

2019 Novel Coronavirus Vaccination Among Medical Students

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Abstract

COVID-19 vaccination of medical students is essential since these students will have contact with patients and will become future healthcare leaders. Hence, we surveyed medical students at Texas Tech University Health Science Center in Lubbock, TX, and received 234 responses. The majority of students were vaccinated against COVID-19 (215/234; 91.8%) and reported pro-vaccine attitudes, such as support for a COVID-19 booster shot (191/234; 81.6%) and an annual COVID-19 vaccine (186/234; 79.5%). Among those who did not receive the COVID-19 vaccine, the most frequent reasons included waiting for more evidence (16/19; 84.2%) and concern about the side effects (15/19; 79.0%). These results indicate that medical students consider vaccination important and suggest that students can provide an important resource for patients and public education.

Keywords

COVID-19, SARS-CoV-2, vaccination, medical students

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Introduction

The COVID-19 pandemic has generated important discussion about the need for vaccination, especially among healthcare professionals. Indeed, it is argued that healthcare professionals have the responsibility to both protect patients and set an example to the community by being vaccinated against SARS-CoV-2. However, vaccine hesitancy and skepticism among these professionals exist, suggesting a variety of views on vaccination which can send a mixed message to patients and the public. Several studies have examined vaccination rates and attitudes among healthcare workers,^{1–3} revealing a spectrum of vaccine acceptance, with 1 study in early 2021 finding hesitancy as high as 56%.⁴ Reasons for hesitancy in this group range from concern about safety and effectiveness to support of COVID-19 conspiracy theories.⁵

Medical students are also an important group in this discussion, as students both interact with patients and will become future healthcare leaders. Furthermore, attitudes during training may reflect the effectiveness of medical education about vaccines and may influence attitudes that these students will carry into medical practice. Students also serve as important sources of medical information for family and friends. Medical students represent a unique group that is both well-educated but not fully trained, thus creating a

bridge between fully-trained medical professionals and educated but non-medical laypersons. Furthermore, students have undoubtedly experienced the effects of the COVID-19 pandemic due to alterations in medical education.^{6,7} However, studies on medical students' attitudes toward vaccination are limited, with few measuring actual vaccination rates. This study intends to determine both the COVID-19 vaccination rate among medical students and their attitudes toward vaccination and reasons for vaccine hesitancy.

Methods

We conducted an anonymous online survey of medical students that was open from 13 July 2021 to 3 August 2021 using email distribution lists for all medical school classes at the Texas Tech University Health Sciences Center in Lubbock, TX, after getting approval from the Institutional Review Board (L21-088). An initial invitation email, as

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well as 2 reminder emails at 1-week intervals, were sent to potential participants via a university administrator. Students were offered a chance to be randomly selected for a \$20 gift card as an incentive. The distributed information was confidential and participants were permitted to terminate their participation at any time. Kobotoolbox (<https://www.kobotoolbox.org/>) and Excel were used to collect and analyze survey data. Class size was based on the standard class size (180) set by the university. Bivariate analysis was conducted to analyze the difference between those who got vaccinated and those who did not. A chi-squared test was used for categorical variables. It was considered significant if the *P*-value was $<.05$.

Results

A total of 234 students out of 720 of medical students responded to the survey (Table 1). The majority of students (215/234; 91.9%) received the vaccine. Most vaccinated students experienced side-effects (130/215; 60.4%); the most common were relatively minor side-effects, including injection site pain (161/215; 74.9%), fatigue (142/215; 66.0%), fever/chills (130/215; 60.5%), and muscle aches (120/215; 55.8%). A majority of students had also been tested for COVID-19 (162/234; 69.2%) and 19.1% (31/162) of these students tested positive. Of note, 4 students tested positive for COVID-19 but did not receive the vaccine. Finally, there were no significant differences between the 2 groups regarding gender, medical student class, age, and the source of COVID-19 information (Table 3).

Attitudes and behaviors regarding COVID-19 and other vaccinations were generally supportive. The majority also had received childhood immunizations (233/234; 99.58%), supported vaccination against other illnesses (229/234; 97.9%), would recommend the COVID-19 vaccine to a family or friend (211/234; 90.2%), believed in the need for COVID-19 vaccination (209/234; 89.3%), supported a COVID-19 booster shot (191/234; 81.6%), and would receive an annual COVID-19 vaccine (186/234; 79.5%) (Table 2). Less support was reported for vaccine mandates for healthcare workers (153/234; 65.4%) and medical students (146/234; 62.4%). Of those who were not vaccinated, the most common reasons included waiting for more evidence (16/19; 84.2%), concerns about side-effects (15/19; 79.0%), felt vaccines were insufficiently studied (15/19; 79.0%), mistrust in public health information (11/19; 57.9%), low self-risk assessment for COVID-19 infection (10/19; 52.6%), and no requirement for vaccination (7/19; 36.8%) (Table 2). The majority of respondents received information about COVID-19 vaccination from professional sources, including public health websites (202/234; 86.3%), medical professionals (180/234; 76.9%), medical school professors/faculty (137/234; 58.6%), and medical/academic journals (118/234; 50.4%).

Significant differences were noted between vaccinated and unvaccinated students in belief about receiving other vaccines, prior testing for COVID-19 infection, and prior testing for COVID-19 antibodies (Table 3).

Discussion

Vaccination rates in medical students present concerns both for both patients and public safety and may reflect the attitudes of future physicians. Most students in this survey received the COVID-19 vaccine and expressed support of COVID-19 vaccination and vaccination generally. Interestingly, far fewer students expressed support for vaccine mandates than were vaccinated (65.4% and 62.4% vs 95.1%), suggesting that support for mandates and willingness to personally vaccinate may not always be linked. Similarly, Janssen et al⁸ noted that among healthcare workers who were willing to be vaccinated, only 60% supported mandatory vaccinations. Next, only 1 student in this survey had not received any childhood vaccines, suggesting that the vast majority of students, including those who chose not to vaccinate, did not come from families that were opposed to vaccination. Reasons for not vaccinating centered around concerns of safety/credibility, mistrust in public information, and not feeling at risk for COVID-19. This is similar to prior studies of medical students, in which concerns about safety and side-effects were often the most frequent reasons for vaccine hesitancy.⁹⁻¹¹ Some students expressed uncertainty regarding vaccination questions, including the need to receive the COVID-19 vaccine (5.6%), the need for annual (14.5%) and booster (12.8%) COVID-19 vaccinations, mandates for healthcare workers/medical students (19.7% and 20.9%, respectively), and recommendations to family members (6.0%). Of those who did not vaccinate, 36.84% stated that they would consider vaccinating in the future, and 26.3% were unsure. This suggests that many students who did not have strictly “pro-vaccine” attitudes or behavior likely demonstrate vaccine hesitancy rather than outright opposition. Furthermore, it is possible that additional training, information, and clinical exposure will motivate those who are uncertain about vaccination to have more “pro-vaccine” attitudes and behaviors. For example, there was 1 instance of a student who had not received childhood vaccinations who received the COVID-19 vaccine, suggesting that family attitudes about or childhood exposure to vaccines do not necessarily predict future vaccination behaviors. Finally, there was a significant difference between vaccinated and unvaccinated groups regarding COVID-19 testing, suggesting that those who are vaccinated are more likely to have been tested for COVID-19. This may be due to increased adherence to public health guidelines as well as concern for personal safety or the safety of contacts such as family, friends, and patients.

Table 1. Demographics of Survey Respondents.

Variable	Category	Number	Percentage
1. Age	<25	154	65.81
	25-30	74	31.62
	30-40	5	2.14
	>40	1	0.42
2. Gender	Male	86	36.75
	Female	147	62.82
	Prefer not to disclose	1	0.42
3. Medical student class	MS1	89	38.03
	MS2	67	28.63
	MS3	36	15.38
	MS4	42	17.94
4. Did you get the COVID-19 vaccine?	Yes	215	91.88
	No	19	8.12
5. If you received the COVID-19 vaccine, which one did you receive?	Pfizer	58	26.98
	Moderna	148	68.84
	Johnson & Johnson	9	4.18
6. If you received the Moderna or Pfizer COVID-19 vaccine, did you receive the second dose?	Yes	204	99.03
	No	2	0.97
7. If you received the COVID-19 vaccine, did you have any side effects?	Yes	195	90.69
	No	20	9.3
8. If you had side effects from the COVID-19 vaccine, which side effects did you have? (Select all that apply)	Fever/chills	130	60.47
	Injection site pain	161	74.88
	Injection site redness/swelling	40	18.6
	Fatigue	142	66.04
	Headache	89	41.39
	Muscle aches	120	55.81
	Anaphylaxis	0	0
	Palpitations	5	2.32
	Blood clots	0	0
9. Have you ever been tested for COVID-19?	Yes	162	69.23
	No	72	30.77
10. If you have been tested for COVID-19, have you ever tested positive for COVID-19?	Yes	31	19.14
	No	131	80.86
11. If you tested positive for COVID-19, when did you test positive? (Select all that apply)	Before the first dose of COVID-19 vaccine	25	80.65
	Between the first and second dose of COVID-19 vaccine (Moderna and Pfizer)	2	6.45
	After the first dose (Johnson & Johnson)	0	0
	After the second dose of vaccine (Moderna and Pfizer)	0	0
	Tested positive and did not receive vaccine	4	12.9
12. Have you ever been tested for COVID-19 antibodies?	Yes	36	15.38
	No	198	84.62
13. If you have been tested for COVID-19 antibodies, when did you test positive?	Before the first dose of COVID-19 vaccine	6	16.67
	Between the first and second dose of COVID -19 vaccine (Moderna and Pfizer)	3	8.33
	After the first dose (Johnson & Johnson)	1	2.78
	After the second dose of vaccine (Moderna and Pfizer)	11	30.56
	Tested positive and did not receive vaccine	2	5.56

Table 2. Attitudes Regarding Vaccination.

Variable	Category	Number	Percentage
1. Do you believe in the need to get vaccinated for COVID-19?	Yes	209	89.32
	No	12	5.13
	Unsure	13	5.55
2. Do you believe in the need to be vaccinated against other diseases (eg, hepatitis B, measles, mumps, etc.)?	Yes	229	97.86
	No	2	0.85
	Unsure	3	1.28
3. Did you receive any childhood vaccinations?	Yes, all of them	224	95.73
	Yes, some of them	9	3.85
	No	1	0.42
	Unsure	0	0
4. Did you receive an influenza vaccine (“flu shot”) last year?	Yes	207	88.46
	No	23	9.83
	Unsure	4	1.71
5. If you chose not to get the COVID-19 vaccine, please indicate why (select all that apply)	Concerned about side-effects	15	78.95
	Don't believe vaccine is effective	5	26.31
	Don't believe COVID-19 is a health risk	6	31.58
	Don't trust public health information regarding COVID-19/vaccinations	11	57.89
	Vaccines weren't studied enough	15	78.95
	Had a friend/relative who had a serious reaction to the vaccine	5	26.31
	Believe that natural infection/immunity is better	5	26.31
	Do not feel at risk for COVID-19 infection	10	52.63
	Believe that diet/alternative medicine is better prevention for COVID-19	5	26.31
	Believe that herd immunity is preferable to mass vaccination	2	10.53
	Believe that masks/social distancing/hygiene are better prevention	0	0
	Had side-effects from previous vaccines (non-COVID-19)	3	15.79
	Had a friend/relative who had a serious reaction to a vaccine (not COVID-19)	1	5.26
	Concerned vaccination would interrupt daily schedule	3	15.79
	Vaccine not available/too expensive	0	0
	Waiting until more evidence about the vaccine is available	16	84.21
	6. If you have not had the COVID-19 vaccine, are you considering getting the COVID-19 vaccine in the future?	Already had COVID-19 infection	4
Not required to be vaccinated		7	36.84
Other		4	21.05
7. If a COVID-19 “booster” shot was available in the future, would you plan to get it?	Yes	7	36.84
	No	7	36.84
	Unsure	5	26.32
8. If an annual COVID-19 vaccine became available (similar to the annual influenza vaccine), would you plan to get it?	Yes	191	81.62
	No	13	5.56
	Unsure	30	12.82
8. If an annual COVID-19 vaccine became available (similar to the annual influenza vaccine), would you plan to get it?	Yes	186	79.49
	No	14	5.98
	Unsure	34	14.53

(continued)

Table 2. (continued)

Variable	Category	Number	Percentage
9. Where do you receive information about COVID-19 vaccines? (Select all that apply)	Public health websites (eg, CDC)	202	86.32
	News media	121	51.71
	Social media	88	37.61
	Podcasts/radio talk shows	35	14.96
	Medical professionals	180	76.92
	Medical/academic journals	118	50.42
	Medical school professors/faculty	137	58.55
	YouTube	30	12.82
	Blogs	9	3.85
	Friends/family	74	31.62
10. Do you believe that vaccines should be mandated for healthcare workers?	Yes	153	65.38
	No	35	14.96
	Unsure	46	19.66
11. Do you believe that vaccines should be mandated for medical students?	Yes	146	62.39
	No	39	16.67
	Unsure	49	20.94
12. Do you believe that social distancing and/or masks are effective at preventing the spread of COVID-19?	Yes	189	80.77
	No	18	7.69
	Unsure	27	11.54
13. Would you recommend getting the COVID-19 vaccine to a family member/friend?	Yes	211	90.17
	No	9	3.85
	Unsure	14	5.98

Table 3. Bivariate Analysis of Demographics and Vaccination Attitudes.

	Received COVID-19 vaccine	Did not received COVID-19 vaccine	P-Value
Age			
<20	1	0	.748
20-25	138	15	
25-30	70	4	
30-40	5	0	
>40	1	0	
Gender			
Male	82	4	.312
Female	132	15	
Prefer not to disclose	1	0	
Medical school class			
MS1	79	10	.335
MS2	61	6	
MS3	34	2	
MS4	41	1	
Have you ever been tested for COVID-19?			
Yes	153	9	.031*
No	62	10	
Have you ever been tested for COVID-19 antibodies?			
Yes	30	6	.041*
No	185	13	

(continued)

Table 3. (continued)

	Received COVID-19 vaccine	Did not received COVID-19 vaccine	P-Value
Do you believe in the need to be vaccinated against other diseases (eg, hepatitis B, measles, mumps, etc.)?			
Yes	214	15	<.001*
No	1	1	
Unsure	0	3	
Did you receive any childhood vaccinations?			
Yes, all of them	208	16	.018*
Yes, some of them	6	3	
No	1	0	
Where do you receive information about COVID-19 vaccines? (Select all that apply)			
Public health websites (eg, CDC)	186	16	.055
News media	111	10	
Social media	80	8	
Podcasts/radio talk shows	29	6	
Medical professionals	164	16	
Medical/academic journals	104	14	
Medical school professors/faculty	127	10	
YouTube	25	5	
Blogs	7	2	
Friends/family	64	10	
Other	5	4	

* $p < 0.05$.

The rates of vaccination in this survey are higher than those observed or predicted for medicals students at earlier points in the pandemic. For example, a survey of U.S. medical students by Lucia et al¹² before approval of the COVID-19 vaccine found that 23% were unwilling to receive the vaccine immediately after FDA approval. A study of Ugandan medical students noted similar rates of hesitancy in March 2021, soon after the availability of the Astra Zeneca vaccine in that country.¹¹ Furthermore, a study of students in India from February to March 2021 noted a 64.5% vaccination rate, with 27.9% of those who agreed to vaccination having yet to receive the vaccine.¹⁰ Higher rates observed in our study may be due to increased confidence in the vaccine over time, the training and educational environment, or differences in the type of vaccine available across countries. Of note, a similar study surveyed residents and fellows at the same institution and found similar rates of COVID-19 vaccination (77/81; 95.1%), which may reflect institutional or geographic attitudes about vaccination.¹ Finally, the majority of unvaccinated respondents (84.2%) were first and second-year students. This is consistent with Szmyd et al¹³ who observed increasing rates of vaccination and academic year were correlated, although also limited by a higher frequency of first and second-year respondents.

This study is limited by disproportionate rates of “pre-clinical” (first and second-year medical students) (66.7%) respondents, whose lack of clinical experience may have affected their willingness to be vaccinated. The study also

reflects a specific geographic region at a single university. Future studies should compare students at different universities and geographic regions to determine if differences exist. This study also reflects the attitudes of students several months after the present COVID-19 vaccines became available in the United States and may not be fully comparable to studies performed earlier in the pandemic. Finally, while many studies have examined healthcare worker attitudes and rates regarding COVID-19 vaccination, far fewer studies have examined medical students, meaning that additional studies will be needed to establish reliable trends and compare differences across groups and regions.

In summary, we found a high rate of vaccination among medical students at the surveyed institution. However, any degree of vaccine hesitancy in a group that is both well-educated and interacts with potentially vulnerable patient populations raises concerns. Vaccine hesitancy may also limit training opportunities for students and potentially indicates the attitudes students will have as future physicians and healthcare leaders. While people will understandably have concerns about vaccination, special emphasis may be needed to promote vaccination in this group. This and similar studies can help identify reasons for this hesitancy and allow administrators and educators to address them.

Declaration of Conflicting Interests


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