Original Research Article

Knowledge, attitudes, and practices regarding ocular manifestations of covid 19 among students in a medical college in Saudi Arabia- a cross sectional study

ABSTRACT

Background: The coronavirus pandemic has forced governments of different countries to implement measures to control the spread of the virus and improve health awareness. Medical students are thought to have a significant role in public health promotion. Although there are studies assessing the level of knowledge of COVID-19 among medical students, there are very few assessing the level of knowledge about the ocular manifestations of COVID-19. Therefore, this study aims to assess the level of knowledge, attitudes, and practices regarding the ocular manifestations of COVID-19 among medical students a medical college in Saudi Arabia.

Methods: An online, questionnaire based cross sectional study was conducted to assess the knowledge, attitudes, and practices regarding the ocular manifestations of COVID 19 among medical students.

Results: The level of knowledge about COVID-19 was adequate. However, there was a deficient knowledge regarding some aspects of ophthalmological involvement in coronavirus disease. Female students and those of higher academic years demonstrated significantly higher knowledge. Attitudes and practices regarding prevention of infection and personal protective measures were satisfactory. The main source of information about COVID-19 was social media and internet.

Conclusions: This is probably the first study investigating the ophthalmological knowledge of COVID-19 among medical students in this region. The level of knowledge about COVID-19 was adequate but knowledge about some ophthalmological aspects was insufficient. Students had adequate knowledge about COVID prevention and personal protective measures. It is suggested to include knowledge of COVID-19 in the curriculum to fill gaps in the knowledge, especially in the preclinical years. Seminars and training programmes could also add to the same.

Keywords: COVID-19, SARSCoV2, Ophthalmology, Medical students, Saudi Arabia

1. INTRODUCTION

The corona virus pandemic and its consequences represent one of the most important medical events in recent times. The novel corona virus, severe acute respiratory syndrome (SARS CoV2) causing Coronavirus disease 2019 (COVID-19), was first identified in Wuhan, the capital city of Hubei province in China.[1,2] To date, there are almost 490,853,129 confirmed cases of COVID-19, including 6,155,344 deaths, reported to WHO.[3] Although the first cases presented as

pneumonia of unknown origin, the disease has wide ranging manifestations, the spectrum of which can extend from being completely asymptomatic to acute respiratory distress and multiorgan dysfunction. Ocular signs and symptoms have also been reported in COVID-19 patients and there is increasing recognition of conjunctivitis as a prodromal symptom of this disease.[4] Over the past couple of months, more and more studies are emerging that prove that the virus can also affect structures like the cornea, uvea, retina and the optic nerve. This disease, was noted to be very infectious, highly contagious and spread across the globe very fast.[5] This in combination with the ubiquitous clinical manifestations and a mortality rate of 2-3%, has prompted health authorities in many countries, including Saudi Arabia, to impose lockdowns and restrict free movement to contain the pandemic.[6-11] As with all public health programmes, success depends on the government intent being supported by strong compliance from an aware and knowledgeable population. Studies conducted in Saudi Arabia have found varying levels of awareness of COVID-19 disease and its prevention, ranging from good level of awareness to less than desired level. [11-13] Medical students are thought to have a significant role in public health promotion.[14] An aware and knowledgeable medical student would be not just a good role model and health educator for his family, but also to the community he belongs. In fact, during the COVID pandemic in USA, year 3 medical students participated in telehealth clinics under supervision, which not only exposed them to an important health care delivery modality but also allowed them to actively participate in and deliver tele health care.[15] For a medical student to serve as an health promoter and a health educator, he/she has to have a basic knowledge about the COVID-19 virus, disease manifestations and preventive strategies. There are many studies assessing the level of knowledge of COVID-19 among medical students, but very few assessing the level of knowledge about the ocular manifestations of COVID-19, especially in the Kingdom of Saudi Arabia. The present study was conducted to assess the level of knowledge, attitudes, and practices regarding the ocular manifestations of COVID 19 among medical students in Saudi Arabia.

2. MATERIAL AND METHODS

A cross sectional study was conducted to assess the level of knowledge, attitudes, and practices regarding the ocular manifestations of COVID 19 among medical students. Knowledge was compared across years of study, gender and other variables.

This online, questionnaire-based study was conducted in in a medical college in the Eastern province of Saudi Arabia. Saudi medical students of all years from the university were included in this research. The College of Medicine students have preclinical years which include the preparatory year and years 1-3. Clinical years, in which the students have small group teaching in the clinics include 4 and 5 years.

The online Google form questionnaire was distributed through social media including What'sApp, Facebook and e-mail. Participation was voluntary and informed and participants were assured about confidentiality. The participants were provided with a brief information about the research at the beginning of the questionnaire and asked to proceed only if they wanted to. Individual consent was taken by clicking on the 'agree' button on a question asking about their willingness to participate in the study. Students were requested to answer the questions to the best of their knowledge without any assistance. The study commenced after obtaining appropriate permission from the College of Medicine IRB.

The online questionnaire had a total of 27 questions divided into 3 sections. Section A had 7 questions assessing demographic information and information about eye diseases, glass and contact lenses use and a history of COVID-19 infection among the student or family members. Section B had 12 questions assessing knowledge of general and ocular manifestations of COVID-19. Students who answered 6 or less questions correctly were said to have less than adequate level of knowledge. Attitudes and practices regarding COVID-19, especially ophthalmological, were assessed through 8 questions in section C. The questionnaire was designed by an ophthalmologist and validated by another faculty member. This was followed by pilot testing, following which, it was disseminated to the medical students.

The results obtained from the google form questionnaire were analysed by using the SPSS software version 22. The data was analysed using percentages and means and chi square test for comparison between groups. A P-value of less than 0.05 was considered significant.

3. RESULTS

A total of 359 medical students participated in the study, of which 188 were female and 171 were male students. The participants were from different academic years in which 43.1% were in the clinical years, and 56.8% pre-clinical. The characteristics of the participants are presented in **(Table 1).**

Table 1: General characteristics of study participants (N:359)

			Gender		
			Female	Male	Total
Academic Year	**Pre-clinical**	Prep year	35	25	60 (16.7%)
		1st year	17	15	32 (8.9%)
		2nd year	28	27	55 (15.3%)

		3rd year	26	31	57 (15.9%)
	Clinical	4th year	50	27	77 (21.4%)
		5th year	32	46	78 (21.7%)
Total			188 (52.4%)	171 (47.6%)	359 (100%)

Enquiry about the medical background revealed that nearly half of the participants themselves or their family members had COVID-19 infection in the past 6 months. Majority of the participants (82.7%) had no chronic eye problems, however, 41.2% of the participants were contact lens wearers. The medical background of the participants are presented in **(Table 2).**

Table 2: Medical background of study participants (N:359)

Have you or any family member tested positive for COVID 19 in the past 6 months?	No	183	51.0%
	Yes	176	49.0%
Do you have any eye problem which needs regular follow up?	No	297	82.7%
	Yes	62	17.3%
Do you wear glasses/ contact lenses?	No	211	58.8%
	Yes	148	41.2%
Have you done any refractive surgeries?	No	334	93.0%
	Yes	25	7.0%

Concerning the knowledge about COVID-19, majority answered the general COVID-19 questions correctly (K1-K5). Over half of the students had more than adequate knowledge of COVID-19(51.3%). However, the majority of the questions regarding the ocular manifestations were scored incorrectly as shown in **(Table 3).**

Table 3: Knowledge about COVID-19 and its ocular manifestation (N:359)

K1- COVID 19 is an RNA virus.	Correct	220 (61.3%)
	Incorrect/ Didn't know	139 (38.7%)
K2- The incubation period of the COVID 19 virus is 2-14 days.	Correct	333 (92.8%)
	Incorrect/ Didn't know	26 (7.2%)
K3- The main clinical presentation of COVID 19 infection in symptomatic patients is cough and fever.	Correct	316 (88.0%)
	Incorrect/ Didn't know	43 (12.0%)
K4- Regular hand washing is an effective preventive method.	Correct	342 (95.3%)
	Incorrect/ Didn't know	17 (4.7%)
K5- Wearing mask is an effective preventive method.	Correct	350 (97.5%)
	Incorrect/ Didn't know	9 (2.5%)
K6- The eye can be involved in COVID 19 infections.	Correct	222 (61.8%)
	Incorrect/ Didn't know	137 (38.2%)
K7- The most common ocular manifestation of COVID 19 is conjunctivitis.	Correct	130 (36.2%)
	Incorrect/ Didn't know	229 (63.8%)
K8- The COVID-19 virus never affects the retina.	Correct	51 (14.2%)
	Incorrect/ Didn't know	308 (85.8%)
K9- Sore eye is the most common ocular symptom seen in COVID 19 patients.	Correct	103 (28.7%)

	Incorrect/ Didn't know	256 (71.3%)
K10- The tears may contain the virus in COVID positive patients.	Correct	97 (27.0%)
	Incorrect/ Didn't know	262 (73.0%)
K11- The COVID-19 virus does not affect vision.	Correct	61 (17.0%)
	Incorrect/ Didn't know	298 (83.0%)
K12- Hand eye contact is an important factor in the pathogenesis of conjunctivitis in COVID 19.	Correct	223 (62.1%)
	Incorrect/ Didn't know	136 (37.9%)

In the attitude part of the study, 23.1% of the participants strongly agreed/agreed that any patient presenting with ocular irritation, watering, redness, and photophobia in these times should be suspected to be COVID positive while 47.1% of the participants strongly agreed/agreed that they should be just advised to do COVID-19 testing. 64.4% students said that COVID 19 patients should be discouraged from touching the eyes to avoid eye involvement. 87.2% participants strongly agreed/agreed that hand hygiene is important to prevent spread of COVID 19 including eye involvement and 64.3% strongly agreed/agreed that protective face shield and goggles should be worn on examining any patient with red eye. The results are presented in **(Table 4).**

Table 4: Study participants attitudes toward the ocular manifestations of COVID 19		**Frequency & percentage**
During these times, any patient presenting with ocular irritation, watering, redness and photophobia should be suspected to be COVID positive.	Agree	68 (18.9%)
	Disagree	105 (29.2%)
	Neutral	152 (42.3%)
	Strongly agree	15 (4.2%)
	Strongly Disagree	19 (5.3%)
Any person presenting with ocular irritation, watering, redness and photophobia during the time of the pandemic should be advised COVID 19 testing.	Agree	135 (37.6%)
	Disagree	62 (17.3%)
	Neutral	112 (31.2%)
	Strongly agree	34 (9.5%)
	Strongly Disagree	16 (4.5%)
Hand hygiene is important to prevent spread of COVID 19 including eye involvement.	Agree	92 (25.6%)
	Disagree	7 (1.9%)
	Neutral	30 (8.4%)
	Strongly agree	221 (61.6%)
	Strongly Disagree	9 (2.5%)
Protective face shield and goggles should be worn on examining any patient with red eye.	Agree	124 (34.5%)
	Disagree	35 (9.7%)
	Neutral	91 (25.3%)
	Strongly agree	107 (29.8%)
	Strongly Disagree	2 (0.6%)
COVID 19 patients should be discouraged from touching the eyes to avoid eye involvement.	Agree	103 (28.7%)
	Disagree	36 (10.0%)
	Neutral	88 (24.5%)
	Strongly agree	128 (35.7%)
	Strongly disagree	4 (1.1%)

Concerning the protective measures to be adopted by the participants during the ophthalmology clinical rotation, the most common measures adopted were wearing mask (n=309), using disinfectant/hand sanitizer (n=304), maintaining reasonable distance from the patients (n=273), and wearing face shields/goggles (n=223). When the participants were

asked about what actions they would take in case they develop eye irritation, watering, redness or photophobia, the majority (n=303) reported that they would consult an ophthalmologist followed by strictly observing hand hygiene(n= 134) and doing COVID 19 test (n= 117). 76.61% of the students strongly agreed/agreed that conducting more seminars and workshops about the ocular manifestations of COVID 19 would be effective in increasing awareness among students.
The most common source of information about COVID-19 was reported to be social media and internet(n=326), followed by medical journals and websites(n=202).
Chi-square test showed no significant relationship between the knowledge level and a past history of positive COVID 19 within the participants of their families, or a history of any eye problems or using glasses/ contact lenses. However, a statistically significant relationship was noted between participants' knowledge level and their gender and academic year with a p value less than 0.05 as shown in **(Table 5).**

Table 5: Factors associated with knowledge level of COVID-19 ocular manifestations

Academic Year	Prep year	23 (6.4%)	37 (10.3%)	60 (16.7%)
	1st year	16 (4.5%)	16 (4.5%)	32 (8.9%)
	2nd year	18 (5.0%)	37 (10.3%)	55 (15.3%)
	3rd year	21 (5.8%)	36 (0.0)	57 (15.9%)
	4th year	43 (12.0%)	34 (9.5%)	77 (21.4%)
	5th year	63 (17.5%)	15 (4.2%)	78 (21.7%)
	P value	<0.001*		
Gender	Female	111 (30.9%)	77 (21.4%)	188 (52.4%)
	Male	73 (20.3%)	98 (27.3%)	171 (47.6%)
	P value	0.002*		
Do you have any eye problem which needs regular follow up	No	164 (40.7%)	151 (50.8%)	297 (82.7%)
	Yes	38 (10.6%)	24 (6.7%)	62 (17.3%)
	P value	0.082		
Do you wear glasses/ contact lenses?	No	108 (30.1%)	103 (28.7%)	211 (58.8%)
	Yes	76 (21.2%)	72 (20.2%)	148 (41.2%)
	P value	0.975		
Have you done any refractive surgeries?	No	169 (47.1%)	165 (46.0%)	338 (93%)
	Yes	15 (4.2%)	10 (2.8%)	25 (7.0%)
	P value	0.364		
Have you or any family member tested positive for COVID 19 in the past 6 months?	No	88 (24.5%)	95 (26.5%)	183 (51.0%)
	Yes	96 (26.7%)	80 (22.3%)	176 (49.0%)
	P value	0.221		

4. DISCUSSION

A total of 359 students participated in this study, of which there was almost equal participation by males and females. The highest participation was by the 4th (21.4%) and 5th (21.7%) year students.
Over half of the students in this study had a more than adequate level of knowledge about COVID-19. This is similar to studies conducted among medical students in other countries like India, Jordan, Turkey, Pakistan etc.[16-21] Medical students are expected to be abreast of the latest developments in the health field. However, some of the questions about ophthalmological knowledge did not receive as many correct responses. The questions with maximum correct responses were those about eye involvement and role of hand eye contact in the pathogenesis of COVID-19 conjunctivitis. A large volume of available researches about COVID-19 conjunctivitis and the role of hand eye contact in the pathogenesis of the same could be behind more accurate responses to questions regarding them. Public health messages stressing the importance of hand hygiene in the prevention of coronavirus infection could also have played a role in reinforcing the role of hand eye contact in the causation of COVID-19 conjunctivitis. The questions with the least correct responses were

those about visual impairment and retinal involvement in COVID-19. The last few months have shown increasing reports of posterior segment involvement in COVID-19 infection. The incidence of retinal involvement ranged from 7% to almost 55% in various studies.[22-24] There are also case reports of COVID-19 infection affecting visual acuity.25-30 Although conjunctivitis and sore eyes have been known to be associated with COVID-19 disease for many months, increasing information about retinal and optic nerve involvement is relatively recent. This could probably explain the reason for the relatively poor responses to questions regarding the same.

On analysis of the level of knowledge, female medical students had more knowledge regarding the ocular manifestations of COVID 19 than male students and this was found to be statistically significant. (p=0.002). A similar trend was noted regarding the level of COVID-19 knowledge among Saudi nursing students ,in which female students showed better knowledge, and also among medical students and dental students in Pakistan as well.[20,31,32] It has been noted that female students in medical schools outperform male students in academic tests and OSCE exams and they showed certain personality traits that could be responsible for the success in assignments and exams.[33,34] Probably the more accurate responses from the female students are a reflection of the same.

Fourth and fifth-year students (clinical years) demonstrated significantly higher knowledge scores than the other groups ($p< 0.0001$). The results were found to be similar to two studies among medical students from Pakistan, and even among nursing students in Saudi Arabia, all of which showed a positive correlation between level of knowledge and years of study.[20,21,32] On the contrary, Khasawneh AI et al noted similar knowledge between preclinical and clinical years of medical students.[35] It is expected that levels of knowledge would be higher in the advanced years of the medical course. Clinical exposure probably makes the senior students more aware and knowledgeable about COVID-19 and sensitizes them to methods of prevention and personal protection. Progress testing in Saudi University students has shown a gain in clinical knowledge in the senior years of medical schools.[36] Besides the students of year 4 and 5 have ophthalmology clinical rotations and year 5 students are expected to have knowledge of ocular involvement in systemic diseases and infections in their curriculum. All these could explain the higher knowledge scores in clinical years.

Analysis of the attitude part of the questionnaire showed that only 23% students felt that COVID should be considered in any patient presenting with ocular irritation, watering, redness and photophobia during these times. Conjunctivitis is reported to be the commonest ocular manifestations of COVID-19 and there are even reports of keratoconjunctivitis in COVID-19 infection.[37-41] This is one aspect which need more awareness. Similar to other studies, most of the students opined that wearing a mask was an effective measure to prevent spread of COVID-19.[19-21] Majority of the students mentioned that face shield and goggles should be used when examining a patient with red eye. This is in concurrence with the guidelines of the American Academy of Ophthalmology which recommends the use of eye protection like masks and face shields/goggles during ophthalmological examination.[42] 87.2% participants strongly agreed/agreed that hand hygiene is important to prevent spread of COVID-19 including eye involvement and 64.4% students said that COVID 19 patients should be discouraged from touching the eyes to avoid eye involvement. Conjunctivitis has been reported to be seen more often in COVID patients with history of hand eye contact.[37] Thus, hand hygiene and frequent handwashing could represent one method to reduce the occurrence of COVID related conjunctivitis and the students seem to be well aware of the same.

Regarding the practices part of the survey, majority of the participants said that they would use mask, protective face shield and goggles and practice hand hygiene during the ophthalmology rotation. More than 90% of medical students used mask and practiced hand hygiene in studies from India and Pakistan, and the results of this study parallel the same. A large number of students said that they would consult an ophthalmologist if they developed eye irritation, watering, redness or photophobia in these times. This suggests that they would probably avoid self-medication in COVID times.

The most common source of information for the medical students was social media and internet. This was similar to researches among the general population and among nursing students in Saudi Arabia.[32,43] Social media was also found to be the most common source of information for medical students in other countries like India, Jordan, Turkey, Pakistan etc.[16-21,31] A study among Pakistani medical students assessing the level of knowledge of COVID-19 symptoms noted that students erred in questions about symptoms which were not mentioned in social media and internet.[21] Although the social media represents an easily accessible source of information, unsafe social media content may be detrimental.[44] Al Suraihi et al suggests that authentic social media pages can supply medical students with reliable information.[45] The social media has been found to have a significant impact in affecting the public perception during the COVID-19 pandemic and studies found a significant correlation between social media and spreading panic about COVID-19 in Saudi Arabia and in another location.[46,47] Medical students should be aware of the risks associated with social media and familiarize themselves with trustworthy platforms to ensure access to accurate and reliable information.[48] Supplementing knowledge obtained from the social media channels with traditional sources of information like indexed journals could go a long way in helping a medical student be up to date with the latest medical information. Students in the present study also felt that conducting more seminars and workshops about the ocular manifestations of COVID-19 could help increase knowledge and awareness about the same.

5. CONCLUSION

The COVID-19 pandemic represents a huge public health challenge and medical students are thought to play a vital role in the war against the virus by serving as health educators, volunteers and even as clinical assistants. In this study, the knowledge about the general aspects of COVID-19 was satisfactory, but knowledge about some ophthalmological aspects was deficient. However, the students had adequate knowledge about COVID prevention and personal protective measures against the same and majority of the students in the clinical years were following the same. Social media and the internet were the commonest sources of information about COVID-19. Considering the comparatively lower level of knowledge among the preclinical years and the public health importance of COVID-19, it is suggested to include knowledge of COVID-19 in the curriculum of the preclinical years. This could be supplemented by seminars and training programmes. Judicious use of the internet bolstered by information from traditional sources like indexed journals could also help in improving knowledge and inculcating positive attitudes and practices among the medical students, thus making them effective warriors in the war against the SARS CoV2 virus.

ETHICAL APPROVAL

THE STUDY WAS APPROVED BY THE IRB COMMITTEE AT KING FAISAL UNIVERSITY, AL AHSA. ALL PARTICIPANTS WERE VOLUNTEERS AND ASKED TO DO THEIR BEST. ALL DATA WERE KEPT CONFIDENTIAL AND USED ONLY FOR RESEARCH PURPOSES.

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