

The Prevalence And Risk Factors Of COVID-19 Among Taibah University's Medical Students And Their Families

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Abstract

Background: The incidence rate of COVID-19 infection among medical students may vary owing to diverse factors such as increased opportunities for contact, their medical background, and their behavior during the pandemic, which may reflect the incidence in their families.

Methods: a retrospective cohort study comparing medical and non-medical students (244 for each group).

Results: The incidence of COVID-19 in medical students was 20.5%, and 41% of the medical students surveyed reported one or more COVID-19 infections in their families, compared to 23.8% and 45.9% of non-medical students, and their families, respectively. 4.7% of medical students had severe symptoms compared to non-medical (8.2%). Regarding the risk factors for infection, there were no significant differences between any of the groups except in PPE use. Medical students and their families had a shorter duration of illness.

Conclusion: COVID-19 infection in medical students is most often transmitted by a family member. Medical students and their families are not more likely than others to contract COVID-19 infection, but they may have fewer symptoms, a shorter duration of illness, and less need for hospitalization.

Keywords: COVID-19, medical students, risk factors

Introduction

The spread of coronavirus disease of 2019 (COVID-19) has sent shock waves throughout the world, generating uncertainty, fear, and questions about medical students' role, safety, and well-being.^[1] Given that they are considered frontline healthcare workers who are studying and training in hospitals and medical schools, which are classified as densely populated sites with a high risk of coronavirus outbreaks, they are at great risk of infection by the virus.^[2] Moreover, the morbidity and mortality associated with this pandemic is variable across locations and populations.^[3-5] Few prior studies have evaluated COVID-19 prevalence and risk factors among Saudi medical students during the COVID-19 pandemic.^[6] According to previous studies, more than 80% of medical students consider regular hand washing, paying more attention to personal hygiene, and staying at home as the three most often employed strategies that help to reduce the incidence of COVID-19.^[7-9] The amount of exposure to risk factors of COVID-19 among medical students has not been well studied. Theoretically, medical students have an advantage over the general

population, as they are aware of infection control protocols and trained to minimize the transmission of illnesses directly to their families^[10] or indirectly through the propagation of knowledge in their houses;^[7] however, infections still occur in medical students. Our research question deals with the incidence and risk factors of COVID-19 among medical students.

Aim of the work: This study aimed to determine the prevalence and risk factors of COVID-19 among medical students at Taibah University and their families.

Subjects and methods

This study was conducted following the approval of the scientific research ethics committee at Taibah University, Saudi Arabia (IORG0008716-IRB00010413, study ID: STU-20-017, date of decision: 3/3/2021). We conducted a retrospective cohort study comparing medical and non-medical students (as a control group) in terms of the incidence and risk factors of COVID-19 infection. Our study population comprised medical (244 students), and non-medical students (244 students) in the male and female sections of Taibah University who were registered at the university in the same academic year and accepted to share in the study. We included all students registered in our college of medicine in the year 2021 who agreed to participate in our study and a comparable number of non-medical students in Taibah University. We excluded students with brothers or sisters who participated in the same study (to avoid duplication of the results, which would affect the analysis), thus we included only one member from each family.

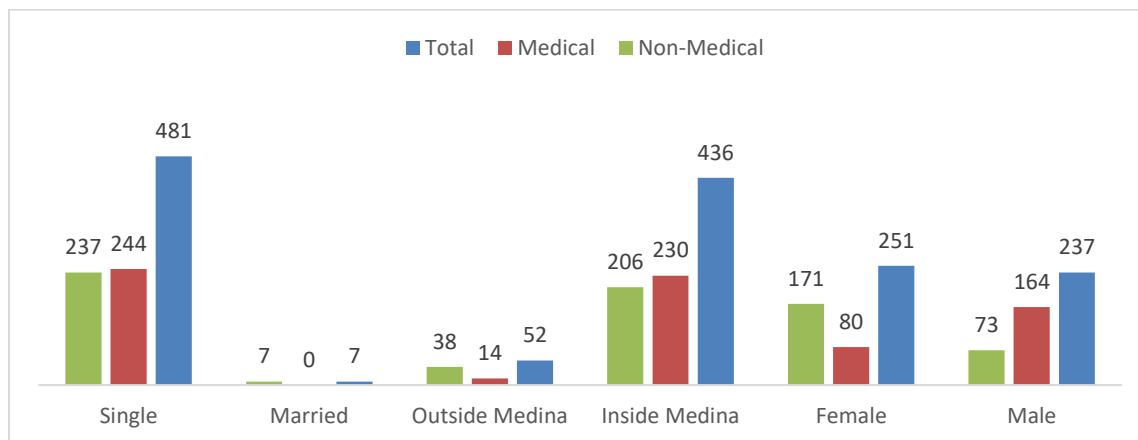
A case was considered positive for COVID-19 only if the student had a documented positive nasopharyngeal or oropharyngeal swab. A questionnaire was used to collect personal, social, and medical data, including possible risk factors for the students and their families. The questionnaire was subjected to a pilot study to measure its reliability and validity. Then, it was introduced to our entire subjects through their official emails in the period between 4/3/2021 and 30/6/2021. The data were processed using SPSS Statistics version 20 (IBM Corp., Armonk, NY, USA).

The relative risks were calculated by comparison between the positive and negative cases in the two groups. Quantitative data were expressed, as appropriate, as median or mean \pm standard deviation (SD). The results for all categorical variables were expressed in the form of a percentage (%). The suitable significant tests were used to calculate the p-value.

Results

The study included 244 medical students, 164 (67.2%) males, and 80 (32.8%) females, while the non-medical students comprised 73 males (29.9%) and 171 (70.1%) females. All the students in the two groups were aged 18–26 years, most of them (94.3% of medical students and 84.4% of non-medical students) lived in Medina city, and all the medical and 98.6% of the non-medical students were unmarried (**Figure 1**).

Figure 1: Participants' demographic data



The incidence of COVID-19 infection was 20.5% among medical students and 41% among their families, compared to 23.8% and 45.9% in non-medical students and their families, respectively (Table 1).

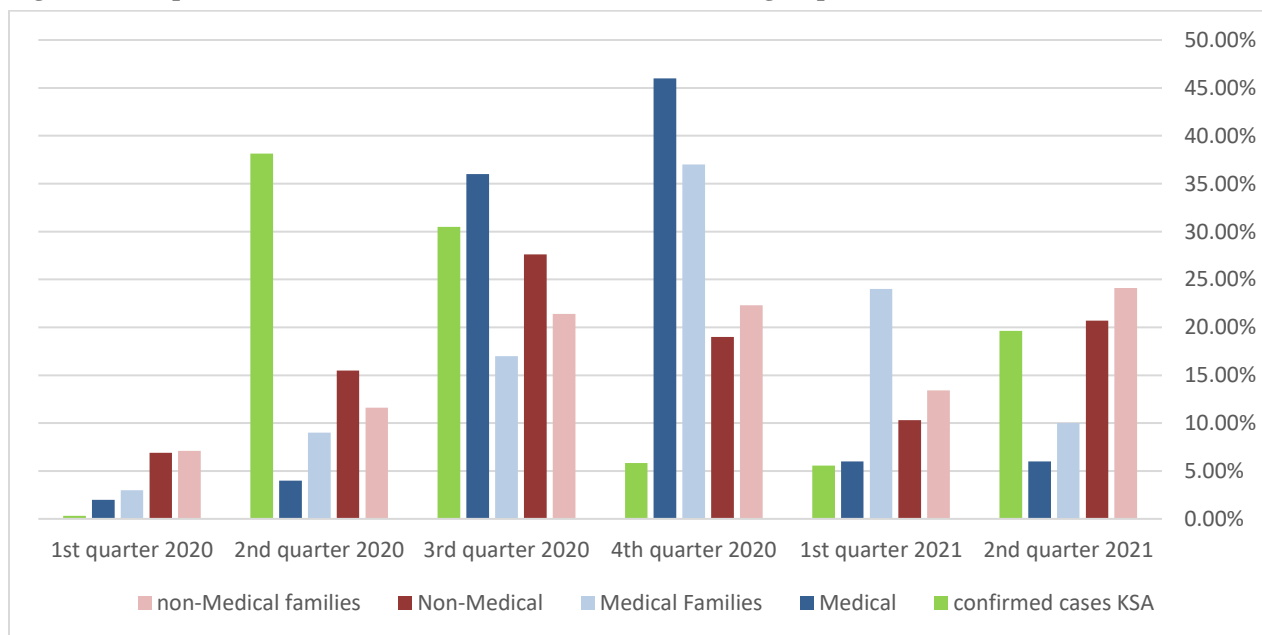
Table 1: Incidence of infection in medical and non-medical students and their families.

		Student questions				Family member questions			
		Specialization		Chi ²	P-value	Specialization		Chi ²	P-value
		Medical	Non-medical			Medical	Non-medical		
		Occurrence of infection				Infection of a family member			
Infected	N	50	58	.761	.383//	100	112	1.20	.273//
	%	20.5%	23.8%			41.0%	45.9%		
Not infected	N	194	186						
	%	79.5%	76.2%			59.0%	54.1%		

*Statistically significant at 0.05 **highly significant at 0.01 \\ Not statistically significant

Regarding the time of infection, medical students recorded their highest rate of infection (46.0%) in the 4th quarter of 2020, followed by the 3rd quarter of 2020 (36.0%), while the infection rate among non-medical students increased in the 3rd quarter of 2020 (27.6%), followed by another surge in the 2nd quarter of 2021 (20.7%). Family members of medical students recorded the highest infection rates in the 4th quarter of 2020 (37.0%), followed by the 1st quarter of 2021 (37.1%), while the infection rate among family members of non-medical students increased in the 2nd quarter of 2021 (24.1%), which constituted the 2nd highest increase in the number of cases among non-medical students, followed by the 4th quarter of 2020 (22.3%), as shown in Figure 2.

Figure 2: Temporal distribution of the incidence of infection in all groups.



Regarding knowledge of the source of infection in positive cases, there were no significant differences between medical and non-medical students who reported that they knew the source of infection (62% and 74.1%, respectively), but the difference between their families was statistically significant. Among family members of non-medical students, 71.4% knew the source of infection, compared to 56.0% of family members of medical students. At the same time, 71.0% of medical students and 79.1% of non-medical students considered the source of infection to be a family member living in the same residence, and the difference was not statistically significant; however, this figure was

66.1% and 46.3% of family members of medical and non-medical students, respectively, constituting a significant difference (Table 2).

Table 2: Comparison between infected medical and non-medical students and their family members regarding knowledge of the source of COVID-19 infection.

		Student questions				Family member questions			
		Specialization		Chi ²	P-value	Specialization		Chi ²	P-value
		Medical	Non-medical			Medical	Non-medical		
Infection source knowledge									
Known	N	31	43	1.83	.176//	56	80	5.47	.019*
	%	62.0%	74.1%			56.0%	71.4%		
Unknown	N	19	15			44	32		
	%	38.0%	25.9%			44.0%	28.6%		
If known, the source was:									
Family member	N	22	34	1.567	.457//	37	37	6.79	.034*
	%	71.0%	79.1%			66.1%	46.3%		
Friend	N	5	3			11	17		
	%	16.1%	7.0%			19.6%	21.3%		
stranger	N	4	6	8	26				
	%	12.9%	14.0%	14.3%	32.5%				

*Statistically significant at 0.05 **highly significant at 0.01 // Not statistically significant

In Table 3 medical students had a significantly higher frequency of exposure to COVID-19 positive patients than non-medical students (67.2% compared to 39.3%, respectively). In addition, medical students had a significantly higher number of contact events than non-medical students.

Table 3: Comparison of contact status between medical students and non-medical students.

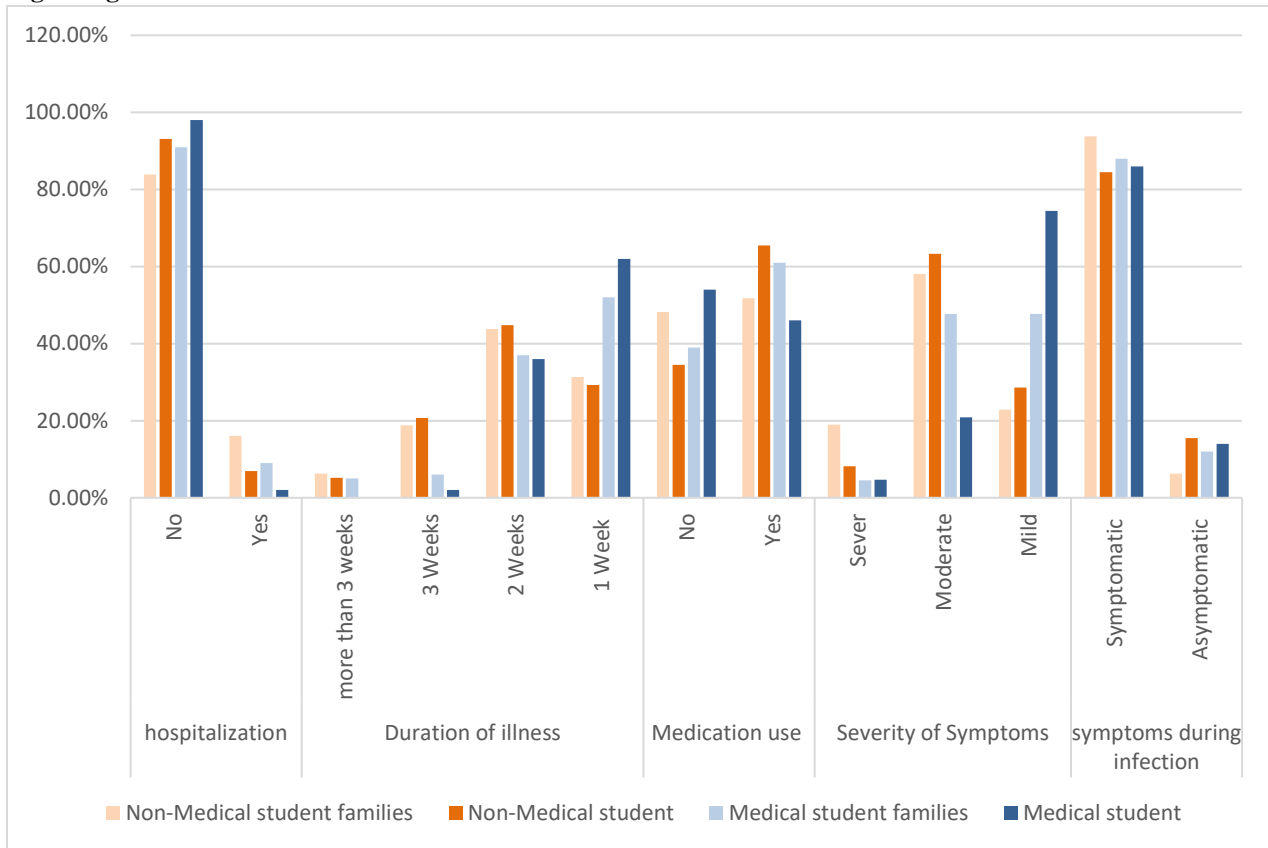
Contact and exposure			Specialization		Chi ²	P-value
			Medical	Non-medical		
History of contact	Yes	N	164	96	38.07	.000**
		%	67.2%	39.3%		
	No	N	80	148		
		%	32.8%	60.7%		
Number contacts	1	N	49	44	13.66	.034*
		%	29.9%	45.8%		
	2	N	48	21		
		%	29.3%	21.9%		
	3	N	29	16		
		%	17.7%	16.7%		
	4	N	10	0		
		%	6.1%	0.0%		

	5	N	10	3		
		%	6.1%	3.1%		
	6	N	1	2		
		%	0.6%	2.1%		
	more than 6	N	17	10		
		%	10.4%	10.4%		

*Statistically significant at 0.05 **highly significant at 0.01 \ Not statistically significant

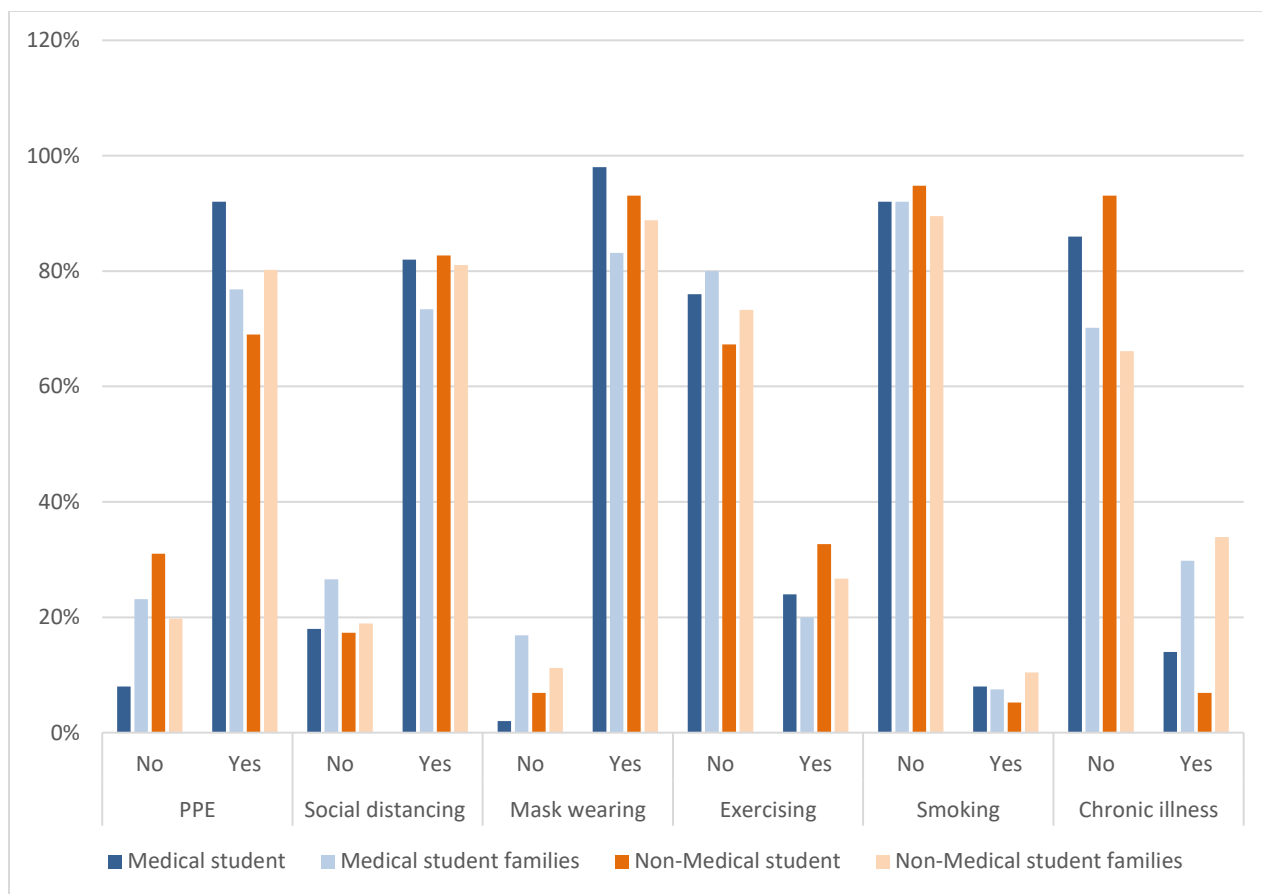
Regarding the disease course, **Figure 3** shows that there was a statistically significant difference regarding the severity of symptoms in the four groups, as 74.4% of medical students reported milder symptoms, while 63.3% of non-medical students had moderate symptoms. Among the family members of medical students, the majority had mild symptoms (47.7%), while most family members of non-medical students had moderate symptoms (58.1%). There was also a statistically significant difference regarding the use of medication during the infection: 54.0% of medical students did not take any medication, while (65.5%) of non-medical students used medications. Likewise, most family members of medical students did not use any medications (61.0%), compared to 51.8% of family members of non-medical students. **Figure 3** also shows a highly significant difference in the infection duration between the four groups, as medical students and their families, in general, had a relatively shorter duration of illness, with 62.0% of medical students recovering within 1 week and only 2.0% of cases lasting 3 weeks or more, while the majority (52.0%) of their family members recovered within 1 week, and 37.0% recovered in the second week. The majority (44.8%) of non-medical students recovered within 2 weeks, and 25.9% of all cases lasted 3 weeks or more. Nevertheless, 43.8% of family members of non-medical students had an illness lasting 2 weeks, 31.3% recovered in less than a week, and 25.1% of all cases lasted 3 weeks or more, in comparison to 11% of medical students' family members. Finally, there was no statistically significant difference between medical and non-medical students and their families regarding hospitalization, but generally, non-medical students and their families had a higher rate of hospitalization.

Figure 3: Comparison between infected medical and non-medical students and their family members regarding the course of COVID-19 infection.



In **Figure 4** there were no significant differences between any of the groups except in PPE use between medical and non-medical students and in mask wearing among participants' families: 92% of medical students were using PPE compared to 69% of non-medical students, and the difference was statistically significant. Most people in all groups were committed to social distancing, the least committed being family members of medical students (73%), although the difference was not significant. As for mask-wearing, family members of non-medical students were more adherent to the use of masks, with only 11.2% reporting not using masks, compared to 17% of medical students' family members. Regarding exercise, the majority of people in all groups reported that they did not exercise routinely or at all, and the highest proportion of non-medical students reported exercising: 32.7% compared to 24% of medical students. There were no significant differences between any of the groups regarding smoking, with the majority of people in all groups reporting that they did not smoke. The same applied to all groups regarding chronic illness.

Figure 4: Comparison between infected subjects regarding protective measures, particular social habits, and the presence of chronic illness.



Discussion

The sample population of this study included 488 participants, 244 of whom were Taibah University medical students. The study aimed to determine if the pattern of COVID-19 infection in medical students at Taibah University and their families differed from that in non-medical students and their families, regarding the incidence, symptoms, course of infection, risk factors, and the role of preventive measures.

Medical students are at a greater risk of contracting COVID-19 infection than the general population because they are frontline healthcare workers who are studying and training in hospitals and medical schools, which are classified as densely populated sites with a high risk of COVID-19 outbreaks.^[2] To compensate for this high risk, medical students are trained in infection control to prevent/minimize the transmission of diseases from patient to patient or from patients to themselves, and we hypothesized that medical students would be less likely than the general population to be infected with COVID-19 and that this decrease in risk would be linked to their medical background and infection control training. The first question we asked was, “Do medical students get more or fewer infections than their non-medical counterparts?” The second question was, “Is their medical background reflected in the incidence of COVID-19 in their families?”

We estimated the incidence of COVID-19 in medical students during a 15-month period (January 2020–March 2021) to be 20.5%, and 41% of medical students reported one or more COVID-19 infections among their family members. This is compared to 23.8% and 45.9% of non-medical students and their families, respectively. Although our medical students and their families had a numerically lower incidence, this was statistically insignificant, and no conclusions can be drawn from it. Our study showed that, although medical students have more contact with positive cases, they had low incidence of COVID-19 compared to non-medical students. This might indicate that the medical background and infection control training that medical students receive gives them an advantage over non-medical students, given

that they are exposed to positive cases on a daily or weekly basis with comparable infection rates; nevertheless, frequent exposure to the infection may build up their immune system against the disease, which may also be reflected in the severity of symptoms, as we noticed in this study, where the medical students had significantly lower symptom severity and used fewer medications than non-medical students; however, the perception of symptoms and the medical background may be the main factors in these differences. Not surprisingly, the number of positive cases in non-medical students and their families followed the same trajectory as that in the Kingdom of Saudi Arabia,^[11] while peak infection rates in medical students and their families occurred in the 4th quarter of 2020, which may be justified by the nature of their training environment in hospitals. It should be noted that during the 1st quarter of 2021, there was a noticeable decrease in the number of cases across all four groups.

According to the participants, the source of infection in both groups was someone inside their home and not a hospital patient with a confirmed infection, as we expected for medical students and their colleagues in the study rooms. However, that is consistent with the mode of transmission of COVID-19,^[12] which can be transmitted from symptomatic and asymptomatic patients to persons in close contact with them, as stated by other studies.^[13,14] In the context of our eastern society, where most households comprise a relatively large number of individuals combined with particular social habits that are not in line with aerosol prevention measures, there is a general laxity in following preventive measures, which might explain why most of our participants stated that they may have contracted the illness from someone inside their home. This is also an explanation for the higher incidence in large families than in small ones. Based on the participants' responses, our data regarding the use of protective equipment indicated that medical students on average had higher adherence, which did not translate to their families, and that non-medical student's families were more compliant with the use of protective equipment. Regarding social distancing, we found that medical students were slightly more compliant, and non-medical students' families had higher compliance to social distancing; however, any differences in the data we gathered on maintaining social distance and the use of protective equipment remained statistically insignificant. By contrast, the results showed that family members of non-medical students wear masks significantly more than those of medical students. The data, however, show no significant difference between medical and non-medical students regarding mask use. These results may reflect the fact that knowledge about the prevention of COVID-19 was disseminated all over the world due to the pandemic and was not exclusive to medical students and their families.

Our data show that having a chronic illness or taking medication, was not a risk factor for contracting COVID-19 in students, in contrast to other studies and WHO recommendations for COVID-19, which stated that chronic illnesses are both risk and poor prognostic factors for COVID-19.^[15] This is maybe explained by the demographics of our study sample, which included university students with ages ranging from 18 to 24 years, an age category in which the incidence of chronic illnesses is low and may thus have been underestimated in our work. We also found that participation in sports and exercising had no relation to the incidence of COVID-19 in our sample. Our results regarding smoking showed no association between smoking and COVID-19 infection, contrary to the evidence provided by previous studies stating that smoking increases the risk of respiratory tract infections due to impaired respiratory tract immunity by several mechanisms.^[16] Out of all 488 student participants, 37 (7.58%) individuals were smokers, and only 7 of those individuals became infected with COVID-19. The lack of significance in these results could be due to the low number of participants and low number of smoking individuals within the sample.

Regarding other factors that might affect the susceptibility to acquiring COVID-19 infection, we found that medical students averaged significantly more hours of sleep per day. This behavior causes medical students to stay in their homes more and interact less with the community. Other studies that measured medical students' knowledge and behaviors during the pandemic revealed that most medical students followed many strategies to protect themselves from being infected with COVID-19, one of which was staying in their homes.^[7-9]

Limitations

Unfortunately, there were no studies similar to ours, either locally or internationally, with which to compare our results, and most studies concentrated on the behaviors, attitudes, and knowledge of medical students. We considered

gathering data from students through face-to-face interviews to increase the study's validity, but it was not possible due to our limited time window and the unavailability of the students. So, in appreciation of the participants and our limited time, we provided them with online questionnaires, and to make the results more reliable, we also provided them with written instructions.

Conclusion

The prevalence of COVID-19 in Taibah medical students is comparable to the prevalence of non-medical students. The peak incidence of infection in medical students and their families occurred in the fourth quarter of 2020, compared to non-medical students who had an earlier peak in the third quarter of 2020. COVID-19 infection in medical students is mostly transmitted by a family member inside the home. Medical students significantly have more contact with positive cases, and significantly use protective measures more than non-medical students. Medical students and their families are not more likely than other students and their families to contract COVID-19, but they may have fewer symptoms, a shorter duration of illness, and less need for hospitalization.

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