity in social media were predictors of SMA.

The results of the present study showed that female used social media significantly less than male in classrooms and clinical and practical settings. Other studies have found that gender has an effect on students' academic performance [18], and that there are gender differences in cognitive-motivational performance in the educational setting, female have more internal control, motivation, and time management in education, and female have a more adaptive approach to learning tasks [19]. In addition, male face more academic and behavioral problems and female with higher social skills have a higher grade point average and fewer disciplinary problems [18]. These factors may have led to better self-control and less use of social media in female.

In both groups, there was a common activity on social media at night before going to bed. In this study, first-year students were examined. Entering the university is accompanied by accepting new roles, meeting academic demands and adapting environment. Most

of the students' time during the day is spent adapting new conditions, and sometimes it is difficult to find time to balance various issues [20]. For this reason, students may have more time to use social media at night before going to bed.

In the present study, in both groups, Instagram was the most commonly used social media. In the study conducted by Ebrahimpour et al. (2015) in Iran with a survey of 1000 students from 7 universities of medical sciences and in the study conducted by Torkian et al. (2019) with a survey of 400 students at kerman university of medical sciences, the most commonly social media used by male and female students was Telegram [1, 2]. These results are not consistent with the present study. Due to the ease of using Instagram and the feeling of satisfaction from Instagram's social interactions and entertainment, which leads to a positive effect on Iranian users, the popularity of Instagram is growing day by day [21]. The reason for the non-alignment of the articles may be the more up-to-date reviews and results in the present study. However, in the study conducted by Aparicio et al. in Spain (2022), the most used social media by students was Instagram [3], which is consistent with the present study.

In the present study, male used Instagram significantly more than female. In a study conducted by Aparicio et al. (2022), male used Instagram more than female [3]. Instagram is one of the most commonly social media, which, while providing an opportunity to share photos and videos, also provides the opportunity to interact with and discuss the visual content produced. A significant part of the content of Instagram is personal sexual images that are uploaded by the users [22]; and sexual interests and behaviors play a role in the use of sexual Internet content in male [23]. The sexual attractiveness of women's images on Instagram is higher than for men [22] and men use Internet pornography [24], which may have contributed to boys' increased use of Instagram.

In the present study, about 90% of male and female students used VPNs and proxies, and there was no significant difference. Filtering social media reduces Internet speed and makes it difficult to access required sites [25] and students acknowledge that proxies and VPNs violate their privacy and jeopardize the possibility of collecting [26]. However, the desire to use various facilities of social medias [25] and access restricted content [26] leads to the use of proxies and VPNs to remove restrictions [25, 26].

In our study, overall score of SMA in females was lower than males, but there was no statistical difference between them. In the study conducted by Aparicio et al. (2022) in Spain on 278 male and female students, female students were more addicted to social media [3], the results are inconsistent with the present study. Azizi et al. (2019), in Kermanshah-Iran by examining 360 students using the Bergen social media addiction scale, reported that the SMA in male was significantly higher than female [7]. In the meta-analysis conducted by Zewde et al. in Africa (2022), male students were more SMA [24], Gender differences can affect various addictive behaviors, including Internet addiction, and it has been found that males have more addictive behaviors [27]. Males also participate in Internet pornography and online games [24], these factors may increase SMA.

In the present study, both groups were in the range of normal users of social media.

The people with higher social and economic status have more access to the internet, which in turn leads to more use of social media [10]. In the current study, the majority of students declared that their income was equal to their expenses. It is possible that these students have limited access to the internet and thus fall within the range of normal internet users. In the study of Azizi et al. (2019), which examined the students in Kermanshah-Iran, the students SMA was average [7], the results were not in line with the present study. The difference in socio-demographic, difference in evaluation methods, and different cutting points of tools can lead to different results in studies.

In the current study, SMA in the subdomain of individual performance in male was significantly lower than females and subdomain of social communication in male; it was significantly higher than females. According to the study of Suárez-Perdomo et al. (2022), social media can be a factor for procrastination in personal, professional, and academic work [28], SMA is more effective in reducing individual performance and procrastination [28]. In the current study SMA in females was lower than that of males; therefore, this factor may have led to a decrease in addiction to social media in the individual performance subdomain compared to male students. In the early stages of social media communication, women and men establish dyadic relationships, then women often expand their social media, while men continue to maintain dyadic relationships [(29)]. This factor may have led to an increase in SMA in female.

In the present study, male and female students' use of smartphone social media in the clinical and practical settings were predictors of SMA. Alkaabi et al. (2017) surveyed 84 students in the United Arab Emirates reported that students use smartphone social media in the classroom for different reasons, including chatting with family and friends, playing games, cheating, and using social media in the classroom leads to SMA [30]. In addition, academic procrastination [28] and negative effects on grade point average [12]. These factors might have led to inappropriate organization of time, lack of focus on course material and less motivation to learn in the classroom, and SMA in dimensions of individual performance, time management and self-control.

In the current study, the amount of activity on social media was a predictive factor of SMA and decreasing the hours of activity on social media was a protective factor of SMA in male students.According to a meta-analysis conducted by Zewde et al. (2022), using smartphone social media for more than 4 hours per day was one of the factors of SMA [24]. Torkian et al. (2022) reported that with the increase in time spent using social media, students are more at risk of SMA [2]. These studies showed the amount of activity in social media was predictive factor of SMA, and increasing hours of activity on social media is a risk factor and decreasing hours of activity on social media is a protective factor for SMA, these results are consistent with the present study. Excessive use of smart phone technology to enter social media leads to SMA due to the extent and acceptability of social media by the user [31].

The comparison of SMA among female and male first-year students living in dormitories was done for the first time in Iran, which is the strength of the present study. The first

limitation of the present study was that the questionnaire was completed by first-year students, it reduces the ability to generalize it to students studying in higher years. Another limitation of the present study was that, non-native students living in the dormitory were examined in the study; the results may not be generalizable to native students. It is suggested to compare native students with students living in the dormitory and conduct longitudinal studies in future studies.

CONCLUSION

In the present study, male and female students were in the range of normal users of smartphone social media. The most commonly social media used by female and male students was Instagram. Use of social media in clinical settings and amount of daily activity in social media were predictors of SMA. Educators and administrators in clinical settings and classrooms need to review educational rules and policies regarding use of smartphone social media. Administrators make decisions students use of social media appropriately and in a controlled manner, including implementing continuous monitoring, implementing incentive and punitive policies, educate on digital citizenship and time management skills for using social media.

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Ethical Declaration: The Ethics Committee of Ilam University of Medical Sciences has granted permission and approval, which can be found under code: IR.MEDILAM.REC.1398.139. Also, a written permission letter from the Cultural and Student Vice-Chancellor was submitted. To comply with the ethical aspects, it was possible to participate in the study voluntarily after presenting the objectives of the study to the students, and a written informed consent form was obtained from the eligible students, and they were given the assurance that the information was confidential. In order to gain more trust, it was also acknowledged that there was no need to write the name on the questionnaires.

Author Contrubition: Researcher AM: developed the specific study idea, data gathering, preparation the article draft, F.Kh: Concept development, study design, preparation the article draft, H.N: Statistical and data analysis, preparation and revise the article draft, B.S: data gathering, Statistical and data analysis, preparation the article draft, E.B-V: Project leader, Concept development, study design, preparation the article draft. All authors read and approved the final manuscript. Also each author agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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ORIGINAL ARTICLE

Post-traumatic stress and secondary traumatic stress of earthquake-affected and non-affected healthcare workers after the 6th February Earthquake in Türkiye

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Abstract

Objective: This study aims to investigate the presence of post-traumatic stress disorder and secondary traumatic stress in earthquake-affected healthcare workers (HCW) and non-affected deployed health workers.

Method: Healthcare professionals deployed to earthquake-affected areas from the provinces not affected by the earthquake were determined as the first group and healthcare personnel who have experienced the earthquake themselves were determined as the second group. Data was collected via a form to investigate sociodemographic information, occupational exposure, post-earthquake experience, Post-Traumatic Stress Disorder Symptom Self-Report Scale (PSS-SR), and Secondary Traumatic Stress Scale (STSS). Mann-Withney U test, Kruskal Wallis test, and chi-square test were used to evaluate the analytical relationship.

Results: The median PSS-SR score of healthcare workers who were non experienced of the earthquake (14.0 (5.0-29.0)) was found to be lower than the median PSS-SR score (27.0 (16.0-34.0)) of healthcare workers who were affected by the earthquake ($p<0.001$). The median STSS score of healthcare workers who had non experienced the earthquake (30.0 (22.0-48.0)) was found to be lower than the median STSS score of the earthquake-affected healthcare workers (50.0 (38.0-58.0)) ($p<0.001$). The sleep patterns and nutrition patterns of the earthquake-affected healthcare personnel were more negatively affected than the non-affected healthcare personnel ($p<0.001$).

Conclusion: The PSS-SR and STSS scores were higher and sleep patterns and nutrition were affected more after the earthquake than those who were non-earthquake victims. For this reason, in health workforce planning, it would be appropriate to continue services by deployed healthcare workers instead of disaster-affected healthcare workers and to provide psychological support to earthquake-affected healthcare workers.

Keywords: Stress Disorders, Post-Traumatic, Mental Health, Disasters, Earthquakes

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INTRODUCTION

After earthquakes, the majority of survivors bear witness to the loss of relatives and friends, physical injuries, and the destruction of their homes and workplaces. This situation leads to both severe economic losses for the surviving individuals and the persistence of traumatic memories, resulting in psychological problems[1]. Particularly, healthcare professionals residing in earthquake-prone regions, due to the nature of their professions, experience heavier emotional and psychological processes, being exposed to more traumatic memories compared to other individuals.

One commonly observed psychiatric disorder following natural disasters is post-traumatic stress disorder (PTSD)[2]. PTSD is a psychiatric disorder characterized by symptoms such as re-experiencing the traumatic event, avoidance of stimuli reminiscent of the traumatic event, slowed reactions, decreased interest, increased arousal, and disruptions in sleep and eating patterns, occurring after a negative life event[3]. The prevalence of PTSD after earthquakes varies between 6.6% and 64% in different studies, depending on the frequency, severity, and diagnostic criteria of the traumatic events[4,5]. In a study conducted with emergency responders involved in disaster response in Türkiye, the prevalence of PTSD was found to be 2.1%[6].

Stress symptoms following trauma can also manifest in individuals who did not directly experience the trauma but witnessed, heard about, or worked with trauma victims. These stress symptoms, occurring indirectly and not stemming from direct exposure to trauma, are defined as secondary traumatic stress (STS)[7]. In a study involving professions working with trauma victims, 68.7% of participants exhibited moderate levels, and 18% showed severe symptoms of traumatic stress[8].

Among professionals dealing with earthquake victims, both their own victimization and their medical with the injured contribute to the emergence of post-traumatic stress disorder and secondary traumatic stress symptoms. Additionally, those assigned to earthquake-prone areas from outside the region are expected to experience symptoms of secondary traumatic stress.

On February 6, 2022, two major earthquakes with a magnitude of 7 or higher occurred in the Pazarcık and Elbistan districts of Kahramanmaraş in Türkiye. The earthquakes most significantly affected 11 provinces, resulting in the loss of more than 50,000 lives and over 122,000 injuries[9,10]. During this period, both local medical staff directly affected by the earthquake and reinforcements from outside the region were assigned to the earthquake-stricken area.

The aim of this research is to investigate the symptoms of PTSD and STS in eartquake-experienced healthcare professionals actively working in hospitals and tent cities in the earthquake-stricken region, as well as those assigned to the earthquake-stricken area from outside.

METHOD

The data for this descriptive cross-sectional study were collected online in August 2023, which marked the six month after the earthquake. To avoid confusion between Acute Stress Disorder and PTSD, symptoms must persist for at least one month. It has been noted that late-onset PTSD can be diagnosed by the sixth month[3]. During the first month, the

response to trauma is unstable[11], and in some individuals, symptoms may naturally decline within three to six months. A substantial proportion of patients exhibit spontaneous remission within six months[12-14], whereas the risk of chronicity increases beyond this period. Therefore, to capture the long-term effects of the earthquake, data collection began after the sixth month, which marks the first step in demonstrating the long-term impact. In the study, data were gathered through a research-designed questionnaire investigating sociodemographic information, professional exposure, and post-earthquake experiences, along with the Self-Report Post-Traumatic Stress Disorder Scale (PSS-SR) and the Secondary Traumatic Stress Scale (STSS) forms.

The required sample size for the study, considering 80% power, a type 1 error of 0.05, and a medium effect size in a t-test using Gpower, was determined to be 102 individuals. With reserves, a total of 133 individuals were included in the study. The study comprised two groups: healthcare professionals temporarily assigned from outside the earthquake-stricken area (Group 1) (n=62) and earthquake-affected healthcare professionals (Group 2) who had provided services to traumatic patients (n=71).

Since the researchers did not have a list of workers or contact details for those working in the region, healthcare workers in the affected areas (Malatya, Kahramanmaraş, Hatay, Adıyaman, Gaziantep) were reached through solidarity-based social media groups (WhatsApp, Telegram). They were asked to forward the link to the online survey form to healthcare workers in their institutions or those temporarily assigned to the region. In order to reach the temporarily assigned workers, they were asked to complete the form through the social media groups created for the volunteers assigned to the region and to forward the form to other individuals who had been deployed with them. The study included healthcare professionals working in first, second, and third-level health institutions, as well as health directorates, who were involved in the establishment of temporary settlements and the provision of healthcare services. Healthcare workers who were not in the region during the earthquake, those working in administrative roles only in desk jobs, and individuals who were on administrative leave after the earthquake and did not participate in the relief efforts were excluded from the study.

The data were collected anonymously online through a platform called Google Forms. Before starting the survey, participants were presented with an informational form outlining the research's purpose, the information about researchers responsible for conducting the study, and the criteria for who should complete the survey. The form also included a statement indicating that participation was voluntary. After consenting to participate, individuals were asked to complete a series of multiple-choice, open-ended, and Likert-type questions on the online form, which took approximately 10 minutes. To prevent data loss, it was mandatory for all questions to be answered in order to submit the survey. No personal contact details, such as names or phone numbers, were collected. To avoid duplicate responses, participants were required to log in using their email addresses on Google Forms; however, the researchers were restricted from viewing the participants' email addresses. The first section of the online

data collection form included questions designed by the researchers to gather sociodemographic information, professional experience, disaster-related work experience, the location of post-earthquake duties, details about life and property losses, emotions evoked by working in the disaster area, and challenges in accessing basic needs. The second section contained the PSS-SR form for assessing PTSD, while the third section included the STSS form to assess secondary traumatic stress (STS).

PSS-SR was developed by Foa et al. (1993), it validation and realibility in Turkish was made by Aydın et al. (2012) The Likert-type scale comprises 17 questions, and scores range from 0 to 51, with higher scores indicating increased levels of post-traumatic stress[15,16]. Secondary Traumatic Stress Scale (STSS), developed by Bride et al., was validated and made reliable in Turkish by Yıldırım et al. The Likert-type scale consists of 17 questions, and scores range from 17 to 85, with higher scores indicating increased levels of secondary traumatic stress[17,18].

Data obtained from the study were analyzed using the Statistical Package for Social Sciences (SPSS) 19.0 (IBM Corp.). The Kolmogorov-Smirnov test was conducted to assess normal distribution suitability. Descriptive statistics, including numbers and percentages, as well as medians and quartiles (Q1-Q3), were presented together. To evaluate the relationship between scale scores of two independent variables, the Mann-Whitney U test was employed, and for assessing the relationship between scale scores of more than two independent variables, the Kruskal-Wallis test was utilized. The chi-square test was applied to evaluate the relationship between categorical variables.

RESULTS

Participants' median age was 33.0 (29.0-40.5) and 54.9% were female. The median of professional experience was 10.0 (5.0-16.0) years. The median age of healthcare professionals affected by the earthquake is significantly lower than those assigned through deployment (p=0.014). The rate of participants who worked in hospital among earthquake-affected healthcare professionals participating in the study is significantly higher compared to those assigned through deployment (p<0.001). The sociodemographic characteristics of the participants are provided in Table 1.

Of the participants, 27.1% experienced the loss of relatives or acquaintances in the earthquake. Additionally, 17.3% of the participants reported moderate to severe damage in their homes. Among earthquake-affected healthcare professionals (n=71), 52.1% reside in their own homes, 29.6% in the homes of relatives, and 18.3% in communal living spaces after the earthquake. Among healthcare professionals deployed to the area (n=62), 48.4% stayed in dormitories, 25.8% in tents, 12.9% in hospitals, and 12.9% in containers following the earthquake. Of those deployed, 83.9% stayed in these accommodations with their teams from their home cities, 12.9% with earthquake-affected healthcare professionals, and 3.2% stayed alone. Moreover, 93.5% of healthcare professionals deployed to the area came to work voluntarily in the earthquake-stricken region.

Table 1. Sociodemographic and Occupational Characteristics of Participants

		Total (n=133)		Group 1 (n=62)		Group 2 (n=71)		
		Median (Q1-Q3)		Median (Q1-Q3)		Median (Q1-Q3)		p
Age		33.0 (29.0-40.5)		32.0 (29.0-36.0)		35.0 (30.0-42.0)		0.014
Professional experience (Years)		10.0 (5.0-16.0)		9.0 (5.0-14.0)		11.0 (5.0-18.0)		0.293
		n	%	n	%	n	%	
Gender	**Female**	73	54.9	32	54.6	41	57.7	0.478
	Male	60	45.1	30	48.4	30	42.3	
Kids	**Have**	56	42.1	18	29.0	38	53.5	0.004
	Not have	77	57.9	44	71.0	33	46.5	
Martial Status	**Married**	82	61.7	34	54.8	48	67.6	0.183
	Single/Divorced	51	38.3	28	45.2	23	32.4	
Profession	**Medical Doctor**	43	32.3	18	29.0	25	35.2	0.343
	Nurse/Midwife	51	38.3	22	35.5	29	40.8	
	Other	39	29.3	22	35.5	17	23.7	
Duty Station	**Hospital**	60	45.1	18	29.0	42	59.2	<0.001
	Temporary Sites	73	54.9	44	71.0	29	40.8	
Experienced in working post-earthquake	**Yes**	47	35.3	24	38.7	23	32.4	0.563

Changes in sleep, nutrition, and personal hygiene status of healthcare professionals affected by the earthquake and those deployed to the area are presented in Table 2. Earthquake-affected healthcare professionals experience insomnia more frequently compared to their deployed counterparts (p<0.001). Moreover, earthquake-affected healthcare professionals exhibit unhealthier eating habits after the earthquake in comparison to those deployed (p<0.001). There is no significant difference in the changes in the sexual lives of both groups (p=0.191). Earthquake-affected healthcare professionals face more challenges in bathing compared to those deployed (p<0.006). Additionally, earthquake-affected healthcare professionals encounter more difficulties in accessing clean water (p<0.001) and personal hygiene materials (p<0.001) compared to their deployed counterparts.

The most common feelings experienced by healthcare personnel while working after the earthquake are the feeling of usefulness (57.1%), the feeling of despair (39.8%) and the feeling of togetherness (37.6%), respectively. Positive emotions are seen more frequently in assigned healthcare workers (90.3%) than in the earthquake victim group (56.3%) (p<0.001). Negative emotions are seen more frequently in earthquake-affected healthcare professionals (74.6%) than in the assigned group (45.2%) (p=0.001). Feeling nothing, feeling of being useful, and feeling of togetherness are significantly more common in the assigned group than in the earthquake victim group (p=0.045, p=0.003, p=0.003, respectively). Feelings of despair, worthlessness, and injustice are more common in the earthquake victim group than in the assigned group (p=0.004, p=0.002, p<0.001, respectively). (Table 3).

Table 2. Changes in Basic Needs After Earthquake Experience

		Total (n=133)		Group 1 (n=62)		Group 2 (n=71)		
		n	%	n	%	n	%	P
Sleep	Same	48	36.1	34	54.8	14	19.7	<0.001
	Difficulty falling asleep	63	47.4	28	45.2	35	49.3	
	Can't sleep	22	16.5	0	0.0	22	31.0	
Nutrition	Same	62	46.6	44	71.0	18	25.4	<0.001
	More healtier	4	3.0	4	6.5	0	0.0	
	Less healtier	67	50.4	14	22.6	53	74.6	
Sexual Needs	Same	88	66.2	46	74.2	42	59.2	0.191
	Negatively affected	40	30.1	14	22.6	26	36.6	
	Positively affected	5	3.8	2	3.2	3	4.2	
Having trouble taking a bath		105	78.9	42	67.7	63	88.7	0.006
Experiencing toilet problems		63	47.4	28	45.2	35	49.3	0.634
Experiencing clean water problems		77	57.9	12	19.4	65	91.5	<0.001
Having a shortage of hygiene kit		77	57.9	30	48.4	47	66.2	0.038

Group 1: Earthquake non-experienced healthcare workers, Group 2: Earthquake experienced healthcare workers

Table 3. How Participants Felt After Taking Part in the Post-Earthquake Healthcare Works

	Total (n=133)		Group 1 (n=62)		Group 2 (n=71)		
	n	%	n	%	n	%	P
Positive Feelings	96	72.2	56	90.3	40	56.3	<0.001
Feeling nothing	4	3.0	4	6.5	0	0.0	0.045
Heroic feelings	7	5.3	4	6.5	3	4.2	0.705
Being useful	76	57.1	44	71.0	32	45.1	0.003
Togetherness	50	37.6	32	51.6	18	25.4	0.003
Negative Feelings	81	60.9	28	45.2	53	74.6	0.001
Anger	26	19.5	8	12.9	18	25.4	0.113
Helplessness	20	15.0	8	12.9	12	16.9	0.689
Despair	53	39.8	16	25.8	37	52.1	0.004
Worthlessness	19	14.3	2	3.2	17	23.9	0.002
Injustice	28	21.1	4	6.5	24	33.8	<0.001
Pity	21	15.8	6	9.7	15	21.1	0.117
Insufficiency	15	11.3	8	12.9	7	9.9	0.780

Group 1: Earthquake non-experienced healthcare workers, Group 2: Earthquake experienced healthcare workers

The median PSS-SR score for all participants was 23.0 (10.0-32.5). The earthquake-affected group had a higher PSS-SR median score (27.0 (16.0-34.0)) compared to the deployment group (14.0 (5.0-29.0)) (p<0.001). Among professional groups, the nurse/midwife group had a higher PSS-SR median score (28.0 (17.0-34.0)) compared to medical doctors (16.0 (6.0-30.0)) (p=0.041). The median STSS score for all participants was 45.0 (27.0-54.0). There was a significant difference in the STSS median scores between individuals working in hospitals (intensive care, emergency department, ward, operating room) (49.0 (35.0-54.0)) and those working in management and delivery of healthcare services in tent-cities facilities (37.0 (23.0-50.0)) (p=0.002). After pairwise comparisons,

itwasdeterminedonlythatindividualsworking in the emergency department of the hospital had higher STSS median scores compared to those working in tent facilities. Although there seemed to be statistical significance in the multiple comparisons among professional groups, post-Bonferroni correction revealed no significant difference in STSS median scores among professional groups. While no relationship was found between the presence of any loss of life in their surroundings ("yes/no") and STSS and PSS-SR scores. But individuals with loss of life among their relatives had higher STSS and PSS-SR scores compared to those who lost acquaintances or had no loss at all. There was no relationship found between marital status and STSS and PSS-SR scores (p>0.050). Similarly, there was no relationship between having children and STSS and PSS-SR scores (p>0.050) (Table 4). A strong positive correlation was observed between STSS and PSS-SR scores (r=0.878, p<0.001). A low positive correlation was found between age and PSS-SR score (r=0.296, p=0.001), and a weak positive correlation was found between age and STSS score (r=0.207, p=0.017). Professional experience showed a weak positive correlation with STSS and PSS-SR scores (r=0.289, p=0.001, and r=0.196, p=0.024, respectively).

Table 4. PSS-SR and STSS Score Assosiated Factors

		PSS-SR		STSS	
		Median (Q1-Q3)	**P**	**Median (Q1-Q3)**	**P**
Group	Deployed (1)	14.0 (5.0-29.0)	<0.001	30.0 (22.0-48.0)	<0.001
	Earthquake victim (2)	27.0 (16.0-34.0)		50.0 (38.0-58.0)	
Duty Station	Hospital	24.5 (15.0-33.0)	0.098	49.0 (35.0-54.0)	0.002
	Temporary Sites	23.0 (8.0-30.0)		37.0 (23.0-50.0)	
Experienced in working post-earthquake	Yes	24.0 (11.0-34.0)	0.665	46.0 (27.0-54.0)	0.604
	No	22.5 (10.0-31.5)		43.5 (26.0-53.0)	
Profession	Medical Doctor	16.0 (6.0-30.0)	0.041	41.0 (24.0-53.0)	0.209
	Nurse/Midwife	28.0 (17.0-34.0)		46.0 (31.0-57.0)	
	Other	17.0 (11.0-34.0)		44.0 (25.0-51.0)	
Gender	Female	27.0 (14.5-33.5)	0.004	46.0 (31.5-54.0)	0.006
	Male	17.0 (5.0-29.8)		37.5 (22.0-49.0)	
Martial Status	Married	23.0 (10.0-31.3)	0.976	45.0 (24.8-54.0)	0.501
	Single/Divorced	23.0 (11.0-33.0)		44.0 (27.0-61.0)	
Kids	Have	27.0 (13.3-34.0)	0.070	46.0 (29.0-58.8)	0.131
	Not have	20.0 (10.0-30.0)		41.0 (25.5-52.0)	
Loss of Life From Surrondings	Yes	24.0 (12.5-34.8)	0.198	48.0 (30.3-57.8)	0.107
	No	22.0 (10.0-30.0)		44.0 (24.0-53.5)	

PSS-SR: Post-Traumatic Stress Disorder Symptom Self-Report Scale, STSS: Secondary Traumatic Stress Scale, SD: Standart Deviation

Individuals who experienced negative emotions while working after the earthquake had significantly higher scores in both PSS-SR and STSS compared to those who did not experience negative emotions (p<0.001). The median PSS-SR and STSS scores were significantly lower for individuals who did not feel any impact from their work after the earthquake compared to those who felt something (p=0.001 and p=0.003, respectively). Participants who felt useful had lower PSS-SR scores (15.0 (8.0-25.8))

compared to those who did not feel useful (30.0 (18.5-37.0)) (p<0.001). Similarly, those who felt useful had lower STSS scores (31.5 (23.3-48.0)) compared to those who did not feel useful (51.0 (41.0-62.0)) (p<0.001). Individuals who felt despair had higher PSS-SR scores (30.0 (21.5-36.0)) compared to those who did not feel despair (15.0 (8.0-27.8)) (p<0.001). Likewise, those who felt despair had higher STSS scores (52.0 (45.0-61.5)) compared to those who did not feel despair (32.5 (23.0-48.0)) (p<0.001). Participants who perceived injustice had higher PSS-SR scores (30.0 (22.3-35.5)) compared to those who did not perceive injustice (20.0 (9.0-30.5)) (p=0.007). Similarly, those who perceived injustice had higher STSS scores (50.5 (40.3-62.0)) compared to those who did not perceive injustice (41.0 (24.0-52.5)) (p=0.003). While the presence of a sense of pity did not affect STSS scores, individuals who felt a sense of pity had higher PSS-SR scores (30.0 (21.0-36.0)) compared to those who did not feel a sense of pity (21.5 (10.0-30.8)) (p=0.021). Similarly, the presence of a sense of togetherness did not affect STSS scores, but individuals who felt a sense of togetherness had lower PSS-SR scores (15.0 (8.0-27.3)) compared to those who did not feel a sense of togetherness (27.0 (14.0-34.0)) (p=0.013). Participants who felt a sens of insufficent had higher PSS-SR scores (30.0 (17.0-36.0)) compared to those who did not feel a sense of insufficiency (22.0 (10.0-31.0)) (p=0.009). Similarly, those who felt a sense of insufficiency had higher STSS scores (50.0 (45.0-62.0)) compared to those who did not feel a sense of insufficieny (42.0 (24.8-53.3)) (p=0.027). (Table 5)

Table 5. The Relationship Between Feelings of Working After the Earthquake and PSS-SR and STSS Score

		PSS-SR		STSS	
		Median (Q1-Q3)	**p**	**Median (Q1-Q3)**	**P**
Positive Feelings	Yes	17.0 (8.0-28.8)	<0.001	36.0 (24.0-50.0)	<0.001
	No	30.0 (25.0-37.5)		53.0 (45.0-62.0)	
Feeling nothing	Yes	2.0 (1.0-3.0)	0.001	19.5 (17.0-22.0)	0.003
	No	24.0 (11.0-33.0)		45.0 (28.0-54.0)	
Heroic feelings	Yes	25.0 (10.0-28.0)	0.732	46.0 (23.0-48.0)	0.916
	No	23.0 (10.0-33.0)		44.0 (27.0-54.0)	
Being useful	Yes	15.0 (8.0-25.8)	<0.001	31.5 (23.3-48.0)	<0.001
	No	30.0 (18.5-37.0)		51.0 (41.0-62.0)	
Togetherness	Yes	15.0 (8.0-27.3)	0.013	34.0 (26.0-50.5)	0.098
	No	27.0 (14.0-34.0)		48.0 (29.0-54.0)	
Negative Feelings	Yes	28.0 (17.0-34.0)	<0.001	48.0 (37.5-58.0)	<0.001
	No	11.5 (5.0-25.5)		30.5 (22.0-47.0)	
Anger	Yes	24.5 (14.0-32.3)	0.219	46.0 (29.0-53.3)	0.480
	No	22.0 (8.0-33.0)		44.0 (24.0-54.0)	
Helplessness	Yes	24.5 (16.3-33.5)	0.248	49.0 (39.5-61.0)	0.063
	No	22.0 (10.0-32.0)		44.0 (26.0-53.0)	
Despair	Yes	30.0 (21.5-36.0)	<0.001	52.0 (45.0-61.5)	<0.001
	No	15.0 (8.0-27.8)		32.5 (23.0-48.0)	

Table 5.(continue) The relationship between feelings of working after the earthquake and PSS-SR and STSS score					
Worthlessness	Yes	29.0 (23.0-34.0)	0.123	46.0 (41.0-54.0)	0.247
	No	21.5 (10.0-31.5)		43.5 (26.0-54.0)	
Injustice	Yes	30.0 (22.3-35.5)	0.007	50.5 (40.3-62.0)	0.003
	No	20.0 (9.0-30.5)		41.0 (24.0-52.5)	
Pity	Yes	30.0 (21.0-36.0)	0.021	50.0 (37.0-61.0)	0.106
	No	21.5 (10.0-30.8)		44.0 (25.3-53.0)	
Insufficiency	Yes	30.0 (17.0-36.0)	0.009	50.0 (45.0-62.0)	0.027
	No	22.0 (10.0-31.0)		42.0 (24.8-53.3)	

PSS-SR: Post-Traumatic Stress Disorder Symptom Self-Report Scale, STSS: Secondary Traumatic Stress Scale

DISCUSSION

This study has shown that both earthquake experienced and non-experienced healthcare professionals who were involved in post-earthquake duties were negatively affected by both the traumatic events they experienced and the traumas of the patients they treated. In this study, although there was no cut-off value on the scale used, considering the studies in the literature, when suggested cut-off score is selected, it is thought that PTSD is present in 76.1% of healthcare professionals affected by the earthquake. A meta-analysis revealed that PTSD was observed in 16.4% of healthcare professionals after earthquakes[19]. In a study conducted after the Elazığ Province, Türkiye earthquake, severe trauma was found in 25.8% of healthcare professionals in the early period[20]. In a study of healthcare professionals in China after an earthquake, the prevalence of PTSD was found to be 19%[21]. The overall prevalence of PTSD among healthcare worker was 21.9% in Nepal two months after the earthquake[22]. A study conducted in China one year later an earthquake was found %17.0 prevalence of PTSD among medical rescue workers[23]. In Taiwan, 12.7% of emergency medical technicians who responded to the earthquake met the criteria for partial PTSD[24]. In Pakistan, a study conducted 24 months after the earthquake found that the prevalence of PTSD was 42.6% among individuals, the majority of whom had experienced the earthquake and were actively working as disaster rehabilitation and reconstruction workers in the affected region[25]. A study conducted among earthquake survivors in Nepal found that the prevalence of PTSD was 24% ten months after the earthquake[26]. A study on Italian earthquake survivors report a 21.7% prevalence of PTSD[27]. The prevalence of PTSD among survivors of the 2017 Jiuzhaigou earthquake was found to be 52.7%[28]. A meta-analysis of 46 studies found that the incidence of PTSD among earthquake survivors was 23.7%, with a combined incidence of 28.8% for those diagnosed within 9 months and 19.5% for those diagnosed after 9 months[29]. In this study conducted on healthcare workers following the Kahramanmaraş earthquakes, the prevalence of PTSD was found to be higher compared to both healthcare workers in Türkiye and other countries, as well as the PTSD prevalence in studies conducted on the general population of survivors. The higher rate of PTSD in this study may be explained by the occurrence of two consecutive earthquakes with high magnitude, the continued occurrence of aftershocks with a magnitude of 5 or higher during the data collection period, and the ongoing destruction of buildings and presence of heavily damaged

buildings within the cities. Furthermore, the widespread and extensive destruction caused across multiple cities may have contributed to a higher prevalence of PTSD, compared to earthquakes that resulted in smaller-scale damage in more localized areas. Variations in PTSD prevalence observed in the literature following earthquakes may be influenced by factors such as the material and emotional losses experienced by individuals, their resilience and social support, the sociodemographic characteristics of the study populations, and the time elapsed between the earthquake and the study. The higher prevalence of PTSD among healthcare workers compared to the general population may also be influenced by their involvement with traumatic patients, both physically and mentally.

PSS-SR and STSS scores were higher in healthcare professionals exposed earthquake compared to those who came on duty. During a traumatic event such as war in Sudan, the levels of STS and burnout in first responders providing first aid were found to higher than those coming for international aid[30]. In the Kosovo War, the prevalence of PTSD in first aid staff from Kosovo was higher than those deployed by international organizations[31]. In a study of soldiers deployed from the surrounding areas to the earthquake zone in China, it was found that the secondary trauma and burnout levels of these soldiers who were not victims of the earthquake were low, and their satisfaction feelings were high[32]. Similarly, in this study, positive feelings such as a sense of usefulness and a sense of togetherness were more common in those who came on duty from non-affected area, while negative feelings such as despair, injustice, and worthlessness were more common in the group affected by the earthquake. It is expected that positive feelings will be more common in the group where about 90% volunteered, leading to professional and spiritual satisfaction. For earthquake-affected healthcare professionals, continuing to work by leaving behind their losses, families, and routines may explain the presence of negative feelings such as despair and worthlessness.

In women, PSS-SR and STSS scores are higher. Studies conducted after earthquakes in Türkiye, China, Australia, and other countries have also shown that women are more affected by trauma than men[20,21,33]. Similarly, a study conducted after an earthquake in Japan and a meta-analysis examining predictors of STS revealed that women are more prone to secondary trauma than men[34,35]. Although this study showed that marital status and having children did not affect PSS-SR and STSS scores, it has been shown in the literature that having children and being married affect the presence of PTSD[21]. In this study, although the status of having children was asked, there may have been no relationship between having children and scale scores because the ages of the children and whether the children experienced the earthquake were not asked in detail. While previous experience working after an earthquake does not affect the level of STS in this study, working experience as a health working was weakly corraleted STSS scores. Literature has been shown that as experience increases in healthcare professionals serving after a terrorist attack or earthquake, the level of STS decreases[36,37].

Personal basic needs of the participants, it is seen that sleep patterns worsen in earthquake-affected individuals, and access to clean water and toilets becomes more difficult. The

reason for healthcare professionals affected by the earthquake living in worse conditions is thought to be that, in the early period, organization could not be fully achieved within the province, people coming from outside were prepared in advance, and planning for them was made, so the likelihood of experiencing problems in personal needs was estimated to be lower. Therefore, it is essential for every institution to plan for the basic needs of its personnel before a disaster. When looking at both groups, the only personal basic need that is not affected is sexual activity. While an increase in sexual activity is expected with the survival instinct in disaster situations, the working group's pre-earthquake higher living standards, the intensity of work, and the fact that they survived may cause this instinct to be deactivated or individuals to avoid giving the right answer to the question culturally.

Ensuring the sustainability of healthcare services necessitates addressing the basic needs and health requirements of healthcare personnel. This study demonstrates that a significant number of healthcare workers affected by the earthquake suffer from PTSD and STS and are unable to adequately meet their basic needs during the first six months following the disaster. While focusing on the continuity of healthcare service delivery, this study emphasizes the importance of addressing the basic needs and mental health of healthcare personnel, ensuring that their well-being is not overlooked in the provision of healthcare services. Therefore, disaster preparedness should focus on minimizing the anticipated impact and implementing supportive mechanisms in the aftermath. To achieve this, emergency response systems that include mental health support should be established before disasters occur. Personnel working in high-risk earthquake zones should receive training to enhance their resilience to disaster-related stressors, and volunteers willing to serve during disasters should be identified in advance and included in stress management and resilience training programs. Following a disaster, all healthcare personnel who have worked in the affected region should receive routine psychological counseling and be screened for PTSD and STS. Those diagnosed with these conditions should be provided with appropriate mental health interventions. To prevent burnout among healthcare professionals working in disaster zones, temporary or permanent reassignments should be considered. Additionally, workload-related stress should be mitigated through rotational work schedules in high-stress units. In addition to psychological support, ensuring healthcare workers' access to essential resources such as adequate shelter, clean water, food, and rest facilities should be a priority. Disruptions in basic needs can exacerbate stress, negatively impacting both mental well-being and professional performance. Therefore, institutional disaster response plans should include pre-established provisions for securing safe accommodations, sufficient supplies, and proper living conditions for healthcare personnel in disaster-affected regions.

This study has several limitations. Although the data were collected six months after the earthquake, aftershocks and building destructions are still ongoing in the region. Therefore, it should be considered that scale scores may be high due to the continued traumatic stimulus. Although the scale scores

of those who came on duty are lower than those affected by the earthquake, they are higher than the healthy community average. It should be kept in mind that the reason for this may not only be the experienced secondary traumatic event, but also experience of aftershocks while they were working in the region. Considering these limitations, it is thought that repeating the study one year later would be more reliable. In this study, PTSD and STS assessments were conducted using self-report scales without clinical interviews. This may have led healthcare professionals working under earthquake conditions to report their symptoms more severely due to the distress caused by their working environment. Alternatively, some participants might have underreported their symptoms due to concerns about being identified as having a mental health condition. Therefore, the reported prevalence rates of PTSD and STS should not be considered as clinical diagnoses, and the presence of self-reporting bias should be taken into account when interpreting the results. Additionally, since researchers did not have access to contact lists of both local healthcare personnel and those assigned to the region, participants were recruited using the snowball sampling method. As a result, the findings cannot be generalized to all healthcare workers in the earthquake-affected area. Furthermore, individuals who responded to the survey may have been those particularly interested in the topic, more severely affected by the earthquake, or wishing to make their experiences visible. This introduces the possibility of volunteer bias, which should be considered when evaluating the results, as it may have led to a higher reported prevalence of PTSD compared to other studies.

CONCLUSION

Earthquakes constitute traumatic events, and the active engagement of healthcare professionals who are victims of earthquakes exacerbates the traumatic stresses related to the earthquake itself and the secondary traumatic stress symptoms arising from the traumatic experiences of the patients they attend to. This study has demonstrated that both PSS-SR scores and STSS scores are significantly elevated in healthcare professionals affected by the earthquake compared to those who were deployed for duty. Therefore, the imperative of providing support to healthcare professionals affected by the earthquake should not be overlooked. If feasible, after support is provided through deployment, healthcare professionals impacted by the earthquake should be excluded from operational procedures.

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ORIGINAL ARTICLE

Prevalence and underlying determinants related to COVID-19 vaccine hesitancy among Iraqi Healthcare professionals in Hilla City

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Abstract

Objective: This study aims to assess the prevalence of COVID-19 vaccine hesitancy among healthcare workers in Hilla City and understand the underlying reasons.

Method: A cross-sectional study was conducted at various health institutions in Al-Hilla City, randomly selected, from July 1, 2022, to November 1, 2022. A three-part questionnaire was used to collect information from all healthcare workers (HCWs) at these institutions who consented to participate. The first part was focused on socio-demographics. The second part gathered information on COVID-19 infection history and vaccination status. The third part used a five constraints scale questionnaire to evaluate the psychological factors affecting COVID-19 vaccine hesitancy among unvaccinated participants, which is composed of five main subscales: "confidence, complacency, constraints, calculation, and collective responsibility." Data were analyzed using the Statistical Package for the Social Sciences (SPSS) program.

Results: The study of 521 healthcare workers revealed a vaccine hesitancy rate of 12.5%, influenced by lack of confidence (86.2%), complacency (70%), and low collective responsibility (93.8%). Non-medical staff relying on social media for information were more likely to be hesitant ($p < 0.05$). Vaccine hesitancy was significantly associated with occupation, workplace, and information sources ($p < 0.05$) but showed no link to gender, marital status, education, or chronic disease history ($p > 0.05$).

Conclusion: The non-vaccinated participants were mostly non-medical healthcare workers employed in hospitals, with social media as their main source of information. Inadequate trust in the vaccine, a low sense of collective responsibility, and an underestimation of disease risk were key factors influencing vaccination decisions.

Keywords: COVID-19, Health Personnel, Vaccination Hesitancy, Vaccination Refusal, Vaccines

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a serious, contagious disease that caused a worldwide outbreak [1]. The World Health Organization declared it a global health crisis [2].

It has been understood that vaccination is the most vital measure to control an epidemic. Vaccine development efforts began globally in January 2020 following China›s sharing of the virus›s genetic sequence [3].

The success of vaccination programs relies on people's preparedness to receive the vaccines. Due to their rapid development, concerns about the safety and effectiveness of new COVID-19 vaccines arose, contributing to vaccine hesitancy and complicating efforts to achieve widespread vaccination [4].

The COVID-19 vaccination program in Iraq began in early 2021, offering vaccines such as Pfizer-BioNTech, AstraZeneca, Sinopharm, and Sputnik V. Initially, healthcare workers and high-risk groups were prioritized. The program included two primary doses, with booster doses introduced in late 2021. Vaccines were distributed via hospitals and primary healthcare centers, and mandatory policies for healthcare workers were implemented by September 2021[5].

Healthcare workers (HCWs) were among the first groups recommended for COVID-19 vaccination by the World Health Organization [3]. The underlying reasons for this are the following. First, HCWs face a significantly greater danger of infection compared to the public, due to their interaction with patients during diagnosis and treatment. Corona viral test results showed that front-line HCWs have 11 times more positive rates than the general community [6].

Second, HCWs play a role in transmitting infections to patients through physicians' hands, equipment, and surrounding surfaces. Studies demonstrate that physicians can be a significant pathway for spreading hospital-acquired infections [7]. They can also spread the disease to their relatives, and others [8]. Therefore, healthcare workers are expected to be essential in achieving high vaccination rates and controlling the public health crisis [9]. The interaction between patients and healthcare workers (HCWs) is the basis for building public confidence in vaccines and addressing vaccine hesitancy [10]. Patients often have a strong trust relationship with their healthcare providers [11]. Effective communication from HCWs regarding vaccine benefits, risks, and importance empowers patients to make confident vaccination decisions. However, earlier studies have shown that a large percentage of HCWs are vaccine-hesitant in their personal lives, which may negatively affect their attitudes toward vaccines [12].

To increase Coronavirus disease 2019 vaccine rates among HCWs, their concerns about the vaccine must be addressed effectively. The causes of vaccine hesitancy have to be identified, and this information should be used to establish confidence in the vaccine. Therefore, the current study evaluates hesitancy toward the COVID-19 vaccine among Iraqi healthcare personnel and explores the reasons behind any vaccine hesitancy.

METHOD

A cross-sectional study was conducted at various health institutions in Al Hilla City. Using simple random sampling, three of five hospitals and three of twenty primary

healthcare centers were selected for the study. The total number of healthcare workers (HCWs) in these selected institutions, which formed the study's sampling frame, was 602 HCWs.

All healthcare workers employed at the selected institutions during the study period were invited to participate, regardless of shift timing. Those who were absent for extended periods (e.g., leave, travel) were not included. This included both medical staff providing direct clinical care (e.g., doctors, nurses, health officers, midwives, pharmacists, and medical laboratory technologists) and non-medical staff involved in non-clinical services (e.g., administrative employees, lawyers, accountants, cleaning staff, janitors, and others in non-clinical roles). Invitations were distributed through institutional announcements and direct communication.

The sample size was determined using the standard formula for survey studies: [$n = Z^2P\ (1–P)/d^2$], with a precision level of 0.05 and a 95% confidence interval. A previous study reported that 57.4% of healthcare workers were hesitant to receive a COVID-19 vaccine [13]. Based on this, the minimum required sample size was calculated as 376. However, to improve representativeness and strengthen statistical analysis, the sample size was increased to 521.

Among the 549 invited healthcare workers, 28 declined to participate, yielding a response rate of 94.9%.

Data were collected from July 1 to November 1, 2022, through interviews using a questionnaire adapted from previously published studies [14]. The questionnaire consisted of three sections. The first section gathered socio-demographic data. The second included questions related to COVID-19, such as family members who had previously contracted COVID-19 and sources of information on COVID-19 vaccination.

The third section focused on non-vaccinated HCWs, utilizing the translated, validated, and reliable Arabic form of the Five Constraints Scale (5C scale) to evaluate psychological factors influencing vaccine uptake[14]. This scale consists of 15 validated statements divided into five subscales: confidence, complacency, constraints, calculation, and collective responsibility.

The first subscale (Q1-Q3) measured confidence in vaccine effectiveness and safety, as well as trust in healthcare organization leaders and authorities.

The second subscale (Q4-Q6) assessed complacency, defined as the belief that vaccine-preventable diseases pose low risks and that vaccination is unnecessary.

The third subscale (Q7-Q9) explored constraints, such as limited access or personal concerns that might hinder vaccination.

The fourth subscale (Q10-Q12) evaluated calculation, reflecting an individual's effort to weigh infection risks against vaccination risks to make an informed decision.

The fifth subscale (Q13-Q15) assessed collective responsibility, focusing on the willingness to protect others through self-vaccination and contribute to herd immunity.

Non-vaccinated HCWs responded to three questions for each subscale on a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). Neutral responses scored a 4, and reverse-coded items (marked R) were adjusted accordingly. The mean of these scores

was used to calculate subscale scores. The minimum required scores for the subscales were 5.7 for confidence, 4.7 for complacency, 6.0 for constraints, 6.3 for calculation, and 6.2 for collective responsibility.

A pilot study involving 20 HCWs was conducted to assess the questionnaire's clarity and completion time. While their feedback was used to improve the questionnaire, their data were excluded from the main study.

Participants were verbally informed about the study's purpose before the interviews. All collected information was kept confidential, and data were anonymized to protect participant identities. Ethical approval was obtained from the Babylon Governorate Health Directorate (Approval No. 78, dated 28/6/2022).

Data entry and analysis were performed using the Statistical Package for Social Sciences (SPSS) version 25. Categorical data were presented as numbers and percentages, while continuous data were described using means and standard deviations. The relationship between independent categorical variables was analyzed using the Chi-square test or Fisher's exact test. Mean differences were compared using the independent samples t-test. Statistical significance was set at a p-value of 0.05 or lower.

RESULTS

The present study included 521 healthcare workers. Their mean age was 33.2 years, with a standard deviation (SD) of 10.3 years. A total of 48.2% were in the age group of less than 30 years, and about two-thirds were females (67.0%). The majority were married (64.7%), most of them lived in urban areas (82.7%), and 72.4% of the participants worked in a hospital, as shown in [Table 1].

Table 1. Sociodemographic characteristics of participants (n = 521)

Characteristic		**n**	**%**	**Mean ± SD**
Age (years)				33.2±10.33
Age groups (years)	<30	251	48.2	
	30-40	146	28.0	
	41-50	63	12.1	
	51-60	54	10.4	
	61-70	7	1.3	
Gender	Male	172	33.0	
	Female	349	67.0	
Marital status	Married	337	64.7	
	Single	167	32.1	
	Separated or Widow	17	3.2	
Residence	Urban	431	82.7	
	Rural	90	17.3	
Workplace	Hospital	377	72.4	
	PHCC	144	27.6	
Occupation	Medical HCWs: doctor, nurse, Midwives, Pharmacists and other	411	78.9	
	Non-medical HCWs administrative employees, accountants, cleaning staff, and others	110	21.1	
Years of experience of participants				8.89 ± 9.53

Table 1. (Continued) Sociodemographic characteristics of participants (n = 521)			
Years of experience groups (years)	< 5	234	44.9
	6-10	146	28.0
	11-15	42	8.1
	16-20	18	3.5
	>20	81	15.5
Educational level of participants	Illiterate	3	0.6
	Read and write	6	1.2
	Primary School	12	2.3
	Intermediate School	16	3.1
	Secondary High School	66	12.7
	Institute	168	32.2
	College	223	42.8
	Higher Education	27	5.2
Total		521	100

The majority of participants (87.5%) had no history of chronic diseases; more than half of the participants (51.3%) had a previous personal history of COVID-19, and 62.8% had a family history of COVID-19, as shown in [Table 2].

Table 2. Distribution of participant according to their history of chronic disease and COVID-19 infection and vaccination			
Characteristic		**n**	**%**
Chronic diseases	No chronic disease	456	87.5
	Single disease	54	10.4
	Multiple diseases	11	2.1
Personal history of COVID-19 disease	Yes	267	51.3
	No	197	37.8
	Not sure	57	10.9
Family history of COVID-19 infection	Yes	327	62.8
	No	164	31.5
	Not sure	30	5.7
COVID-19 vaccination status	Vaccinated	456	87.5
	Non vaccinated	65	12.5
Total		521	100.0

Of the total number of non-vaccinated HCWs (65), 56 (86.2%) did not have confidence in the effectiveness and safety of vaccines, the vaccine delivery system, and the policymakers. Additionally, 30 (46.2%) of non-vaccinated HCWs reported complacency, which is a perception of low disease risk and no need for vaccination. Six (9.2%) had constraints against vaccination, 39 (60%) did not calculate to weigh the risk of infection versus the risk of vaccination, and 61 (93.8%) did not have collective responsibility for protecting others through self-vaccination or did not know enough about herd immunity, as shown in [Figure 1].

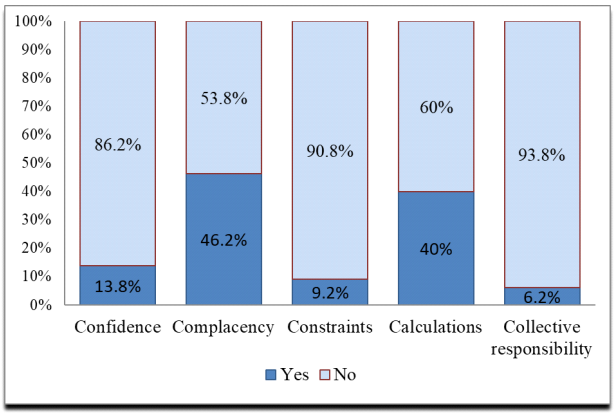

Figure 1. Distribution of non-vaccinated HCWs according to the Five Constraints Scale of COVID-19 vaccine hesitancy

Table 3 compares the socio-demographic characteristics of HCWs based on their COVID-19 vaccination status. Non-vaccinated HCWs were more likely to work in hospitals (93.8%) compared to vaccinated HCWs (69.3%), a statistically significant difference ($p < 0.001$). Additionally, a higher proportion of non-vaccinated HCWs were non-medical staff (32.3%) compared to vaccinated HCWs (19.1%) ($p = 0.021$). While non-vaccinated HCWs were slightly younger and more likely to be female, these differences were not statistically significant ($p > 0.05$). Similarly, there was no significant association between vaccination status and marital status, residence, educational level, or years of experience ($p > 0.05$).

Table 3. Distributions of Socio-demographic factors among participants according to their COVID-19 vaccine status

Variable		Receiving the COVID vaccine						p-value
		COVID-19 vaccine recipients		COVID-19 vaccine non-recipients		Total		
		n	%	n	%	n	%	
Age groups (Years)	<30	215	47.1	36	55.4	251	48.2	0.174
	31-40	129	28.3	17	26.2	146	28	
	41-50	53	11.6	10	15.4	63	12.1	
	51-60	52	11.4	2	3.1	54	10.4	
	61-70	7	1.5	0	0	7	1.3	
Age (years) Mean ± SD		33.51± 10.56		31.08±8.30		33.2±10.33		0.076
Gender	Male	149	32.7	23	35.4	172	33.0	0.664
	Female	307	67.3	42	64.6	349	67.0	
Marital status	Married	299	65.6	38	58.5	337	64.7	0.441
	Single	141	30.9	26	40	167	32.1	
	Separated and Widow	16	3.5	1	1.5	17	3.3	
Residence	Urban	381	83.6	50	76.9	431	82.7	0. 186
	Rural	75	16.4	15	23.1	90	17.3	
Occupation	Medical	369	80.9	44	67.7	413	79.3	0.013
	Non-medical	87	19.1	21	32.3	108	20.7	
Educational level	Illiterate	2	0.4	1	1.5	3	0.6	0.107
	Read and write	5	1.1	1	1.5	6	1.2	
	Primary School	8	1.8	4	6.2	12	12.3	
	Intermediate School	15	3.3	1	1.5	16	3.1	
	Secondary High School	63	13.8	3	4.6	66	12.7	
	Diploma (Institute)	149	32.7	19	29.2	168	32.2	
	Collage	190	41.7	33	50.8	223	42.8	
	Higher Education	24	5.3	3	4.6	27	5.2	
Workplace	Hospital	316	69.3	61	93.8	377	72.4	<0.001
	PHCC	140	30.7	4	6.2	144	27.6	
Years of experience	< 5	199	43.6	35	53.8	234	44.9	0.422
	5-10	129	28.3	17	26.2	146	28	
	11-15	39	8.6	3	4.6	42	8.1	
	16-20	15	3.3	3	4.6	18	3.5	
	> 20	74	16.2	7	10.8	81	15.5	
Total N		456	100.0	65	100.0	521	100.0	

A negative history of chronic disease among vaccinated HCWs was (88.2%), while in non-vaccinated HCWs it was (83.1%), the statistical analysis showed no significant association ($p > 0.05$). The history of COVID-19 disease in non-vaccinated participants was (52.3%) while in vaccinated participants it was

(51.1%), the statistical analysis showed no statistically significant association (p > 0.05). The family history of COVID-19 disease in non-vaccinated participants was (64.6%) while in vaccinated participants it was (62.5%), the statistical analysis showing no statistically significant association (p > 0.05), as shown in [Table 4].

Table 4. Distribution of participants according to the history of chronic disease, and personal and family history of COVID-19 disease concerning their vaccination status

Variable	Receiving COVID vaccine						p-value
		COVID-19 vaccine recipients		COVID-19 vaccine non-recipients		Total	
		n	%	n	%	n	%	
Chronic disease	none	402	88.2	54	83.1	456	87.5	0.576
	Single disease	45	9.9	9	13.8	54	10.4	
	Multiple diseases	9	2	2	3.1	11	2.1	
COVID infection history	Yes	233	51.1	34	52.3	267	51.2	0.673
	No	171	37.5	26	40	197	37.8	
	Not sure	52	11.4	5	7.7	57	10.9	
Family member's history of COVID -19 infection	Yes	285	62.5	42	64.6	327	62.8	0.951
	No	145	31.8	19	29.2	164	31.5	
	Not sure	26	5.7	4	6.2	30	5.8	
Total		456	100	65	100	521	100	

The findings in [Table 5] showed a statistically significant association between vaccination and the main source of information among the participants (p-value = 0.004), with the highest proportion of vaccinated individuals. (55.7%) cited doctors and other HCWs as the main source of information, while social media platforms and YouTube were the main sources for the highest percentage of non-vaccinated HCWs (46.2%)

Table 5. Distribution of participants according to the source of information about the COVID-19 vaccine concerning their vaccine status

The main source of information about COVID-19 vaccination	Receiving COVID vaccine				Total		p-value
	COVID-19 vaccine recipients		COVID-19 vaccine non-recipients				
	n	%	n	%	n	%	
Doctors/HCWs	254	55.7	21	32.3	275	52.8	0.004
TV /newspapers /news releases	44	9.6	9	13.8	53	10.2	
Social media platforms /YouTube	118	25.9	30	46.2	148	28.4	
Scientists/scientific journals/ conferences	34	7.5	4	6.2	38	7.3	
People around them	3	0.7	1	1.5	4	0.8	
No source	3	0.7	0	0.0	3	0.6	
Total n (%)	456	100	65	100	521	100	

DISCUSSION

This study found that 12.5% of HCWs were hesitant to receive the COVID-19 vaccine. The main reasons for hesitancy included a lack of confidence (86.2%), low collective responsibility (93.8%), and complacency (70%). Vaccine hesitancy was significantly associated with occupation, workplace, and information sources (p < 0.05) but not with gender, marital status, education, or chronic

disease history. These findings highlight the critical need for targeted interventions, especially among non-medical HCWs who rely on social media for vaccine information. Compared to previous studies in the region, our findings indicate a higher vaccine acceptance rate is higher than that reported in regional and global studies conducted among healthcare workers before the introduction of the vaccine, such as in Kurdistan (72.1%) [15], Kuwait (83.3%) [16], Saudi Arabia (64.9%, 64.4%) [17, 18], Oman (40%) [19], and Egypt (48% among medical students) [20]. These differences in acceptance rates before and after the vaccine introduction could be because the willingness to get vaccinated does not necessarily mean that individuals will do so. These decisions are complex, influenced by many factors, and can change over time [21].

In studies among the general population in Iraq, the acceptance rate was 77.6% and 61.7% [22, 23]. Vaccination acceptance was higher among healthcare workers compared to the general population. Three main reasons explain this: the higher medical knowledge of HCWs, their concern about catching COVID-19 from patients, and their worry about spreading the infection to their families. A study found that healthcare workers were at high risk of contracting COVID-19, which worried them due to the potential of spreading the infection to their families [24]. Lastly, the Iraqi government's mandatory vaccination policy for healthcare workers, implemented in September 2021, played a significant role [25].

Current results showed no association between the vaccination status of HCWs and their sex ($p > 0.05$). This is similar to what was found in studies conducted in Iraqi Kurdistan [13, 26], Baghdad [27], and the general population in Iraq [22]. Many studies have found that males had a higher vaccination acceptance rate than females, as observed in studies on healthcare workers in Iraqi Kurdistan [15] and Saudi Arabia [17]. In contrast, one study reported higher acceptance among females [28]. This could be explained by the fact that most of the current participants (67%) were female, so no clear relationship could be determined. Alternatively, it may be based on a recent study showing that female healthcare workers were infected more often than male ones, while male healthcare workers had higher mortality rates than female healthcare workers [29].

This study did not find significant differences in vaccination rates between different age groups ($p > 0.05$). Researchers reported higher vaccination rates among younger HCWs [30]. In contrast, others who were older were more likely to receive the vaccine [31]. There is no clear explanation for this discrepancy. Social media exposure and misinformation might make younger healthcare workers less likely to get vaccinated, while the higher risk of serious illness for older healthcare workers encourages them to get the vaccine. Conversely, older HCWs could be more concerned about potential vaccine side effects and less involved in COVID-19 patient care.

The non-medical HCWs were more cautious about accepting the COVID-19 vaccine than medical HCWs. This is also reported by other studies [13, 19], as medical health workers are at a higher risk of contracting infections, are more likely to be aware of the risks associated with infectious diseases [32], and have a greater understanding of the significance of vaccines in preventing the transmission of such diseases.

Regarding the workplace, in our study, vaccine

hesitancy was higher among hospital workers than PHCC workers. As a consequence of direct contact with COVID-19, HCWs might become less concerned about the virus, leading to a decreased perception of personal risk. Additionally, since the PHCC is smaller and has fewer employees, it is easier to request that employees bring their vaccination card or a negative (PCR) test weekly for those who are not vaccinated. In Iraq, unvaccinated employees are required to provide a verified negative test at their workplaces every week [25]. In contrast, hospitals have many employees and large facilities, making it more challenging to monitor each employee. There has been controversy over a Kurdistan study [15]. According to this study, PHCC workers are more cautious about vaccines than hospital workers. This may be because the study was conducted shortly before the local availability of the vaccine.

Our study showed no relation between educational level and vaccination status, which is consistent with an earlier study [27]. Other studies conducted among the general public found that higher vaccine acceptance is more common among individuals with higher education levels [22, 33]. The reason for this might be that healthcare workers have higher education levels than the general population.

Current findings show that comorbidities were not related to vaccination, similar to the findings of other researchers [3, 26]. In contrast, previous research found that comorbidities increased the likelihood of vaccine acceptance [34,35]. In other studies, HCWs with comorbidities showed more hesitancy toward vaccines, which could be associated with fears of adverse effects [36]. These differences from the present study could be because most of the current respondents were young and did not have chronic conditions.

Misinformation about COVID-19 and vaccines is a potential determinant associated with vaccine hesitancy. Among the vaccinated (55.7%), doctors and other healthcare workers were the main sources of information, while social media platforms and YouTube were the primary sources for non-vaccinated HCWs. The association was highly significant ($p = 0.004$). Our results are comparable to those of others [23, 27]. The role of social networks in shaping public attitudes toward COVID-19 vaccines has been investigated in several studies [28].

Among the Five Constraints Scale, the highest percentage in the present study was due to a lack of collective responsibility. This suggests that 93.8% of non-vaccinated HCWs did not feel a sense of social responsibility to protect others by vaccinating themselves and contributing to herd immunity[37]. Collective responsibility has been associated with increased vaccine acceptance in previous studies [38,39]. Similarly, **59.6%** of participants in a survey across 13 Arab countries, including Iraq, lacked collective responsibility [40].

The second-highest percentage of non-vaccinated HCWs (86.2%) in our sample lacked confidence in public health authorities, vaccine safety, and the effectiveness of the vaccine. This concern has been reported in other studies [14,36].

Complacency was the third determinant, with 46.2% believing their immune system was sufficient, reducing their intention to vaccinate. This belief affects their intention to get vaccinated and has been reported in other studies [41].

Calculation, or weighing risks and benefits, was observed in 40% of non-vaccinated HCWs, potentially exposing them to misinformation and lowering vaccine uptake [16,38]. It is possible that individuals who extensively searched for information were exposed to misinformation, reducing their willingness to get vaccinated.

Lastly, only 9.2% reported constraints, suggesting that access to vaccination was not a significant concern. Earlier studies showed that greater constraints were associated with lower vaccine intake [13,16].

The limitations of this study include the geographically homogeneous sample from Al Hilla City, which limits generalizability, and its focus on non-vaccinated HCWs, which prevents comparisons with vaccinated counterparts. Additionally, the survey was conducted early in the vaccine rollout, providing only a snapshot of HCWs' attitudes. Several potential biases may have influenced the study findings. Response bias may have occurred as participants with strong vaccination opinions were more likely to respond. Recall bias is also a concern since self-reported data on infection history and vaccination status may be inaccurate. Additionally, information bias could result from self-assessments, leading to potential misclassification errors in evaluating vaccine hesitancy. However, to our knowledge, this is the first Al-Hilla study to use the validated and translated 5C tool to assess COVID-19 vaccine hesitancy, with a good sample size drawn from both primary and secondary health institutions.

CONCLUSION

In this study, 12.5% of healthcare workers hesitated about COVID-19 vaccination (delay or refusal). Non-medical staff working in hospitals were likelier to be unvaccinated and relied heavily on social media for information. Complacency, lack of collective responsibility, and confidence about COVID-19 are the major determinants of vaccine hesitancy. There are no available constraints for vaccination among most non-vaccinated healthcare workers. Based on study findings, vaccination of healthcare workers needs to be addressed by providing more training and education regarding COVID-19 disease, vaccine, and herd immunity to increase their trust in policymakers, safety, and effectiveness of vaccines, with a concentration on non-medical healthcare workers and those working in the hospital.

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Ethical Declaration: Participants were verbally informed about the study's purpose before answering interview questions. All collected information from participants was kept confidential. Data was collected anonymously, meaning participants were not identifiable. The study received approvals from the Babylon Governorate health directorate (No.78 on 28/6/2022).

Author Contrubition: Dr. Rasha Raheem Al-mansoori contributed to data collection, manuscript preparation, and literature reviewing. Professor Shaymaa Abdullateef Alfadhul contributed to the study design, statistical analyses, and interpretation of data.

Author Contribution: Concept: SA, Design: SA, Writing: RRA Data collection: RRA, Data analysis: RRA, SA Revising the manuscript critically: RRA, SA Final approval: FA, PO,

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ORIGINAL ARTICLE

The reasons behind incomplete children vaccination in a sample from Iraqi society

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Abstract

Objective: This study was conducted to assess the prevalence of incomplete vaccination among children aged under 15 years and the factors associated with it.

Method: A cross-sectional study was conducted among 330 children who visited the main two teaching hospitals in Al-Kut City (Al Zahraa Teaching Hospital 'the 6th-floor' and Al Karama Teaching Hospital), in addition to three Primary Healthcare Centers (PHCCs) (Abdullah Ben Rawaha, Al Hakeem, and Badra) in Al-Kut City/ Wasit Province/ Iraq. Data were collected using a modified and translated questionnaire from a previous study.

Results: The number of children who got the vaccine in their lives was 85.2%, and only 50% of them mentioned completing the vaccine schedule. The main cause of non-compliance was the long-distance walking to the health center (70.3%). Children who were eligible but didn't receive the vaccination (60%) due to factors like doctor refusal. More than half (55.2%) mentioned a lack of awareness regarding the schedule. Complications were noted in only 10.9%, with the highest percentage complaining of elevated body temperature (6.1%). There is a significant association between the vaccination status of children and their ages, monthly family income, parents' education, and residency (P value < 0.001). Gender was also associated with (P-value =0.002).

Conclusion: In this study, a higher percentage of children didn't receive their routine vaccines as recommended by health facilities, and this may relate to many factors like age, gender, family income, and parents' educational level. These results are of great value in planning for increasing vaccination coverage.

Keywords: Barriers, Children vaccination, Immunization, Iraq

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INTRODUCTION

Immunization is the process of artificially inducing immunity through vaccination (active immunization) or the administration of antibodies (passive immunization). Vaccination is the administration of any vaccine or toxoid (inactivated toxin) for the prevention of disease [1].

Over the years, studies have shown the effectiveness of vaccination as the most effective public health measure to prevent vaccine-preventable diseases (VPD), especially in children [2, 3]. Vaccines save 2 to 3 million lives annually [2], and they save lives from many diseases, such as diphtheria, tetanus, whooping cough, influenza, and measles [4, 5]. Worldwide, smallpox was eliminated, with a 94% reduction in the incidence of poliomyelitis, and a 94% reduction in neonatal tetanus, in addition to eliminating disease, disability, and death from common childhood diseases [6]. About 29% of deaths among children under five years of age can be eliminated and prevented by vaccines worldwide [7, 8]. The Expanded Program on Immunization (EPI), launched in 1974, has improved the survival and health of children worldwide. The goal is to provide at least 95% of children with the basic vaccination series [9].

Since 1983, the Global Advisory Group (GAG) of the World Health Organization (WHO) Expanded Program on Immunization (EPI) has advised program managers to explore ways to reduce missed vaccination opportunities. A straightforward strategy to increase vaccination coverage is to vaccinate all eligible children in any case. To achieve and maintain high vaccination coverage over the next ten years, the WHO is actively encouraging member countries to adhere to the Missed Opportunities for Vaccination (MOV) strategy. When people eligible for vaccination visit a health facility but do not receive the necessary vaccinations, it is called MOV. According to WHO recommendations, children are considered fully vaccinated when they receive the following vaccines: BCG against tuberculosis, three doses of pentavalent vaccine (DPT HepB Hib), PCV against polio, two doses of Rotavirus, and a measles vaccine. Before the age of 12 months, children who have missed at least one dose of these vaccines are considered to have received incomplete vaccination [10].

According to the WHO, global vaccination coverage has decreased from 86% in 2019 to 81% in 2021. In addition, it is reported that in 2021, approximately 25 million children under one year did not receive basic vaccines, 19.9 million children did not receive recommended doses of vaccination, and the number of unvaccinated children has increased by 5 million since 2019. Thus, reaching high vaccination coverage remains one of the most pressing public health problems worldwide, especially in low- and middle-income countries [11, 12]. In addition, vaccination dropout rates in Asian and African countries remain stable from year to year [13]. The WHO said that Iraq was one of the 10 countries where 70% of children under one year of age have not received diphtheria, tetanus, and pertussis (DTP3) [14]. According to WHO and UNICEF reports, the highest estimated vaccine coverage in Iraq during 2023 was for DPT1 (97%) followed by BCG (93%), while it was only (51%) for both HepB and MCV2 [15]. Despite its widespread use, low vaccination rates have been recorded even in developing countries. Failures or delays in vaccinating children in high-risk

groups can limit the impact of vaccination programs on disease burden [16]. It is necessary to identify the determinants associated with the lack of vaccination to inform and optimize interventions. Several studies, mostly based on the Demographic and Health Survey (DHS), have examined these determinants and found common factors associated with non-vaccination, for example: low monthly family income, low family education, young maternal age, and distance from the health facility. In all cases, they have not studied the risk factors after vaccination, and some factors may be specific to the vaccine administered at birth [17-19].

Although vaccination services are provided free of charge in Iraq, comprehensive vaccination coverage remains low. Geographical variation was noticed in different places in Iraq; some met the optimal coverage of EPI, while others were still under the threshold necessary to save children from VPD [20]. This may be related to some obstacles that vary in different places. Including maternal age, low family income, low educational level for both parents, lack of proper information, and distance from healthcare services [21,22]. The overall prevalence of incomplete vaccination coverage in Al-Kut has not yet been studied, and the reasons for non-utilization of vaccination services remain poorly understood and documented. Therefore, this study aims to determine the prevalence of incomplete vaccination among children under 15 years of age in Wasit Province and identify the key determinants of underutilization of vaccination services. Specifically, the study seeks to answer the following research questions:

1. What are the key socio-cultural, economic, and logistical barriers influencing parental decisions regarding childhood vaccination in Al-Kut, Wasit Province?

2. How do healthcare accessibility, provider communication, and parental misconceptions act as barriers to childhood vaccination completion in Al-Kut?

By addressing these questions, this study will provide essential insights into the factors contributing to incomplete vaccination and help develop effective strategies to improve vaccination coverage, reduce vaccination failure rates, and ultimately decrease the burden of infectious diseases among children.

METHODS

Study design and setting:

This cross-sectional study was conducted among children in AL-Kut City/ Wasit Province/ Iraq. The target population in this study was children who visit the main two teaching hospitals in the city (Al Zahra Teaching Hospital 'the 6th-floor' and Al Karama Teaching Hospital), in addition to three Primary Healthcare Centers (PHCCs) (Abdullah Ben Rawaha, Al Hakeem, and Badra). The data was collected from the beginning of March till the 28th of April 2024.

Sampling and sample size:

The sample size was calculated according to the cross-sectional study design equation for sample size (n = Z2 P (1-p) / d2). Z is the value of the standard normal distribution (Z =1.96). Considering (P) prevalence of MOV in Iraqi children was 31.6% [23], degree of precision =0.05, and power of the study =80%. The calculated required sample was 330. A convenient sample of parents who have children who met the inclusion criteria

was included in this study while visiting the selected places for data collection with their children. A convenient sample (non-probability sampling technique) was used to collect the required sample size by choosing suitable and available participants while they were inpatients, waiting to see to doctor, or in other places like pharmacies of the selected hospitals and PHCCs.

Inclusion criteria:

Children of both sexes who were under the age of 15 years old and visited the selected places during the study period for different reasons were included.

Exclusion criteria:

Children who were too ill or whose parents were harry to wait to complete the questionnaire and those whose parents' refused participation were excluded from the study.

Data collection tool:

A self-assessment questionnaire was given to parents who could read the questionnaire and answer the questions. Parents who could neither read nor write were interviewed by the researchers themselves. The questions included in the questionnaire were adapted from a previously published study that already tested for reliability [24], with some modifications to be clearer and more suitable to the Iraqi community. It was prepared in English and then translated into Arabic (by a language expert) to make it easier and convenient for the parents of the participants to understand. Experts in community medicine evaluated the questionnaire, and it was pretested with 5 parents before the final data collection for the validity and reliability of this tool.

The questionnaire consisted of two parts:

Part 1: was designed to collect information about socio-demographic data like age, sex, the sequence of the child between his/her Siblings, number of Siblings, the place of residence, monthly family income, and the level of education of both father and mother.

Part 2: was designed to collect information about the immunization status of the child and factors related to missed opportunities of immunization (distance from the child's house to the health center, child's health status on the day of vaccination, the availability of vaccine, the staff training, and if there are any previous complications when taking vaccine.... etc.).

Statistical analysis:

Data were analyzed by the Statistical Package for Social Sciences software program (SPSS), version 26. Categorial variables were presented by frequency and percentage. The association between different variables was assessed by either the Chi-square test or Fisher's Exact test. The significant P-value was less than 0.05.

The dependent variable in this study is the vaccination status. The independent variables were Sex, age, residence, monthly family income, level of education of both parents, child sequence among his siblings, and children number.

RESULTS

The results of this study were based on the analysis of 330 samples of children whose parents completed filling out the questionnaires. Those children were divided into two groups: those who completed their

vaccinations and those who did not complete their vaccinations.

The sociodemographic characteristics of the study participants (Table 1) show that most of the parents who filled out the questionnaire were mothers (70%). More than half of the participating children were males (54.5%). The majority of the participants' ages range between 0-7 years (81.2%). Nearly two-thirds of the participants lived in urban areas (65.5%). Moreover, the family's monthly income was more than 750 $ in nearly half of the samples (49.1%).

Table 1. Frequency of socio-demographic structures of the 330 participants

Variables		n	%
Parent who fills out the questionnaire	Father	99	30
	Mother	231	70
Sex	Male	180	54.5
	Female	150	45.5
Age (years)	≤ 3	141	42.7
	4-7	127	38.5
	8-11	52	15.8
	≥ 12	10	3.0
Place of residence	Urban	216	65.5
	Rural	114	34.5
Family monthly income (USA $)	< 250	47	14.2
	250-499	52	15.8
	500-749	69	20.9
	750-1000	86	26.1
	>1000	76	23.0

The educational level of the participants is shown in Table 2. Nearly half of the mothers (47.6%) were Illiterate or (read and write) or had graduated from primary school. Nearly one-third (28.2%) had having college and above education. Of the fathers, more than half (52.4%) had having college and above education.

Table 2. Educational level of the study participants

Educational level	Mothers		Fathers	
	n	%	n	%
Illiterate or read and write	93	28.2	51	15.5
Primary school	64	19.4	33	10.0
Intermediate school	39	11.8	36	10.9
Secondary school	41	12.4	37	11.2
College and above	93	28.2	173	52.4

Figure 1 illustrates the overall number of siblings in the families. More than half of the families had 1-3 siblings (54.5%), and few had more than 7 siblings (6.1%).

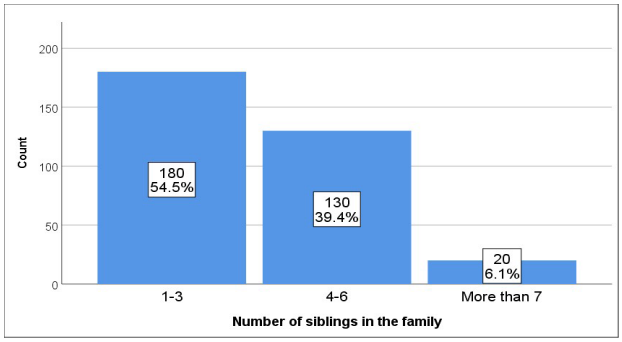

Figure 1. Number of siblings in the families of the participants

Figure 2 illustrates the sequence of the child among his siblings. It shows that around three-quarters of the children ranged from the 1st to the 3rd (70%). Only 2.7% had the 7th sequence and above.

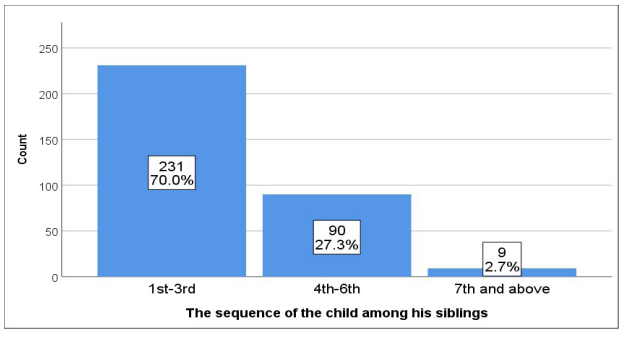

Figure 2. The sequence of the child among his siblings.

Out of 330 samples that were selected, the majority of the participants were vaccinating their children in general (85.2%). As for the children included in the questionnaire, half

of those registered were taking their vaccines regularly according to the schedule of the health center, and the other half were not taking them as required, as shown in Table 3.

Table 4 shows whether children received their routine vaccinations as recommended by the health center in association with their demographic features.

Table 3. Vaccination history of the children.

Vaccination history		n	%
Did you vaccinate your children at all?	Yes	281	85.2
	No	49	14.8
Did this child receive his routine vaccines as recommended in the primary health care center?	Yes	165	50
	No	116	35.2

Table 4. The association between childhood vaccination and socio-demographic data

		Yes		No		
		n	%	n	%	
Sex	Male	76	42.2	104	57.8	**0.002**
	Female	89	59.3	61	40.7	
Age (Years)	0-3	49	34.8	92	65.2	**<0.001**
	4-7	74	58.3	53	41.7	
	8-11	36	69.2	16	30.8	
	12-15	6	60.0	4	40.0	
Residence	Urban	143	66.2	73	33.8	**<0.001**
	Rural	22	19.3	92	80.7	
Monthly family income (USA $)	<250	1	2.1	46	97.9	**<0.001**
	250-499	11	21.2	41	78.8	
	500-749	33	47.8	36	52.2	
	750-1000	60	69.8	26	30.2	
	>1000	60	78.9	16	21.1	
Level of education of the mother	Illiterate/ read and write	15	16.1	78	83.9	**<0.001**
	Primary school	27	42.2	37	57.8	
	Intermediate school	24	61.5	15	38.5	
	Secondary school	28	68.3	13	31.7	
	College and above	71	76.3	22	23.7	
Level of education of the father	Illiterate/ read and write	5	9.8	46	90.2	**<0.001**
	Primary school	4	12.1	29	87.9	
	Intermediate school	15	41.7	21	58.3	
	Secondary school	20	54.1	17	45.9	
	College and above	121	69.9	52	30.1	
Child sequence among siblings	1st-3rd	117	50.6	114	49.4	**0.481**
	4th-6th	42	46.7	48	53.3	
	7th and above	6	66.7	3	33.3	
Children number in the family	1-3	90	50.0	90	50.0	**0.158**
	4-6	61	46.9	69	53.1	
	More than 7	14	70.0	6	30.0	

The highest percentage of female children received their vaccines as recommended by primary health centers (59.3%) and those between the ages of 4-7 years (58.3%), as well as those who lived in urban areas (66.2%). Those with a good monthly family income of 750_1000$ and above 1000$ were (69.8%) and (78.9%) respectively. The table also shows the extent of the influence of the educational level of the parents, as the rate of consistency in vaccinating children increases with the increase in the educational level, whether for the mother or the father as it shows that a greater proportion of vaccinated children had parents with a college education and above, for the mothers (76.3%) and the fathers (69.9%). A significant association was found between the vaccination status of the children and their sex, age, residency, family income, and parent education.

For those children who didn't complete their vaccination (165), Table 5 illustrates the possible causes leading to non-adherence to the recommended vaccination schedule. The most frequently mentioned causes were long-distance walking to the health center (70.3%), followed by children going to the health center at the time of appointment but returning home without vaccination (60%) then the lack of information about the days for vaccination (55.2%). Respondents who were concerned about the vaccine's safety were (40.6%). Only 7 (4.2%) parents mentioned being ill on the day of immunization as a cause of non-compliance with the routine vaccination schedule.

Table 5. Logistical factors affecting compliance with childhood vaccination schedule.

Possible causes of incomplete vaccination	**Yes**		**No**	
	n	**%**	**n**	**%**
The presence of health centers in the city or village	127	77	38	23
Vaccination campaigns reach the area	141	85.5	24	14.5
Have a concern about vaccine safety	67	40.6	98	59.4
Engaged in work or have no time to accompany the child to receive the vaccine	57	34.5	108	65.5
Long waiting time at the health facility	50	30.3	115	69.7
The vaccine was not found on the appointment day, so I received the vaccine the next day.	23	13.9	142	86.1
The child's ill health at the time of immunization	76	46.1	89	53.9
Lack of information about the days for vaccination	91	55.2	74	44.8
Forget the days of immunization	56	33.9	109	66.1
Long-distance walking to the vaccination center	116	70.3	49	29.7
Parents' illness on the day of vaccination	7	4.2	158	95.8
Lack of money	19	11.5	146	88.5
The child came to a health facility or outreach site and did not receive the vaccination for which he was eligible	99	60	66	40
Among the 99 who mentioned not receiving vaccines although going to health centers, the reasons were:	**n**		**%**	
There was no vaccine in that center	9		9.1	
There was no specialized staff	21		21.2	
The doctor didn't accept child vaccination	65		65.7	
The vaccine was expired	4		4	

Among the 99 who mentioned not receiving vaccines although going to the health center, for most of them, the reasons were the doctor didn't accept child vaccination (65.7%) followed by a lack of specialized staff in the health center (21.2%).

Even though 147 incompletely vaccinated children showed no previous complications, the other children (n=18, 10.9%) complained of one or more of those complications. The main complication was elevated body temperature, which was a complaint among 15 children, while rash and fever were complaints among 2 children, and only one child had abdominal pain as shown in table 6.

Table 6. Previous complications among the participants.

Presence of previous vaccine complications		n	%
Previous complications in the same child or other children	Yes	18	10.9
	No	147	89.1
	Total	165	100.0
From the total (165) who didn't complete their child vaccination, the complications that appeared are:	Abdominal pain and allergy	1	0.6
	Elevated body temperature	15	6.1
	Elevated body temperature and rash	2	0.6

Table 7 illustrates the perception of the respondents for the reasons behind incomplete vaccination. The highest percentage of the participants agreed that the lack of accessibility to a health facility was the most important contributing factor among them (38.5%), followed by receiving warnings from neighbors and relatives about the danger of vaccines (35.8%). Only one-quarter of them mentioned migration from the place of original residence to another place (25.7%).

Table 7. Perception-based factors for reasons behind incomplete vaccination

Perception of reasons behind incomplete vaccination	Responses (Yes)		Percentage of Cases (165)
	n	%	
Migration from the place of original residence to another place	46	25.7	27.9
The accessibility to a health facility with immunization facilities was poor	69	38.5	41.8
Receiving warnings from neighbors or relatives about the danger of vaccines	64	35.8	38.8
Total	179	100.0	108.5

DISCUSSION

Vaccination is one of the most effective and cost-effective health interventions. The factors that determine incomplete vaccination are complex. This study aims to evaluate the most common reasons for not completing the vaccination schedule among children in a sample of Iraqi society.

The results of this evaluation can help open a new perspective for future research that will go beyond recognizing these reasons and evaluate to reduce and overcome the difficulties faced by such a challenge.

In the present study, most of the parents who completed the questionnaire were mothers. This can be explained by the fact that the mother is the one who is closest to the children, whether in hospitals or health centers. Most of the participants live in urban areas since

the questionnaires were distributed to a greater extent in the city center and to a lesser extent in rural areas. Most of the parents had a good monthly family income based on their educational level, which was well above high school. Most of the children's sequence among their siblings run between the 1st-3rd sequence (70.0%); this was consistent with the study conducted in Ethiopia[7].

In this study, about half of the children studied stated that they were fully vaccinated; this result is lower than that reported by UNICEF Iraq statistics in 2015 (72%) [25] and by the Department of Primary Health (PHCD) / MOH in 2014 (73%) [26]. In comparison to other countries in the region, the UNICEF statistical report in 2015 shows the following results: Saudi Arabia (96%) [27], Jordan (98%) [28], Turkey (97.6%), and Syria (58%) [25].

Vaccination coverage: In general, according to the results of the questionnaires distributed to selected families, the percentage of vaccinated children in each family reached (85.2%). This can be related to the cultural and scientific levels of these families. In addition to the distribution of educational and guidance campaigns by the Iraqi Ministry of Health on the importance of vaccination in overcoming diseases and protecting their most important risk factors, as well as the fact that vaccination is free in Iraq. Other researchers in Iraq reported percentages of children who were not vaccinated at all, (0.5%) [29] and (6%) [30], which is lower than what was reported in this study (14.8%). Another study in Baghdad [30] found that 22.3% of children were not vaccinated. Much higher rates were reported by other researchers outside Iraq: Prakash in India in 2006 (35%) [31] and Nisar in Pakistan in 2007 (30%) [32]. This diversity may be due to differences in study contexts, sampling techniques, and the fact that these studies were conducted in poor urban areas where most children come from families with low socio-economic status.

Age and gender:

The results of this study show a significant relationship between vaccination status with children's gender and age. The percentage of incomplete vaccinations decreased with age, reaching a maximum in the age group of 0 to 3 years (65.2%), then decreasing after the age of 3 years, The fact that the parents might perceive that certain vaccines are less critical for older children, especially if the child is healthy or if they have already received some vaccinations also younger children often have more frequent healthcare visits due to routine check-ups, while older children may see healthcare providers less frequently, leading to missed vaccination opportunities. The percentage of incomplete vaccinations is significantly higher among males (57.8%) than among females (40.7%). On a broader scope, boys are more likely to get vaccinated due to social and cultural aspects [4]. However, in certain areas, girls could potentially have better coverage. In some households, it is believed that males are "stronger," so they are less likely to be afflicted by sickness, which creates an excuse for not vaccinating them to the same degree as girls. A study conducted in Baghdad, Al-Karkh region, reported that the percentage of incomplete vaccinations reaches its maximum in the age group from 12 to 24 months (43.7%) and that the percentage of incomplete vaccinations is significantly higher in males (55.7%) than in females (44.3%) [33]. Some studies found no direct effect of gender on a child's vaccination

status, like that conducted in 165 countries by Fuertes [34].

Parents' education:

Regarding maternal education, the study found a statistically significant relationship between vaccination status and maternal education (P < 0.001). The percentage of incompletely vaccinated children was high among children of mothers with little education (83.9%) and mothers who are illiterate or only able to read and write. This percentage decreased among children whose mothers had secondary or higher education. In contrast, other studies have shown that the percentage of unvaccinated children was high among children of highly educated mothers (47%), and the percentage of unvaccinated children was higher among children of working mothers (governmental employees) (51.4%) [33]. Many other studies confirmed the results of this study and found that the majority of incompletely vaccinated children came from parents with a low level of education [23_30, 33]. Public health education is a well-defined way to encourage the population to healthy behaviors and involvement in preventive measures. Internet, as it is widely used by people, can serve as an excellent tool in focusing on vaccine-related awareness gaps, distributing children's vaccination schedules for parents, and answering any questions that may arise about the vaccination efficacy and side effects [35, 36].

Number of children in the family:

In the present study, there was no statistical association between the number of family members and vaccination status. Although extended families with more than 7 children seem to have a higher rate of complete vaccination of their children, this contradicts many other studies that have found a significant association with the number of family members and children [7, 8, 10, 11, 17, 33].

Reasons for incomplete vaccination:

Half of the collected samples were from children who did not complete the vaccination schedule for several reasons, the most frequent was the long distance between the vaccination center and the child's place of residence. In this study, it was found that there was an inverse relationship between the distance of the health center, the beneficiary's home, and the vaccination status (70.3%) of children who did not complete the vaccination schedule. This may be because, according to them, the family does not have private transport to go to the vaccination center or a long distance to walk. The study also found that the lack of family information about the schedule and days of vaccination is an important factor in the failure to vaccinate children (55.2%), possibly due to the loss of the vaccination card. In addition, professional engagement contributed to 34.5% of the reasons. Migration from the original place of residence to another place contributed to (25.7%) of cases and attributed several reasons to warnings received from neighbors or relatives about the risk of vaccines (35.8%). Among the children who are not vaccinated despite visiting the health center, most are not vaccinated by the specialist doctor, this is because of their illness (65.7%). A smaller percentage did not receive vaccines due to the lack of specialized personnel for vaccination (21.2%) and the unavailability of the vaccine at the vaccination appointment, which only accounts for approximately (9.1%) of all reasons. In comparison, another researcher

in Iraq found that the main reasons for delaying vaccination are social commitments and busy family responsibilities (63.4%). When a mother/family experiences a social event such as death or illness, participation in a vaccination exercise becomes a matter of lower priority. The second reason was the change of residence, which represents approximately (35.5%) of the causes; people move within the country (internal movements, 24%) and between countries neighbors (external movements, 11.4%). This migration is associated with low vaccination coverage, which may be due to the poor social integration of migrant populations. The third reason for incomplete vaccination is childhood illness (24.6%); of them (71.4%) are due to the decision of the family, and the rest (28.6%) due to the medical opinion in the health center on the day of the vaccination, which is considered as a reason for the lack of vaccination opportunity. The second reason for not having the opportunity to be vaccinated was the unavailability of the vaccine at the vaccination appointment, which only accounts for approximately (5%) of all reasons. In some cases, several reasons have been mentioned, and considerable overlap has been observed [33]. In Nigeria, a study of rural Nigerian children in 2021 found that the reasons were: concern about the safety of the vaccine (38.8%), long journey (17.5%), long waiting time (15, 2%), lack of money (10.6%), lack of personnel (5.4%), childhood diseases (3.6%), lack of vaccine (3.5%) and about (5%) others [1]. An Indian study was conducted in the urban slums of Agra district in 2022 to demonstrate the biosocial factors associated with routine immunization coverage shows that (98.6%) of incompletely vaccinated children live in neighborhoods that are not covered by the Integrated Child Development Services (ICDS) program, (81%) came from large families, (60.5%) were born in state hospitals, (71.4%) had illiterate mothers, and (30%) of them lived more than one kilometer from the nearest health institution [19]. The diversity mentioned between the current study and comparable studies may be due to the difference in the sampling frame and to the differences in the socioeconomic and security levels where these studies were carried out. Health sector policymakers can use these data for improvement in vaccination coverage by increasing awareness campaigns. It helps track vaccination rates, identifying trends and gaps in coverage. This is crucial for controlling vaccine-preventable diseases. By identifying specific populations or areas with low coverage, health authorities can design targeted outreach and education programs to improve vaccination rates. Understanding coverage disparities can help ensure that vulnerable populations receive the necessary vaccinations and promote health equity. Effective research can guide healthcare centers in optimizing their resources and staffing for vaccination efforts. Identifying obstacles can help direct resources and action.

Limitations:

The limitations of this study can be summarized as follows: First, there may be other possible factors that can influence vaccination that were not considered in this study. In addition, this study did not include a qualitative method to answer the questions "Why?". Second, when the vaccination cards were not available, the vaccination records were based on the self-reports of the caregivers, which led to a risk of recall bias that is not unique to this study. Bias can also be stated because the survey was

administered to illiterate people by others. Finally, this study included a relatively small sample and focused on visitors to hospitals and primary health centers and mainly those who lived in urban places. This may be caused by a non-probability sampling technique, which may limit the generalizability of the study results and their implications for all children and all health parameters of the reference population of the provinces of Iraq. Despite the limitations mentioned above, the results are important for understanding the obstacles to full immunization coverage in children.

CONCLUSION

Although a large percentage of the participating children received vaccinations, the majority did not follow the proper schedule due to various related factors. There is a need to promote and sensitize people about the importance and positive effects of vaccination as well as the negative effects of not fully vaccinating.

Future studies need to understand the role of culture, how vaccines are perceived, and how willing people are to receive them. Also, it will be useful for understanding the contributions of community leaders and organizations toward promoting vaccine uptake. An assessment of the impact of health communication strategies and campaigns on improving vaccine coverage, analyzing the impact of social networks and other means of mass communication and disinformation on the vaccination attitude and decision-making process vis-à-vis vaccination needs to be done. In addition, there is also a need to properly address the underlying factors that contribute to vaccine hesitancy and the ways through which acceptance of vaccines can be increased. To enhance the generalizability of the results, we recommend a future studies employ probability sampling methods to ensure a more representative sample of the population. Participants from all Iraqi provinces, including equal representation from both urban and rural areas, are essential to understanding the factors influencing incomplete vaccination across different demographic and geographic contexts.

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Conflict of Interest : No

Ethical Declaration: Official approval and permission to conduct this study were obtained from the ethics committee of the Faculty of Medicine of Wasit University. Verbal consent was obtained from each respondent (parent) before data collection, and then the objective of the study was explained. The names of the participants are not recorded, and all forms of questionnaire data are kept secure and used only for research purposes.

Authorship Contributions:

Author Contribution: Concept: TMJT, SID, SBAA, Design: TMJT, SID, SBAA, Writing: TMJT, SID, SBAA, Data collection: TMJT, SID, SBAA, Data analysis: TMJT, SID, SBAA, Revising the manuscript critically: TMJT, SID, SBAA, Final approval: TMJT, SID, SBAA.

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