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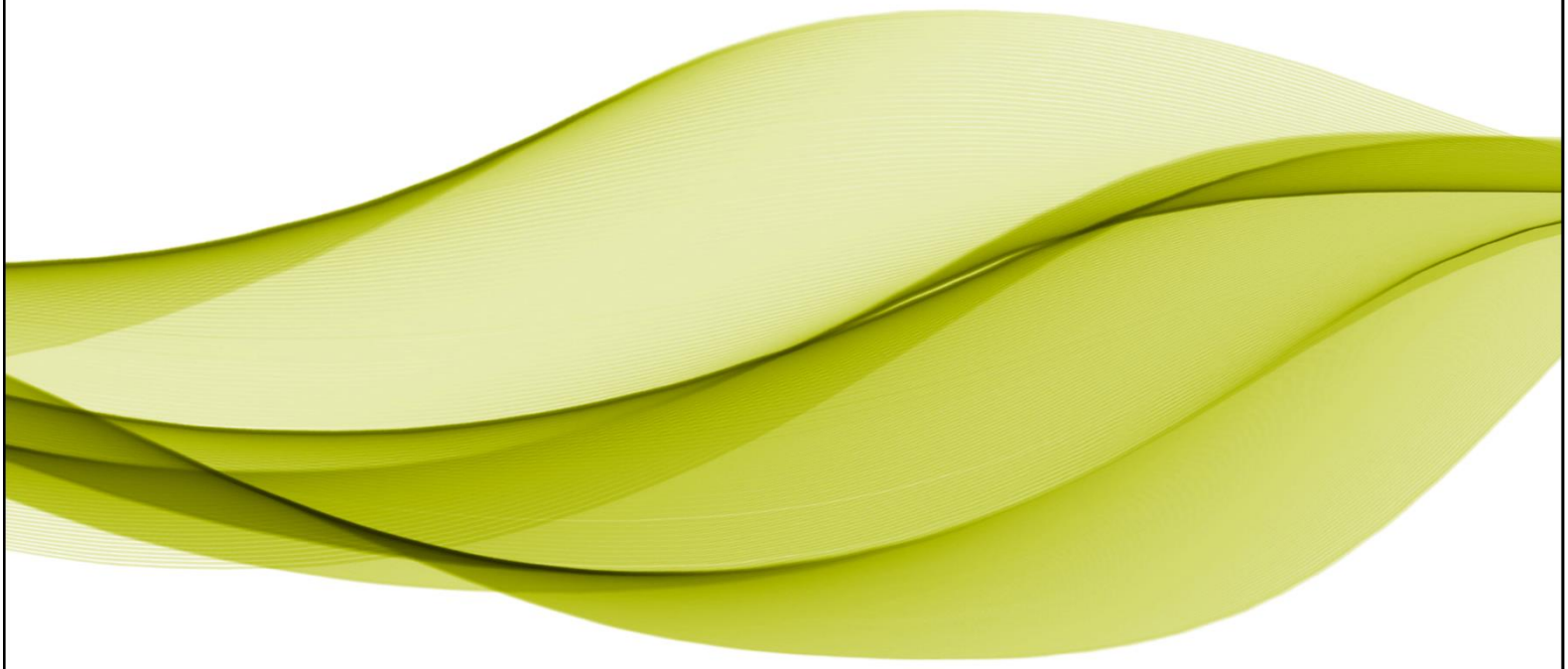

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Editor's Notes

The World Health Organization declared the COVID-19 outbreak a public health emergency of international concern. The direct and indirect impact of COVID-19 on NCDs emerge. Recently the number of submitted COVID-19 related papers to MJHR has increased. Therefore, we welcome COVID-19 related papers that have impacts on NCDs diagnosis, treatment, prognosis, and management.

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Knowledge, Attitudes, and Practices of Saudi Citizens on COVID-19 Pandemic: A Multi-region Survey

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Knowledge, Attitudes, and Practices of Saudi Citizens on COVID-19 Pandemic: A Multi-region Survey

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Abstract

Background: Although policies and guidelines may not always be optimal in all settings, a tailor-fitted guideline is appropriate. This study aims to determine the differences in the knowledge, attitudes, and practices (KAP) of Saudi citizens toward Coronavirus Disease 2019 (COVID-19).

Methods: A quantitative-comparative-correlational approach was carried out from March 21 to May 22, 2020. Descriptive statistics, ANOVA, and *t*-test were used to determine the differences in knowledge and demographic characteristics. Linear regression was used to determine relationships among KAP.

Results: The participants' knowledge yielded 82.83%, positive attitudes (M = 2.10; SD = 1.15) and good practices (M = 2.10; SD = 1.15). Significant differences in knowledge were found for gender ($t = -6.79$; $p < 0.001$), marital status ($F = 10.59$; $p < 0.001$), education ($F = 32.46$; $p < 0.001$), occupation ($F = 6.79$; $p < 0.001$), and area of residence ($F = 7.53$; $p < .001$). Knowledge and practices showed a significant relationship ($p < 0.001$).

Conclusions: Gender, marital status, education, occupation, and area of residence are all causal factors that differ regarding knowledge. Moreover, a significant relationship between knowledge and practice is established, which is necessary to improve. These study results can serve as a basis for creating effective health education programs toward COVID-19.

Keywords: attitudes, COVID-19, knowledge, practice, Saudi citizens

INTRODUCTION

The Ministry of Health (MOH) in Saudi Arabia confirmed the first COVID-19 case in the Kingdom on March 2, 2020.[1] Since then, the number of active and critical COVID-19 cases in Saudi Arabia has increased dramatically, and the death toll had risen to 6,596 as of March 19, 2021.[2] From its first detection, Saudi health authorities implemented measures to prevent the further spread of infection. COVID-19 is considered highly contagious with clinical symptoms of fever, dry cough, fatigue, myalgia, and dyspnea.[3,4] The cause of the disease is believed to be a novel strain from the coronavirus (CoV) family that can spread from person to person through respiratory droplets and direct contact.[5] Hence, extreme measures were implemented to avoid the further spread of infection due to its high virulence. According to WHO[6], COVID-19 can be prevented using a combination of public health measures, such as the following: rapid case identification, diagnosis, and management; identification and follow-up of contacts; infection prevention and control in health care settings; implementation of health measures for travelers; population awareness; and risk communication.

The Saudi Arabia MOH devised strict disease prevention and control guidelines, emphasizing hand washing, home quarantine, and reporting of Patient Under Investigation cases.[7] Indeed, Saudi Arabia implemented containment efforts to prevent an increase in COVID-19 cases, such as suspension of foreign flights to and from the Kingdom[8] and the MOH dissemination of COVID-19 prevention information via social media, official websites, and commercials.[9] In addition, the MOH implemented city lockdowns, physical distance, use of disposable medical or cloth masks, hand washing, and gathering size limitations to prevent and decrease the disease transmission.[10] However, despite these measures, the COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE)[11] showed that several efforts failed to work, and thus, the curfew was extended to nearly 24 hours for 21 days, with a brief reprieve for purchasing necessities. In this context, controlling the disease required careful adherence to preventive measures to stop its spread.

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While policies and guidelines may not always be optimal in all settings, tailor-fit guidelines may be appropriate.[12] As such, a study from the perspective of the public knowledge, attitudes, and practices (KAP) can help in establishing appropriate measures. According to Singh *et al*.,[13] controlling infectious diseases largely depends on the knowledge, attitudes, practices, and behavior of the local community. Previous research has considered the KAP concerning different diseases. However, to the best of the current researchers' knowledge, scarce literature has examined COVID-19 KAP since the Kingdom of Saudi Arabia relaxed its nationwide curfew.[14] To this end, collecting public KAP can serve as baseline data for future pandemic policies and ways to become better-informed individuals in society.[15]

This study is of significance in enhancing the efficiency of the current health education programs of the government. Moreover, the results can be used to create effective COVID-19 health education programs with the consideration of the present KAP of the general populace. Therefore, this study aims to determine the KAP regarding COVID-19 differences in knowledge based on demographic characteristics of Saudi citizens. In addition, the relationship of knowledge to attitudes and to practice, and of attitudes to practice are identified.

METHODS

This quantitative-comparative correlational study used a Likert-scale survey instrument to determine the KAP toward COVID-19 Saudi citizens from March 21 to May 22, 2020.

The online questionnaire has four parts: demographics, KAP on COVID-19. Part I includes the demographic variables, such as age, gender, marital status, education, income, occupation, area of residence, Internet access at home, Internet access in other areas, and primary sources of information. Part II of the online questionnaire regarding knowledge has 14 questions adapted from previous literature[16] and modified to extract the objectives of the present study. These questions were answered on a true/false basis with an additional "I do not know" option. A correct answer was assigned 1 point while incorrect and unknown answers were assigned 0 point. The total knowledge score ranged from 0 to 12, with a high score denoting a very good knowledge of COVID-19. Attitudes toward COVID-19 were measured using two questions regarding their agreement on the absolute control, and the confidence in winning the battle against, the disease. The responses are "strongly agree" (1), "agree" (2), "neither agree nor disagree" (3), "disagree" (4), and "strongly disagree" (5). Finally, the assessment of respondents' practices was composed of two behaviors, namely, going to a crowded place and wearing a mask when going out. The responses are "always" (1), "often" (2), "sometimes" (3), "rarely" (4), and "never" (5). Therefore, the lower mean answers denote positive attitudes and practices.

Content validity was used to ensure relevance and purpose of the measurement, yielding 0.78 and 0.79 for relevance and clarity, respectively. The method was pre-tested in Hail city with 50 respondents and yielded a Cronbach's alpha of 0.71.

The participants were citizens from important regions of Saudi Arabia, two each of large and medium-sized regions and one small-sized region. The following inclusion criteria were set to: (1) 18 years old and above; (2) not presently admitted to the hospital as a COVID-19 patient; and (3) willing to participate. Snowball sampling was used from the researchers' networks.

The Institutional Review Board of the University of Hail committee provided their approval for this research (H-2020-153).

The researchers collected the data online. Google forms were used to generate an online survey link and quick response (QR) code linked to the online questionnaire, both of which were shared through various social media platforms (e.g., WhatsApp, Twitter, Snapchat, and Instagram). Moreover, an online poster was posted on websites and official Twitter accounts of several local and popular media outlets, such as the Saudi Gazette and Arab News, along with the link and QR code for the online questionnaire. The poster included a brief introduction to the study background, objectives, methods, voluntary nature of participation, declarations of anonymity and confidentiality, and instructions for completing the questionnaire. Finally, citizens were instructed to fill out the online questionnaire by clicking the link or scanning the QR code.

The data were analyzed using SPSS Version 21. The frequency and percentage were utilized to determine the demographic profile of the respondents. A one-way ANOVA and independent sample t-test was used to determine their differences. The relationships of the demographic profiles to KAP were treated with Pearson correlation.

RESULTS

Table 1 presents the demographic information and its differences. A total of 623 Saudi citizens responded to the online survey. Among the respondents the demographics are as follows: almost half (49.8%) are 20–30 years old with income of over 7000 Saudi Riyals; the majority are female (60.5%) and married (52.5%); most worked in private firms and with tertiary education (both profiles with 74.5%); lived in the Northern region (61.2%); and gained COVID 19 information from social media (71.1%). The comparison of gender (t = 6.79; p < 0.001), marital

status (F = 10.59; p < 0.001), education (F = 32.46; p < 0.001), occupation (F = 6.79; p < 0.001), and area of residence (F = 7.53; p < 0.001) revealed statistically significant differences in COVID-19 knowledge.

Table 2 presents the frequency and percentage of respondents with correct answers per question regarding knowledge. The mean knowledge score of respondents is 11.53 out of 14 (82.83%). In general, almost all Saudi participants are knowledgeable on measures to reduce the spread of COVID-19 infection (items 10 to 13), and more than 92% answered correctly. However, only slightly more than half (58.91%) of the participants can differentiate COVID-19 infection from the common flu (item 2). Interestingly, very few (17.17%) know the leading cause of COVID-19 and others still believe that the cause is eating or contacting wild animals.

Table 3 shows the average response regarding attitude and practice. In terms of attitudes toward the recent infection, most of the participants agree that COVID-19 can be successfully controlled (M = 1.94; SD = 0.83) and have confidence that Saudi Arabia can win the battle against the disease (M = 1.63; SD = 0.75). Meanwhile, regarding practices, respondents often avoid crowded places (M = 2.10; SD = 1.15) and always wear masks when leaving home (M = 1.23; SD = 0.67).

TABLE 1. Knowledge score of COVID-19 by demographic variables (N = 623)

Characteristics	Frequency (%)	*M* (SD)	*t*/*F*	*p*
Age				
20–30 years old	310 (49.8)	11.42 (1.79)	2.12	0.970
31–40 years old	236 (37.9)	11.53 (1.87)		
41–50 years old	58 (9.3)	12.03 (1.23)		
>50 years old	19 (3.0)	11.79 (0.85)		
Gender				
Male	246 (39.5)	10.96 (2.14)	−6.79	< 0.001
Female	377 (60.5)	11.91 (1.34)		
Marital Status				
Never Married	274 (44.0)	11.24 (1.97)	10.59	< 0.001
Married	327 (52.5)	11.83 (1.39)		
Separated	22 (3.5)	10.82 (2.89)		
Education				
Elementary/Intermediate	5 (0.8)	11.20 (0.84)	32.46	< 0.001
Secondary	56 (9.0)	9.48 (2.57)		
Upper Secondary	98 (15.7)	11.60 (1.50)		
Tertiary	464 (74.5)	11.77 (1.76)		
Income				
7000 SR and below	313 (50.2)	11.54 (1.84)	0.10	0.920
Above 7000 SR	310 (49.8)	11.53 (1.68)		
Occupation				
Private	464 (74.5)	11.80 (1.37)	6.79	< 0.001
Government	159 (25.5)	10.74 (2.43)		
Area of Residence				
Central region	86 (13.8)	11.10 (2.29)	7.53	< 0.001
Eastern region	37 (5.9)	10.43 (2.15)		
Western region	87 (14.0)	11.64 (1.37)		
Northern region	381 (61.2)	11.76 (1.62)		
Southern region	32 (5.1)	11.00 (1.55)		
Source of Information				
Social media	443 (71.1)	11.55 (1.77)	0.60	0.690
Newspaper /journal	16 (2.6)	11.31 (1.70)		
MOH	131 (21.0)	11.59 (1.48)		
Colleagues/friends	11 (1.8)	11.45 (2.21)		
Search engines	9 (1.4)	11.33 (1.12)		
Television	13 (2.1)	10.77 (3.49)		

Legend: M = Mean; SD = Standard Deviation; t = t-value; F = F-value

TABLE 2. Knowledge of participants toward COVID-19 (N = 623)

Knowledge on COVID-19	Correct	Incorrect
1. The main clinical symptoms of COVID-19 are fever, fatigue, dry cough, and myalgia.	589 (94.5)	34 (5.5)
2. Unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with the COVID-19 virus.	367 (58.9)	256 (41.1)
3. COVID-19 has no effective cure at present, but early symptomatic and supportive treatment can help most patients recover from the infection.	560 (89.9)	63 (10.1)
4. Not all persons with COVID-19 will develop to severe cases. Only those who are elderly, have chronic illnesses, and are obese are more likely to be severe cases.	488 (78.3)	135 (21.7)
5. Eating or contacting wild animals would result in infection by the COVID-19 virus.	107 (17.2)	516 (82.8)
6. Persons with COVID-19 cannot infect others when a fever is not present.	491 (78.8)	132 (21.2)
7. The COVID-19 virus spreads via the respiratory droplets of infected individuals.	585 (93.9)	38 (6.1)
8. Ordinary residents can wear general medical masks to prevent infection by the COVID-19 virus.	518 (83.1)	105 (16.9)
9. Children and young adults do not need to take measures to prevent infection by COVID-19 virus.	555 (89.1)	68 (10.9)
10. To prevent infection by COVID-19, individuals should avoid going to crowded places such as train stations and taking public transportation.	597 (95.8)	26 (4.2)
11. Isolation and treatment of people who are infected with COVID-19 are effective ways to reduce the spread of the virus.	609 (97.8)	14 (2.2)
12. People who have contact with someone infected with the COVID-19 virus should be immediately isolated in a proper place. In general, the observation period is 14 days.	610 (97.9)	13 (2.1)
13. Frequent hand washing with soap and water for at least 20 seconds, especially after you have been in a public place or after blowing your nose, coughing, or sneezing, is recommended to prevent the spread of the disease.	576 (32.5)	47 (7.5)
14. Hand rubbing of hand sanitizer that contains at least 60% alcohol can be used if soap and water are not readily available.	533 (85.6)	90 (14.4)

TABLE 3. Attitude, and practices of participants toward COVID-19 (N = 623)

Attitude and Practice on COVID-19	Mean	SD
Attitude	**1.79**	**0.69**
Do you agree that COVID-19 will finally be successfully controlled?	1.94	0.83
Do you have confidence that Saudi Arabia will win the battle against the COVID-19 virus?	1.63	0.75
Practice	**1.66**	**0.71**
In recent days, do you avoid crowded places?	2.10	1.15
In recent days, do you wear a mask when leaving home?	1.23	0.67

Pearson coefficient was used to test the relationship between participants' KAP regarding COVID 19. However, the only relationship between knowledge and practice was established based on the findings of the study with a *P*-value of less than 0.001. This result indicates that as the participants gain knowledge on COVID-19, the more they agree that Saudi Arabia can finally control and win the fight against the disease, which is a sign of positive attitude (Table 4).

TABLE 4. Relationships between knowledge, attitude, and practice

Variables	r	*P**
Knowledge and Attitude	−0.022	0.58
Knowledge and Practice	−0.024*	< 0.001
Attitude and Practice	−0.020	0.62

*Pearson correlation

DISCUSSION

The above results can be used to inform policymakers for improved delivery and efficiency of current health education programs. In this study, the Saudi citizens had good knowledge of COVID-19 disease, which can be attributed to their educational status, where approximately 75% are at the tertiary level. Moreover, the MOH has exerted its best efforts to inform people on COVID-19 through social media. This present study is consistent with that of Al-Hanawi and colleagues [17], in which people gained knowledge regarding COVID-19 to

protect themselves and their families. Moreover, Alhazmi *et al*.[10] found that knowledge of COVID-19 in Saudi Arabia has an average of 81.3%. Similarly, Olapegba *et al*.[18] found that the Nigerian public exhibited relatively high knowledge regarding COVID-19, which is credited to their information from TV and radio. As such, the MOH's massive informational campaign on COVID-19 is practical and must be continued to address the knowledge gap among Saudi citizens.

The good attitudes and practices of the respondents in this study imply a better disposition of Saudi citizens amid this pandemic. The results can be credited to their excellent knowledge of the disease and its prevention. As such, the public's understanding of COVID-19 enhances their attitude, leading to exemplary practice. Indeed, earlier studies found that the respondents' attitudes and practices about COVID-19 were optimistic [10,19] despite misinformation that has been widely disseminated. Al-Hanawi and colleagues[17] believed that the government's unprecedented steps and rapid response in establishing tight controls and preventive measures against COVID-19 to secure residents and ensure their well-being can explain the positive views and high confidence in controlling the disease. As such, notably, the Kingdom's leadership used its prior experience with the spread of the MERS-CoV to implement a set of proactive and preventive measures to combat COVID-19.

Significant differences are observed when Saudi citizens are compared in terms of knowledge and their demographic characteristics. This study found higher knowledge on COVID-19 among females more than males, participants who worked for private companies over those in the government sector, and married people than those who are single or separated. Similarly, people from the Northern region present better knowledge than those from the Central and Eastern areas, while Saudi citizens from the Western regions differ significantly from those from the East. Such a result can be credited to the active information dissemination and communication of the regional health authorities. The implications are thus addressing the significant variables can perhaps further advance the knowledge of COVID-19 and, thereby help with the decreasing number of infected individuals. The present findings are similar to those of earlier studies. For example, knowledge differs based on gender, marital status, education, occupation, and area of residence.[16] Moreover, KAP differences were found among geographical regions, and the causal factors are gender, marital status, and education qualification for several regions.[20] This difference held true for the findings in Bangladesh, where a large variety of sociodemographic characteristics, such as age group, gender, education level, monthly family income, and location of urban residence dwellers, had a significant effect on participant knowledge ratings.[21] Such findings highlight the importance of continuous improvement of knowledge through education initiatives that target these factors. To this end, improving the KAP of the general population is critical and effective health education programs[22] must be developed with consideration of KAP modifying elements.[23] The assumptions if that as knowledge in these areas improves, attitudes and practices concerning COVID-19 also improves.[24,25] In this context, health policymakers can determine the efficiency of current health education programs for the public since the COVID-19 outbreak.

Apart from determining the good general knowledge of COVID-19 among Saudi citizens, this study found that knowledge and practice has a significant relationship. This suggests that the good knowledge of Saudi citizens is highly likely to be observed in their practice toward precautionary measures against COVID-19. Indeed, the general population demonstrates a solid understanding of COVID-19 and is expected to display appropriate disease prevention measures.[14] Furthermore, earlier studies have established this relationship between knowledge and practice,[26] with poor knowledge associated with poor practice.[27] According to Almoayad *et al*.,[28] a high likelihood of implementing preventive measures during the COVID-19 pandemic was associated with complete knowledge and attitude ratings. By contrast, a study on the KAP of medical and allied health students found no relationship between knowledge and attitudes, and thus knowledge does not translate to attitudes.[19] The present findings recommend that the incessant provision of information regarding COVID-19 by the government improves the status of Saudi Arabia in terms of preventing the infection and spread of the disease.

Overall, the present findings provide a basis for innovative public health solutions through scientific evidence and can serve as a reference for future public healthcare initiatives. This study also helps select the best platforms for delivering health education programs to address the COVID-19 pandemic. Thus, Saudi citizens can receive appropriate and timely knowledge on the disease.

The authors acknowledge the study limitations and suggest measures to address such concerns in future investigation. One limitation is the non-representation of each region in Saudi Arabia, where generalization of the results may not be possible. This issue can be addressed by using criteria on the regions to be included in the study. For example, large cities can be used to represent large or small regions. Moreover, this study has not explored the differences the participants' attitudes and practices in terms of demographic characteristics, which may enhance the research substance. Therefore, future studies are recommended to include differences in attitudes and practices. Lastly, the English version of the questionnaire should be translated into Arabic to enable the participation of more Saudi citizens.

CONCLUSIONS

Saudi citizens have good knowledge, positive attitudes, and good practices toward COVID-19. However, gender, marital status, education, occupation, and area of residence are all causal factors that differ in their knowledge. Moreover, a significant relationship is established between knowledge and practice, but no significant relationships are found from knowledge to attitudes and attitudes to practice. Therefore, policymakers can use this evidence as a basis to create effective health education programs for COVID-19.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Perceived Preparedness of Healthcare Workers to Cope with COVID-19 Pandemic in Hail Region Hospitals, Kingdom of Saudi Arabia: A Cross-Sectional Study

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Perceived Preparedness of Healthcare Workers to Cope with COVID-19 Pandemic in Hail Region Hospitals, Kingdom of Saudi Arabia: A Cross-Sectional Study

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Abstract

Background: All hospitals must have emergency plans because they play a crucial role in providing critical care. This study assesses the perceived hospital preparedness of healthcare workforces to cope with the COVID-19 pandemic regarding their demographic characteristics.

Methods: This study utilized a descriptive, cross-sectional design to investigate the preparedness of hospital and healthcare workers in the city of Hail, Saudi Arabia. A convenience and snowball sampling method was used. A total of 330 healthcare workers participated in the study, which utilized a Google Form survey and was adapted from the Centers for Disease Control and Prevention (CDC). Descriptive statistics, t-test, one-way ANOVA, and Kruskal-Wallis were used to analyze the data. Data collection was conducted in July and August 2020.

Results: Overall, hospital employees agreed that they and their hospital were prepared for COVID-19 (2.98). No significant difference ($p > 0.362$) was found in the perception of male and female employees. However, hospital preparedness significantly differed by profession ($p < 0.020$) and educational attainment ($p < 0.030$); the post hoc test showed that COVID-19 preparedness was high for respondents with higher educational attainment, years of experience ($p < 0.003$), and the number of training sessions attended ($p < 0.003$).

Conclusions: The healthcare workforce is prepared to combat COVID-19. Of the demographic profiles of the healthcare workers, only sex was not a factor in preparedness. Profession, educational attainment, years of experience, and the number of related training sessions were all determinants of the healthcare workers' preparedness. These demographic characteristics can serve as factors in training and retraining the staff in battling COVID-19.

Keywords: COVID-19, healthcare workers, hospital, preparedness

INTRODUCTION

The novel coronavirus (COVID-19) has exacerbated stress and put major pressure on healthcare organizations. In response to the increasing number of COVID-19 cases in many countries, on March 11, 2020, the World Health Organization (WHO) mandated that all countries start aggressive action and scale up their emergency response mechanisms.[1] The magnitude of the illness has overwhelmed the healthcare system and healthcare workers.[2] It is assumed that the services delivered will be disrupted if hospitals are not prepared. In response, hospital workforces have introduced integrated hospital-wide strategies with steps to handle the inevitable increase in hospitalized patients with COVID-19.[2] Nonetheless, although hospitals may be prepared to address the problem, the demands may not be met because of the severity of cases.[3] Likewise, hospital workforces are facing challenges in activating their mandatory functional undertakings during the pandemic.

Since hospitals play a critical role in providing mass critical care, they must have emergency plans.[4] Although it is argued that all hospitals are mandated to have action plans for managing epidemics and pandemics,[5] these plans need to be apprised, and the hospital workforces must be capacitated to use them. Specifically, straightforward cooperation between critical hospital departments is imperative. In this context, healthcare systems must be prepared to meet the demands of the population affected by the pandemic[6] and maintain the condition of the people in times of health crises. The actions of Saudi Arabia in preparing its healthcare workers and hospitals to face the pandemic are commendable. For example, the Ministry of Health (MOH) has done its part to train healthcare workers and provide sufficient infrastructure/spaces and protocols for COVID-19.[7] Also, the MOH has disseminated an immense volume of COVID-19 preventive information via social media, government blogs, and advertising.[8] Saudi Arabia's health system is funded by the government, and that of

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non-citizens is provided by their employers.[9] Thus, the government was prepared to satisfy the healthcare needs of citizens. For example, the MOH has already prepared measures to ensure that all medical supplies are available in adequate quantities to resolve this situation, including personal protection devices, monitoring agents, ventilators, and drugs. These constraints and measures played a significant role in restricting the spread of SARS-CoV-22.[10]

Activating the emergency response of a hospital means preparing the healthcare workforce. In this situation, training and retraining workers are essential. Healthcare workers and hospitals need to be prepared since they play a critical role in the preventing and controlling COVID-19.[11] It is essential to note that knowledge and preparedness in the management of COVID-19 are vital to preventing and controlling the spread of this infectious disease.[12] This is fundamental to the healthcare workers and the hospital itself. Thobaity and Alshammari[13] recommended backing up the crisis plan to sustain the frontlines and bolster the preparedness in the critical line of defense. Al Mutair *et al*.,[14] on the other hand, suggest that hospitals must integrate their strategies based on evidence and that a team-based approach is an effective strategy. Conversely, Albaqawi *et al*.[15] suggest that training is an essential aspect of preparation. As such, appropriate steps must be provided for containing, monitoring, and preventing infectious disease dissemination at work and among nurses.

This study assesses the perceived preparedness of healthcare workforces to cope with the COVID-19 pandemic regarding their demographic characteristics. It is vital to facilitate accomplishing the ultimate objectives of hospital preparedness. Exploring hospital workforce preparedness identifies the problems that can be addressed on point, thereby preventing confusion during an epidemic or pandemic. Moreover, the preparedness of a hospital and its workforce will maintain the provision of care on time and without delay during and at the time of a pandemic.

METHODS

This study utilized an analytical cross-sectional design to investigate hospital workforce preparedness related to the demographic characteristics of healthcare workers in the Hail Region, Saudi Arabia. The researchers used the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) to guide the reporting of observational studies in this research.

All hospitals in the city of Hail were included in this study (Hail General Hospital, King Salman Specialist Hospital, Maternity Hospital, Saudi German, and King Khalid Hospital). Compared with other regions, these hospitals had the densest populations regarding the number of patients and ≥300-bed capacities. Moreover, most hospitals (e.g., King Khalid Hospital, King Salman Specialist Hospital, and Hail General Hospital) were the main reference hospitals in Hail and neighboring regions. The hospital workforce considered in this study included nurses, medical doctors, pharmacists, and medical technologists. Convenience and snowball sampling were used, resulting in 330 healthcare workers serving as study participants. The following were the inclusion criteria: (a) full-time employees of participating hospitals, (b) willing to participate, and (c) those who participated in preparation training sessions conducted by the hospitals. Exclusion criteria were those who were recruited as employees while conducting the study.

The study used a Google Form survey questionnaire. A link for the questionnaire was given to the key persons of the hospital, and they were requested to send it to their staff within their unit. The contact information of the researcher(s) was included instead of participants' clarifications. The participants were fully informed that the study would be used only for specific purposes. Their participation was not mandatory. They could withdraw should they consider the information too personal. Data collection was done in July and August 2020.

The researchers secured the requisite documents for data gathering and sought approval from the Ethics Review Board of the University of Hail preceding the online dissemination of the survey questionnaire. The purpose and procedures of this study were explained in the informed consent. Informed consent was obtained from participants before data collection.

The researchers utilized the Comprehensive Hospital Preparedness Checklist for Coronavirus Disease 2019 (COVID-19) developed by the Centers for Disease Control and Prevention.[16] It was in a checklist where slight modifications were made to suit the local context. Instead of depicting mandatory requirements, this tool emphasizes significant areas to assess hospital preparedness, highlighting the essential scope of health facility guidelines.

The questionnaire was divided into two parts. Part 1 concerned demographic characteristics: Sex, profession, educational attainment, years of service, and the number of related training sessions attended. Part II highlighted the basic dimensions of the health institutions' assessment of the preparation of suspected COVID-19 patients upon admission. This preparation included essential dimensions, such as policies on infection prevention and control and the training for staff personnel (2 items), the steps for promptly recognizing and putting the diagnosed or suspected COVID-19 patients into isolation (12 items), the placement of patients (7 items), precautionary measures based on

transmission (4 items), the movement of patients whether diagnosed or suspected within the facility (4 items), hand hygiene (2 items), environmental cleaning (5 items), monitoring and managing healthcare personnel (3 items), and visitor access and movement within the facility (4 items). The instrument was answered with a four-point Likert scale (1 = strongly agree, 2 = agree, 3 = disagree, and 4 = strongly disagree). The researchers calculated the percentage of respondents who achieved the ceiling and floor effects, with 15% reaching the ceiling or floor scores. This implies the reproducibility and responsiveness of the questionnaire.

Meanwhile, the validity and reliability were conducted. The instrument obtained an overall content validity index score of 0.79 for relevance and 0.78 for clarity, affirming high content validity. Internal consistency was tested with Cronbach's alpha, which was 0.79 in this study.

Statistical analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) software version 23. The demographic variables were treated and presented as frequencies and percentages, whereas descriptive statistics were expressed using means and standard deviations. Levene's test was used for the comparative part of the study for equality of variances, the independent *t*-test was used for equality of means, and the one-way ANOVA was used for multiple variables. The Kruskal-Wallis rank-sum test was used to measure significant differences and identify correlations, and the Kruskal-Wallis test was used as a post hoc test. The researchers set the statistical significance at $p < 0.05$.

RESULTS

Table 1 presents the demographic information of Hail hospital employees. Most participants were females (73.9%). Nurses (88.2%) had the highest percentage, and most had a bachelor's degree (76.4%). The participants were nearly equally distributed regarding their years of experience with 1 to 5 years of experience (31.5%), 6 to 10 years (34.2%), and 11 and above (34.2%) years. The number of training sessions attended varied, with 1 to 3 related training sessions attended (56.7%), no training sessions attended (23.3%), and 4 or more training sessions attended (20%).

Table 2 shows the perceived hospital preparedness among employees of Hail hospitals. Most hospital employees perceived hand hygiene (3.09) as the most prepared dimension, with the movement of patients with confirmed or suspected COVID-19 within the facility as 3.04. Overall, hospital employees agreed that their hospital was prepared for COVID-19.

Table 3 shows the differences in hospital preparedness along with demographics of hospital employees. Although

TABLE 1. Demographic information (N = 330)

Variables	Frequency (N)	Percentage (%)
Sex		
Male	86	26.1
Female	244	73.9
Profession		
Nurse	291	88.2
Doctor	18	5.5
Pharmacist	6	1.8
Medical technologist	15	4.5
Educational attainment		
Bachelor	252	76.4
Diploma	50	15.1
MA	22	6.7
Doctorate	6	1.8
Years of experience		
1–5	104	31.5
6–10	113	34.2
≥11	113	34.2
Number of related training sessions attended		
0	77	23.3
1–3	187	56.7
≥4	66	20.0

TABLE 2. Perceived hospital preparedness

Hospital Preparedness on the Following Dimensions	Mean	Standard Deviations (SD)
Infection prevention and control policies and training for healthcare personnel (HCP)	2.91	0.70
The facility provides education and job-specific training to HCP regarding COVID-19	2.98	0.68
Patient placement	2.95	0.66
Transmission-based precautions (use standard, contact, airborne precautions plus eye protection for patients with confirmed or suspected COVID-19 cases)	2.93	0.69
Movement of patients with confirmed or suspected COVID-19 within the facility	3.04	0.61
Hand hygiene	3.09	0.61
Environment cleaning	3.00	0.62
Monitoring and managing HCP	2.94	0.65
Visitor access and movement within the facility	2.98	0.67
Overall preparedness	2.98	0.51

3.27–4.00: Strongly Agree; 2.52–3.26: Agree; 1.76–2.51: Disagree; 1.00–1.75: Strongly Disagree

no significant difference was found in the perceptions of male and female employees ($p > 0.362$), the hospital preparedness significantly differed by profession ($p < 0.020$). The post hoc test revealed that pharmacists had the highest rating for preparedness and nurses had the lowest, as indicated by the mean rank of 266 and 171, respectively.

Coronavirus disease 2019 (COVID-19) preparedness also significantly differed by educational attainment ($p < 0.03$). The post hoc test showed that COVID-19 preparedness was high for respondents with higher educational attainment.

It is noteworthy that coronavirus disease 2019 (COVID-19) preparedness significantly differed by years of experience ($p < 0.003$). Respondents with at least 11 years of experience had a higher level of COVID-19 preparedness than those with experience between 6 and 10 years and 1 and 5 years.

Further, COVID-19 preparedness significantly differed by the number of training sessions attended. The post hoc test revealed that the level of COVID-19 preparedness was higher for those with 1 to 3 training sessions attended than those without training. Also, it was higher for those with at least four training sessions compared with those without training. However, the preparedness did not differ for those who attended between 1 and 3 training sessions and more than 4 training sessions.

TABLE 3. Differences in hospital preparedness along with demographics of hospital employees

Variable	Mean/Rank	*SD*	*p*
Sex			0.362
Male	2.93	0.70	
Female	3.00	0.43	
Profession			0.020*
Nurse	160	4.82	
Doctor	199	0.68	
Pharmacist	266	6.15	
Administrators	171	3.54	
Educational attainment			0.030*
Bachelor	160	1.50	
Diploma	164	1.38	
Masters	219	0.48	
Doctorate	204	0.89	
Years of experience			0.003*
1–5	2.98	0.60	
6–10	3.03	0.41	
≥11	3.09	0.46	
Number of related training sessions			0.003*
0	2.98	0.66	
1–3	2.69	0.56	
≥4	3.03	0.45	

**Significant at 0.05*

DISCUSSION

This study assessed the preparedness of the healthcare workforce in relation to their demographic characteristics. Overall, healthcare workers believed that they were prepared to combat COVID-19. This may be due to the remarkable experience of Saudi Arabia in managing the previous outbreak of MERS-CoV in 2012. In addition to the preparedness of healthcare workers, the WHO has made a tremendous effort to spearhead online training for healthcare workers. The WHO's goal is to train and prepare healthcare workers, and their resources are available in different languages.[17] Nonetheless, a study by Al-Ashwal *et al*.[18] maintains that, even though most healthcare workers demonstrated good knowledge about the virus, they were not optimally prepared for dealing with COVID-19.

In this current study, no significant difference was found in the perceptions of the male and female employees. This indicates that gender is not a critical predictor at the hospital and healthcare worker preparedness levels in this COVID-19 event. However, in comparison, the Al-Ashwal *et al*.[18] study found that females were not as prepared as their male counterparts in defeating COVID-19. According to the WHO,[17] pandemics have various effects on gender, and individual experiences are likely to vary. Therefore, strong gender analysis may be used with prudence to achieve more effective COVID-19 preparedness. Such a result contributes to the understanding of hospital administrators in customizing preparation strategies in dealing with COVID-19.

Conversely, hospital preparedness significantly differed by profession. Specifically, pharmacists had the highest rating, and nurses had the lowest. This result implies that job responsibilities may vary between professions and that those with more job functions can overwhelm the preparedness. Pharmacists, for example, are confined mainly within the walls of the pharmacy, providing more time to prepare combating COVID-19. In comparison, nurses have more responsibilities, allowing less time due to the demands of their work. The job of a pharmacist is pharmacist-centric, whereas nurses are the ultimate nexus between patients and other healthcare teams. Along with their unwavering care, nurses are continuously linked to patients in their respective critical functions against COVID-19.[13,19] This connection makes the input of nurses an invaluable contribution to hospital administrators for updating their knowledge and skills to improve their preparations for combating COVID-19.

Healthcare workers who have higher education are more prepared than those with a lower educational status. This result may be because healthcare workers who have attended higher education are more theoretically ready

and updated. Therefore, their educational status helped them to be more prepared for facing the disease. Such a result agrees with the study of Tripathi and colleagues,[20] where more healthcare workers with higher educational backgrounds were more aware of disease symptoms. The theories of knowledge that they have acquired could have helped them understand the nature of COVID-19. To Tripathi *et al*.,[20] such knowledge can be deciphered with the healthcare providers' preparedness and explained in improved practices toward COVID-19 prevention.

The preparedness of the hospital workforce on COVID-19 differs significantly by years of experience. This demonstrates that healthcare workers who have more years of experience are more prepared than their counterparts. This can be explained by more years of experience are profitable to healthcare workers. The study by Pasay-an,[21] for example, mentioned that nurses who have more experienced at work have better control in the workplace and stronger control of the situation. Moreover, to Al-Dossary *et al*.,[22] more work experience can improve the realization, views, and precautionary practices, leading to better practice of the profession. Albeit good outcomes regarding the years of experience, Alsaqri *et al*.[23] claimed that years of experience might not be a determinant for workers to advance the work in the organization. While healthcare workers with more experience demonstrate better preparedness than those with less, additional training program focus will be channeled to those who have less experience.

Further, COVID-19 preparedness differs significantly by the number of training sessions attended. This suggests that the more training, the more prepared the healthcare workers are to combat COVID-19. Loutfy and colleagues[4] recommended the need for hospitals to be prepared through departmental and train-the-trainer training in advance of an outbreak. It is indubitably expected that healthcare workers must have access to and training on infection control protocols.[24] Numerous training sessions have been conducted to prepare healthcare workers in response to the growing number of COVID-19 cases. One such example is simulation training on the scenario, which most hospitals in Saudi Arabia are conducting.[25] Dieckmann and associates[26] suggest that simulation as part of the training of the healthcare workers demonstrates advancement in addressing the pandemic, and it is advantageous in combating future pandemics. However, it is unfortunate that, with the expected positive outcomes of training, some studies claimed that training and education such as COVID-19 are limited to less than 40% of healthcare workers.[27] As such, one consideration should be to teach new personnel and nurses who are less skilled should patient numbers exceed the disaster plan capacity[28] since there is a nursing staff shortage at the time of a pandemic.[29] Overall, nurses should be trained on how to deal with the situation regularly through the support of hospital administrators.[30]

The researchers acknowledged some of the limitations of this study. While the researchers acknowledge that cultural adaptation is essential in using current tools in different cultural and linguistic contexts, this has not been considered. Moreover, the surveys used are self-administered and are prone to biases. Also, their use of non-probability sampling may preclude generalization of the findings. These limitations can be addressed in future investigations, where using mixed methods and probability sampling are recommended.

CONCLUSIONS

The healthcare workers in this study believed that they were prepared to combat COVID-19. While there was no difference regarding the sex of healthcare workers, their profession, educational attainment, years of experience, and the number of related training sessions were determinants of their preparedness. These demographic characteristics can serve as factors in training and retraining the staff in battling COVID-19.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Depression and Behavioral Changes Associated with Social Media Dependency During COVID-19 Pandemic Among University Students in Bangladesh: A Cross- Sectional Study

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Depression and Behavioral Changes Associated with Social Media Dependency During COVID-19 Pandemic Among University Students in Bangladesh: A Cross-Sectional Study

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Depression and Behavioral Changes Associated with Social Media Dependency During COVID-19 Pandemic Among University Students in Bangladesh: A Cross-Sectional Study

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Abstract

Background: With its rapid spread, the coronavirus disease 2019 (COVID-19) pandemic had a detrimental effect on students' psychological well-being, depression, and behavioral changes due to indefinite educational leaves, lockdowns, restricted outdoor activities, and excess use of social media. This study aims to assess the relationship of social media exposure with the psychological well-being, depression, and behavioral changes of Bangladeshi university students.

Methods: A web-based cross-sectional survey was carried out on 530 students from June 17 to July 10, 2020, to evaluate psychological well-being, depression, behavioral changes, and social media exposure via self-reported measures.

Results: The prevalence of factors were as follows: poor psychological well-being was 24.9%; moderate to severe depression was 56.6%; severe behavioral changes was 32.1%; and of moderate to severe addiction to social media exposure was 38.3%. All factors were positively associated with social media exposure. Multivariate logistic regression showed that the addiction of participants to social media was 7.488 times higher with severe behavioral changes (OR: 7.488; 95% CI 4.708–11.909), 2.299 times higher with poor psychological functioning (OR: 2.299; 95% CI 1.421–3.721), 30.54 times higher with severe depressed (OR: 30.54; 95% CI 15.0–62.177) than that of individuals without such symptoms.

Conclusions: The above findings imply that the government needs to pay greater attention to improve the overall situation of Bangladeshi university students.

Keywords: behavioral changes, COVID-19, depression, psychological well-being, social media

INTRODUCTION

The Hubei province of Wuhan, China, was the first to be affected by a pneumonia outbreak in December 2019. After lengthy scientific research procedures, Chinese scientists isolated the novel coronavirus (nCoV) from patients on January 7, 2020. Later, the virus was named severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2),[1] and the World Health Organization (WHO) named the disease as the coronavirus 2019 (COVID-19).[2] On January 30, 2020, WHO declared the COVID-19 outbreak as a public health emergency of international concern, particularly posing a high risk to countries with weak health systems.[3] With over 118,000 cases of worldwide and further risk of global spread, WHO declared COVID-19 a pandemic on March 11, 2020.[4]

In Bangladesh, after confirming the first three cases of COVID-19 on March 8, 2020, the government declared a special leave called lockdown from March 26, 2020, to reduce the community transmission.[5, 6] Such sudden leave had negative effects on the daily activities and studies, creating pressure on Bangladeshi students as all educational institutions were closed. Home quarantine, social distancing, boredom, and disease risk are all associated with adverse effects.[7] Widespread outbreaks of COVID-19 cause public panic, psychological stress, and mental disorders, including anxiety, depression, and post-traumatic stress disorder.[8] According to WHO, distress, anxiety, loneliness, sleep problems, and fear of uncertain, wide-spreading infectious diseases are natural psychological responses because of the rapid and random changes in the environment.[9, 10] Students face physiological, psychological, and social adaptation

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problems due to immature psychological and emotional development.[11] Adverse psychological outcomes increase due to the pandemic itself and its easily available information and misinformation via social media.[12] As a result, people from all socioeconomic classes may suffer from a rapidly increasing COVID-19 panic, which may be more harmful than the virus itself.[13] A Chinese study identified that stable family income and living with parents had positive effects on anxiety, with the rates of severe, moderate, and mild anxiety symptoms among university students at 0.9%, 2.7%, and 21.3%, respectively.[14] During the COVID-19 pandemic, depressive symptoms increased in prevalence, and without early intervention, may become long-term.[15, 16]

In fear of the frequent disease transmission, avoidance behaviors were implemented, as such for public transport usage, social events, crowded places, and school closures.[17, 18] During the COVID-19 pandemic, the stage of the outbreak, disease perception, and government involvement are associated with behavioral changes.[19] Several studies suggest that within a population, many people maintaining social distancing behaviors can hamper daily lives, have detrimental social implications, and increase risks in the future.[17, 20]

The unpredicted and sudden lockdown forced people to stay home and spend more time on social media while searching for news or information about the pandemic.[21] Social media quickly spreads both rumors and useful information, but many delinquents are deliberatively spreading fake information to cause psychological trauma, confusion, and anxiety.[22, 23] WHO has reported that due to a massive infodemic, correct and incorrect information during the COVID-19 pandemic increase the difficulties for people to find reliable and trustworthy guidance.[24] People's behavior is strongly influenced by fast-spreading information. WHO reported that rumor and misinformation through social media are the driving force of fear, anxiety, and stigma.[25] Social media exposure can also enhance post-traumatic stress disorder (PTSD) symptoms.[26] During this pandemic, social media helps by providing health information, telemedicine, and online psychological counseling, but may also harm by spreading negative emotions, rumors, and fake news that are associated with potential adverse effects such as the promotion of stress, loneliness, and depression.[21, 27]

Given the abovementioned discussions, Bangladesh may also need to determine the psychological status changes among university students, who are the nation's future driving force. Therefore, this study investigates the depression, psychological functioning, behavioral changes, and addiction to social media exposure among Bangladesh university students during the quarantine period of the COVID-19 outbreak. The relative factors that affect the depression level, psychological functioning, and behavioral changes are examined to determine the influence of social media exposure. Thus, we can deepen our understanding of the depression level, psychological functioning, and behavioral adaptations of Bangladeshi university students during the COVID-19 pandemic and suggest enhancement initiatives to policymakers.

METHODS

Study design

A web-based cross-sectional study was carried out from June 17 to July 10, 2020, after the lockdown started. A total of 530 students from 55 Bangladeshi universities (public, private, and national) willingly participated in the study. Data were collected online, given that community-based sampling was not feasible due to the COVID-19 pandemic. The survey link was distributed among Bangladeshi university students via social media using a convenient sample.

Ethical approval

This study was approved by the ethical committee of Noakhali Science and Technology University, Noakhali, Bangladesh (Application no: 101).

Study procedures

The questionnaire was set both in Bangla (the native language of participants) and English to achieve better understanding. The online survey was carried out using Google survey tool (Google Forms). Participants were obtained using a convenience sampling technique, yielding 530 respondents (61.7% male, 38.3% female) who completed the entire survey. The inclusion criteria were status as a current Bangladeshi student, Internet access, and genuineness in response. The students who were unwilling to participate in the study were excluded.

Survey content

The survey contained a semi-structured and self-related questionnaire with an informed consent letter. The questionnaire included questions on socio-demographic data, behavioral changes, psychological well-being, depression, and social media exposure. Socio-demographic data such as age, gender, and educational status were also collected. Educational status was classified into two categories, namely, undergraduate and post-graduate.

Behavioral changes were measured by asking questions regarding engagement in negative beliefs about oneself, blaming oneself for a crisis experience, negative feelings, losing interest in enjoyable activities, feelings of loneliness, having problems with positive feelings, aggressive behavior, excessive risk-taking, excessive carefulness or attentiveness, excitement, trouble paying attention, and problems with falling or staying asleep.

Respondents rated their answer on each item as "not at all," "sometimes," and "most of the time."

Psychological function was measured by using 18 items from the psychological well-being multi-dimensional scale that was theoretically derived by Ryff. This scale originally included 20 items for six subscales, namely, autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance.[28] The present study used a modified 18-item version, consisting of three items for each of the six subscales.[29] The items included positive and negative questions, and the answer was recorded on a 6-point Likert-type scale ranging from "strongly disagree" to "strongly agree." Negative questions were reverse-coded. Scores from all items are added, and a high total indicates greater well-being.

Depression level was measured using "Patient Health Questionnaire-9" (PHQ-9), a modified version of the original PRIME-MD, a 3-page questionnaire that can be entirely self-administered by the patient.[30] Nine items are scored from 0 ("not at all") to 3 ("nearly every day"). Scores from all items are added, and a high total indicates greater depression level. Levels of depression are diagnosed based on the presence of depressive symptoms for at least "more than half the days" in the past two weeks, namely, major depression for five or more of the nine depressive symptoms, and other depression levels for 2–4 depressive symptoms.

Addiction to social media was measured by questions on the duration of use, frequency of using apps, changes in feelings or efforts due to increase or reduction of Internet use, such as satisfaction or adverse emotional effects, respectively. Addiction level was categorized by using a Likert-type scale.

Statistical analysis

Microsoft Excel 2016 and IBM SPSS Statistics version 23.0 were used to carry out data analysis. Data editing, sorting, and coding were carried out using Microsoft Excel, and the file was subsequently imported into SPSS software for descriptive statistics (frequencies, percentages) and first-order analysis (i.e., chi-square tests). Logistic regression was performed with a 95% confidence interval to determine the significant associations between categorical variables. These associations were considered statistically significant if the *p* was less than 0.05.

RESULTS

Among the 530 participants, most were males (61.7%) and with the range 22–25 years of age (57.4%). This study included 1st–4th year M.Sc. students, although most of the participants were 4th-year students (28.8%). Responses show that participants had moderate behavioral changes than usual (46%), no changes (21.9%), and severe changes (32.1%). Psychological well-being was rated as mainly moderate (64.5) and otherwise poor (24.9). Depression was rated as moderately severe (14.5%) and severe (13.6%). Most of the respondents reported addiction to social media exposure as moderate (33.2%) and severe (5.1%). These outcomes of all the key variables are shown in Table 1.

Social media exposure had a statistically significant correlation with behavioral changes, psychological well-being, and depression as *p* (0.001, 0.001, and 0.001, respectively) were less than 0.05 (Table 2). Approximately 2.9% of respondents have moderate changes in behavior and 10.6% had severe changes, particularly for respondents with severe addiction to social media. For those who can control their addiction (mild) to social media, the majority (66%) of respondents have normal or no changes in behavior. Approximately 21% of respondents who are severely addicted to social media face severe depression.

Table 3 shows the regression analysis of participants' social media exposure and their behavioral changes, psychological well-being, and depression. Among the participants, addiction to social media is 7.488 times higher with severe behavioral changes (OR: 7.488; 95% CI 4.708–11.909) and 2.734 times higher with moderate behavioral changes (OR: 2.734; 95% CI 1.812–4.123) than those with no behavioral changes. In terms of

TABLE 1. Outcomes of key variables

Variables	Total
Gender	
Male	327 (61.7%)
Female	203 (38.3%)
Educational Status	
Undergraduate	388 (73.2%)
Post-graduate	142 (26.8%)
Behavioral Changes	
Normal/No changes	116 (21.9%)
Moderate changes	244 (46.0%)
Severe changes	170 (32.1%)
Psychological well-being	
Good psychological functioning	56 (10.6%)
Moderate psychological functioning	342 (64.5%)
Poor psychological functioning	132 (24.9%)
Depression level	
Minimal	77 (14.5%)
Mild depression	153 (28.9%)
Moderate depression	151 (28.5%)
Moderately severe depression	77 (14.5%)
Severe depression	72 (13.6%)
Social media exposure	
Normal/No addiction	37 (7.0%)
Mild addiction	290 (54.7%)
Moderate addiction	176 (33.2%)
Severe addiction	27 (5.1%)

psychological well-being, the social media exposure is 2.299 times higher with poor psychological functioning (OR: 2.299; 95% CI 1.421–3.721) and 1.381 times higher with moderate psychological functioning (OR: 1.381: 95% CI 0.893–2.137) than those with good psychological functioning. Social media exposure is 3.589, 11.698, 14.826, and 30.54 times higher with mild (OR: 3.589; 95% CI 2.02–6.376), moderate (OR: 11.698; 95% CI 6.231–21.961), moderately severe (OR: 14.826; 95% CI 7.492–29.340) and severe (OR: 30.540; 95% CI 15.0–62.177) depression compared with those with no depressive symptoms.

The results in Table 4 show no significant gender differences in overall psychological well-being given that $p > 0.05$. Male and female participants responded similarly to the six psychological well-being dimensions. However, significant gender variations were observed in the depression scale with $p < 0.001$. Compared with males (M male = 6.152, SD male = 5.718), female respondents scored higher for depression (M female = 8.039, SD female = 6.205, $p = 0.000$).

The effect of lockdown on one's behavioral changes was evaluated with the following options "Most of the time," "Sometimes," and "Not at all" (Table 5). In most areas, the majority of participants reported the option "Sometimes." However, several participants reported slight negative changes in behavior such as negative feelings (20.2%), losing interest in enjoyable activities (20.6%), feeling alone or isolated (23.0%), annoying or angry or aggressive behavior (17.2%), becoming too attentive (22.8%), having trouble paying attention (24.9%), and problem in sleeping (19.8%).

TABLE 2. Correlation of social media exposure with behavioral changes, psychological well-being, and depression

Variables	Social media exposure				*p*
	Normal or no addiction (%)	Mild addiction (%)	Moderate addiction (%)	Severe addiction (%)	
Behavioral changes					
Normal or no changes	23 (19.8)	77 (66.4)	14 (12.1)	2 (1.7)	
Moderate changes	12 (4.9)	153 (62.7)	72 (29.5)	7 (2.9)	0.000***
Severe changes	2 (1.2)	60 (35.3)	90 (52.9)	18 (10.6)	
Psychological well-being					
Good psychological functioning	7 (12.5)	34 (60.7)	13 (23.2)	2 (3.6)	
Moderate psychological functioning	22 (6.4)	200 (58.5)	109 (31.9)	11 (3.2)	0.001**
Poor psychological functioning	8 (6.1)	56 (42.4)	54 (40.9)	14 (10.6)	
Depression					
Minimal	24 (31.2)	46 (59.7)	7 (9.1)	0 (0)	
Mild depression	10 (6.5)	114 (74.5)	29 (19)	0 (0)	
Moderate depression	3 (2)	75 (49.7)	65 (43)	8 (5.3)	0.000***
Moderately Severe depression	0 (0)	34 (44.2)	39 (50.6)	4 (5.2)	
Severe depression	0 (0)	21 (29.2)	36 (50)	15 (20.8)	

*** (p <0.001); ** (p <0.01); *(p <0.05)

TABLE 3. Association between social media exposure and related covariates

Determinants	Coefficient	SE	Odd ratio	95% Confidence Interval [CI]	
				Lower	Upper
Behavioral changes					
Normal or no changes			1 Reference		
Severe changes	-4.283	0.546	7.488***	4.708	11.909
Moderate changes	-1.394	0.448	2.734**	1.812	4.123
Psychological well - being					
Good psychological functioning			1 Reference		
Poor psychological functioning	-8.133	0.584	2.299	1.421	3.721
Moderate psychological functioning	-0.857	0.510	1.381*	0.893	2.137
Depression					
Minimal Condition			1 Reference		
Mild depression	-1.806	0.577	3.589**	2.020	6.376
Moderate depression	-4.549	0.668	11.698***	6.231	21.961
Moderately severe depression	-5.830	0.761	14.826***	7.492	29.340
Severe depression	-7.893	0.839	30.540***	15.000	62.177

*** (p <0.001); ** (p <0.01); *(p <0.05)

TABLE 4. Summary of gender differences in psychological well-being and depression

Psychological well-being	Mean	SD	*p*
Autonomy			
Male	6.685	2.036	0.146
Female	6.428	1.866	
Environmental mastery			
Male	6.443	2.246	0.980
Female	6.438	2.207	
Personal growth			
Male	7.587	1.691	0.073
Female	7.315	1.691	
Positive relations with others			
Male	7.195	2.348	0.736
Female	7.123	2.507	
Purpose in life			
Male	7.134	2.155	0.742
Female	7.073	1.903	
Self-acceptance			
Male	6.889	2.110	0.157
Female	6.620	2.150	
Depression			
Male	6.152	5.718	0.000***
Female	8.039	6.205	

***(*p* <0.001); **(*p* <0.01); *(*p* <0.05)

TABLE 5. Effect on COVID-19 on behavioral changes

Effects on COVID-19 on behavioral changes	Frequency (%)		
	Most of the time	Sometimes	Not at all
Negative beliefs about yourself, about other people or the world (for example, thinking: I am bad, I have something wrong, I cannot trust anyone and this world is all bad)?	46 (8.7)	287 (54.2)	197 (37.2)
Blaming yourself or someone else for a crisis experience or what happened next?	58 (10.9)	261 (49.2)	211 (39.8)
Do you have any negative feelings such as fear, dread, anger, guilt or shame?	107 (20.2)	300 (56.6)	123 (23.2)
Are you losing interest in the activities you used to enjoy?	109 (20.6)	222 (41.9)	199 (37.5)
Feeling alone or isolated from others?	122 (23.0)	223 (42.1)	185 (34.9)
Having problems with positive feelings (for example, being unable to feel happy or feeling loving for the people around you)?	55 (10.4)	177 (33.4)	298 (56.2)
Behaving annoyingly, getting angry or aggressive?	91 (17.2)	248 (46.8)	191 (36.0)
Taking too much risk or doing something that could hurt you?	28 (5.3)	153 (28.9)	349 (65.8)
Becoming too careful or attentive?	121 (22.8)	260 (49.1)	149 (28.1)
Excited or easily startled?	57 (10.8)	261 (49.8)	134 (25.3)
Having trouble paying attention?	132 (24.9)	264 (49.8)	134 (25.3)
Problems falling asleep or staying asleep?	105 (19.8)	209 (39.4)	216 (40.8)

DISCUSSION

COVID-19 is a global pandemic that became the most devastating and challenging public health crisis with a rapidly increasing mortality rate. As such, people of all ages have suffered from psychological outcomes. Due to the unpredictable vacation and uncertain future of educational institutions, university students are more vulnerable to psychological consequences and increase their addiction to social media. This study investigated the behavioral changes, psychological well-functioning, depression, and social media exposure of Bangladeshi university students during the COVID-19 pandemic. Psychological suffering results from mental health problems, which are considered a public health concern.[31] In this study, among university students,

10.6% had good psychological functioning, while 64.5% and 24.9% had moderate and poor psychological functioning, respectively. A Chinese study reported that approximately two weeks after the outbreak of COVID-19, 40.4% of youth had psychological problems. This number is less than half of ours and indicates that the pandemic duration is also an essential factor.[32] A Spanish study found that 50.43% of participants showed moderate or severe psychological effects of outbreak and lockdown, which was lower compared with our findings.[33]

The current findings from the web-based cross-sectional survey indicated that over two-thirds of students experienced moderate to poor psychological functioning (89.4%) and mild to severe depression (84.5%). This prevalence rate was almost similar to another Bangladeshi study, which reported 82.4% mild to severe depression.[34] Previous Bangladeshi studies also reported the prevalence of depression among students in higher academic levels, such as 54.3% of medical and 52.2% of university students suffering from moderate to extremely severe depression.[31,35] In addition, 62.9% of university students experienced moderate to extreme depression, which was higher than the current findings (56.6%).[36] A Chinese study reported that after one month of home quarantine, 9% of university students were depressed, a number very much lower than our result.[37] In Spain, as study of the students, administrative staff, faculty members, and academic staff of the University of Valladolid found 48.1% exhibited signs of psychological symptoms and depression.[33] University students in Greece reported a 74.3% increase of depression during the lockdown[38] while those in Albania reported a 25.2% difference in the prevalence of moderate to severe depression compared with our result.[39] In Bangladesh, numerous university students work in part-time jobs, such as private tutoring, to cover their educational expenses and at times provide financial support to their families. Their dependence on part-time jobs is gradually increasing.[40] Under the lockdown, prolonged unemployment and insecure economic conditions are the most significant contributor to depression among university students.[34] Unemployment, which is associated with mental health, limits the feelings of achievement, accomplishment, and satisfaction, leading to possible impairment of psychological well-being and self-esteem.[41]

The uncertain situation, prolonged unemployment, and risk of mental health problems cause behavioral changes. The increased prevalence of negative feelings, losing interest, feeling alone, annoying or angry or aggressive behavior, becoming too attentive, and sleeping problems, also lead to the possible increase in the prevalence of depression during this pandemic. In the present sample, 46% had moderate behavioral changes than those with normal or no changes (21.9%) and severe changes (32.1%) in behavior. By comparison with a Spanish study in behavioral changes, our results showed similarities and differences, such as problems in paying attention (24.9% vs. 33.8%), sleeping problems (19.8% vs. 36.4%), annoying or angry or aggressive behavior (17.2% vs. 16.8%), feelings of loneliness (23.0% vs. 19.6%), hopelessness (8.7% vs. 33.5%), excited or restlessness (10.8% vs. 29.1%).[42] In our study, almost half of the participants reported that sometimes they had negative changes in their behavior such as negatives beliefs about themselves (54.7%), blaming themselves (49.2%), negative feelings (56.6%), losing interest in enjoyable activities (41.9%), feeling alone or isolated (42.2%), problems with positive feelings (33.4%), annoying or angry or aggressive behavior (46.8%), taking too much risk (28.9%), becoming too attentive (49.1%), excited (49.1%), having trouble paying attention (49.8%), and sleeping problems (39.4%). The findings lead to great concern and reflect the effect of COVID-19 on normal behavior.

Social distancing and isolation due to the pandemic and lockdowns affected mental health and increased reliance on social media. On the one hand, social media is an excellent source of information and entertainment, but on the other hand, can also adversely affect mental health by providing misinformation. In late January 2020, people of Wuhan and Hubei province experienced direct trauma via the media.[22] A Chinese study reported "less" (8.8%), "sometimes" (9.2%), and "frequently" (82.0%) for social media exposure.[43] In our study, most of respondents reported their addiction to social media exposure as mild (54.7%), moderate (33.2%), and severe (5.1%). Thus, social media exposure is significantly associated with the psychological well-being, depression, and behavioral changes of Bangladeshi university students.

During the COVID-19 pandemic, exposure to social media considerably increased and had detrimental effects on students' mental health and normal behavior due to restrictions in normal daily activities. Negative changes in mental health and behavior are a matter of concern to the family, society, and the country, and it requires proper attention from every level. The findings can help to realize and address the current situation before more devastating conditions occur. These negative impacts can be minimized by spending quality time with family, making homestead gardens, and using technology for learning and developing skills.

CONCLUSIONS

The findings show a high prevalence of poor psychological well-being, depression, and behavioral changes, which are positively associated with social media exposure during the COVID-19 outbreak. The government needs to pay greater attention to improving

such conditions while fighting COVID-19. Current quarantines limit the space and restrict outdoor activities, directly affecting physical activity and quality of life. Safe, effective, and low-cost means to gain physical fitness, such as home exercise under proper guidance, positively influence the overall quality of life. Therefore, this study suggests increasing physical movement, limiting social media use, and spending quality time with family.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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Quality of Life of Pharmacy Students with Polycystic Ovarian Syndrome in South India: A Cross-Sectional Study

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Quality of Life of Pharmacy Students with Polycystic Ovarian Syndrome in South India: A Cross-Sectional Study

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Abstract

Background: One in five women in India suffers from polycystic ovarian syndrome (PCOS). In this study, we aimed to evaluate the quality of life of pharmacy students suffering from PCOS and provide awareness through counseling.

Methods: A cross-sectional study was conducted on 103 students with PCOS for 6 months. The Polycystic Ovarian Syndrome Quality of Life (PCOSQ) questionnaire was used to determine the quality of life.

Results: The prevalence of PCOS in our study was 39.5%. The mean age of the students was 21.1 (±1.8) years. The mean duration of the disorder was 17.8 (±13.0) months. More than three-quarters (77.6%) of them were under medications. Menstrual problems had a severe negative impact on the quality of life. In addition, emotion, body hair, weight gain, and infertility had a moderate impact on the quality of life. A significant association was observed among sleeping habits and infertility problems (p = 0.014), physical activity, weight (p = 0.032), and menstrual problems (p = 0.042).

Conclusions: Menstrual problems have a significant impact on the quality of life of students with PCOS. Moreover, health science students must develop an awareness of prevalent noncommunicable diseases to help themselves and the society.

Keywords: noncommunicable diseases, pharmacy, polycystic ovarian syndrome, quality of life, students

INTRODUCTION

One in five women in India suffers from polycystic ovarian syndrome (PCOS), a hormonal disorder.[1,2] Women aged between 15 and 30 years are the most affected.[1] Emotional wellbeing is also affected, making women vulnerable to anxiety and depression. Irregular periods may lead to endometrial cancer. Excess body hair makes women feel depressed because others will see their facial hair. Weight gain affects body image and increases the risk of cardiovascular and endocrine diseases. In addition, women experience difficulties in becoming pregnant too.[3] Collectively, these effects will affect their quality of life. Imparting awareness through effective counseling can bring significant changes in the attitudes and behavior of women with PCOS. Health science students will play a significant role in this aspect because they study the prevention and management of various diseases.

No previous reports have evaluated the quality of life of pharmacy students with PCOS and provided counseling on the disorder. Thus, we aimed to assess the quality of life of pharmacy students with PCOS. The Polycystic Ovarian Syndrome Quality of Life questionnaire (PCOSQ)[4] measured health-related quality of life. The questionnaire contains 26 items, which are grouped into five domains, namely, emotional (eight items), body hair (five items), weight (five items), infertility (four items), and menstrual problems (four items). Each question is associated with a 7-point scale. The highest score indicates an optimal impact, whereas the lowest score indicates a negative impact on the quality of life.

Irrespective of the quality of life, we provided awareness of PCOS through effective counseling using booklets (with pictograms) from Pcosindia.org. We also provided information about the best smartphone applications for meditation, diet planning, weight loss, fitness, and essential websites for PCOS women during counseling.

METHODS

A cross-sectional study was conducted on students studying Pharmacy at a private pharmacy college for 6 months (September 1, 2019 to February 29, 2020). A simple questionnaire that identifies students suffering from PCOS was prepared and distributed to all female students. Of the 400 students, 158 were identified with PCOS, and a sampling frame containing 158 students was made. The estimated sample size was 113 (with a 5% margin of error, 95% confidence interval, 158 population size, and 50% response distribution). Then, a simple random sampling technique was used to randomly select students. However, only 103 students expressed their willingness to participate in the study. We obtained

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written informed consent from these students after we explained the aim and objective of our study and assured the confidentiality of the information. Students were allowed to select the mode of contact. They were contacted either in person or through a telephonic interview. Details such as age, education, duration of PCOS, medications used, complementary and alternative medications used, other complaints, and sleeping habits were collected. Sleeping habits were categorized into three. Mild indicated that sleep was interrupted 5 to 15 times per hour on average. Moderate indicated that sleep was interrupted 16 to 30 times per hour on average, whereas severe indicated that sleep was interrupted more than 30 times per hour. The study was in accordance with STROBE guidelines.

Frequencies and percentages were reported for qualitative data. The Mann–Whitney test was used to determine the association between variables and domains of the questionnaire. The Kruskal–Wallis test was used to find the association between variables (with ≥ three groups) and domains of the questionnaire. The level of significance was considered at p <0.05. Jeffrey's Amazing Statistical Program (version 0.12.1) software was used for statistical analysis. The study was approved by the Institutional Ethical Committee (VIPT/IEC/69/2019).

RESULTS

Table 1 illustrates the sociodemographic details of the patients. The participation rate was 91.15% (103 out of 113 participants). The mean age of the pharmacy students was 21.11 (±1.75) years. Most of the students were graduates (84.46%), had no comorbidities (56.31%), used different medications (77.67%), and did not use complementary alternate medications (62.13%). The mean duration of the disorder was 17.81 (±13.00) months, and the average weight was 72.8 (±10.39) kg. Mild and no sleep disturbances constituted 66%. Half of them reported no other problems.

Table 2 provides the mean scores for the five domains of the questionnaire. Based on the mean score of the domains, menstrual problems (14.19) have a negative impact, and emotions have an optimal impact on the quality of life. As shown in Table 3, a statistically significant association was observed between sleeping habits and infertility problems (p = 0.014), physical activity and weight (p = 0.032), and menstrual problems (p = 0.042).

As shown in Table 4, more than half of the students were non-compliant (54.6%) and had insufficient knowledge of managing the disease (62.9%). Nearly half of the students showed negligence toward symptoms (45.4%). These knowledge and practice aspects are identified during interaction with the students.

TABLE 1. Sociodemographic characteristics of the students with polycystic ovarian syndrome (N = 103)

Characteristics	Frequency	Percentage
Age in years		
18–21	66	64.1
22–25	37	35.9
Education		
Graduation	87	84.5
Post-graduation	16	15.5
Duration in months		
2–22	71	68.9
23–44	25	24.3
45–64	7	6.8
Comorbidities		
Yes	45	43.7
No	58	56.3
Physical activity		
Yes	77	74.8
No	26	25.2
Sleeping habits		
Mild	34	33.0
Moderate	22	21.3
Severe	13	12.6
None	34	33.0
Medications		
None	23	22.3
Progesterone	28	27.1
Clomiphene citrate	11	10.6
Ethinyl estradiol	11	10.6
Levonorgestrel	10	9.7
Metformin	9	8.7
Others	11	10.6
Complementary alternative medicine		
None	64	62.1
Ayurveda	5	4.9
Homeopathy	29	28.1
Both	5	4.9
Other problems		
None	56	54.3
Pigmentation	15	14.6
Acne	14	13.6
Migraine	10	9.7
Blemishes	8	7.8

TABLE 2. Mean scores of the domains of the PCOSQ questionnaire

Name of the domain	Mean (standard deviation)
Emotion	30.44 (11.79)
Body hair	22.12 (9.08)
Weight	19.49 (8.92)
Infertility problems	19.51 (8.26)
Menstrual problems	14.19 (6.41)

TABLE 3. Association of sociodemographic variables with the domains of the PCOSQ questionnaire

Name of the variable	Emotion (*p*)	Body hair (*p*)	Weight (*p*)	Infertility problems (*p*)	Menstrual problems (*p*)
Duration	0.447	0.591	0.367	0.061	0.068
Age	0.327	0.204	0.317	0.622	0.134
CAM**	0.872	0.323	0.543	0.994	0.730
Comorbidities	0.347	0.145	0.274	0.414	0.220
Sleeping Habits	0.205	0.088	0.142	0.014*	0.379
Physical Activity	0.328	0.459	0.032*	0.069	0.042*

**p*<0.05; ***CAM*-Complementary Alternative Medicine

TABLE 4. Knowledge and practices of students toward the disease

S. No.	Knowledge and practices	Frequency (%)
1	Negligence toward symptoms	49 (45.4%)
2	Nonadherence	37 (34.3%)
3	Noncompliant	59 (54.6%)
4	Insufficient knowledge on disease	29 (26.9%)
5	Insufficient knowledge on management	68 (62.9%)

DISCUSSION

The prevalence of PCOS in our study was 39.5% (158\400). Studies from India reported a prevalence between 6% and 13.54%.[5–7] Of 10 Indians, four are insufficiently active[8], and over 50% of Indian women are inactive.[9] Therefore, a sedentary lifestyle, physical inactivity, and weight gain attribute to the increased prevalence of PCOS in India. Nearly three-quarters of the students are physically inactive. It directly or indirectly contributes to hormonal imbalance.

In our study, emotions, body hair, weight, and infertility problems moderately affect students' health-related quality of life (HRQoL). Menstrual problems had severe impact on students' HRQoL. Veena et al.[6] and Radhika et al.[10] reported menstrual problems as domains that had severe impact on the quality of life of women with PCOS. Few studies reported that hirsutism had a negative influence on different dimensions of the quality of life of women[11,12] and adolescents.[13] Some studies reported weight and infertility as a significant factor indicating poor quality of life.[14,15]

Some studies focused on the emotional burden of PCOS in adolescents and women. Depression and anxiety are negatively correlated with the quality of life of adolescents with PCOS.[12] Based on previous reports, depression is a significant predictor of physical, psychological, and social domains of quality of life assessed using the World Health Organization Quality of Life-Brief Form (WHOQOL-BREF).[16] This variation in studies can be accounted for the difference in ages of study population and different phenotypes of women with PCOS. For example, weight gain and acne are more common in teenage girls, whereas obesity and infertility are more prominent in adult women. Similarly, phenotypes C and D do not contain hirsutism.[17] PCOS is a multifactorial disease, in which genetic, environmental, endocrine and behavioral variables all interact, resulting in a diverse phenotype with metabolic, reproductive, and psychological characteristics that adversely influence women's health and quality of life throughout their lives. As women aged, the PCOS phenotype improves with clinical characteristics, and the syndrome progresses from a reproductive disorder to a metabolic disorder.[18]

In this study, sleeping habits had statistically significant association with infertility problems. Women with PCOS were approximately 1.5 times likely to have sleep problems than those without PCOS. This finding was true even when other variables causing sleep disturbances were considered.[19] Sleep disturbances include delay of onset of sleep, struggling to maintain sleep, varied sleep duration, or awakening early.[20] In addition, evidence of a complex and bidirectional relationship between PCOS and sleep problems is observed. Sleep deprivation is a component of the pathophysiology of PCOS.[21] However, PCOS was not associated with daytime sleepiness or unintended early awakening.[22] After controlling for other variables, depressive symptoms and obesity mediate the increasing occurrence of difficulty in maintaining sleep (OR = 1.92; 95% CI: 1.12–3.31).[22]

Physical activity has statistically significant association with menstrual problems and weight in our study. Various studies have demonstrated that losing body weight can restore menstrual cycle in women with PCOS.[23,24] Meta-analysis reported moderate evidence that aerobic exercise alone[25] or vigorous intensity exercise[26] can decrease body mass index in women with PCOS. Physical activity indirectly regulates menstrual cycle by regulating body weight. However, not only weight gain but also weight loss also can affect the regularity of menstrual cycle. A Korean study observed a U-shaped association pattern between changes in body weight (body weight

gain or body weight loss) and irregular menstrual cycles among obese women.[27] Some studies reported that a combination of weight loss and diet or oral contraceptive pills would be more beneficial. For example, a micro diet can effectively reduce patients' body weight and regulate menstruation in obese patients with ovulatory disorders.[28] The combination of weight loss and oral contraceptive pills can improve several physical and mental domains related to quality of life, depressive symptoms, and anxiety disorders and provide benefits to overweight/obese women with PCOS.[29]

During our interaction with the students, we learned their knowledge and practices toward the disease. Surprisingly, most of them were non-compliant (54.6%) and reported insufficient knowledge on PCOS management (62.9%). The students who adhered to the treatment reported a reduction in the symptoms. We provided awareness and management of PCOS using a pre-defined booklet and useful digital resources.

Awareness about PCOS management is a potential tool that may improve quality of life. Simple lifestyle modifications such as weight management and regular physical activity can significantly improve quality of life. With physical activity, we can control obesity, which contributes many diseases. At present, we can use websites that provide proper management strategies for PCOS. Therefore, we opted to provide counseling for every student with PCOS. We prepared a counseling leaflet containing a brief overview and management strategies for each domain that can affect their quality of life. The counseling material contains pictograms extracted from an information booklet[30] that is free to use for girls and women with PCOS and contains evidence-based information on PCOS. Furthermore, we provided resources such as websites and smartphone applications to provide awareness and improve PCOS management. The counseling materials and a list of websites and smartphone applications can be found in the supplementary files.

Complete knowledge of the PCOS and counseling for adolescents should be included in the curriculum to provide awareness toward the disorder and lifestyle modification. The course structure should also include conducting awareness programs on noncommunicable diseases that commonly occur among the community members. It will help them comprehensively understand the disease and responsibility toward the society.

The study has a few limitations. As the students are unsure about their height, we cannot calculate their body mass index. We did not assess the diagnosis of PCOS. However, we included students who are already suffering from PCOS. We assessed awareness with open-ended questions only because we decided to strengthen their awareness of the disease and management aspects. The study results cannot be generalized to the whole population because of the small sample size.

CONCLUSIONS

In our study, menstrual problems affected the quality of life of students. Most of the students have insufficient knowledge and non-compliant to the therapy. Therefore, modifying curriculum is necessary to enhance knowledge of PCOS and lifestyle modifications.

CONFLICT OF INTEREST

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Parental Differences in Knowledge, Perception, and Safety Behaviors Regarding Home Injuries in an Urban Malaysian District

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Parental Differences in Knowledge, Perception, and Safety Behaviors Regarding Home Injuries in an Urban Malaysian District

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Abstract

Background: Parents play an essential role in the prevention of home-related injuries among children. Traditionally, mothers provided direct overall care, whereas evidence on fathers' roles in children's injuries is limited. This study assesses the differences between parents of children attending kindergarten regarding their knowledge and perception of home injuries and safety behaviors.

Methods: A cross-sectional study was conducted from January to April 2018 in 10 private kindergartens in the Selangor district in Malaysia. Self-administered questionnaires on sociodemographic data, knowledge of home injuries, perceptions toward home injuries, and safety behaviors at home were distributed. Descriptive and bivariate analyses were done to determine associated factors.

Results: A total of 147 fathers and 182 mothers participated. Differences in parental knowledge, perception, and safety behaviors were not statistically significant ($p > 0.05$). A poor correlation existed between both knowledge ($r = 0.099$, $p = 0.073$) and perception ($r = 0.207$, $p < 0.001$) with behavior scores. Most parents regarded injuries involving children at home as unavoidable and perceived mild injuries as the norm. However, most parents agreed that monitoring children's activities could reduce injury risk.

Conclusions: Healthcare practitioners should promote safe behavioral practices to both parents equally to improve their children's knowledge and perception of home injuries.

Keywords: children, home injury, knowledge, parents, perception

INTRODUCTION

Unintentional injury among children is a public health concern as it causes significant morbidity and mortality, particularly among young children worldwide.[1] In 2016, the Malaysian National Health and Morbidity Survey estimated that nearly two million children below five years old sustained some form of injury, with a higher prevalence among children aged 0–4 years. The majority (80.5%) of these accidents occurred within the house compound.[2] The most commonly reported injuries are falls, lacerations, burns, choking or suffocation, and drowning.[3] In 2017, statistics on the causes of death in Malaysia listed accidental drowning and submersion as the fifth leading cause of death for those under five years old.[4]

Surprisingly, it was reported that mothers accepted home injuries as everyday phenomena during the child's development.[5] Despite this, specific injuries resulted in long-term complications, such as permanent disability, and some even led to death. According to WHO, 830,000 children die from such injuries annually, and many more sustain variable degrees of disability, where most injuries are unintentional.[6] Many studies have been conducted to evaluate factors contributing to injury occurrence among children and preventive practices. In addition to commonly studied sociodemographic factors, other determinants identified in these studies include home environment, parental knowledge of home injuries, and parental perceptions or attitudes toward home injuries.[7–10]

Knowledge of unintentional childhood injuries is an essential contributing factor to prevent home injuries. Parents with a better understanding establish better safety measures, thereby reducing such injuries among their children.[9] Younesian and colleagues investigated the contributory factors of home injuries. They concluded that improving mothers' level of knowledge and their attitudes toward child safety were significant factors in preventing injuries.[10] Parents can prevent injuries by providing a safe home environment for children by reinforcing practical home safety measures. Thus, increasing parents' awareness and educating

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young parents on safety practices, particularly at home, are essential steps to retard the impact of unintentional injury at home.[3]

Mothers are traditionally seen as the main person involved in providing direct care to their children relative to the father. A father's role may involve interactive play and more willingness to engage in risk-taking opportunities associated with injury.[11] Nonetheless, there are limited studies to determine the father's role in child injury. A survey by Damashek *et al*. reported that toddlers tend to be involved with a higher level of physical activities under their fathers' care, thus increasing their risks of unintentional injury.[12]

This leads to the question: is the paternal role in children's home injury prevention comparable to the maternal role? Strategic planning to prevent home injuries among children, understanding the knowledge, perception, and safety practices of home-related injuries among fathers is as vital as that among mothers.

METHODS

Study design

This cross-sectional study was conducted at ten private kindergartens in the Hulu Langat district, one of the largest districts in Selangor, Malaysia, from January to April 2018. The sample size was determined using StatCalc Epi Info version 7 (Epi Info™, CDC). The minimum required sample size was 333, which was calculated based on the percentage of mothers' knowledge and estimated the proportion of fathers with the correct response taken from a previous study by Nadeeya *et al*. to reach a precision of 0.05 with a 95% confidence level.[13] An additional 10% was factored in for incomplete responses.

Study population

The kindergartens were randomly selected by a multi-stage cluster sampling using an online numbering system. There are six sub-districts in the Hulu Langat district, with 60 registered kindergartens. Two kindergartens were randomly selected for each sub-district. The owners of the selected kindergartens were asked to participate in this study. If the owner refused to participate, another kindergarten from the same sub-district was randomly selected. The biological parents of the children were invited to participate in the study. The caregivers or guardians of the children other than parents, i.e., grandparents and babysitters, were excluded.

The questionnaire used a designated color for each parent (blue for fathers & pink for mothers). Only one parent from each child was given the questionnaire to minimize the possibility of data contamination between parents. The receiver of the questionnaire was reminded of the study's intention and not to discuss the answers with their spouse/partner. If parents had more than one child in the kindergarten, they would only receive one questionnaire. Every other child will receive a questionnaire for either the mother or father using their attendance sheet.

Study questionnaire

A bilingual questionnaire was used to collect the data. Each respondent was given one week to complete the questionnaire. Four sections were to be answered in each questionnaire. The first section consisted of sociodemographic data, including date of birth, gender, ethnicity, religion, marital status, level of education, occupation, total household income, and relation to the child.

The second and third sections were on knowledge and perception of home injuries, respectively. These sections were adapted from the previous study by Nadeeya *et al*.[13] The original questionnaire was in the Malay language. The back-to-back translation was done by four independent certified translators. Thereafter, face validity was performed among 10 parents. The second section on knowledge of home injuries consisted of 16 items. There were three options for each item in both sections: ″Yes,″ ″No,″ or ″Unsure.″ A "Yes" response was given a score of 1 and a score of 0 for a "No" or "Unsure" response. A total score for the section was obtained by adding up the scores for each item. The total knowledge score ranged from 0 to 16. Higher scores reflected better knowledge of the respondent.

The third section was on the perceptions of home injury consisting of 11 items to be answered on a Likert scale. The options were ″Strongly disagree,″ ″Disagree,″ ″Neutral,″ ″Agree,″ and ″Strongly Agree.″ The negative item was reversely coded. The total perception score ranged from 1 to 55. Higher scores reflected a better perception of the respondent.

The fourth section was on safety behavior at home. Items in the safety behavior sections were developed and adapted from previous studies by Halperin SF *et al*., Lee LK *et al*., and Mulvaney C *et al*.[14–16] It underwent content validity through discussion with one senior family medicine specialist and one public health specialist. There were six items in that section. Respondents selected each item as ″Almost always,″ ″Often,″ ″Sometimes,″ ″Seldom,″ or ″Almost never.″

Similarly, they were answered on a Likert scale. The total safety behavior score ranged from 5 to 25. For safety behavior practices, the lower scores reflected better safety behavior.

Subsequently, a pilot test was done among 40 parents from one kindergarten for the reliability of the questionnaire. The Cronbach alpha for the internal consistency was 0.65, 0.60, and 0.56 for the knowledge,

perception, and behavior domains, respectively. Samples in the pilot study were excluded from the actual sample size.

Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences software, version 23.0. The respondents' sociodemographic characteristics, knowledge, and perception scores were reported as descriptive statistics. Mann-Whitney U and Kruskal-Wallis tests were used to establish the association between knowledge and perception scores with the sociodemographic variable. The Spearman correlation was used to establish the relationship between knowledge and perception with safety behavior. A p of less than 0.05 was statistically significant.

This study received ethical approval from the Medical Research Ethics Committee of the National University of Malaysia. Permission to collect data from the kindergarten was sought from the owners. Consent to use the questionnaire was also obtained from the original author. All participants had signed a written consent before their participation.

RESULTS

A total of 18 kindergartens were asked, with eight of them refusing to participate. Altogether, a total of 329 respondents completed the questionnaire. One hundred forty-seven were fathers, and 182 were mothers. The age of respondents ranged from 22 to 61 years old, with a median age of 36 (IQR = 7.0) years. The majority of respondents were Malay (93.9%), married (97.9%), received tertiary education (62.9%), and were employed (80.5%). Only 196 participants disclosed their income, with a median income of RM 5000 (IQR 4600). All background characteristics were comparable between the groups, except fathers were higher in employment numbers than mothers (Table 1).

The respective minimum and maximum scores for the respondents' knowledge, perception, and behavior domains are presented in Table 2. The knowledge, perception, and behavior scores were almost similar between fathers and mothers. Mothers scored a slightly higher minimum score for reporting safety behaviors at home compared with fathers, with a score of 14 and 11, respectively. All three scores were not significantly different between the two groups ($p > 0.05$).

A correlation test was done to study the relationship between knowledge and perception with behavior scores. We found a poor correlation between knowledge and perception with behavior scores, with an r of 0.099 ($p = 0.073$) and 0.207 ($p < 0.001$) for knowledge and perception, respectively.

The scores for knowledge and perception were compared with demographic characteristics (Table 3). There was no correlation between the parents' age with knowledge and perception scores with r = 0.051 and r = 0.041, respectively. Also, the Malay ethnic group and parents who received a tertiary education had a significantly

TABLE 1. Background characteristic of parents (N = 329)

Characteristics	Fathers (n = 147)	Mothers (n = 182)	Overall Respondents (n = 329)
Median Age (IQR)	37 (8.0)	36 (7.0)	36 (7.0)
Ethnic			
Malay	141 (95.9)	168 (92.3)	309 (93.9)
Non-Malay	6 (4.1)	14 (7.7)	20 (6.1)
Marital Status			
Married	144 (98.0)	178 (97.8)	322 (97.9)
Single Parents	3 (2.0)	4 (2.2)	7 (2.1)
Level of Education			
Primary	2 (1.4)	3 (1.6)	5 (1.5)
Secondary	53 (36.1)	64 (35.2)	117 (35.6)
Tertiary	92 (62.6)	115 (63.2)	207 (62.9)
Employment			
Employed	144 (98.0)	121 (66.5)	265 (80.5)
Unemployed	3 (2.0)	61 (33.5)	64 (19.5)
Socio-economic status (RM) (n = 196)			
Median Income (IQR)	5,150 (4761)	5,000 (4500)	5,000 (4600)
Low (< 4,930)	15 (10.2)	17 (12.0)	32 (12.1)
Moderate (4,930-10,509)	61 (41.5)	72 (50.7)	133 (50.4)
High (> 10,510)	46 (31.3)	53 (37.3)	99 (37.5)

higher median score for knowledge and perception (p < 0.010). In addition, family income showed a significant association with perception score, where a higher income had a higher perception score (p = 0.027).

TABLE 2. Knowledge, perception, and behavior score of respondents (N = 329)

	Fathers (n = 147)	Mothers (n = 182)	*p*
Knowledge			
Min	5	6	
Max	16	16	0.293[a]
Median (IQR)	11 (3.0)	11 (2.0)	
Perception			
Min	30	30	
Max	49	49	0.614[a]
Median (IQR)	38 (6.0)	38 (5.0)	
Behaviour			
Min	11	14	
Max	25	25	0.990[a]
Median (IQR)	21 (4.0)	21 (4.0)	

[a] Mann-Whitney U test

TABLE 3. Association between knowledge and perception score with sociodemographic characteristics

Characteristics	Knowledge Score		Perception Score	
	Median (IQR)	*p*	Median (IQR)	*p*
Median Age	11 (3)	r=0.051[a] 0.361	38 (6)	r=0.04[a] 0.455
Ethnic				
Malay	11 (3)	< 0.01[b]	38 (6)	<0.01[b]
Non-Malay	10 (3)		36 (5)	
Marital Status				
Married	11 (2)	0.618[b]	38 (5)	0.456[b]
Single Parents	12 (3)		38 (5)	
Education Level				
Primary	9 (2)		31 (8)	
Secondary	11 (3)	<0.01[c]	37 (5)	<0.01[c]
Tertiary	12 (3)		38 (6)	
Employment Status				
Employed	11 (3)	0.572[b]	38 (6)	0.894[b]
Unemployed	11 (4)		38 (5)	
Income				
Low	11 (2)		37 (7)	
Moderate	11 (3)	0.125[c]	37 (5)	0.027[c]
High	11 (2)		39 (7)	

[a]Spearman correlation
[b]Mann-Whitney U test
[c] Kruskal-Wallis test

Overall, parents' knowledge was considerably good since only four items in the knowledge domain had less than half of respondents answering correctly. Five items had over 90% of fathers and mothers giving the correct response (Figure 1). The items with poor correct responses for both groups were how to perform cardiopulmonary resuscitation (CPR) in children (24%), vitamins as a common source of poisoning in children less than six years old (33.1%), knowledge regarding the appropriate age for a child to bathe alone (38.9%), and knowledge about the suitability of using a baby walker at home (45.3%).

Four items in the knowledge of home injury section showed significant differences between fathers and mothers (p < 0.05). The items were safe to play with coins, the safest sleeping position for the baby, using a baby walker, and knowledge about performing CPR in children. More mothers (51.1%) had responded correctly regarding using a baby walker, compared with fathers (38.1%). In contrast, 61.2% of fathers knew the safest sleeping position for babies compared with 47.8% of mothers.

Figure 2 shows the parents' responses to the perception of home injuries. The majority of the respondents agreed that mild injuries are regular occurrences among children. Almost half of the mothers (47.3%) agreed that injuries could not be avoided, whereas 40.1% of fathers disagreed. Despite this, both parents did not agree that falls and wounds are less dangerous than poisoning and drowning. More than half of the parents (51.4%) thought their children had a low potential for injuries at home. The majority of parents (91.2%) opined that monitoring children's activities would be helpful to reduce injury risk. Also, 62.3% of parents viewed that using safety equipment could help reduce home injuries among children. More than two-thirds of parents disagreed that it is safe for older siblings who are less than 12 years to supervise younger children. Most parents (68.1%) would agree to practice injury prevention.

Both parents generally had acceptable self-reported safety behaviors regarding safety behaviors, as more than 70% of respondents responded appropriately for all items (Figure 3). The term *appropriate* response mentioned above reflects the appropriate correct answer given by the respondents to the given statement, whereas an answer of "very often" and "always" for the *true/positive* statements, or "rarely" and "never" for the *negative/false* statements. Mothers reported more appropriate safety responses than fathers, except for two items holding the child when handling hot water and storing sharp objects in a locked cabinet.

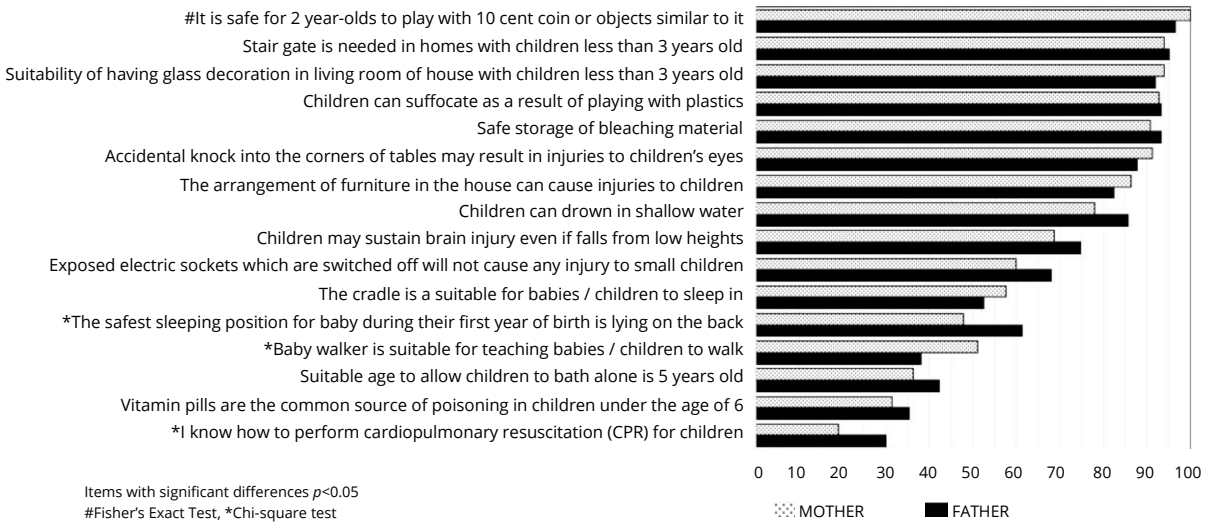

FIGURE 1. Percentage of correct responses on knowledge of home injuries in children

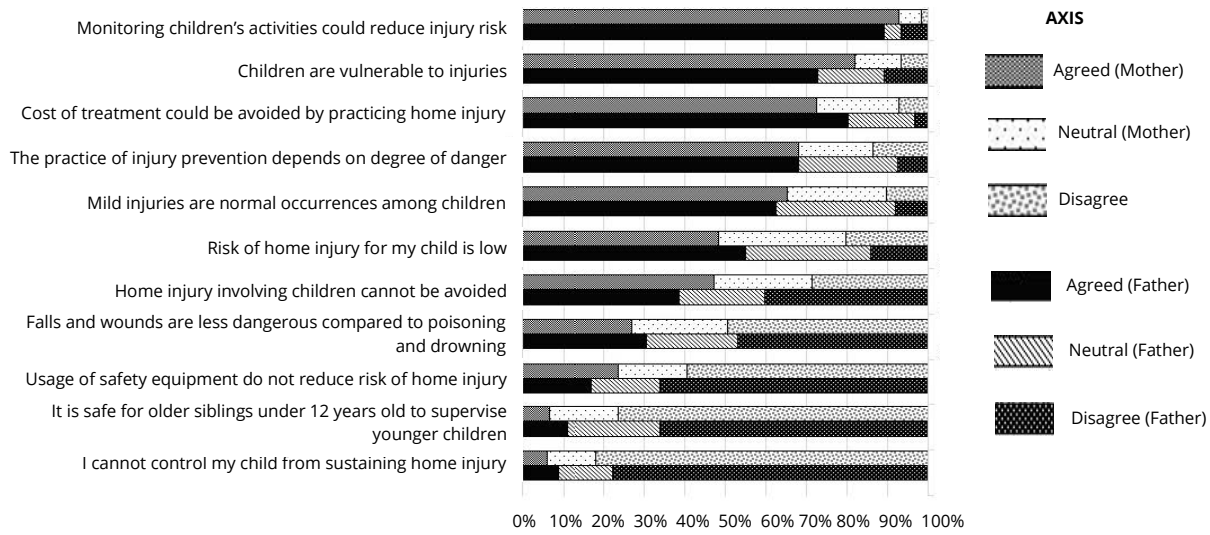

FIGURE 2. Percentage of responses on the perception of home injuries

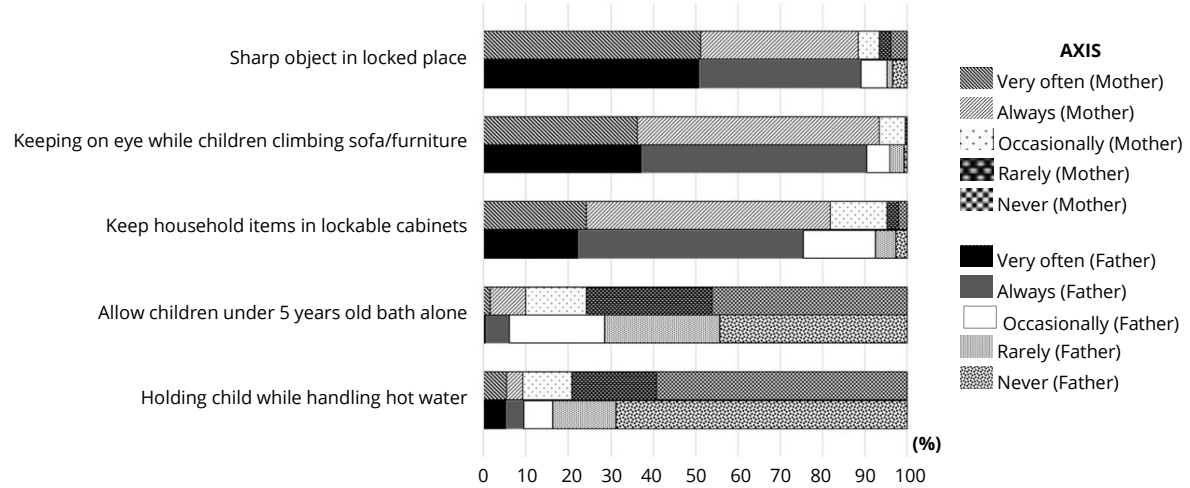

FIGURE 3. Percentage of Likert scale responses on safety behaviors in the household

DISCUSSION

In this study, fathers and mothers were compared to identify the possible factors that could be improved in planning for injury prevention strategies. The total number of respondents in our study was 329.

Our study found that Malay ethnicity had higher knowledge and perception scores on home injury among children. This was probably due to the homogeneity of the respondents. We also found that parents with a higher level of education had better knowledge of home injuries and higher perception scores. However, a study in Iran contradicts our results, whereby they found that higher educated mothers as a predictor of poor knowledge.[17] This difference was because higher educated mothers worked and had less involvement in caring for their children. For the perception of home injury, higher income was associated with better scores. Perception is the process of attaining awareness or understanding of sensory information.[18] It may be postulated that higher income parents have better and more conducive home environments that can stimulate thinking. However, further research needs to be conducted to support this hypothesis.

In this study, fathers had an overall total knowledge and perception score for home injuries comparable to that of mothers. However, on further analysis of individual knowledge items, four were associated with the parental role (fathers and mothers). The items were safe to play with coins, the safest sleeping position for the baby, the usage of baby walker, and knowledge to perform CPR in children. Despite the previously limited research on the paternal role, the findings of this study indicated that fathers in this century participated more in caring for their children. This increases their awareness of the knowledge and perceptions related to home injuries.

Knowing about safety does not always translate into good practices.[19] Our study found no correlation between knowledge and perception score of home injuries toward self-reported safety behaviors. Knowledge and perception are among predictors that are mainly studied for preventive measures for all injuries. Our findings differ from Ramdzan *et al*., who studied the association of knowledge with their corresponding safety practices.[19] They found that, generally, mothers had better safety practices in conjunction with better knowledge. Nevertheless, both parents may not have felt that these injuries were preventable rather than an inevitable part of growing up.[20] Despite the above findings, the importance of injury prevention education should not be undermined.

Limited data compare parents concerning injury preventive measures regarding specific types of injuries. Thus, little is known about the potential factors contributing to the findings of why more fathers had better knowledge of a baby's sleeping position and the better knowledge of mothers concerning the use of baby walkers. Since mothers are the more predominant caregivers, they may have their own experiences or have heard about the adverse effects of using baby walkers, preventing their use.

Almost two-thirds of fathers and half of mothers agreed that using infant walkers is suitable for teaching children to walk. The findings were consistent with a previous study in Kuwait, which found that one of the main reasons parents used baby walkers was to promote walking.[21] However, it is essential to note that using baby walkers caused home injuries. It was reported that from 1990 to 2014, approximately 230,676 children who were less than 15 months old were treated for infant walker–related injuries in the United States emergency departments, primarily for head or neck injuries.[22] Besides, nearly half of United Arab Emirates families using baby walkers had at least one child who sustained an injury, averaging two injuries per family. In the same study, the most frequent external cause of a potentially harmful baby walker incident was hitting a hard object, followed by flipping over, accessing dangerous items, and falling down stairs.[19,23] Given these occurrences, it is crucial to create awareness among parents regarding baby walker–related injuries.

One in four of the respondents knew how to perform CPR. More fathers reported knowing how to perform CPR than mothers. In fact, in a study conducted among urban mothers, only one in five respondents knew CPR.[21] A study done by Farizan *et al*. revealed that most parents of primary school children of a district in Selangor, Malaysia, were not certified and not confident in performing CPR.[24] Being skillful in CPR is essential to prevent severe consequences of home injuries among children. Programs should be offered to help parents to acquire this skill.

In this study, 61.1% of parents could not identify the appropriate age for children to bathe alone, as recommended by the American Academy of Pediatrics 2003.[25] This finding was concurrent with a previous study, which stated that parents had different views in allowing their children to take baths alone. Two earlier studies reported that the mean age that parents allowed children to bathe alone was 6.6 and 7.5 years old. [26, 27] Also, bath drowning was more prevalent in young children, particularly those younger than five.[28] This might be an important reason why more parents opted to disagree with the statement in this study. They probably allowed children to shower alone at an older age to prevent bath drowning.

Most parents perceive that children are vulnerable to injury and mild injuries are regular occurrences in children. This finding is reminiscent of the previous study

by Arulogun *et al*.[5] One qualitative study indicated that parents regard injuries as not preventable and part of development.[20] Likewise, most parents in this study considered home injuries among children as unavoidable. Despite that, only half of the parents thought their child had a low risk of home injuries. This could be because most respondents felt that they could control their child from sustaining an injury. Regarding injury prevention, almost all parents agreed that supervision could reduce the risk of injuries. This was consistent with the finding in a study that mothers had perceptions that inadequate supervision of their child could be an injury risk to their child.[29]

Our study sampled parents from a small urban district on the west coast of Peninsular Malaysia and should not be generalized to represent the entire population.

CONCLUSIONS

In summary, the knowledge, perception, and behavior scores of parents of kindergarten-aged children in an urban district are approximate. Fathers are equally involved as mothers in caring for the safety of their children. Knowledge and perception were not correlated with the safety behavior of parents. Education on the prevention of home injuries should emphasize knowledge about CPR, vitamins as a cause for poisoning, and the dangers of using baby walkers.

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CONFLICT OF INTEREST

The authors declare no conflict of interest in this study.

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Prevalence and Associated Factors of Dizziness Among a National Community-Dwelling Sample of Older Adults in India in 2017–2018

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Prevalence and Associated Factors of Dizziness Among a National Community-Dwelling Sample of Older Adults in India in 2017–2018

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Abstract

Background: This study aimed to determine the prevalence and associated factors of dizziness in older community-dwelling adults in India.

Methods: The cross-sectional sample was composed of 21,343 individuals (≥65 years) from the Longitudinal Aging Study in India (LASI) Wave 1 in 2017–2018. Dizziness was assessed by determining if the individuals suffered from "persistent or troublesome dizziness or light headedness" in the past 2 years.

Results: Women and men had the overall prevalence of 14.6%/17.2% and 11.6% in past 2-year dizziness, respectively. Adjusted logistic regression analysis revealed that sociodemographic factors (female sex), physical chronic conditions (angina), geriatric conditions (incontinence and impaired vision), stress and mental health (poor or fail self-rated health, perceived discrimination, neurological or psychiatric problems, insomnia symptoms, persistent headaches, and severe fatigue or exhaustion) and health risk behavior (tobacco use) were positively associated with dizziness.

Conclusions: One in seven older adults in India had past 2-year dizziness. The factors associated with dizziness included female sex, angina, incontinence, impaired vision, poor or fair self-rated health, perceived discrimination, neurological or psychiatric problems, insomnia symptoms, persistent headaches, severe fatigue or exhaustion, and tobacco use.

Keywords: aged, chronic disease, dizziness, India, mental health

INTRODUCTION

Dizziness is a general term to explain the feeling we have when our sense of balance is impaired. Many people who experience dizziness experience difficulty explaining exactly how it makes them feel. For example, some people who feel dizzy, light-headed, giddy, or off-balance describe the feeling as if they or their surroundings are spinning.[1] In a review on 20 studies in the adult population, lifetime prevalence estimates that significant dizziness ranges between 17% and 30%, and vertigo varies between 3% and 10%.[2] In low- and middle-income countries, among older adults, the prevalence of dizziness is 15.2% in Columbia (≥60 years),[3] 24.5% in Nigeria,[4] and 45% in Brazil (N = 391, ≥65 years).[5] In a cross-sectional study in a geriatric outpatient clinic (≥65 years) in rural central India, the prevalence of dizziness/vertigo is 3%.[6] National population-based data on dizziness in India are lacking. Having dizziness may have a great social impact, as shown in a study on patients suffering from dizziness in England.[7] With the potentially large social and health impact of dizziness, its prevalence and associated factors in the general older adult population in India should be assessed. Relevant findings can potentially provide a basis for developing health care policies for older adults in India.

Most people with dizziness problems tend to have more than one risk factor, suggesting that dizziness is a multifactorial geriatric syndrome.[8] Sociodemographic factors associated with dizziness may include increasing age,[9,10] female sex,[5,9,11] having health insurance,[12] and living alone.[13] Physical chronic conditions related to dizziness are hypertension, heart disease,[12] cardiovascular disease,[9] history of osteo/rheumatoid arthritis,[13] osteoporosis,[9] and physical multimorbidity.[3,9]

Geriatric conditions that increase the odds of dizziness are impaired vision,[3,11,13] short-sightedness (defined by glasses),[9] impaired hearing,[11] memory disturbance,[9,14] cognitive impairment,[3,15] incontinence,[9] recurrent falls,[5] falls,[9,14] impaired function of lower extremities,[13] mobility problems,[9] impaired balance,[8] and use of more than four medications.[3]

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Stress and mental health factors include the following: poor self-rated health status,[3,9,12] perceived stresses,[16] and mental and emotional stress[17] are associated with dizziness. Mental health conditions related to dizziness include depression or depressive symptoms,[3,5,9,12,13] presence of anxiety,[13] psychological disorders,[15] sleep disorder,[9] excessive sleepiness,[14] and short sleep.[16] In addition, other health problems linked to dizziness are perceived fatigue,[5,18] excessive drowsiness,[5] headaches,[19] and migraine.[10] Furthermore, several health risk behaviors, including physical inactivity,[18,20,21] no exercise,[22] smoking,[4,16] and alcohol use,[16] are associated with dizziness. However, studies have yet to explore dizziness among community-dwelling older adults in India. As such, this study aimed to determine the prevalence and associated factors of dizziness in older adults in India.

METHODS

Sample and procedures

In this secondary data analysis, data from the cross-sectional and nationally representative "Longitudinal Aging Study in India (LASI) Wave 1, 2017–2018" were utilized; "the overall household response rate is 96%, and the overall individual response rate is 87%."[23] In a household survey, "interview, physical measurement, and biomarker data were collected from individuals aged 45 and above and their spouses regardless of age,"[23] but the sample was restricted to persons aged ≥65. This study was approved by the "Indian Council of Medical Research Ethics Committee in January 2017, and written or oral informed consent was obtained from the participants." [23]

Measures

Outcome variable

Dizziness was assessed with one question from the Health and Retirement Study on having "persistent or troublesome dizziness or light headedness in the past 2 years" (yes or no).[23]

Covariates

Sociodemographic indicators included education level, sex, age, and residential status. The subjective socioeconomic status was sourced from the following item: "Please imagine a 10-step ladder, where the people who were the worst off and had the least money, least education, and worst jobs or no jobs were at the bottom; the people who were the best off and had the most money, most education, and best jobs were at the top of the ladder. Please indicate the number (1–10) on the rung on the ladder where you would place yourself"[23] (defined as 1–3 low, 4–5 medium, and 6–10 high).

Physical chronic conditions were sourced from the following questions: "Has any health professional ever told you that you have…?": 1) "chronic lung diseases such as asthma, chronic obstructive pulmonary disease/chronic bronchitis, or other chronic lung problems; 2) chronic heart diseases such as coronary heart disease (heart attack or myocardial infarction), congestive heart failure, or other chronic heart problems; 4) diabetes or high blood sugar; 5) bone or joint disorder (arthritis or rheumatism, osteoporosis, or other bone/joint diseases); and 6) stroke" (yes/no).[23] *Angina* was assessed with the "World Health Organization's Rose angina questionnaire"[24] defined on the basis of "discomfort at walking uphill or hurrying or at an ordinary pace on level ground. Furthermore, the pain should be located at the sternum or in the left chest and arm, causing the patient to stop or slow down, and the pain should resolve within 10 min when the patient stops or slows down."[25] *Hypertension* was defined as "systolic blood pressure (BP) ≥ 140 mm Hg and/or diastolic BP ≥ 90 mm Hg (based on the last two average values of three BP readings) or where the participant is currently on antihypertensive medication."[26]

Geriatric conditions consisted of impaired cognition,[23,27] measured underweight (<18.5 kg/m^2), injurious falls (past 2 years), incontinence, self-reported impaired vision, and hearing impairment.[23]

Stress and mental health variables

Self-rated health status was sourced from the question: "In general, would you say your health is excellent, very good, good, fair, or poor?" Responses were coded as "1 = poor, 2 = fair, 3 = good, 4 = very good, and 5 = excellent."[23]

The assessed *life event stressors* included 1) victims of violent crime ("In the last 12 months, have you been the victim of a violent crime, such as assault/mugging/threat to life/others?" (yes/no), 2) disaster exposure causing health effects ("In the last 5 years, has your health been severely affected by disasters such as floods, landslides, extreme cold and hot weather, cyclones/typhoons, droughts, earthquakes, tsunamis, or any other natural calamities?" (yes/no), and 3) man-made incident causing health effects ("In the last 5 years, has your health been severely affected by man-made incidents such as riots, terrorism, building collapses, fires, traffic accidents, or any other man-made incidents?" (yes/no).[23] Any affirmative response was coded with 1, and if no affirmative was coded 0.

Perceived discrimination was sourced from the Everyday Discrimination Scale (EDS) (short version).[28] Cronbach's alpha for the EDS in this study was 0.86.

Neurological or psychiatric disorder (health care provider diagnosed any neurological/ psychiatric problems) (Yes, No).[23]

Major depressive disorder was evaluated with the "Composite International Diagnostic Interview short form (CIDI-SF)."[29,30] Study respondents were required to "endorse either anhedonia or depressed mood for most

of the day for most of a 2-week period or more," and those who fulfilled this criterion "completed an additional seven symptoms: lost interest, feeling tired, change in weight, trouble with sleep, trouble concentrating, feeling down, and thoughts of death."[31] "Those with a score of ≥3 were considered to meet the criteria for having MDD in the previous 12 months;[31,32] MDD symptomology scores ranged from 0 to 7."[31]

Insomnia symptoms were assessed with four questions adapted from the Jenkins Sleep Scale (JSS-4)[33]: "How often do you have trouble falling asleep?" 2) "How often do you have trouble with waking up during the night?" 3) "How often do you have trouble with waking up too early and not being able to fall asleep again?" 4) "How often did you feel unrested during the day regardless of the number of hours of sleep you had?" Response options were "never, rarely (1–2 nights per week), occasionally (3–4 nights per week), and frequently (5 or more nights per week)" (item four was reverse coded). Insomnia problems were "coded as 'frequently' for any of the four symptoms as one."[34] "JSS-4 proved excellent reliability and demonstrated good construct validity."[35] The internal consistency of JSS-4 was 0.87 in this study.

The *loneliness* question used was sourced from the CES-D-10[36]: "How often did you feel alone in the past week?" Response options were coded into "no loneliness: 0 = rarely or none at all (<1 day), sometimes, or 1–2 days/week and 1 = occasionally, all the time, or 3–7 days/week."

Persistent headaches and severe fatigue or exhaustion were assessed on the basis of the HRS questions with an affirmative response to the following question: "Have you had any of the following persistent or troublesome problems in past 2 years?" 1) Persistent headaches and 2) severe fatigue or exhaustion (yes/no).[23]

Current tobacco use was assessed as follows: 1) "Do you currently smoke any tobacco products (cigarettes, bidis, cigars, hookah, cheroot, etc.)? and 2) Do you use smokeless tobacco (such as chewing tobacco, gutka, pan masala, etc.)?"[23]

Heavy episodic alcohol use was assessed with the following question: "In the last 3 months, how frequently have you had at least five or more drinks on one occasion?"[23] and defined as "1–3 days per month, 1–4 per week, five or more days per week, or daily."

Physical activity was assessed with the following questions: 1) "How often do you participate in sports or vigorous activities, such as every day, more than once a week, once a week, 1–3 times a month, or hardly ever or never?" 2) "On the days you did vigorous activity, how much time did you usually spend doing any vigorous activity? (___min)", 3) "How often do you take part in sports or activities that are moderately energetic such as…?" and 4) "How much time did you usually spend doing any moderate activity on average in a day?"[23] The participants were classified to be having a high physical activity as follows: ">300 min/week moderate physical activity or ">150 min/week vigorous intensity or >300 min/week moderate + vigorous intensity; whereby time in vigorous activity is doubled").[37,38]

Data analysis

Descriptive statistics was applied to describe sociodemographic and health information. Univariate and multiple logistic regressions were conducted to estimate the associations between sociodemographic factors, physical chronic conditions, geriatric conditions, stress and mental health, and health risk behavior variables with dizziness (dependent variable). The variables significant in univariate logistic regression analysis were subsequently included in the multiple logistic regression models. Only complete cases were considered for the analysis, and data were significant if $p < 0.05$. Statistical analyses were conducted by using "STATA software version 15.0 (Stata Corporation, College Station, TX, USA)" and considering the multistage sampling and weighting of data.

RESULTS

Sample characteristics

The sample included 21,343 older adults (≥65 years, median 70 years). Among them, 52.5% were women, and 47.5% were men. The majority (70.4%) of the study participants lived in rural areas, 39.6% had a low subjective socioeconomic status, and 58.8% had no schooling. Furthermore, 20.9% had a bone/joint disease, 5.7% heart disease, 5.7% chronic lung disease, 14.5% diabetes, 3.0% stroke, 9.3% angina, and 51.8% hypertension. Regarding geriatric conditions, 28.4% were underweight, 5.6% had a history of falls, 10.9% impaired cognition, 4.7% incontinence, 15.5% impaired vision, and 11.3% impaired hearing. In addition, 51.2% rated their health as poor or fair, 9.2% suffered from life stressors, and 17.7% experienced discrimination. Approximately 8.2% had major depressive disorder, 2.9% had a neurological or psychiatric problem, 15.3% had insomnia symptoms, 15.5% had loneliness, 12.3% had persistent headaches, and 24.8% had severe fatigue or exhaustion. Moreover, 33.0%, 2.3%, and 47.6% used tobacco, had heavy alcohol, and moderately engaged in high physical activity, respectively. The past 2-year dizziness had overall prevalence of 14.6%/17.2% among women and 11.6% among men (Table 1).

Associations with dizziness

In multiple logistic regression analysis, sociodemographic factors (female sex), physical chronic conditions (angina), geriatric conditions (incontinence, and impaired vision), stress and mental health (poor or fail self-rated health, perceived discrimination, neurological or psychiatric problems, insomnia symptoms, persistent headaches,

and severe fatigue or exhaustion), and health risk behavior (tobacco use) were positively associated with dizziness (Table 2). In univariate logistic regression analysis, no schooling was positively related to dizziness, whereas higher socioeconomic status and urban residence were negatively associated with dizziness. Stroke, chronic lung disease, bone or joint disorders, injurious falls, impaired cognition, underweight, impaired hearing, exposure to life stressors, major depressive disorder, and loneliness were positively linked to dizziness, whereas a high physical activity was negatively associated with dizziness (Table 1).

TABLE 1. Sample and dizziness characteristics and univariate logistic regression results among older adults (≥65 years) in India, 2017–2018 (N = 21,343)

Variables	Sample %	Dizzy %	Not dizzy %	Odds Ratio (95% CI)	*p*
Sociodemographic factors					
All		14.6	85.4		
Age in years					
65–74	67.9	66.4	68.2	1 (Reference)	
75–84	25.2	26.7	25.0	1.10 (0.96, 1.26)	0.128
85 plus	6.9	6.9	6.8	1.03 (0.80, 1.33)	0.795
Sex					
Male	47.5	37.9	49.1	1 (Reference)	
Female	52.5	62.1	50.9	1.58 (1.39, 1.79)	<0.001
Education					
≥1 year	41.2	32.4	42.7	1 (Reference)	
No schooling	58.8	67.6	57.3	1.55 (1.35, 1.79)	<0.001
Socioeconomic status					
Low	39.6	46.0	38.5	1 (Reference)	
Medium	36.0	35.2	36.2	0.81 (0.69, 0.96)	0.016
High	24.3	18.7	25.3	0.62 (0.51, 0.75)	<0.001
Residential status					
Rural	70.4	77.3	69.2	1 (Reference)	
Urban	29.6	22.7	30.8	0.66 (0.54, 0.81)	<0.001
Health factors					
Physical chronic conditions					
Hypertension	51.8	54.8	51.3	1.15 (0.99, 1.34)	0.064
Heart disease	5.7	6.4	5.5	1.17 (0.83, 1.66)	0.370
Angina	9.3	14.8	8.4	1.89 (1.56, 2.30)	<0.001
Stroke	3.0	4.0	2.8	1.47 (1.10, 1.96)	0.010
Chronic lung disease	5.7	6.4	5.5	1.52 (1.20, 1.92)	<0.001
Bone or joint disorder	20.9	27.2	19.8	1.51 (1.23, 1.86)	<0.001
Diabetes	14.5	14.8	14.4	1.03 (0.79, 1.33)	0.837
Geriatric conditions					
Injurious falls	5.6	8.9	5.1	1.81 (1.41, 2.33)	<0.001
Impaired cognition	10.9	15.2	10.2	1.58 (1.26, 1.97)	<0.001
Underweight	28.4	34.0	27.5	1.35 (1.17, 1.57)	<0.001
Incontinence	4.7	10.0	3.8	2.80 (2.24, 3.51)	<0.001
Impaired vision	15.5	25.0	13.8	2.08 (1.73, 2.49)	<0.001
Impaired hearing	11.3	14.0	10.8	1.35 (1.09, 1.66)	0.005
Stress and mental health					
Poor or fair self-rated health	51.2	65.2	48.9	1.96 (1.69, 2.28)	<0.001
Life stressors	9.2	12.7	8.6	1.54 (1.27, 1.88)	<0.001
Perceived discrimination					
0	82.3	76.8	83.2	1 (Reference)	
1–2	11.0	11.7	10.9	1.16 (0.92, 1.47)	0.216
3–6	6.7	11.5	5.9	2.11 (1.70, 2.64)	<0.001

Table 1. continues

Variables	Sample %	Dizzy %	Not dizzy %	Odds Ratio (95% CI)	*p*
Neurological or psychiatric disorder	2.9	5.9	2.5	2.47 (1.72, 3.55)	<0.001
Major depressive disorder	8.2	14.1	7.2	2.12 (1.73, 2.59)	<0.001
Insomnia symptoms	15.3	28.3	13.1	2.61 (2.25, 3.02)	<0.001
Loneliness	15.5	20.3	14.7	1.47 (1.19, 1.82)	<0.001
Persistent headaches	12.3	31.8	8.9	4.76 (4.01, 5.66)	<0.001
Severe fatigue or exhaustion	24.8	54.8	19.7	4.92 (4.30, 5.64)	<0.001
Health risk behavior					
Current tobacco use	33.0	36.4	32.4	1.19 (1.05, 1.36)	0.007
Heavy alcohol use	2.3	2.5	2.3	1.11 (0.77, 1.62)	0.572
Physical activity					
None	38.1	42.8	37.3	1 (Reference)	
Low	14.3	14.0	14.3	0.85 (0.69, 1.05)	0.133
Moderate	8.4	7.5	8.6	0.76 (0.56, 1.04)	0.089
High	39.2	35.7	39.8	0.78 (0.64, 0.95)	0.014

TABLE 2. Multiple logistic regression with dizziness among older adults (≥65 years) in India, 2017–2018

Variables	Adjusted Odds Ratio (95% CI)	*p*
Sociodemographic factors		
Sex		
Male	1 (Reference)	
Female	1.54 (1.29, 1.84)	<0.001
Education		
≥1 year	1 (Reference)	
No schooling	1.04 (0.86, 1.26)	0.671
Socioeconomic status		
Low	1 (Reference)	
Medium	1.01 (0.83, 1.23)	0.898
High	0.94 (0.75, 1.18)	0.599
Residential status		
Rural	1 (Reference)	
Urban	0.83 (0.69, 1.01)	0.067
Health factors		
Physical chronic conditions		
Angina	1.48 (1.15, 1.49)	0.002
Stroke	1.33 (0.86, 2.06)	0.201
Chronic lung disease	1.14 (0.88, 1.47)	0.336
Bone or joint disorder	1.13 (0.93, 1.38)	0.226
Geriatric conditions		
Injurious falls	1.24 (0.91, 1.69)	0.168
Impaired cognition	1.03 (0.79, 1.34)	0.817
Underweight	1.16 (0.97, 1.39)	0.103
Incontinence	1.54 (1.13, 2.10)	0.006
Impaired vision	1.43 (1.13, 1.82)	0.003
Impaired hearing	1.15 (0.89, 1.48)	0.271
Stress and mental health		
Poor or fair self-rated health	1.28 (1.08, 1.53)	0.005
Life stressors	1.08 (0.82, 1.42)	0.579

Table 2. continues

Variables	Adjusted Odds Ratio (95% CI)	*p*
Perceived discrimination		
0	1 (Reference)	
1–2	0.80 (0.60, 1.07)	0.130
3–6	1.47 (1.10, 1.96)	0.009
Neurological or psychiatric disorder	1.59 (1.08, 2.36)	0.020
Major depressive disorder	1.15 (0.88, 1.50)	0.317
Insomnia symptoms	1.73 (1.40, 2.13)	<0.001
Loneliness	1.06 (0.85, 1.33)	0.611
Persistent headaches	2.81 (2.32, 3.41)	<0.001
Severe fatigue or exhaustion	3.11 (2.62, 3.69)	<0.001
Health risk behavior		
Current tobacco use	1.26 (1.05, 1.51)	0.013
Physical activity		
None	1 (Reference)	
Low	0.98 (0.77, 1.24)	0.867
Moderate	0.82 (0.62, 1.10)	0.187
High	0.99 (0.81, 1.21)	0.917

DISCUSSION

This study was the first to evaluate the prevalence and associated factors of dizziness among older adults in India. The past 2-year prevalence of dizziness (14.6%) was similar to that in a community-based study in Columbia (past 1 month, 15.2%, ≥60 years)[3] but lower than that in Nigeria (past 1 month, 24.5%, ≥65 years)[4] and Brazil (past 1 year, 45%, ≥65 years).[5] Conversely, it was higher than that in a geriatric outpatient clinic in India (3%).[6]

Consistent with several studies,[5,9,11] our study showed that female sex was associated with dizziness. Some studies have found an increase in the prevalence of dizziness with age,[9,10] but we did not find differences in the prevalence of dizziness by age group. Consistent with previous studies,[9,12,13] our findings revealed that physical chronic conditions (angina, and in unadjusted analysis heart disease, stroke, chronic lung disease, and bone or joint disorder) were associated with dizziness. Furthermore, our results agreed with previous studies,[3,5,9,11,13–15] which demonstrated that several geriatric conditions (incontinence, impaired vision, and in unadjusted analysis, injurious falls, impaired cognition, underweight, and impaired hearing) were positively associated with dizziness.

In terms of stress and mental health, poor or fair self-rated health was associated with perceived discrimination, neurological or psychiatric problems, insomnia symptoms, persistent headaches, severe fatigue or exhaustion, and dizziness. These results were consistent with previous findings.[3,5,9,10,12,14,16,18,19] Regarding the association between insomnia symptoms and dizziness, Kim *et al*.[39] suggested that "it is important to consider sleep disturbance in patients with psychogenic dizziness, such as phobic postural vertigo and chronic subjective dizziness, or nonspecific dizziness." Furthermore, evidence has emerged that "psychotherapy may be effective in patients with dizziness that is medically not sufficiently explained or due to a psychiatric disorder."[40]

High associations were found between severe fatigue or exhaustion, persistent headaches, and dizziness, indicating that these symptoms may be precipitants of dizziness;[41] therefore, dizziness has multifactorial nature.[8] In a study among patients with chronic dizziness, dizziness is correlated with general fatigue and headache.[42] Other studies have suggested that fatigue and dizziness co-occur with common underlying processes, such as increased inflammation, but correlation was 0.29 in this study.[5] In contrast to a previous study that found an association between depression and dizziness,[3,5,9,12,13] our study observed such an association in univariate analysis.

Several studies have shown an association between physical inactivity and dizziness,[18,20–22] whereas our study demonstrated that a high physical activity was protective against dizziness in unadjusted analysis. Some studies have suggested that physical therapy may be potentially effective for older people with dizziness, vertigo, and balance disorders.[43] In several studies,[4,16,44] current tobacco use was associated with dizziness in this study. Emerging evidence has indicated that possible genetic variants increase vulnerability to dizziness while smoking.[44,45]

This study was limited by the assessment of some variables via a self-reporting and cross-sectional study design. The type of dizziness and positions or activities associated with dizziness was not assessed. Some

geriatric conditions, such as medication use (prescription and nonprescription), delirium, and frailty, were not examined.

CONCLUSIONS

One in seven older adults in India had past 2-year dizziness. Dizziness was related to several factors, namely, female sex, angina, incontinence, impaired vision, poor or fair self-rated health, perceived discrimination, neurological or psychiatric problems, insomnia symptoms, persistent headaches, severe fatigue or exhaustion, and tobacco use. The prevalence of dizziness among community-dwelling older adults is high and significantly associated with potentially remediable physical, mental, and social conditions. Therefore, policies for elderly care in India should be formulated.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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Trends and Determinants of Family Planning Utilization Among Men in Indonesia

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Trends and Determinants of Family Planning Utilization Among Men in Indonesia

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Abstract

Background: Population growth rate in the world is still increasing. To control population growth, governments issue family planning programs for married women and men. However, contraception use is still dominated by women. This study aims to analyze the trends and determinants of family planning utilization among men in Indonesia.

Methods: This study is quantitative in nature with a cross-sectional design, using secondary data from the Indonesian Health Demographic Survey (2007–2017). The sample comprised married men with a total of 27,859 respondents. For the final analysis, we conducted logistic regression statistical tests to determine family planning utilization among men.

Results: Family planning utilization trends among married men in Indonesia increased. The proportion utilization of family planning among men was 3.7% (2007), 4.2% (2012), and 5.6% (2017). Higher and secondary education, media exposure, age, type of residence, and economic status significantly correlated with family planning utilization among married men. Higher education was the most dominant factor associated with family planning utilization among males in Indonesia ($p < 0.001$; Prevalence Ratio (PR) 4.636 Confidence Interval 95% (3.645–5.897).

Conclusions: Male education is the most crucial factor of family planning utilization. Increasing knowledge regarding family planning is expected to increase information and awareness about family planning utilization.

Keywords: contraceptive agents, family planning service, Indonesia, male

INTRODUCTION

Population growth rate still increases and reproductive health problems still occur. Approximately 210 million pregnancies are reported annually worldwide, 182 million of them in developing countries. Approximately 46 million pregnancies (20%) each year end in abortion, 36 million abortions occur in developing countries, and 10 million in developed countries.[1] It also happens in Indonesia. Indonesia is one of the five most populous countries where population growth is still relatively high. To control population growth, the government has issued family planning programs for married women and men. However, contraception use is still dominated by women. Utilization for men is relatively low in Indonesia. The Indonesian Demographic and Health Survey (IDHS) 2017 reports that only 2.5% of men use condoms and 0.2% vasectomy.[2] According to the data from the Indonesian Ministry of Health 2018, 1.75% of men use contraception.[3] Men's involvement in reproductive health issues is significant to achieve Sustainable Development Goals (SDGs). SDG number 5.6 targets to ensure universal access to sexual and reproductive health and reproductive rights.[4] Global commitment, linked to the Program of Action of the International Conference on Population and Development and the Beijing Platform for action, has been stated to involve men in family planning and reproductive health programs.[5]

Men have an important responsibility to reduce unwanted pregnancies, especially in developing countries.[6] Male participation in family planning is low in semi-urban Nigeria. These reasons are related to various complex factors, such as the desire to have more children and their old age.[6] Men's ideas about their ideal family members, gender preferences, ideal birth intervals, family planning methods, and the sociocultural environment can influence their reproductive behaviors. In developing countries, such as Ethiopia, having children, especially boys, is one of the criteria that determines the reputations of men, women, and family strength associated with low male participation in family planning.[7]

Various factors influence males to use contraceptives. A study in Bangladesh reports that men likely participate in family planning. Wives who are educated about reproductive health are involved in skilled work, have high knowledge about contraception, connect with social networks and receive messages about family planning and reproductive health, have good partner communication, and have a high age.[8] Research from Kenya states that the region of residence, marital status, religion, wealth, interaction with healthcare providers,

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fertility preference, number of sexual partners, and access to media are all significantly associated with modern contraceptives among sexually active men.[9] Education and the number of children are predictors of contraceptive use in men in Nigeria.[10] Levels of knowledge and education are predictors of vasectomy contraceptive use in Ethiopia.[11]

A study in Indonesia explores contraception utilization from the female perspective. It aims to reduce the burden of unwanted pregnancy. The determinants of modern contraception utilization among women are widely used. However, the male perspective about contraceptive utilization must be considered, not only as partners but also as individuals with reproductive history and desires of their own. Several studies have also explored contraceptive utilization determinants in men but use cross-section data.[12] Comprehensive data are needed to describe the patterns of using male family planning methods in Indonesia. The present study uses time-series data, which can help provide good health policies to expand male family planning membership. It also aims to analyze the trends and determinants of family planning utilization among men in Indonesia.

METHODS

Study design

IDHS data (2007–2017) were used; specifically, the 2007, 2012, and 2017 waves. The IDHS survey is conducted every five years with the aim of obtaining population and public health information with estimates up to the provincial level. It is conducted jointly by the Central Statistics Agency (Indonesian Statistics), BKKBN (Indonesian National Population and Family Planning Agency), and the Ministry of Health of Indonesia. The Government of Indonesia provides the survey funding. The United States Agency for International Development also lends help in conducting the survey. In the IDHS survey, a two-stage stratified sampling method is used and designed to present national- and provincial-level estimates. Data can be accessed from http://dhsprogram.com/data/new-user-registration.cfm.

Sample

The population study was all men aged 15–49 years in 34 provinces in Indonesia who were successfully interviewed by the IDHS team. The total sample was 27,998 (total number from IDHS 2007, 2012, and 2017) married men; 8,730, 9,226, and 9,903 in the 2007, 2012, and 2017 waves, respectively. The sample was selected on the basis of inclusion and exclusion criteria.

Variables

We used family planning utilization as the independent variable. Our dependent variables were level of education, age, media exposure, type of residence, economic status, and number of living children. The explanations of these variables are provided in Table 1.

TABLE 1. Descriptions and coding of variables

Variable	Description and Coding
Family planning utilization	Respondent's acknowledgment of family planning utilization. This variable is divided into two categories: 1 if the respondent is using contraception (condoms, vasectomy, and withdrawal), 0 if the respondent is not using contraception.
Level of education	Education refers to the respondent's acknowledgment of the last education completed. This variable is divided into three categories: 0 if low (not attending school, not completing primary school, and completing primary school), 1 if secondary (completing junior high school and senior high school), and 2 if high (completing college).
Age	The age variable is divided into two categories: 1 if the respondent is > 37 years and 0 if the respondent is ≤ 37 years.
Media exposure	It is divided into two categories: 1 if the respondent receives information about family planning on television, radio, and newspaper or has received information messages by phone within the last six months, 0 if the respondent never received information about family planning on television, radio, newspaper.
Type of residence	It is divided into two categories: 1 if the respondent lives in an urban area, and 0 if the respondent lives in a rural area.
Economic status	Economic status is divided on the basis of the wealth index calculation. Wealth index is a composite measure of a household's cumulative living standard. The wealth index is calculated using easy-to-collect data on the household ownership of selected assets, such as televisions and bicycles, materials used for housing construction, type of water access, and sanitation facilities. This variable is divided into five categories (i.e., 4 if richest, 3 if rich, 2 if middle, 1 if poor, and 0 if poorest).
Number of living children	This variable is divided into two categories: 1 if the respondent has four or more children, and 0 if the respondent has less than four children.

Data analysis

Our data analysis was performed by using univariate, bivariate, and multivariate analysis. The variables were first summarized with descriptive statistics in percentage. Given that all of the variables were categorical, the chi-square test was conducted to select variables related to family planning utilization. Then, multivariate logistic regression models were used to adjust the predictors of family planning utilization among males. The analyses were completed using the statistical package SPSS 23.0 for Windows. This study passed the ethics review of the Ethics Review Center of the Faculty of Public Health, Sriwijaya University, with registration number 081/UN9.FKM/TU.KKE/2021.

RESULTS

Family planning utilization among men in Indonesia increased from 2007 to 2017. In 2007, the percentage was 3.7%. In 2017, family planning utilization among men in Indonesia increased to 5.6%, showing an increase of 1.9%.

Family planning utilization methods include condoms, vasectomy, and withdrawal. Condom use in men increased; in 2007, the percentage was 1.8%, then in 2017, a 1% increase was observed. Hence, the percentage of condom use among men in Indonesia in 2017 was 2.8%. The percentage of withdrawal also increased. The highest increase that occurred from 2012 to 2017 was 1.2%. In contrast to condom use and withdrawal, the percentage of male sterilization from 2007 to 2017 decreased; In 2007, it was 0.5%; in 2017, the percentage decreased by 0.3%. Therefore, the percentage of male sterilization in Indonesia in 2017 was 0.2%.

Table 2 presents the characteristics of the respondents. Almost all respondents are > 37 years old, have secondary education, have no media exposure, and have < 4 number of living children.

Table 3 shows that education, age, media exposure, type of residence, and economic status significantly correlate with family planning utilization among men in Indonesia ($p < 0.05$).

Table 4 presents that the most influential factor, as seen from the most significant Adjusted Prevalence Ratio (PR) value, is education. The results of the multivariate analysis show that the influence of education can be observed from the (PR, which is 2.822 (Confidence Interval (CI) 2.129–3.741). That is, men with high levels of education have a 2.8 times higher chance of utilizing family planning than men with low levels of education after controlling by other factors (age, media exposure, economic status, and type of residence).

TABLE 2. Characteristics of the respondents

Variable	2007		2012		2017	
	n	%	n	%	n	%
Level of Education						
Higher	797	9.1	1,104	12.0	1,258	12.7
Secondary	3,644	41.7	4,395	47.6	5,084	51.3
Primary	4,289	49.2	3,727	40.4	3,561	36.0
Media Exposure						
Yes	1,562	17.9	1,797	19.5	1,443	14.6
No	7,168	82.1	7,429	80.5	8,460	85.4
Age						
> 37 years	5,743	65.8	6,082	65.9	6,982	70.5
≤ 37 years	2,987	34.2	3,144	34.1	2,921	29.5
Type of Residence						
Urban	3,712	42.5	4,709	51.0	4,860	49.1
Rural	5,018	57.5	4,517	49.0	5,043	50.9
Economic Status						
Richest	1,874	21.5	1,857	20.1	2,045	20.6
Rich	1,707	19.6	1,947	21.1	2,149	21.7
Middle	1,784	20.4	1,994	21.6	2,041	20.6
Poor	1,694	19.4	1,854	20.1	1,976	20.0
Poorest	1,671	19.1	1,574	17.1	1,692	17.1
Number of Living Children						
≥ 4	1,581	18.1	1,346	14.6	1,183	11.9
< 4	7,149	81.9	7,880	85.4	8,720	88.1

TABLE 3. Analysis family planning utilization among men

Variable	Yes		No		N	*p*	PR (95% (CI))
	n		%				
Level of Education							
Higher	323	10.2	2,836	89.8	3,159	0.000	4.636 (3.645–5.897)
Secondary	667	5.1	12,456	94.9	13,123		2.181 (1.782–2.669)
Primary	278	2.4	11,299	97.6	11,577		Ref
Media Exposure							
Yes	385	8.0	4,417	92.0	4,802	0.000	2.092 (1.759–2.488)
No	883	3.8	22,174	96.2	23,057		Ref
Age							
> 37 Years	912	4.9	17,895	95.1	18,807	0.012	1.237 (1.048–1.459)
≤ 37 Years	355	3.9	8,697	96.1	9,052		Ref
Type of Residence							
Urban	846	6.4	12,434	93.6	13,280	0.000	2.204 (1.842–2.638)
Rural	421	2.9	14,158	97.1	14,579		Ref
Economic Status							
Richest	441	7.6	5,336	92.4	5,777	0.000	3.164 (2.402–4.167)
Rich	303	5.2	5,500	94.8	5,803	0.000	2.109 (1.601–2.779)
Middle	250	4.3	5,568	95.7	5,818	0.000	1.719 (1.291–2.290)
Poor	149	2.7	5,375	97.3	5,524	0.693	1.062 (0.789–1.428)
Poorest	126	2.5	4,811	97.5	4,937		Ref
Number of Loving Children							
≥ 4	179	4.4	3,931	95.6	4,110	0.616	0.949 (0.774–1.164)
< 4	1,088	4.6	22,660	95.4	23,748		Ref

PR: Prevalence Ratio; CI: Confidence Interval

TABLE 4. Final model multivariate analysis

Variable	*p*	PR (95% (CI))
Level of Education		
Higher	0.000	2.822 (2.129–3.741)
Secondary	0.000	1.737 (1.393–2.167)
Primary		Ref
Media Exposure		
Yes	0.001	1.339 (1.096–1.635)
No		Ref
Age		
> 37 years	0.001	1.278 (1.070–1.527)
≤ 37 years		Ref
Type of Residence		
Urban	0.000	1.627 (1.345–1.969)
Rural		Ref
Economic Status		
Richest	0.018	1.437 (1.066–1.937)
Rich	0.066	1.308 (0.982–1.743)
Middle	0.109	1.274 (0.947–1.712)
Poor	0.605	0.924 (0.686–1.246)
Poorest		Ref

PR: Prevalence Ratio; CI: Confidence Interval

DISCUSSION

This study aims to analyze the trends and determinants of family planning utilization among married men in Indonesia. It reveals that family planning utilization among men in Indonesia increased from 2007 to 2017. The Indonesian government continues to strive, so that male family planning participation can increase by overcoming the factors causing the low male family planning participation. The government also increases the budget for family planning services for men. However, this coverage is still lower than that indicated in a study in Bangladesh, where 40% of men are found to be active about partners' reproductive healthcare.[13]

Moreover, the present study shows that education is the most dominant factor affecting family planning utilization among married men in Indonesia. Men with high levels of education have a 2.8 higher chance to utilize family planning than men with low levels of education, in line with a study in Turkey arguing that education has a positive relationship with family planning utilization. Men with high levels of education have a high chance of taking advantage of family planning.[14] Another research in Ethiopia indicates that men with high levels of education

are 1.4 times more likely to use contraception than men with low levels of education.[9] Other studies also suggest that men with low levels of education have a 40% lower chance of using family planning methods than men with high levels of education.[9]

Level of education is one of the most important and influential factors of family planning utilization. It allows a person to absorb information and understand and apply it in daily behavior. Education can make someone better or worse depending on the understanding, accuracy of application, and the level of someone who is used to understanding and learning something.

Another factor that affects family planning use in married men is media exposure. We find that men exposed to media have a 1.3 times higher chance of utilizing family planning than men not exposed to media. This finding is in line with a study in Ghana revealing the relationship between exposure to mass media (newspaper and television) and contraceptives. Specifically, respondents who read newspapers almost every day have a high likelihood of using modern contraceptives.[15] Another research conducted in Kenya, Senegal, and Nigeria states that media exposure (radio, television, and other mass media) can influence family planning programs for men.[16] It can happen because information about family planning can influence the knowledge of a person through the communication processor obtained through the media. Communication media usually makes advertisements to convey information. The information source impacts someone's attitude toward the message he has received.[17] According to another study on communications programming in Bangladesh, Ghana, Honduras, Guatemala, Pakistan, India, Vietnam, Burkina Faso, Tanzania, and Nicaragua, media exposure, such as that to social media, can create national conversations that address sociocultural barriers to men's contraceptive use. Social media is a rising force that can be harnessed to connect men to information and services, as seen in Facebook by WINGS in Guatemala to publicize vasectomy availability. Social marketing can challenge social norms and help overcome barriers to the acceptability of contraceptive use among men.[18] In another work, most men are reported to have heard about family planning from the radio. Some efforts have been exerted to use media (radio, television, and print ad) to increase family planning decision making and use positive results.[19]

Age is also known as one of the factors affecting family planning utilization. This study indicates that older adults have a 1.2 times higher chance of utilizing family planning than young adults. Other works also reveal a significant relationship between contraception use and age (of men). Men aged > 37 have a 1.1 times higher chance of using contraceptives than men aged < 37 years.[14] Another research states that vasectomy frequency in men is higher in those aged > 35 years.[20] A study in Ethiopia also shows that men aged > 40 have a higher likelihood of using contraceptives than men aged < 39 years.[21] Other studies in the US show that during the 2003–2014 period, the percentage of family planning users nearly doubled, with the most consistent increases occurring between men aged 20–29 and ≥ 30 years.[22] A study in Senegal reports that men in their prime reproductive years (aged 25–35) more likely use contraception than men aged 15–24.[22] Previous studies showed that the best age to rarefy childbirth for women is 20–35 years. Husbands' desire to use contraception based on age and marital status suggests that older age and marital status affect contraceptive acceptance.[14]

Another factor related to family planning utilization is the type of residence. We reveal that men living in urban areas are 2.2 times more likely to utilize family planning than men living in rural areas. A previous study reported that men who live in urban areas are two times more likely to use modern or traditional contraceptives than men who live in rural areas.[23] Research conducted in Kenya also showed significant differences in contraceptive use between men living in urban and rural areas.[9] Another study reported that men living in rural areas are 0.83 times less likely to use condom contraceptives than men living in urban areas.[24] Moreover, a IDHS report indicates that contraception use (e.g., condoms) is significantly higher among men in urban areas than in rural areas.[24–25] Type of residence is one of the main problems of accessing health services, including family planning services. Limited facilities and health workers in rural areas can affect family planning utilization, impacting men's decision making to utilize family planning.

Economic status is also known to be a factor influencing family planning use. This study shows that men with a high economic/richest status have a 3.1 times higher chance of utilizing family planning than their counterpart. Research conducted in the US reveals that one of the main barriers to contraception for low-income men and men of color is financial accessibility.[26] Another research finds that men who belong to the richer and richest wealth quintile have a higher likelihood of using modern contraceptives than those who belong to the poorest quintiles.[27] Research in Uganda also states that economic status is one factor that influences contraceptive use in men.[28] It can happen because modern contraceptive use may involve some financial obligations on the part of users, particularly when such services are inaccessible or service providers are at distant locations from the residence of users who intend to utilize them.[29] Urban areas tend to develop faster than rural ones do, especially in the health sector.[30] Other than that, geographic barriers may be an issue for poor users, which are difficult to address.[31]

Our findings provide a clear target for policy makers. Education is the most influencing factor of family planning

utilization among men. Governments must extend the coverage of family planning utilization through educational information dissemination, counseling and seminars, the Internet, and other media to increase information and awareness about family planning utilization.

The limitation of this study is the cross-sectional survey; therefore, identifying the causal mechanisms of family planning utilization among men and its risk factors is difficult. Despite its limitation, this study has strengths. We use multiyear data and a large, nationally representative sample from a population-based survey, which covers every province in Indonesia.

CONCLUSIONS

Factors that influence family planning utilization among married men are age, media exposure, education, economic status, and type of residence. Education is the most influencing factor of family planning utilization. Increasing knowledge of family planning information has a significant influence decision to utilize family planning among men. Such an increase can be achieved through educational information dissemination, counseling and seminars, the Internet, and other media to increase information and awareness regarding family planning utilization.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Association Between Cigarette Smoking and Breast Milk Levels of Nesfatin-1, Irisin, and Oxidative Stress Markers

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Association Between Cigarette Smoking and Breast Milk Levels of Nesfatin-1, Irisin, and Oxidative Stress Markers

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Abstract

Background: Breast milk is a very important functional food in the prevention of metabolic and chronic diseases. This study aimed to investigate the effects of smoking during pregnancy on the concentrations of nesfatin-1, irisin, and oxidative stress markers in breast milk.

Methods: This study included two groups of 14 smoking and 14 nonsmoking mothers. Malondialdehyde (MDA) level and superoxide dismutase (SOD) activity were measured according to the spectrophotometric method in breast milk samples. Nesfatin and irisin levels were measured by enzyme-linked immunosorbent assay.

Results: Levels of nesfatin-1 and MDA of the smoking group were significantly higher than those in the control group ($p < 0.001$). The SOD activity of the smoking group was significantly lower than that of the control group ($p < 0.001$). No significant difference was found in the breast milk irisin level between the study groups ($p > 0.050$).

Conclusions: Cigarette smoking increases MDA level and decreases SOD activity in breast milk. Nesfatin-1 levels would increase in accordance with increased oxidative stress, and nesfatin-1 acts as a protective mechanism to limit oxidative damage.

Keywords: breast milk, irisin, nesfatin-1, oxidative stress, smoking

INTRODUCTION

Consumption of tobacco products is a risk factor of the 6 of 8 leading causes of death worldwide.[1] At least 7000 chemical substances are present in a cigarette, and most of them are pharmacologically active, toxic, mutagenic, and carcinogenic. The harmful effects of smoking on humans have been emphasized for a long time.[2,3]

Free radicals and reactive oxygen metabolites produced during smoking are the most important factors in the occurrence of these harmful effects on human health. Free radicals cause oxidative damage on membrane lipids, proteins, carbohydrates, and DNA through various molecular pathways.[4,5] Lipid peroxidation in the membranes is one of the most important mechanisms involved in cell damage due to free radicals. Malondialdehyde (MDA), one of the end products of lipid peroxidation, causes cross-binding, and polymerization of membrane components. This also causes some changes in membrane properties, such as deformation, ion transport, enzyme activity, and aggregation of cell surface compounds.[6,7] Many reports have shown that enzymatic and non-enzymatic antioxidants can reduce the harmful effects of free radicals induced by smoking.[8]

Superoxide dismutase (SOD), an enzymatic antioxidant, catalyzes the conversion of superoxide to hydrogen peroxide and molecular oxygen. SOD plays an important role in controlling the levels of superoxide in cells, thus protecting the cell against free radicals.[9,10]

The increased cigarette consumption among women leads to an increase in smoking-induced risks for pregnancy and health problems in children.[11] Breast milk is easy to digest and a natural nutrient with high bioavailability, which contains all the liquid, energy, and nutrients necessary for the growth and development of newborns. Breast milk and breastfeeding offer various benefits for the baby and the mother, in terms of nutritional, developmental, psychological, social, and economic aspects.[12]

Breast milk is a very important functional food in the prevention of metabolic and chronic diseases. In addition to 87%–90% of water contents, breast milk contains various peptide/protein hormones, such as leptin, adiponectin, resistin, nesfatin, irisin, ghrelin, apelin, and motilin.[13] Nesfatin-1 is a 9.7-kDa peptide discovered in 2006, consisting of 82 amino acids, and it is effective in the physiological control of nutritional behavior. It is involved in the control of body weight by suppressing peristaltic movement of the digestive tract,

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eventually decreasing food intake.[14] It can pass the blood–brain barrier through endogenous and exogenous pathways and reach the brain. By such a capacity, it can exhibit anorexigenic effects on the control of body weight; moreover, it is involved in food intake and several metabolic processes.[15] Irisin is a protein discovered first in muscle tissue, with a molecular weight of 12 kDa, and contains 112 amino acids. Irisin is a myokine released from skeletal muscles and is involved in energy consumption by changing white adipose tissues into brown adipose tissues and protecting people from metabolic diseases with regular exercises.[16] Breast milk contains important hormones such as nesfatin-1 and irisin, which participate in the regulation of energy balance. These hormones may contribute to the regulation of growth and development in newborns and infants, participate in appetite control, and influence the development of metabolic diseases in childhood and adulthood. This study aimed to investigate the effects of smoking during pregnancy on the levels of nesfatin-1, irisin, and oxidative stress markers in breast milk.

METHODS

Study population

Ethics committee approval for the study was obtained from Recep Tayyip Erdogan University Ethical Committee (dated July 1, 2021, no. E.151). The study was conducted in a primary care center in the province of Erzurum, with two groups including 14 smoking and 14 nonsmoking mothers.[17,18] The control group consisted of non-smokers. Sociodemographic data of the participants were collected using the Interview Questionnaire Form (which asks for information about the mother, pregnancy period, baby, and smoking).

Mothers who were diagnosed with hypertension, gestational diabetes, hemorrhoids, chronic renal failure, respiratory diseases, anemia, and malignant diseases during pregnancy and puerperium were not included in the study. Mothers whose babies had any health problems were also excluded from the study. Mothers who were between the 1st and 6th months of lactation were informed about the study, and written informed consent was obtained from those who wanted to participate in the study.

Collection of mothers' milk samples and biochemical analysis

From each mother, approximately 10 mL of breast milk was collected in a Falcon tube and stored at −20 °C in a dark environment. MDA, SOD, nesfatin, and irisin levels were measured in breast milk samples. Lipid peroxidation was measured in accordance with the method of Ohkawa et al.,[19] and the level of MDA (end product) in the reaction was measured by a spectrophotometer. Results were given in nmol/mL.

SOD activity was measured in accordance with the method of Sun et al.[20] This was based on the generation of superoxide anion from xanthine catalyzed by xanthine oxidase and then the spectrophotometric measurement of the color intensity of the colored compound created by superoxide anion and nitroblue tetrazolium. Results were given in U/mL.

The levels of nesfatin-1 and irisin in breast milk samples of the patient and control groups were determined by ready-to-use reagents (Chemicon® International Inc., CA, USA) using enzyme-linked immunosorbent assay. Serum levels of nesfatin-1 were given in pg/mL, while serum irisin levels were presented in ng/mL.

Statistical analysis

All data analyses were performed by SPSS for Windows version 17.0. Since the data showed non-normal distribution, Mann–Whitney-U test, a non-parametric test, was used to evaluate the differences between groups. The relationship between the data was evaluated by Spearman's correlation analysis, a non-parametric test; $p < 0.05$ was considered significant.

RESULTS

The sociodemographic characteristics of the study groups are given in Table 1. No significant difference was found between the smoking and nonsmoking groups in terms of age, weight before, and after pregnancy, birth week of the baby, and birth weight of the baby.

Levels of nesfatin-1 and MDA were significantly higher in the patient group than in the control group ($p < 0.001$) (Table 2). The SOD activities of the patient group were significantly lower than those in the control group ($p < 0.001$). The decrease in irisin levels was not significant ($p > 0.050$).

As mentioned in Table 3, MDA levels increased and SOD activities decreased significantly, as the levels of nesfatin-1 increased. Nonetheless, a negative correlation was found between pregnancy weight gain and nesfatin-1 level. In addition, MDA levels demonstrated a significant negative correlation with SOD activity and pregnancy weight gain, whereas irisin presented no significant negative or positive correlation with any other parameters.

DISCUSSION

Cigarette smoking is one of the most common social addictions in our country as it is worldwide, which is potentially harmful to health. Smoking during pregnancy and lactation may negatively affect the growth and development of the baby and decrease the nutritional value of breast milk. In this study, we investigated the

TABLE 1. Sociodemographic characteristics of the participants

	Control group (Mothers who did not smoke during pregnancy)	Experimental group (Mothers who smoked during pregnancy)	*p*
Age (year)	31 ± 9	29 ± 5	>0.05
Weight (kg) 3rd trimester	65 ± 18	66 ± 11	>0.05
Weight before pregnancy (kg)	61.5 ± 24	65 ± 13	>0.05
Birth weights of newborns (g)	3,160 ± 430	3,100 ± 720	>0.05
Birth week of the baby	38 ± 3	37 ± 2	>0.05

Values are presented as mean ± standard deviation (SD).

TABLE 2. Comparison of nesfatin-1, irisin, MDA, and SOD levels between the groups

	Control group (Mothers who did not smoke during pregnancy)	Experimental group (Mothers who smoked during pregnancy)	*p*
Nesfatin-1 (pg/mL)	42.70 ± 4.57	63.68 ± 18.54	<0.001
Irisin (ng/mL)	49.42 ± 8.88	45.63 ± 9.59	>0.05
MDA (nmol/mL)	9.04 ± 2.15	15.02 ± 1.21	<0.001
SOD (U/mL)	77.05 ± 9.46	25.52 ± 13.57	<0.001

MDA, malondialdehyde; SOD, superoxide dismutase

Values are presented as mean±standard deviation (SD).

TABLE 3. Correlation table of the parameters

	(1)	(2)	(3)	(4)	(5)
Nesfatin-1 (1)	1	−0.307	0.600**	−0.606**	−0.404*
Irisin (2)		1	−0.125	0.288	0.275
MDA (3)			1	−0.769**	−0.409*
SOD (4)				1	0.326
Weight taken during pregnancy (5)					1

MDA, malondialdehyde; SOD, superoxide dismutase; ** $p < 0.001$; * $p < 0.05$

effects of smoking on breast milk by measuring levels of MDA, SOD, nesfatin-1, and irisin in smoking and nonsmoking mothers. In addition to being an excellent nutritional source for the newborn, breast milk contains antibodies, cytokines, growth factors, antimicrobial substances, and specific immune cells. Thus, breast milk protects the baby against infections until self-immune system develops.[21]

Breast milk was shown to improve the development of the immune system in newborns, besides its primary protective effects against infections of the gastrointestinal, respiratory, and urinary systems.[22] In this study, no significant difference was between smoking and nonsmoking mothers, with respect to the birth weeks and weights of the babies, which may be attributed to the small sample size of our study groups. The exposure of a pregnant woman to environmental cigarette smoke is dangerous, and the inhaled smoke, whether from herself or others, can easily pass to the babies through the placenta, negatively influencing the growth and development of the baby.[23] The effects of cigarette smoking on low birth weight are particularly pointed to carbon monoxide and nicotine. Cigarette smoke contains numerous toxic chemicals that can damage cellular functions. The high content of oxidants in cigarette smoke stimulates the production of free radicals and lipid peroxidation, causing negative effects on certain membrane lipids. In the body, endogenous enzymatic and non-enzymatic defense systems are activated against free radicals induced by exposure to smoke.[24,25] In a previous study, Ermis *et al*.[26] included 60 mothers and analyzed MDA levels and SOD activities in the serum and breast milk samples. They found increased MDA levels and decreased SOD activities in the breast milk samples of the smoking group. Breast milk has high nutritional value and protects newborns from infections and various diseases. Napierala *et al*.[27] reported that cigarette smoking decreases the nutritional quality of breast milk, which affects adversely the breastfeeding process and breast milk. In our study, the smoking group displayed significantly higher MDA levels than the nonsmoking group but significantly lower SOD levels than the control group. Antioxidant enzyme levels, such as SOD and glutathione peroxidase, are high in breast milk during lactation.[28] Noakes *et al*.[29] reported that smoking leads to adverse outcomes on the fetus, with negative effects on life span, and affects the peroxidative/antioxidative status of the newborn. Based on results and results in the literature, the balance between antioxidants and oxidants

appears to be disrupted in smoking mothers, and MDA levels increased and SOD activities decreased as a result of increased free oxygen radicals released from inflammatory cells. Decreased antioxidant enzyme activity and increased lipid peroxidation further enhanced the pathogenicity of cigarette smoking, adversely affecting the development of newborns. In the early phase of their lives, babies can self-regulate milk intake as a response to environmental and nutritional factors.[30] Recently, various peptide/protein hormones were determined in breast milk, such as leptin, adiponectin, resistin, obestatin, nesfatin, irisin, apelin, motilin, and cholecystokinin. Breast milk hormones regulate the activities of various organs until the endocrine system of the newborn starts to function.[31] In our study, nesfatin-1 levels were significantly higher among smokers than among non-smokers. In addition, irisin was lower in the smoking group, but the decrease in irisin level was not significant. In a study by Solmaz *et al*.,[32] nesfatin-1 was protective against oxidative damage because of its antioxidant and anti-inflammatory properties. A study reported the antioxidant and anti-apoptotic characteristics of nesfatin-1 and its anti-inflammatory effects on cells.[33] The present study demonstrated increased nesfatin-1 levels in the breast milk samples of smokers when compared with those of non-smokers because the body becomes reactive against lipid peroxidation as a self-defense mechanism, which can develop in case of oxidative stress. Irisin, having important roles in the regulation of energy consumption, is also critically involved in the development of diabetes, metabolic syndrome, obesity, and inflammation.[34] Zhu *et al*.[35] reported that irisin inhibits apoptosis induced by oxidative stress.

Cigarettes, containing numerous oxidant substances, can induce apoptosis. Sugiyama *et al*.[36] claimed that irisin could have antioxidant effects on oxidative stress induced by cigarette consumption. In our study, irisin levels were decreased in the milk samples of smokers when compared with those in non-smokers, but it was not significant. To our knowledge, no study has investigated the effects of smoking on the levels of nesfatin-1 and irisin. As a result, early phase nutrition may influence growth and development in the short and long term. We observed that exposure to cigarettes during pregnancy and lactation adversely affected the levels of these two hormones and enzymatic antioxidants.

CONCLUSIONS

This study revealed that cigarette smoking is associated with an increase in MDA levels and a decrease in SOD activities in breast milk. Nonetheless, our results indicate that nesfatin-1 levels may increase with increased oxidative stress. On the contrary, no association was found between cigarette and nesfatin-1 in breast milk. Among its limitations, this study has a small sample size and limited area of research. Further comprehensive studies involving more people living in different regions are warranted.

CONFLICT OF INTEREST

None declared.

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Ectodermal Dysplasia: A Review

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Ectodermal Dysplasia: A Review

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Abstract

Background: Ectodermal dysplasia is a complex group of genetic disorders identified through the abnormal development of ectodermal structures. It is a genetic disorder that affects the development or functions of tissues such as the teeth, hair, nails, and sweat glands.

Methods: This review aimed to introduce the outcomes and increase awareness of ectodermal dysplasia reviewing by the literature.

Results: The characteristic features of this disease, including hypodontia, hypohidrosis, and hypotrichosis, have been discussed.

Conclusions: Ectodermal dysplasia is a heterogeneous group of hereditary disorders with similar clinical findings. It leads to the development of tissue malformations and affects the quality of life of the patient. This review demonstrates that dentists can provide viable and safe alternative conventional treatment modalities for oral rehabilitation in patients with ectodermal dysplasia.

Keywords: clinical aspects, dentistry, ectodermal dysplasia

INTRODUCTION

Ectodermal dysplasia (ED) is a congenital, diffuse, nonprogressive, hereditary disorder that was first described by Thurman. It is defined by the abnormal development of two or more structures derived from the embryonic ectodermal layer and is considered as a large, genetically transmitted, rare complex of multisystem disorders. An accurate diagnosis of this condition can help families cope with the situation and seek proper medical care.

This review aimed to describe the possible craniofacial deformities and characteristics of X-linked hypohidrotic ED (XLHED), i.e., hypodontia, hypohidrosis, and hypotrichosis, and to demonstrate the consequences associated with this disease. Additionally, we aimed to increase awareness regarding this condition using clinical images of some of the patients at our hospital.

ED is generally termed as anhidrotic dysplasia, hidrotic ED, and hypohidrotic ED and is categorized into various subgroups.[1–3] The ectoderm, one of the three germ layers present in the developing embryo, gives rise to the central nervous system, peripheral nervous system (eye, ear, and nose sensitive epithelia), sweat glands, hair, skin, nails, teeth, and enamel.[1, 2, 4–6] The EDA gene codes for the ectodysplasin protein, a critical signaling unit involved in the interaction between the ectoderm and the mesoderm 5; this embryological interaction is crucial for the production of several structures that arise from the ectoderm, such as the skin, sweat ducts, nails, hair, and teeth.[1, 5]

Early detection is very important for the management of individual symptoms and to potentially prevent morbidity and mortality associated with hypohidrosis. Additionally, an early diagnosis might prove beneficial during counseling, particularly in light of the clinical trials that are aimed toward improving the treatment of XLHED in-utero.[1]

Manifestations and Types of ED

The extraoral and intraoral manifestations of ED include the following: tooth agenesis (hypodontia and anodontia) with lack of alveolar bone development; conical teeth; hair dystrophy (sparse or absent hair and hypotrichosis); nail dystrophy; a lack of or abnormal functioning of the sweat glands (hypohidrosis); skin problems such as a smooth, dry skin or hyperkeratosis; cranial abnormalities such as a short face, unusual facial concavity, frontal bossing; a depressed nasal bridge (saddle nose); maxillary retrusion and relative mandible protrusion; visual problems; and respiratory issues[1, 4, 7] as shown in Figure 1–10.

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FIGURE 1. Ectodermal dysplasia is characterized by the absence and/or malformation of teeth (from hypodontia to anodontia with conically shaped teeth)

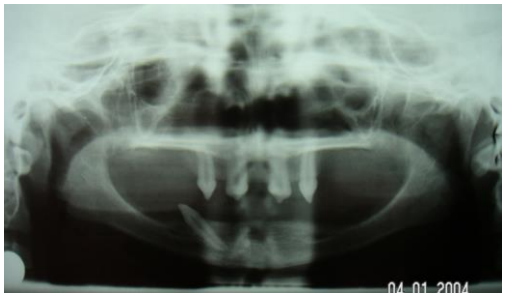

FIGURE 2. Panoramic radiography showing the absence of some permanent teeth and/or malformed conically shaped teeth

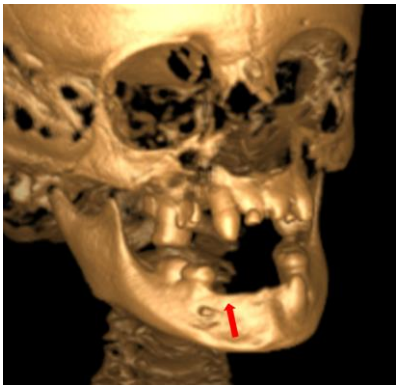

FIGURE 3. Absences of teeth along with the lack of alveolar crest development in the maxillae and mandible in a patient with ectodermal dysplasia

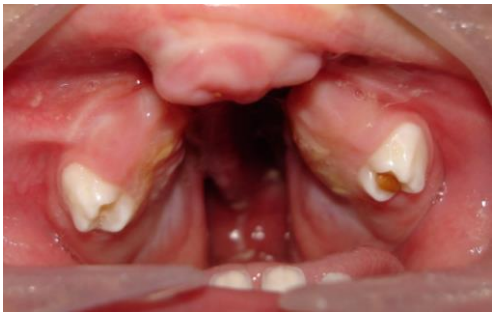

FIGURE 4. Ectrodactyly, ectodermal dysplasia, and cleft lip/palate is characterized by the presence of a cleft lip and palate.

FIGURE 5. Ectrodactyly, ectodermal dysplasia, and cleft lip/palate with syndactyly of the fingers in the feet

FIGURE 6. An ectodermal dysplasia patient with abnormal nails in the hand

FIGURE 7. An ectodermal dysplasia patient with abnormal foot nails

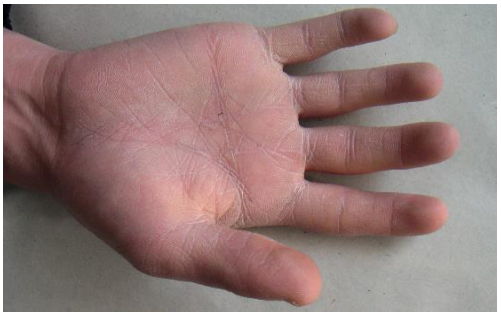

FIGURE 8. Ectodermal dysplasia is characterized by abnormal skin in the hand (dry and cracked).

FIGURE 9. An ectodermal dysplasia patient with dry and cracked skin in the feet

FIGURE 10. Extraoral aspects of patients with ectodermal dysplasia

The earliest recorded cases of ED were described in 1792. Since then, nearly 170–200 different pathological and clinical conditions have been recognized and defined.[1–3] These disorders are considered to be relatively rare with an incidence rate of 1 in 10,000 to 1 in 100,000 births.[2, 8, 9]

The diagnosis of ED is based on the episodes of type of hair, absence of teeth and tooth buds, and tooth morphology. Peeling of the skin at birth, eczema, asthma, and frequent respiratory infections might be additional indications of this disorder. Furthermore, other criteria such as dermatoglyphic analysis, characteristics of lacrimal secretion, and the distribution and pattern of hair in the scalp have been used to diagnose ED. ED is primarily characterized by a partial or complete absence of certain sweat glands (eccrine glands), which results in the lack of or diminished sweating leading to heat intolerance and fever (anhidrosis or hypohidrosis).[1, 2, 4–6]

Classification of Ectodermal Dysplasia

Different forms of ED have been classified according to the functions of the causative genes.[8] Nevertheless, this classification is limited by the relatively low number of causative genes discovered to date and could appear to be somewhat arbitrary because some proteins may be involved in several cellular functions.[8] Genes responsible for at least 30 different types of ED have been identified over the past few decades.[8]

In an attempt to classify the 170–200 different types of EDs, different subgroups have been created on the basis of the presence or absence of the four primary defects[8, 10–12]: ED1, trichodysplasia (hair dysplasia); ED2, dental dysplasia; ED3, onychodysplasia (nail dysplasia); and ED4, dyshidrosis (sweat gland dysplasia). The well-known list of familiar EDs is provided by Ectodermal Dysplasia Society.[13]

The present study included all the major signs observed in patients with ED, such as the presence of sparse hair (trichodysplasia), teeth abnormalities (conical shape and absence); smooth skin (hypohidrosis), abnormal fingers and toenails; skull and facial abnormalities; and pedigree of the patients.[1, 2, 4, 5]

Diagnosis and Treatment of ED

ED is a genetically transmitted rare multisystem disorder. The basic modes of inheritance include new mutations, autosomal dominant, autosomal recessive, and X-linked recessive. According to the medical history and pedigree of the families, it was found that some of the patients were related to each other and presented with similar features, thus confirming the hereditary nature of this disorder. A clinical diagnosis of ED is difficult because the identification of the precise type could be challenging, particularly in the absence of any collaboration between the patient and the different medical specialties.

Steiner's cephalometric analyses have proven useful for examining the presence of maxillary reduction, labial retrusion, chin prominence, nasolabial reinforcement, facial height reduction, and facial concavity. Nevertheless, it should be noted that these measures might be unreliable during tooth agenesis. Partial or total dental agenesis could curb bone growth in the chin.

Due to lack of partial or total bone growth unfortunately, dental implants cannot be used in children.[14–16] They can

be placed only after the bones of the jaw have completed their growth. Discrepancies between the alveolus and the implant are generally due to dentoalveolar growth. The placement of dental implants during the growth period will impede jaw growth and the movement of the teeth into their natural positions within the oral cavity. The earliest recommended ages for dental implants are as follows: at least 15 years for females and 17 years for males.

Implants can be placed in the anterior region of the mandible to support the overdenture from the age of 6 years when the median sutures of the mandible are closed. In adult patients, they can be placed via zygomatic fixation to support the denture in the maxilla, when the dentoalveolar growth is insufficient. Zygomatic surgery can be considered to be a viable and safe alternative to conventional treatment modalities for oral rehabilitation. Nevertheless, clinicians must be aware that zygomatic implant insertion is a difficult procedure and is not risk-free. A highly experienced surgeon with prior special training must perform this procedure for a successful outcome.[5]

Genetic Variabilities in ED

ED is characterized by facial abnormalities, including a prominent forehead, depressed nasal bridge (saddle nose), unusually thick lips, and darkly pigmented skin around the eyes (periorbital and hyperpigmentation). Ectrodactyly–ED–clefting (EEC) is characterized by the presence of a cleft lip and palate, stenosis or atresia of the lacrimal duct systems, ocular complaints (particularly, dry eye symptoms), and syndactyly of the fingers in the hands and toes. EEC is a rare entity associated with mutations in genes that express the protein p63.[17] Patients with ED can present with the following features: prematurely aged appearance; underdeveloped mucous glands of the respiratory tracts; and decreased lung capacity and function, which can potentially increase their susceptibility to recurrent respiratory infections and/or allergic conditions. However, despite the various types of ED described so far, fewer than 30 types have been explained genetically (at the molecular level with the identification of the causative gene).[18]

A multidisciplinary approach and advanced equipment are required for the diagnosis and treatment of this condition. The molecular basis of ED in the light of the most recent advances in molecular biology and has provided a useful tool for diagnosis and research. Approaches to this disorder are based on the functional and molecular findings of genes and the clinical presentations of the related diseases. This clinical functional approach will help in accurately diagnosing the condition and identifying new causative genes. Additionally, it might aid in discovering new molecular interactions among proteins mutated in patients with ED.[19]

Yin *et al*. described a deletion mutation in exon 8 of the EDA (ectodysplasin A) gene as a cause for XLHED.[20] Mutations in the EDA, EDAR, and EDARADD genes result in faulty ectodysplasin A formation, which intercepts the normal interconnection between the ectoderm and the mesoderm and teeth. The improper formation of this ectodermal structure leads to the characteristic features observed in patients with ED.[21] EDA-A1 replacement with EDI200 has been demonstrated to be well tolerated and biologically active in mouse and dog models of XLHED.[22] EDI200, in the early neonatal period, may provide significant and sustained health benefits. A better understanding of the genetic variability in XLHED may relate to the therapeutic response; studies show that we are on the verge of converting a decade of preclinical studies into the first test of a novel paradigm for the rescue and permanent correction of a human developmental disorder.[22]

Role of Dentists

Several types of EDs remain unidentified. Dentists must have better knowledge and understanding of ED before treating the patient to improve their condition. Additionally, they should be aware and experienced regarding the main signs and symptoms of these disorders; moreover, carriers should be identified early for genetic transportation. The molecular diagnosis of a defined group of ED is expected to be feasible and more affordable in the near future. Previous studies, particularly reviews and case series, provide valuable insights into the prevalence, characteristics, and variabilities of the clinical features of ED.[6, 7] These publications provide the clinician with useful information that can be delivered to patients with ED, which could improve the diagnosis and clinical management of those with this disorder.

Dentists have a responsibility to rehabilitate these patients and improve their appearance, masticatory function, and speech. When confronted with multiple dental ageneses, the clinician should look for an association between the signs of ED, because new undedected ED case could also be detected.

CONCLUSIONS

The principal aim of this review was to get experiences for dentists for determine patients who are affected by ED. We believe that this and other similar studies will add to our knowledge and experiences in dealing with for clarity patients with ED. As a result dentists with their increasing knowledge could do diagnosis for undefined ED cases.

ETHICAL APPROVAL

For this study; Approval was obtained from the Harran University Clinical Research Ethics Committee with its decision dated 04.10.2021 and numbered HRU/21.17.21.

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CONFLICT OF INTEREST

The authors report no conflict of interest.

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Does Quran Memorization Influence Adolescents' Intelligence Quotient and Memory Level?: A Cross-Sectional Study in Malaysia

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Does Quran Memorization Influence Adolescents' Intelligence Quotient and Memory Level?: A Cross-Sectional Study in Malaysia

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Abstract

Background: The process of memorizing various reading materials enhances the brain capacity to process, store, and assemble memories and increases the intelligence quotient (IQ) level. However, the connection between the memorization of Quran and the enhancement of memory level is not fully understood. Hence, a cross-sectional study was conducted to examine the correlation between Quran memorization and the IQ level among Muslim adolescents from selected Islamic schools in Selangor, Malaysia.

Methods: The Wechsler Abbreviated Scale of Intelligence was used to measure the student's IQ level, whereas Digit Span and Rey Auditory Verbal Learning Test were used to evaluate the memory level. Questionnaires were distributed for demographic data collection and the Quran memorization level.

Results: The full-scale results for all the four sub-tests revealed that the studied tahfiz students had a low average level of IQ, with a mean of 88.06 ± 15.80. For the short-term verbal memory, the majority (n = 36, 56.3%) were in the normal category, whereby for long-term verbal memory, the majority (n = 20, 31.3%) were below normal. The results showed that the IQ level was non-significant (p = 0.059) but moderately correlated (r = 0.391) with the level of Quran memorization. The coefficient of determination or effect size calculation showed that Quran memorization shared 15.29% of the variability in the IQ level. Multiple linear regression analysis revealed that only the working memory is significant to predict the IQ. Provided that other influencing factors are constant, an increase of one unit in the working memory was predicted to increase 5.55 units of IQ.

Conclusions: In conclusion, the level of Quran memorization was not significantly correlated with the IQ and memory status of Muslim adolescents from the selected Islamic schools in Selangor, Malaysia.

Keywords: adolescent, intelligence quotient, Malaysia, memory, Muslim

INTRODUCTION

Tahfiz schools are centers for Quran-related studies, which include reading, memorization, and interpretation of Islam holy book. Students who enroll in such study are taught to read Quran with proper pronunciation or tajwid. They were are required to learn the meaning of verses to appreciate the teachings of the Quran. As a result, the students are expected to have well balance between religious and secular knowledge. Tahfiz schools have been under government monitoring since 1966.[1] The government efforts have been strengthened recently by the embodiment of the National Tahfiz Education Policy.[2] According to Mohamad Akhir et al., the increased demand from parents to send their children to tahfiz schools has led to an increase in the number of private tahfiz institutions in Malaysia.[3]

Reading of the Quran (holy book of Islam) provides numerous advantages. The memorization of the Quran is related to a high intelligence quotient (IQ) level and improved memory status of an individual.[4] In addition, reading of the Quran is closely linked to the enhanced mental and physical health status and quality of life of an individual.[5–7]

Memorization is defined as the process of storing knowledge in the human brain, and it involves four different aspects, namely, i) learning, ii) memory formation, iii) memory retention, and iv) ability to access memory.[8] The best way to consolidate memories is by

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memorizing the reading material that was just learned, which eventually leads to the improvement of intelligence. Memorization of the Quran can be achieved by reciting it verbally or non-verbally and retrieving the text repeatedly (rehearsal). Quran memorization is also associated with short-term memory, where one can obtain an improved short-term memory, resulting in prompt Quran memorization.[9] Over time, repetitive memorization of the Quran creates a long-term memory.

IQ is a score that demonstrates a person's cognitive abilities with regard to their respective age group.[10] It is measured by a set of standardized tests. Additionally, IQ is known as the physical and psychological potential of an individual, and it can be enhanced by engaging in good religious practices. According to Fitriani, memorization of the Quran is associated with the acquisition of a high level of IQ, emotional intelligence, and spiritual intelligence.[11] Another study has shown that memorization of the Quran improves one's mental health in terms of better brain activity.[12]

Most of the published studies are from other countries, mainly Indonesia. With the recent development of tahfiz studies in Malaysia, the exploration of the significance of memorization of Quran among tahfiz students from various perspectives is justified. Hence, this study aimed to determine the association between the level of Quran memorization with IQ and memory status among students in selected tahfiz schools and its associated factors.

METHODS

Study Design and Participants

This cross-sectional study involved 64 students aged 11–18 years old from two selected tahfiz schools in Selangor, Malaysia. The selection of schools was carried out using the purposive sampling method. The selected schools must be boarding schools and fully tahfiz without mainstream curriculum. The dependent variables were the level of IQ and memory status, and the independent variables were Quran memorization levels. The permission to conduct the study was granted by the Association of Selangor Al-Quran Tahfiz Institutions. This study was also approved by the Research Ethics Committee Universiti Kebangsaan Malaysia (Human) (UKM PPI/111/8/JEP-2018-394). Parental written consents were also obtained and documented before the execution of the study.

Sample Size Calculation

The sample size was calculated using G-power 3.1.9.2. A priori sample size was calculated using t-test family for correlation with the effect size of 0.375, alpha = 0.05, power (1-β) = 0.8, and coefficient of determination = 0.141.[13] The minimum sample size required for the study was 60 students, including a 20% drop-out.

Study Tools

Data collection was performed using standardized and validated questionnaires. The first part of the questionnaire was meant for demographic data. The level of Quran memorization was identified by the number of pages memorized. The whole Quran has 604 pages and 30 juz or sections, and each juz has about 20 pages. A Muslim who has completely memorized all juz in the Quran is known as a "hafiz." The Wechsler Abbreviated Scale of Intelligence (WASI-II) test was used to assess the level of IQ.[10] Rey Auditory Verbal Learning Test (RAVLT) was conducted to assess the short-term and long-term verbal memories of the subjects. The Digit Span test was conducted to measure short-term and working memories. All these questionnaires were administered by trained enumerators.

Level of IQ

The WASI-II test consists of four sub-tests: i) block design, ii) vocabulary, iii) matrix reasoning, and iv) similarities. Predominantly, the block design and matrix reasoning formed the Perceptual Reasoning Index (PRI), whereas vocabulary and similarities were used to determine the Verbal Comprehension Index (VCI). In addition, the total score of VCI and PRI were combined to obtain the Full-Scale IQ (FSIQ). The IQ assessment was administered by a trained enumerator and conducted in a secluded room to avoid any disruption from the external surroundings. Total raw scores were calculated and converted into a sum of T scores, which was then converted into a composite score that consisted of VCI, PRI, and FSIQ. The test lasted for about 30–45 min. The reliability of WASI-II tests for children and adults were 0.87–0.91 and 0.90–0.92, respectively.[10]

Short-Term And Long-Term Verbal Memories

RAVLT consists of two different lists (A and B) with 15 words each. The tests were administered by a trained enumerator. The subject was requested to recall as many words as possible (the order of words was neglected), and the total scores were calculated by measuring the number of words correctly repeated. After five trials of List A, List B was introduced to the subject (interference list). Immediately after the administration of List B, the subject was asked to recall List B without it being repeated back by the enumerator (short recall). After a delay of 30 min, the subject was asked to repeat List A (long recall). The test-retest reliability of the RAVLT test was 0.56 to 0.70.[14]

Short-term and Working Memories

The Digit Span test comprises two sections, including Digit Span Forward (to measure the capacity to recall numbers in the order of the presentation) and Digit Span Backward (to measure the capacity to recall words in reverse from the order of presentation). Digit Span Forward and Backward consist of sets of numbers of

the same length, and the length increases with every set. It was administered using standard instructions. Each correctly answered test was then recorded. The final score was calculated by measuring the maximum length of at least one correct trial. The discontinuation rule was applied when the subject was unable to repeat at least one of the trials of a set of similar length numbers. The test-retest reliability for the Digit Span test was 0.598 to 0.891.[15]

Statistical Analysis

The data obtained were analyzed using IBM Statistical Package for Social Science version 25.0 with a significant $p < 0.05$. Descriptive statistics were employed to determine the sociodemographic data and the level of Quran memorization. Partial Pearson correlation was used to determine the correlation between the level of IQ, memory status, and Quran memorization by controlling several factors, such as age, scores on memorizing tests, years of studying in schools, and academic background. The calculation of the effect size from the value of coefficient determination (R^2) was used to measure the amount of variability in one variable that was shared by the other. The value was then converted into a percentage (multiplied by 100).[16] Meanwhile, multiple linear regression was used to analyze the relationship between short-term verbal memory, long-term verbal memory, short-term memory, working memory, score on the memorization test, and the number of pages memorized with the level of IQ.

RESULTS

Sociodemographic Distribution

The majority of the respondents were Malay (98%) and aged 11–15 years old (78.1%). A total of 30 (47%) and 34 students (53%) were selected from Schools A and B, respectively. In terms of Quran memorization levels, 23 (36%) and 21 (32.8%) students memorized 1–5 and 6–10 juz, respectively. As for 11–15 and ≥16 juz categories, both were memorized by 10 students (15.6%) (Table 1).

Level of IQ Among the Respondents

The full-scale results for all the four sub-tests revealed that tahfiz students have a low average level of IQ, with a mean of 88.06 (± 15.79). A total of 19 students (29.7%) were in the average category, whereas 14 students (21.9%) were in the low-average category. The borderline IQ level category consisted of 17 students (26.6%), and 7 students (10.9%) were in the extremely-low category (Table 1). In addition, the VCI and PRI results showed low averages. Table 2 shows the total marks obtained by the students in each subtest of WASI-11. The highest score was obtained in the block design subtest (29.72 ± 14.71), followed by vocabulary (29.11 ± 9.35), whereas the lowest score was for the matrix reasoning subtest (15.86 ± 5.41).

Comparison of IQ Level Based on the Quran Memorization Categories

One-way analysis of variance (ANOVA) was used to compare the level of IQ based on the category of Quran memorization (Table 2). The analysis showed that the highest level of IQ was observed among students who have memorized the Quran in the category of 16 and above (up to 30). However, the level of IQ revealed no significant difference ($p = 0.798$) based on Quran memorization.

TABLE 1. Socio-demographic distribution and IQ categories of the respondents (N = 64)

Socio-demographic	Frequency (%)
Age group	
≤15 years	50 (78.1)
≥16 years	14 (21.9)
Ethnic	
Malay	63 (98.0)
Indonesian	1 (2.0)
Location	
School A	30 (47.0)
School B	34 (53.0)
Level of Quran memorization	
1–5 juz	23 (36.0)
6–10 juz	21 (32.8)
11–15 juz	10 (15.6)
≥16 juz	10 (15.6)
FSIQ Category	
Very superior (≥130)	-
Superior (120–129)	3 (4.7)
High average (110–199)	4 (6.3)
Average (90–109)	19 (29.7)
Low average (80–89)	14 (21.9)
Borderline (70–79)	17 (26.6)
Extremely low (<70)	7 (10.9)

TABLE 2. Scores obtained for each subtest of WASI-11 and comparison of IQ level based on Quran memorization categories

Category	Mean ± SD
Subtest of WASI-11	
Block Design	29.72 ± 14.71
Vocabulary	29.11 ± 9.35
Matrix Reasoning	15.86 ± 5.41
Similarities	22.16 ± 7.49
Quran memorization categories	
1–5 juz	87.43 ± 12.82
6–10 juz	89.14 ± 19.12
11–15 juz	84.30 ± 14.39
≥16 juz	91.00 ± 17.20

Short-term and Long-term Verbal Memories

The means for the short-term and long-term verbal memories were 11.47 ± 2.37 and 11.28 ± 2.87, respectively. For the short-term verbal memory, the majority (n = 36, 56.3%) were in the normal category, whereby for long-term verbal memory, the majority (n = 20, 31.3%) belonged to the below-normal category (Table 3).

Table 3 also shows the analysis of the Digit Span memory test, which was used to measure the short-term and working memory levels. The mean short-term memory level was 6.13 ± 1.16, and the working memory level was 4.08 ± 0.96. For short-term memory level, the above-normal category consisted of 6 students (9%), the normal category included 53 students (83%), and the below-normal category had 6 students (8%). As for the level of working memory, 23 students (36%) were in the normal category and 41 students (12.5%) in the below-normal category.

Comparison of Memory Levels based on Quran Memorization Categories

One-way ANOVA was employed to compare the differences in memory level based on the level of Quran memorization (Table 4). The Quran memorization ≥ 16 showed the highest mean value for short-term (12.9 ± 2.18) and long-term (12.0 ± 3.43) verbal and working memories (4.5 ± 1.08). The highest mean of short-term memory was observed among the 6–10 (6.24 ± 1.37) Quran memorization category. However, no significant difference (p > 0.05) was observed in the memory level based on the level of Quran memorization.

TABLE 3. Categories of short-term and long-term verbal memories based on the RAVLT memory test and categories of short-term and working memories on the Digit Span memory test (N = 64)

Categories	Frequency (%)
Short-term verbal memory	
Very good performance	-
Good performance	-
Above normal	13 (20.3)
Normal	36 (56.3)
Below normal	11 (17.2)
Poor performance	2 (3.1)
Very poor performance	2 (3.1)
Long-term verbal memory	
Very good performance	3 (4.7)
Good performance	1 (1.6)
Above normal	8 (12.5)
Normal	6 (9.4)
Below normal	20 (31.3)
Poor performance	17 (26.6)
Very poor performance	9 (14.1)
Short-term memory	
Above normal	6 (9.0)
Normal	53 (83.0)
Below normal	5 (8.0)
Working memory	
Above normal	-
Normal	23 (36.0)
Below normal	41 (12.5)

TABLE 4. Comparison of memory status based on Quran memorization categories

Quran memorization categories	Short-term verbal	Long-term verbal	Short-term memory	Working memory
1–5 juz	11.17 ± 2.57	11.09 ± 3	6.04 ± 0.928	3.96 ± 1.022
6–10 juz	11.38 ± 2.334	11.29 ± 2.572	6.24 ± 1.37	4.05 ± 0.865
11–15 juz	10.9 ± 1.853	11.0 ± 2.944	6.0 ± 1.333	4.0 ± 0.9
≥16 juz	12.9 ± 2.183	12.0 ± 3.432	6.2 ± 1.135	4.5 ± 1.08
P	0.204	0.850	0.929	0.510

TABLE 5. Partial correlation between IQ level, memory status, and Quran memorization after controlling other factors

Variables	Level of Quran Memorization (IQ Level)	
	r	*p*
Age, scores on memorization test, years of study and academic background	0.391	0.059
Short-term verbal memory	0.064	0.768
Long-term verbal memory	0.145	0.500
Short-term memory	−0.167	0.435
Working memory	0.319	0.129

Correlation between IQ Level, Memory Status, and Quran Memorization

A partial Pearson correlation test was used to determine the correlation between the IQ and memory status with the level of Quran memorization. Factors, such as age, scores on memorization tests, years of studying in schools, and academic background, were controlled in the analysis. The results showed that the IQ level was non-significant (p = 0.059) but moderately correlated (r = 0.391) with the level of Quran memorization. The coefficient of determination or effect size calculation showed that Quran memorization shared 15.29% of the variability in the IQ level. A non-significant (p = 0.768) weak correlation was also observed between the level of Quran memorization with short-term verbal memory (r = 0.064) with the effect size of 0.4%, long-term verbal memory (r = 0.145) with the effect size of 2.1%, and working memory (r = 0.319) with effect size calculation showing that Quran memorization shared 10.1% of the variability in the IQ level. However, the short-term memory level showed a very weak and non-significant (p = 0.435) negative correlation with the level of Quran memorization (r = −0.167), with the effect size value of 2.8% (Table 5).

Factors that Influence the IQ Level

Multiple linear regression analysis was performed to determine the factors that influence the level of IQ (Table 6). A significant F (6.57) = 2.294 (p < 0.05) model was derived (IQ level = 21.24 + 1.80 verbal short-term memory − 0.44 verbal long-term memory + 1.48 short-term memory + 5.55 working memory − 0.01 number of Quran pages memorized + 0.32 memorizing Quran test score), and it accounted for 23% of IQ level variance through variables including memory level, the number of pages memorized, and memorization test score. Provided that the other influencing factors were constant, an increase of one unit of working memory was predicted to increase 5.55 units of IQ. However, this research is not a causal analysis, and the IQ level influencing Quran memorization is possible. Further studies are warranted to explain this matter.

TABLE 6. Factors that influence the IQ level

Categories	B	Beta	p
Verbal short-term memory	1.799	0.266	0.167
Verbal long-term memory	−0.438	−0.076	0.686
Short-term memory	1.480	0.105	0.387
Working memory	5.547	0.333	0.013*
Number of Quran pages memorized	−0.010	−0.097	0.427
Memorizing Quran test score	0.318	0.148	0.233
Constant	21.236	-	
R^2	0.231		

*significant at p < 0.05

DISCUSSION

This study was carried out to assess the level of IQ and memory status among students studying in tahfiz schools. The respondents were required to memorize the Quran as a part of their tahfiz education syllabus. However, no standardized non-tahfiz academic syllabus is available. The students were not compelled to learn other subjects, such as mathematics, English language, and science. This condition resulted in the difficulty of IQ level assessment. For the same reason, the relationship between academic syllabus and IQ analysis could not be performed. However, our enumerators were well trained in administrating the test to minimize biases and obtain meaningful assessments.

Memorization of the Quran increases the level of intelligence and memory status. Following this information, IQ and memory capacity have been postulated to be positively correlated with the level of Quran memorization. Thus, in this study, we attempted to explain the relationship between the habitual practice of memorizing Quran and the IQ and memory levels. In addition, the other factors that may influence this relationship, such as demographic factors and educational background, were considered. In our study, only male students were included as subjects to limit the influence of internal factors related to gender biases, such as hormonal influence.

A total of 64 male students from two schools were involved in this study, and all of them were from the same population of students from private and non-syllabus academic schools. The memorization categories of the Quran was divided into four different categories of constituents: juz 1–5, 6–10, 11–15 and, 16 and above. The purpose for such differentiation was to ensure that each category had an approximately the same number of respondents from the total sample size obtained. The majority of the respondents were in the age category of 15 years and below, and the data collection was carried out at the beginning of the year. A total of 21.9% of the participants were older students. The WASI-II IQ test showed that the students obtained a mean score of 88.06 ± 15.79. The overall scores of all four sub-tests in WASI-II were in the low-average category. In addition, the VCI and PRI results had low averages. The observed low scores could have been influenced by the respondents' basic educational background. A meta-analysis study by Ritchie & Tucher showed the beneficial effects of education on cognitive abilities or intelligence.[17] This finding can be explicated with descriptive analysis, where 26.6% of the participating students exhibited incomplete or no formal education. Basic formal school education is among the main factors that influence IQ test scores. Accumulated evidence demonstrated that education influences general intelligence or cognitive abilities.[18-20]

Hason demonstrated that students who are exposed to vocabulary at schools, peers, neighborhoods, or social media gained high scores for VCI and PRI components in WASI-II.[21] In general, a student's vocabulary becomes broader based on their daily learning. However, Flynn and Flynn disputed the influence of vocabulary and stated that extensive education and a complex culture, such as language, have an impact on one's level of intelligence.[19]

This study showed that the highest level of IQ was observed among the students who memorized the Quran in the category of juz 16 and above. In general, the brain becomes more active when memorizing words because it affects neuroplasticity of the hippocampus, which is the center of learning and memory in the brain.[20] According to Ibrahim *et al*., increasing repetitions to memorize the Quran in stages increase the cognitive abilities and memory of the hafiz gradually.[22]

The mean for the short-term verbal memory score was 11.47 ± 2.37, and the majority of the students were at least at the normal level. The students in our study showed a higher short-term verbal memory level compared with similar types of memory among the gifted Iranian students (aged between 12–14 years old).[23] This finding showed that memorization of the Quran improves the short-term verbal memory.

In addition, Lau *et al*. reported that moods can affect one's memory level, with positive moods being associated with good short-term verbal memory and fast processing speed.[24] Existing knowledge can also help the memory to process new information, where it provides a good integration structure to new information.[25] If one was to memorize new things, the process would be considered as short-term memory. According to Sulianti *et al*.,[26] short-term memory not only includes numbers but also more complex problems, such as activities involving language. However, not only the educational factor but also other variables that play an important role should be considered in determining the memory level of an individual. Despite a high level of knowledge and education, if both are not used appropriately, they would not benefit the memory level of an individual. Shing and Brod explained that activating such knowledge is important to support the brain neurocognition process.[27]

Our study showed that the level of memory based on the memorization category of the Quran resulted in a high value for the juz 16 and above category. This result indicated that a higher level of memory was obtained with a more advanced level of Quran memorization.

Working memory is important in the cognitive ability related to intelligence.[28-30] Tourva *et al*. proved that working memory is a strong predictor of crystallized and natural intelligence.[31] In addition, Schweizer *et al*. demonstrated that working memory is an important factor in studying cognitive intelligence.[32] The level of working memory can influence one's ability to receive new knowledge and skills.[34]

After the analysis of the two different tahfiz schools independently, the results showed a weak positive correlation for the level of IQ, memory, and Quran memorization. Comparatively, studies by Ibrahim *et al*. and Ismarulyusda *et al*. showed a positive correlation between IQ and memorization level of the Quran.[4, 22] Moreover, both studies included a great number of samples, and the respondents consisted of those who have memorized the Quran from the initial to the final section. Meanwhile, students in the current study focused more on the earliest verses or juz of the Quran. The initial analysis using bivariate correlation showed a very weak correlation between IQ, memory, and Quran memorization level. Further analysis using partial correlation analysis was engaged to control covariates, such as age, scores on memorization test, years of studying in tahfiz school, and academic background. The correlation coefficient for the level of IQ versus Quran memorization increased after controlling the factors. Working memory also showed improvement. However, after employing multivariate analysis, memorization of the Quran did not significantly envisage IQ. Instead, only the working memory can be used to predict the IQ of the participants.

Our group was the first to quantitatively measure and analyze the IQ, memory, and related factors among tahfiz students in Malaysia. Given that this work is a preliminary research, we expect further studies to be carried out on this particular subject. We also realized several limitations of this present study. Future studies should include both genders and perform their analysis accordingly. Tahfiz schools operate in various settings, namely, government supported, privately run, and non-governmental organization-run institutions. Further studies should systematically select these schools to ensure better representation and more generalized findings.

CONCLUSIONS

Our results did not demonstrate any significant correlation between Quran memorization and all the studied parameters. Although not significant, students who had high Quran memorization levels also revealed high IQ and memory levels. Lastly, working memory was the only influencing factor of the IQ score.

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CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

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