Covid-19 and Saudi Medical Students: A Survey on Their Knowledge and Preventive Behavior before Clinical Practice in Hospital

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ABSTRACT

Introduction: COVID-19 has a higher infection rate among health care professionals due to heavy viral load. The medical students and interns are at increased risk of contracting COVID-19 owing to being relatively new in the field and the lack of knowledge and behavioural adaptation.

Aim: This study aimed to assess the knowledge level and adoption of preventive behavioural practices of medical students in Qassim University, Qassim, Saudi Arabia.

Materials and methods: This is a cross-sectional study conducted among 180 medical students studying at Qassim University, Qassim Saudi Arabia. A self-administered questionnaire was distributed among the medical students using an online platform. The questionnaire includes; basic demographic characteristics (age, gender, and academic year level), knowledge, and preventive behavior questionnaires. Data were tabulated in MS Excel and all data analyses were performed using SPSS version 26.

Results: The most common sources of COVID-19 information were social media (52.2%), healthcare workers (51.1%), and official sites (48.3%). Overall, 51.1% of the medical students had low knowledge toward COVID19 potential source of transmission, risk factors, and virulence while good knowledge was accounted for 48.9%. For preventive behavior, most of them were classified into high preventive behavior levels with 89.4% and only 10.6% were low levels. It is important to note that the knowledge level of males was significantly better than females (Z=-1.958; p=0.050).

Conclusion: Despite optimistic preventive behavior, the knowledge of medical students toward the potential transmission, risk factors, and virulence seems to be lacking. Male students seem to have better knowledge than female students.

Key words: COVID-19, Knowledge, Preventive behavior, Medical students

INTRODUCTION

An outbreak of viral pneumonia of unknown etiology occurred in December 2019 in Wuhan city of China [1]. The Coronavirus Study Group (CSG) of the International Committee on Taxonomy of Viruses named it as Coronavirus Disease 2019 (abbreviated "COVID-19"). This is a respiratory disease that is highly infectious, and its main clinical symptoms include fever, dry cough, fatigue, myalgia, and dyspnea. 18.5% of the patients in China with COVID-19 developed the severe symptoms, which is characterized by acute respiratory distress syndrome, septic shock, difficult-to-tackle metabolic acidosis, bleeding and coagulation dysfunction [2,3].

First COVID-19 case was confirmed on March 2, 2020 in Saudi Arabia. According to the ministry of health of Saudi Arabia there were 334,187 confirmed case, 318,542 recovered, 10,906 active, 1,005 critical cases and 4739 deaths by COVID-19 as of September 30, 2020 [4]. Adherence of public and medical staff to the essential control measures is essential to fight this pandemic as there is no definitive treatment or vaccine introduced yet. This phenomenon is largely affected by their knowledge, attitudes, and practices (KAP) towards COVID-19 in accordance with KAP theory [5,6]. Healthcare workers are the front liners against COVID-19 pandemic and are at higher risk of contracting the virus. Around the world, a large number of them have been infected with COVID-19 and thousands have died [7]. Medical staff is always at higher risk of getting infected with contagious diseases. It is well established that COVID-19 is highly contagious and can probably be transmitted even from asymptomatic individuals; therefore the risk is multiplied in medical staff. A recent study which was done in China has revealed that the rate of transmission of COVID-19 infection among health professionals was 29% [8].

Healthcare workers not only involve licensed professionals, such as doctors, nurses, pharmacists, and dentists but also medical students, specifically those who are involved in a clinical internship. During this phase of medical training medical students are expected to participate in various activities within the health system such as involvement in health needs of family and community, promoting health and disease prevention, support in health units and planning of health services, policies, programs and projects. Therefore training of medical students is essential to integrate and consolidate the knowledge that they have acquired. They possess little knowledge about managing patients and are prone to make mistakes easily and this lack of experience heightens their chance of being infected. If they are infected there is high chance of developing an asymptomatic disease and becoming vectors which may aggravate the epidemiological burden of the disease [9].

During the COVID-19 pandemic it is of prime importance to ensure safety and well-being of healthcare professionals for continued quality healthcare services and to control further spread of the disease [10]. The WHO has recommended that in order to prevent disease transmission in healthcare settings the contact and droplet precautions must be followed by healthcare professionals while treating COVID-19 patients. WHO also recommends the correct use of PPE including choosing the right PPE for the setting, putting on, removing and disposing the PPE correctly [11]. In addition, ministry of health Saudi Arabia also issued interim surveillance guidelines for COVID-19. Therefore it is essential for healthcare professionals to adhere to hand hygiene, correct use of PPE and other IPC measures to avoid getting infected from this deadly virus [12].

A study conducted in Iran to assess the knowledge level of medical students about COVID-19 revealed that average of correct answers was 86.96% by medical students, which was higher than some previous studies and similar to another study which reported 87.1% knowledge level of Saudi Arabian healthcare workers about MERS-CoV [13,14]. Another study conducted in Saudi Arabia about the knowledge level of medical interns related to COVID-19 has highlighted that the mean knowledge score of the interns was 6.1 ± 2.7 on a scale of 1 to 10. This showed that the majority of interns possessed moderate level of knowledge about COVID-19. There were only 38% interns who had good knowledge with a score of at least 80% [15].

The preventive behavior is also an important aspect to understand how well medical student respond to the COVID-19 pandemic. The study on Iranian medical student about adoption of preventive behavior for COVID-19 explained that the average score of preventive behavior (94.47%) was higher than a similar study results regarding MERS Coronavirus infection in Saudi Arabia [13,14]. Another study done is Qassim region of Saudi Arabia has identified that 90% of medical interns believed that they can be a virus carrier even if they do not have fever or cough, so taking extra precaution is a must to avoid spread of the infection. 73% interns

thought that they do not need to wear N95 mask at work all the time to avoid getting infected with CPVID-19 whereas 97% medical interns believed that appropriate social distancing can reduce their risk of getting infected or infecting others with COVID-19 [15].

Medical students are among those who may have close contact with the affected people. Therefore lack of proper related knowledge in this population can make them overestimate the situation, increase their stress and anxiety level and may interrupt the appropriateness of their medical judgments [16]. A study of medical students' knowledge of the COVID-19, preventive behaviours and risk perception is necessary owing to critical nature of COVID-19 pandemic and unavailability of it treatment or vaccine. To our knowledge, there is lack of evidence to assess the knowledge level, preventive behaviours, and risk perception among medical students about COVID-19. Hence this study will help to assess these parameters in Saudi medical students.

MATERIALS AND METHODS

This is a quantitative cross-sectional research using survey questionnaire. A comprehensive survey questionnaire had been used to collect information about demographic and study variables of present study. A survey questionnaire was designed using google docs and had been distributed to respondents via Email and Whats App as convenient for respondents. The estimated time for questionnaires completion is 5 minutes. The sample size would be consisted of 306 male and female medical students. Sample size was calculated using the formula: $n = z^2 p(1-p) \backslash d^2$ with 95% confidence level and 5% margin of error. Where n=sample size, z= 1.96 p=0.5, d=0.04. This study was conducted among medical students of Qassim University by distributing research questionnaire containing questions about knowledge and preventive approach to deal with COVID-19. Using paper or electronic questionnaire this study were ran for a period of three months from Oct 2020 to Dec 2020. Non-probability sampling in which convenience sampling technique was used to collect data from list of respondents. Data of all medical students studying at various professional years were collected from records of Qassim University after seeking approval. These participants were contacted and written informed consents were obtained from the participants after brief introduction of the study. Ethical approval was taken from the ethical committee of Qassim university (QUCOM) before proceeding of the study.

Statistical analysis

The data analyses were carried out using Statistical Packages for Software Sciences (SPSS) version 21 Armonk, New York, IBM Corporation. The knowledge toward the potential sources of transmission, risk factors, and virulence of COVID-19 was assessed using 23-item questionnaires discussed in Table where the correct answers had been identified and were coded as 1 while the incorrect answer had been coded with 0.

The total knowledge score has been calculated by adding all 23 items and a score range from 0 to 23 had been generated which indicates that the higher the score, the higher the knowledge toward the potential sources of transmission, risk factors, and virulence of COVID-19 and by using the mean score as a cut-off point to determine the level of knowledge, participants were considered as having low knowledge if the score was below or equal to the mean score while above the mean score was considered high knowledge level.

Regarding preventive behavioural approaches that can reduce the risk for COVID-19, the overall behavior has been measured using 9-item questionnaires discussed in Table where "yes" coded with 1 and "no" coded with 0 were the answer options. The total preventive behavior has been calculated by adding all 9 items and a possible score range from 0 to 9 has been generated which generally means that the higher the score the higher the behavior toward the risk for COVID-19. By using the mean score as a cutoff point to determine the level of behavior, participants were classified as low behavior if the score was equal or below the mean score while above the mean score were considered as high behavior.

Qualitative variables were presented using numbers and percentages while quantitative variables were presented using mean and standard deviation. The knowledge and behavior scores were compared with the basic demographic characteristics by using Mann Whitney Z-test and Kruskal Wallis H test. A P-value of 0.05 was considered statistically significant. Normality tests were conducted using Kolmogorov-Smirnov test and Shapiro Wilk test. Data follows abnormal distribution. Thus, non-parametric tests were applied. Correlation procedures were also performed to determine the linear relationship between the knowledge and behavior scores.

RESULTS

This study was able to recruit 180 medical students. Table 1 presented the basic demographic characteristics of the medical students. The age range was from 21 to 26 years old with the majority (69.4%) were in the younger age group (21 – 23 years) and nearly 70% were males. With respect to their academic year level, 35% were in the 5th year level, another 35% were in the 4th and 30% were in the 3rd year level.

Table 1: Basic demographic characteristics of the medical students (n=180).

Study variables	N (%)
Age group	
21–23 years	125 (69.4%)
24–26 years	55 (30.6%)
Gender	
Male	124 (68.9%)
Female	56 (31.1%)
Academic year level	
3rd year	54 (30.0%)
4th year	63 (35.0%)
5th year	63 (35.0%)

Figure 1 showed the medical students' sources of information related to COVID-19. It was revealed that social media (52.2%) was the source of information by the medical students in relation to COVID-19, followed by healthcare workers (51.1%) and official sites (48.3%) while family and friends were the least sources of information (17.2%).
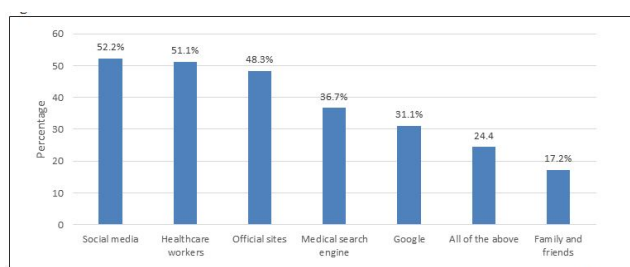

Figure 1: Sources of information related to COVID-19.

In the assessment of knowledge toward potential sources of transmission (Table 2), it can be observed that the medical students were aware that inhalation (86.1%), kissing (81.7%), touching contaminated items (80.6%), handshaking (79.4%) and large droplets (72.8%) were the most common potential sources of COVID-19 transmission while animals (22.2%), mother to fetus (14.4%) and breast milk (8.3%) were the least potentials sources.

For the knowledge of potential risk factors and virulence for COVID-19, it was shown that the top 3 statements where medical students showed strong agreement were; "People with chronic diseases are at higher risk for COVID-19" (agree: 97.2%), "If a person gets COVID-19, he/she should be avoided because of being a potential source of infection" (agree: 97.2%) and "If a person gets COVID-19, his/ her family should be avoided because of

being a potential source of infection" (agree: 96.1%) while the least statement was "Children are at a higher risk for COVID-19" (agree: 24.4%).

Based on the 23 items knowledge questionnaires, the

mean knowledge score was 13.4 (SD 2.82) with more than a half were classified as having low knowledge (51.1%) while 48.9% had good knowledge level.

Table 2: Assessment of the knowledge toward potential sources of transmission, risk factors, and virulence of COVID-19 (n=180).

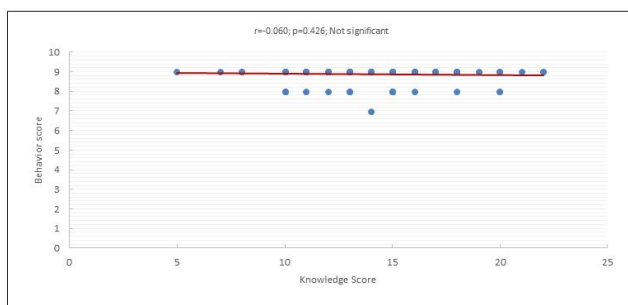| Knowledge about potential sources of transmission of COVID-19	Correct Answer N (%)
Inhalation	155 (86.1%)
Kissing	147 (81.7%)
Touching contaminated items	145 (80.6%)
Handshaking	143 (79.4%)
Large droplets	131 (72.8%)
From Air	115 (63.9%)
Skin contact	83 (46.1%)
Fecal and/or oral route	69 (38.3%)
Contaminated food	59 (32.8%)
Blood transfusion	43 (23.9%)
Animals	40 (22.2%)
Mother to fetus	26 (14.4%)
Breast milk	15 (08.3%)
Knowledge of potential risk factors and virulence of COVID-19	Agree, N (%)
People with chronic diseases are at a higher risk for COVID-19	175 (97.2%)
If a person gets COVID-19, he/she should be avoided because of being a potential source of infection	175 (97.2%)
If a person gets COVID-19, his/ her family should be avoided because of being a potential source of infection	173 (96.1%)
Wearing a mask regularly prevents getting the disease	165 (91.7%)
One sick person can transmit the disease to about four other people	152 (84.4%)
Only sick people should be wearing a mask to prevent the spread of the disease †	151 (83.9%)
I believe that a vaccine can prevent the spread of COVID-19	149 (82.8%)
COVID-19 has a high recovery rate with over 90% of recovery	147 (81.7%)
Pregnant women are at a higher risk of COVID-19	92 (51.1%)
Children are at a higher risk for COVID-19	44 (24.4%)
Total knowledge score (mean ± SD)	13.4 ± 2.82
Low knowledge	92 (51.1%)
High knowledge	88 (48.9%)
† Indicates reverse answer	

In Table 3, it showed 9 items to assess the behavioural approaches that can reduce the risk for COVID-19. Based on the results, all of the medical students agreed that covering the face while coughing/sneezing, wearing a face mask, avoiding large gatherings and crowded areas

were the proper behavioural practice to reduce the risk of COVID-19 infection. Based on the 9 behavioural item questionnaires, the overall mean score was 8.89 (SD 0.33) with nearly all were classified into high behavior (89.4%) and the rest were low (10.6%).

Table 3: Assessment of preventive behavioural approaches that can reduce the risk for COVID-19 (n=180).

Behavior Statement	Correct Answer N (%)
Covering face while coughing/sneezing	180 (100%)
Wearing face masks	180 (100%)
Avoiding large gathering	180 (100%)
Avoiding crowded areas	180 (100%)
Avoiding close contacts	178 (98.9%)
Using disinfectants	178 (98.9%)
Avoid touching face	178 (98.9%)
Staying home	175 (97.2%)
Washing hands for 20 seconds with soap	171 (95.0%)
Total behavior score (mean ± SD)	8.89 ± 0.33
Low	19 (10.6%)
High	161 (89.4%)

Figure 2 depicted the correlation between the knowledge score and behavior score. It can be observed the correlation between the knowledge score and behavior was not statistically significant (r=-0.060; p=0.426).

Figure 2: Correlation (Pearson-r) between knowledge and behavior scores.

In Table 4, we used Mann Whitney Z-test as well as Kruskal Wallis H-test to measure the differences in the knowledge and behavior scores in accordance to the age group, gender, and academic year level.

Based on the results, it was found that gender males showed significantly higher knowledge scores than females (Z=1.958; p=0.050) while the differences in the knowledge and behavior scores of age group and academic year level did not reach statistical significance (p>0.05).

Table 4: Difference in the knowledge and behavior scores in regards to the basic demographic characteristics of the medical students (n=180).

Factor	Knowledge Score (23) Mean ± SD	Z/H-test (P-value)	Behavior Score (9) Mean ± SD	Z/H-test; P-value
Age groupa				
21 – 23 years	13.6 ± 2.62	Z=-1.203;	8.91 ± 0.31	Z=-1.651;
24 – 26 years	14.0 ± 3.22	P=0.229	8.84 ± 0.37	P=0.099
Gendera				
Male	13.9 ± 3.06	Z=-1.958;	8.87 ± 0.34	Z=-1.474;
Female	13.1 ± 2.06	P=0.050 **	8.93 ± 0.32	P=0.140
Academic year levelb				
3rd year	14.0 ± 1.96	H=2.793;	8.89 ± 0.37	H=0.108;
4th year	13.4 ± 3.19		8.89 ± 0.32	
5th year	13.7 ± 3.04	P=0.247	8.89 ± 0.32	P=0.948
aP-value has been calculated using Mann Whitney Z-test				
bP-value has been calculated using Kruskal Wallis H-test				
**Significant at p=0.05 level				

DISCUSSION

This study was carried out to evaluate the knowledge and preventive behavior of Saudi medical students regarding the COVID-19 pandemic. The findings of this study revealed that the overall knowledge of medical students in relation to the COVID-19 potential sources of transmission, its risk factors, and virulence was inadequate. Based on 23-item questionnaires designed to measure the knowledge, 51.1% of them were identified as having a low level of knowledge while 48.9% were in the high level (mean score: 13.7 out of 23 points). This result is consistent with the study of AlNohair et al.[15]. Based on their findings, among 250 medical interns, good knowledge was demonstrated by only 38% of the subjects and the rest were moderate or poor knowledge levels. On the contrary, most published literatures that had been published either locally, regionally, or internationally showed better findings in terms of knowledge toward COVID-19, with reporting good knowledge toward COVID-9 infection varying from 70% to 96% whether the subjects were medical students [9,14,17-21] or healthcare providers [22-23]. Further, our results demonstrated that the perceived knowledge of male students was significantly better than female students (p=0.050). This is contrary to the report of Soltan et al. [19]. Based on their accounts, females exhibited a higher prevalence rate in regards to related-knowledge and practicing behaviours than males while Arslanca et al. [23], documented that there was no significant difference within the knowledge of males and females in relation to COVID-19 which was not consistent with our reports.

Conversely, most of the medical students knew that inhalation, kissing, touching contaminated items, and handshaking were the potentials sources of COVID-19 transmission while their awareness was less those animals, mother to foetus, and breast milk could also lead to the transmission of the disease. Furthermore, medical students were highly aware that patients with chronic diseases were more prone to COVID-19 infection and they believe that patients who had been infected by the virus should be isolated to avoid being the source of infection. On the other hand, medical students were less aware that even children were at higher risk of COVID-19 infection. Consistently, the risk of elderly people for COVID-19 infection had also been reported by Gobel et al. [20], based on their findings, more than one-third of medical and allied health science students knew that elderly persons or people with comorbidities are more prone to acquire COVID-19.

Regarding preventive behavior, medical students exhibited an optimistic behavior in the 9-item questionnaires which assessed their attitude toward the prevention that can reduce the risk for COVID-19. Accordingly, the behavior mean score was 8.89 (SD 0.33) with 89.4% of medical students compromising a high level of behavior and only 10.6% were classified into a low level. Consistently, several studies indicated positive preventive behaviors to control the spread of COVID-19 infection [14,18-19,21]. On the other hand, a study

conducted in Jeddah, Saudi Arabia [17], reported that the attitude of undergraduate nursing students regarding COVID-19 was negative. The deficiency in attitude has been noted specifically regarding the protective measures to control disease transmission as only half of them agreed about it. Furthermore, the authors also noted similar proportion of nursing students (50%) were against the lockdown of crowded places such as schools. In our study, all medical students were aware that preventive behavior such as; covering the face while coughing/sneezing, wearing a face mask, avoiding gathering or crowded places are necessary to control the spread of the disease which showed better preventive behaviours than the previous reports.

Moreover, In a study by Alsoghair et al. [18], they found a positive significant correlation between the knowledge and self-reported preventive behavior which was also similarly reported by Soltan et al. [19] as well as Arslanca et al. [23]. However, this has not been the case in our study, as we found a negative correlation between the knowledge and preventive behavior scores (r=-0.060) which was also similarly reported by Taghrir et al. [14]. Their findings indicated that there was an inverse correlation between related-knowledge and preventive behavior (r=-0.036).

Sources of COVID-19 information are important to fill the gaps in terms of knowledge and preventive behavior. In our study, medical students' main source of information regarding COVID-19 was social media (52.2%), followed by healthcare workers (51.1%) and official sites (48.3%). Similarly, AlNohair et al. [15], accounted that medical interns' main source of information regarding COVID-19 was social media, alternatively, they also indicated newspapers, television, and friends as secondary options in obtaining sources of COVID19 information while on the other hand, Alsoghair and associated [18], indicated that local Ministry of Health materials, Centres for Disease Control and Prevention, and WHO were the most common sources of medical students information regarding the disease while in Ecuador [9], the main source of information regarding COVID-19 among medical students were scientific articles. Even though each author had suggested different entities as the sources of COVID-19 information, however, it can be observed that most of these sources were obtained through an online platform.

CONCLUSION

Despite optimistic preventive behavior, the knowledge of medical students toward the potential transmission, risk factors, and virulence seems to be lacking. Male students seem to have better knowledge than female students. It is necessary to address the gaps in the knowledge as evident in this study, specifically among female students. The health education aimed at improving knowledge about COVID-19 measures is useful for encouraging positive behavioral practices among medical students. Institutional care is also important to raise awareness among populations more importantly among front-liners or for the future front-liners. Finally, training programs

designed for medical students can significantly improve their outlook regarding risk and preventive strategies concerning COVID-19 infection, which could boost their confidence to provide essential care, in addition, to protect them from possible infection due to COVID-19.

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