KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS CORONA VIRUS DISEASE 2019 (COVID-19) AMONG MEDICAL STUDENTS: A CROSS-SECTIONAL STUDY

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Abstract

Introduction: Corona virus disease 2019 (COVID-19), was recognized and has caused serious illness and numerous deaths. The ultimate scope and effect of this outbreak are unclear at present as the

situation is rapidly evolving. The disease causes respiratory illness (like the flu) with main clinical symptoms such as a dry cough, fever, and in more severe cases, difficulty in breathing.

Objective: To assess knowledge, attitude, and practice of medical students towards corona virus disease 2019 (COVID-19).

Materials and Methods: An online cross-sectional survey was conducted among undergraduate medical students in India from September 2020 to February 2021. Participants were recruited using a snowball sampling technique and all data were collected via an online self-reported questionnaire using Google Forms (http://forms.google.com/) as the data collection period coincided with implementation of the COVID-19 lockdown policy in India. Socio-demographics characteristics, social interaction history, information-seeking behavior, as well as knowledge, attitude, and practice toward COVID-19 were collected through a self-reported questionnaire. A p-value of <0.04 indicated statistical significance.

Results: A total of 2000 eligible participants completed the survey, 71.5% of whom were female, and their mean age was 19.4 years old (SD = 2.1). Almost all had sufficient knowledge (87.1%) and good preventive practice (93.6%) towards COVID-19; however, there was also a rather low level of positive attitude recorded, at 65.7%. The multivariable logistic regression analysis showed that the female participants, and the receiving of information from the official websites, reported a significantly higher level of good practice. Besides, students who had a high level of sufficient knowledge and positive attitude towards COVID-19 were more likely to have good preventive practices (All p<0.001).

Conclusion: Many undergraduate medical students in India had positive attitude and practice against COVID-19, yet only a few had adequate knowledge. This warrants further interventions to keep them updated with COVID-19 evidence to maximize their potentials in raising public awareness on COVID-19.

Keywords: COVID-19, Noval corona virus, Knowledge, Attitude, Practice, Social distancing, Lockdown, healthcare students.

Introduction

In December 2019, a pathogenic human corona virus SARS-CoV-2, corona virus disease 2019 (COVID-19), was recognized and has caused serious illness and numerous deaths. The ultimate scope and effect of this outbreak are unclear at present as the situation is rapidly evolving. [1] The disease causes respiratory illness (like the flu) with main clinical symptoms such as a dry cough, fever, and in more severe cases, difficulty in breathing. COVID-19 is highly contagious with a certain mortality rate, and it was classified as a class B infectious disease and managed as a class 'A' infectious disease in China in January 2020. [2] China has taken firm infection control measures, isolating the exposed and suspected cases according to international standards, constantly updating the diagnosis and treatment process, and carrying out public education. [3]

The epidemics of COVID-19 have been recorded over 200 countries, territories, and areas with 2,878,196 confirmed cased and 198 668 death cases. [4] On 11 March 2020, WHO changed the status of the COVID-19 emergency from public health international emergency (30th January 2020) to a pandemic. Nonetheless, the fatality rate of the current pandemic is on the rise (between 2% - 4%), relatively lower than the previous SARS-CoV (2002/2003) and MERS-CoV (2012) outbreaks. [5]

In India, a confirmed case of COVID-19 was reported on 30th January 2020, who was a student traveled from Wuhan, China, and has successfully recovered from the infection on 14th February 2020. [6] On 27th April 2020, the Ministry of Health and Family Welfare confirmed a total of 28,380 confirmed cases, 6362 cured / discharge cases, and 886 death cases in the country from 32 states/ union territories. [7] The infection rate of COVID-19 in India is reported to be 1.7%, significantly lower than the worst affected countries, as the report on 29 March 2020. After a 14-hour voluntary public curfew named as 'Janta Curfew', India immediately announced the implementation of a nation-wide complete lockdown for 21 days (i.e. up to 14th April 2020), which only allowed essential services to operate over the entire 130 million population of India. [8] The battle against COVID-19 is still unending in India.

People's observance of the prevention measures is essential for controlling the spread of COVID-19, which is affected by their knowledge, attitudes, and practices (KAP) towards COVID-19. Therefore, we conducted a survey to investigate the KAP towards COVID-19 among the medical students of a government medical college during the rapid rise period of the COVID-19 outbreak.

Materials and Methods

A cross-sectional survey among undergraduate medical students in India was conducted from September 2020 to February 2021. Participants were recruited using a snowball sampling technique and all data were collected via an online self-reported questionnaire using Google Forms (http://forms.google.com/) as the data collection period coincided with implementation of the COVID-19 lockdown policy in India.

The questionnaire was filled anonymously, voluntarily, and with written consent given by all respondents. To avoid duplicate responses, all participants were required to log into their email accounts, but any personal contact information were not recorded to protect the anonymity of the respondents. During the data collection period, the questionnaire was spread using social media platforms every three days to increase the number of respondents. All procedures conducted in this study have been approved by the Research Ethics Committee of the Shadan College and Hospital

Measurement tools

The questionnaire was developed through literature searches of previously validated questionnaires, [9] and modified to match the context of the study. A preliminary survey was then conducted on 30 participants to enhance the comprehension and the validity of the questionnaire. Further details on the calculation of mini-mum sample size and the development of the questionnaire have been previously discussed elsewhere. [10]

The questionnaire encompassed four primary sections including: (1) socio-demographics characteristics, (2) social interaction history, (3) levels of trust in COVID-19 health information sources, and (4) knowledge, attitude, and practice. Socio-demographics characteristics consisted of age, sex, place of residence, institution type, academic level, living circumstances, marital status, family income, and history of chronic diseases. Living circumstances comprised the number of people living in the household and type of household (e.g., family, non-family, or alone), while family income was classified as low, lower-middle, upper-middle, and high-income class for monthly family income of respectively. [11] On the other hand, the social interaction history section aimed to assess the volunteering experience of respondents in health and non-health sectors, their own and family's COVID-19 disease history, and their history of physical contacts with COVID-19 patients. In addition, we also assessed the medical students' general perception on the reliability of various health

information sources, including televisions, newspapers, online news, social media, official statements from the government and health institutions, and expert opinions.

The final section aimed to investigate the participants' knowledge, attitude, and practice toward the COVID-19 disease. Knowledge was assessed using a 10 items questionnaire encompassing various areas of COVID-19 disease, including pathogenesis, clinical presentation, diagnosis, treatment, and prevention. Each correct answer accounts for one point with a maximum score of 10 points. In contrast, assessment of attitude and practice consisted of 12 questions each using a five-point Likert scales. Higher knowledge, attitudinal, and behavioral scores indicated favorable perceptions. Lastly, the reliability of the questionnaire was appraised using Cronbach's alpha, with a coefficient for knowledge, attitude, and practice of 0.655, 0.726, 0.807, respectively, indicating satisfactory internal reliability. [12]

Statistical analysis
Submitted responses were collected in and managed with the MS Excel for Office 365 MSO ver. 2017. Subsequently, data were analyzed using SPSS 24.0 (SPSS Inc., Chicago, IL) and visualized using R ver. 4.0.3 (R Foundation for Statistical Computing, Vienna, Austria). [13] Categorical data were presented as frequency and percentages, while continuous data as means or medians along with the appropriate mea-sure of dispersion according to the normality of data distribution as tested with Kolmogorov-Smirnov tests.

Outcomes on the knowledge, attitude, and practice were dichotomized according to the Bloom's cut-off (80%), where a sum knowledge score of 8 indicated adequacy and a score of 48 indicated positive attitude and practice, respectively. Potential factors associated with the dependent variables were first analyzed using univariate logistic regression. Any factors associated with each outcome at p0.20 were deemed eligible for inclusion in the multivariate analysis. In addition, correlation between trust in health information sources and knowledge, attitude, and practice, as well as inter-correlations among the dependent variables were investigated with Spearman's rho (ρ). A p-value of <0.05 denoted statistical significance.

Results
All students were invited to participate, of which 2000 accepted; however, there were 84 responses with considerable data missing in the areas of knowledge, attitude, and practice, so they were excluded from this analysis. This resulted in a total of 2000 participants, with complete answers, which were considered in the study. Overall, 2000 students completed the questionnaires, with a mean age of (19.4 ± 2.1). Students who were female accounted for 71.5%. Most of them were students of Nursing – medical engineering and Pharmacy (33.5% and 29.0%, respectively). The majority of them was undergraduates (96.8%) and had internships at a hospital (83.9%). More than two-thirds (71.7%) of students were living with family/relatives. The main source of COVID-19 information was social media (92.6%), and websites of hospitals, the Ministry of Health or WHO (82.5%) (Table 1).

Table 1: Baseline Characteristics of Participants (N=2000)

Characteristics	N (%)
Age (mean ± SD) (years)	19.4± 2.1
Gender	
Male	570 (28.5)
Female	1430 (71.5)
Specialty	

Medicine	326 (16.3)
Dentistry	105 (5.3)
Pharmacy	580 (29.0)
Traditional medicine	186 (9.0)
Nursing - medical engineering	671 (33.5)
Public health	132 (6.6)
Level of education	
Undergraduate	1936 (96.8)
Postgraduate	64 (3.2)
Internship at the hospital	
Yes	1678 (83.9)
No	322 (16.1)
Living conditions	
With family/relatives	1435 (71.7)
With friends	486 (24.3)
Alone	79 (4.0)
Source of COVID-19 information (yes)	
Social media	1851 (92.6)
Websites of hospital/Health Ministry/ WHO	1650 (82.5)
Training courses toward COVID-19	1455 (72.8)
Local government	416 (20.8)
Relatives	323 (16.2)

Table 2 describes COVID-19 knowledge. A high rate of students (87.1%) had sufficient knowledge, with the majority of them (more than 80%) knowing the pathogens, the way of COVID-19 transmission, common signs, specific treatment, medication, as well as being aware of preventive measures, including wearing masks, hand washing, surface cleaning and keeping personal distance from others. Also, there remained a lower level of knowledge about patient groups that are at a high risk of severe illness and death (67.8%).

Table 2: Knowledge toward COVID-19 (N=2000)

Question (Correct Answer)	N (%)
Caused by SARS- CoV-2 (yes)	1780 (89.0)
Transmission by close contact with an infected person through droplets (yes)	1950 (97.5)
Common signs (Fever or Cough or fatigue or sputum production or shortness of breath) (yes)	1960 (98.0)
Specific treatment medication (No)	1871 (93.6)
Prevention of infection (Wear mask, hand washing, surfaces cleaning, keep distance from others) (yes)	1854 (92.7)
People with chronic illness at high risk of severity and death (yes)	1358 (67.8)
Overall knowledge toward COVID-19 (Sufficient)	1741 (87.1)

Table 3 shows a rate of positive attitude, which accounted for 65.7%, with most of them ready to participate in anti-epidemic roles when mobilized (87.3%), accepting isolation if they contract COVID-19 (96.1%), preventing the spread of COVID-19 by washing hands and wearing a mask (95.1%), the hospital infection control programs can reduce the number of COVID-19 cases (93.7%), students have already got a vaccination (86.8%), and a patient should be kept in isolation if contracting COVID-19 (95.6%). A lower rate was recorded for attitudes towards the likelihood of their family members becoming infected (67.3%) and had a positive attitude towards probably getting ill from COVID-19 (54.9%).

Table 3: Attitude toward COVID-19 (N=2000)

Question	N (%)
I think I will probably get illness	1097 (54.9)
I am worried one of my family members may get an infection	1346 (67.3)
If getting COVID-19, I will accept isolation in health facilities	1923(96.1)
Transmission of COVID-19 can be prevented by washing hands with soap frequently and wearing mask	1901(95.1)
Prevalence of COVID-19 infection can be reduced by the active participants of health care workers in hospital infection control programs	1874(93.7)
If a COVID-19 vaccine was available, I would have it	1735 (86.8)
COVID-19 patients should be kept in isolation	1913 (95.6)
I am ready to participate in the team volunteering to support the health force	1746 (87.3)
Overall attitude toward COVID-19 (Positive)	1313 (65.7)

The COVID-19 preventive practice is presented in Table 4. There was a high rate of good practices (89.0%), with over 90% of respondents answering all questions correctly, including washing hands, wearing masks, social distancing, and following the guidelines of the Ministry of Health if suspected of having the Covid-19 infection.

Table 4: Practices of Medical Students toward COVID-19 (N=2000)

Question (Correct Answer)	N (%)
Washing hands frequently (yes)	1874 (93.7)
Washing hands with soap and water or alcohol hand sanitizer (yes)	1901 (95.1)
Average time for washing hands $\geq$ 20 seconds (yes)	1940 (97.0)
Wearing mask when in public or exposing with others (yes)	1963 (98.1)
Wearing mask cover my mouth and nose (yes)	1746 (87.3)
Adhering to social distancing properly according to the Ministry of Health's instructions (yes)	1913 (95.6)
Avoiding unnecessary travel and staying away from large groups of people (yes)	1937 (96.8)
Following the guidelines of the Ministry of Health if a suspected Covid-19 infection (yes)	1746 (87.3)
Overall practice toward COVID-19 (Good)	1780 (89.0)

Table 5 reports the factors associated with practices towards COVID-19 in the bivariate analysis. There was a relationship between prevention practices and gender, source of information, knowledge and attitude regarding COVID-19 ($p<0.04$).

The factors associated with practices towards COVID-19, in the multivariate logistic regression analysis, are reported in Table 6. Participants who were female and receiving information from the websites of hospital/Ministry of Health/WHO, reported significantly higher levels of good practices (OR 1.5 92% CI: 1.5– 2.16, and OR 2.0; 93% CI: 1.14–3.0, respectively, all $p<0.001$). Besides, students who recorded a sufficient level of knowledge and positive attitude toward COVID-19, were more likely to have good preventive practices (OR 4.0 92% CI: 2.41–5.26, and OR 3.7 93% CI: 2.89–5.95, respectively, all $p<0.001$).

Discussion

Medical education primarily aims to inculcate medical students' high-quality skills and competence in preparing them as future healthcare professionals. In a global health crisis, medical students play a

pivotal role in raising public awareness, which in turn may contribute to successful emergency management by mitigating risks, supporting preventive measures, and minimizing negative psychological burdens. [14] To maximize the potentials of these students in educating the communities, it is thus important to explore their knowledge, attitude, and practice toward COVID-19. The present cross-sectional study showed that a majority of Indian medical students had a positive attitude and practice against COVID-19. However, this number was not accompanied by a proportionate number of students with adequate knowledge, indicating the urgent need to take active measures to keep these students updated with COVID-19-related evidence.

In the present study, female medical students were superior to males in terms of knowledge and practice. This finding is further validated by a meta-analysis demonstrating that women were 49.5% more likely to practice and adopt health-protective behaviors in the context of a pandemic outbreak. [15] Our study also revealed that a higher percentage of students from public medical schools demonstrated adequate knowledge towards COVID-19, while medical students from private institutions reported a higher level of practice. Although these results may have noted the importance of embedding and promoting equality between public and private medical institutions as well as between fellow public or private medical institutions them-selves in terms of the medical curriculum adopted and opportunities to practice clinical skills, these findings should be interpreted cautiously, especially considering the complex interrelationship between the explored variables.

One of the most apparent findings to emerge from the analysis was that medical students in clinical years yielded higher knowledge scores compared to pre-clinical students. This result may be explained by the fact that medical students in their final years have been exposed to more experiences and learning opportunities in clinical setup, thereby offering a vast wealth of potential to help and contribute to the pandemic response. With the rigorous years of clinical training they have undergone, qualified clinical-year medical students may therefore contribute beyond being public educators by volunteering to clinically assist the healthcare workers in fighting against COVID-19. [16]

Our analysis further validated that voluntary participation, whether in health or non-health sectors, played a major role in determining one's levels of knowledge, attitude, and practice. In response to the ongoing COVID-19 pandemic, a plethora of volunteering efforts has been established and launched. Willingness to volunteer has been demonstrated to be higher in those who establish preparedness behavior and exhibit higher awareness of responsibility. [17] In addition, depending on the role and scope, volunteering might offer the opportunities to develop relevant knowledge and skills, a positive sense of community, and pro-social behavior. [18] These might explain the higher scores observed in the present survey among medical students with volunteering experience. Accordingly, based on our findings, incremental efforts should more specifically be made by the medical institutions in promoting volunteerism and encouraging more medical students to partake in volunteering opportunities to gain indispensable learning opportunities and collaborate with other healthcare professionals. [19]

Additionally, it was also evident from our study that poor practices were demonstrated among respondents who were unsure whether or not they had been in contact with any COVID-19 positive patient or had been infected with COVID-19. This finding might indicate that the lack of awareness surrounding COVID-19 negatively affects one's level practice. Therefore, a comprehensive approach to increase the awareness of surrounding environment of these students, and in a broader scope–the general population, is urgently required. This may be achieved through rigorous contact tracing, intensive risk communication, as well as mass education efforts. [20]

With the exponential technological advancement over the past few decades, social media seems to be the most plausible way to promote public health behavioral change to increase COVID-19 protective measures. [21] However, our findings suggested that trust in social media as a source of COVID-19 health information was inversely associated with favorable practice in the study population. Although the correlation was clinically negligible, this result noted the importance of managing the information flow of social media, as a source of unfiltered and potentially misleading information, while simultaneously protecting one's freedom of speech. This might be attained by developing algorithms and capabilities to detect fake news, cultivating a standard of conduct in dealing with fake news, and increasing the media literacy and ethical standards of digital users. [22]

Overall, the gaps in knowledge relating to COVID-19 persisted although most respondents in the study demonstrated a high level of attitude and a fair level of practice. These results showed that positive attitude and appropriate practices regarding COVID-19 documented among medical students might suggest their valuable role as role models for the general population. However, as future health professionals, demonstration of high standards of attitude and practice has to be aptly supported by excellence in clinical knowledge and understanding, especially if they are to be involved in global health emergencies. Addressing this knowledge gap will warrant not only a more effective public education but also a safer and more efficient involvement of medical students in public health emergencies beyond their role in raising public awareness. [23]

One's level of knowledge is substantially influenced by an effective and efficient education system that plays a key role in ensuring high-quality teaching and learning. The low level of knowledge reported might be justified by the rapidly evolving COVID-19 evidence, [24] which represents an enormous challenge to medical education and thus may subsequently hinder the delivery of educational materials. Our findings necessitate prompt actions by medical institutions to enhance the breadth of knowledge and understanding of Indian medical students in regards to COVID-19, particularly with reference to infection prevention and control principles. This was demonstrated by Boodman et al., [25] who described the involvement of medical students in Canada to produce a weekly evidence-based newsletter designed to answer COVID-19 clinical questions raised by doctors. Besides improvements observed in research and inter-professional communication skills among the students, this strategy allowed medical students to gain a deeper understanding of COVID-19 while contributing in a concrete way to the pandemic. [26] In addition, attention should also be paid to gradually allow medical students to engage safely in patient-based training with an appropriate balance of online and in-person learning. In-person activities can be conducted by mitigating the risk of physical con-tact with patients through physical distancing and suitable personal protective equipment. [27]

The findings of our study might be of assistance and applicable for stakeholders and policy-makers in designing and transforming existing public health interventions and medical curriculum to equip medical students with the appropriate tools to adapt during a global health crisis. The current pandemic has corroborated the noteworthiness of implementing exhaustive and systematic disaster training programs as part of the medical school curriculum to fight not only the current pandemic but also future unforeseeable global health crises. A key priority should therefore be to plan these dedicated programs to strengthen students' disaster and pandemic preparedness against similar global health calamities. [28]

This study has several strengths and limitations. The relatively large sample size and the wide geographical reach contributed to the strength of the study. Furthermore, the questionnaire had previously been validated and yielded a fair reliability, thus further ascertaining the validity of our findings. However, the study was limited by the unbalanced distribution of pre-clinical and clinical medical students, which could have potentially limited the generalizability of the study results. The generalizability of our findings might also be affected by the constantly evolving evidence on and situation due to COVID-19, thereby implying that the knowledge, attitude, and practice of medical students in India found in this study may change over time. Moreover, due to the cross-sectional nature of the survey, we were not able to disentangle the directionality of the relationships observed.

Conclusion

Undergraduate medical students in India had a considerably positive attitude and practice against COVID-19. However, further interventions are required as these figures were not complemented with a proportionate number of students with adequate knowledge. Such interventions should aim to keep the students updated with COVID-19 evidence and simultaneously providing them with opportunities to contribute to the pandemic as public educators and role models for communities, while also equipping them with appropriate knowledge and skills to prepare for future public health emergencies. In turn, this approach may create a positive feed-back loop enhancing the students' knowledge, attitude, and practice, which were positively inter-correlated in this study.

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