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COVID-19 Vaccine Acceptance and Hesitancy Among Dental and Medical Students

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Background:

As of January 2021, the COVID-19 pandemic has exacted a heavy toll in terms of the burden of disease and deaths worldwide. The United States (US) alone has experienced 24 million cases and over 400,000 deaths thus far.[1] It is an impressive feat of modern science that within a year of the SARS-CoV- 2 being recognized and sequenced, several COVID-19 vaccines are now available in many countries around the world. The urgency for vaccination is growing by the day with increasing numbers of cases and reports of the virus variants in the United Kingdom, Brazil, and South Africa that are spreading to other countries.

Although COVID-19 vaccines are still scarce, all frontline healthcare providers (HCPs) have been prioritized for vaccination in the US. Vaccination of HCPs will ensure an adequate workforce to deal with infected patients. The guidelines from the National Academies of Science, Engineering and Medicine (NASEM) have recommended vaccination of all frontline HCPs, including dentists and dental hygienists, in the first phase of the COVID-19 vaccine rollout.[2]

The primary aim of this study is to ascertain the attitudes, perceptions, and hesitancy of medical students (MS) and dental students (DS) to the COVID-19 vaccine. The information obtained will help identify potential concerns that need to be addressed to ensure adequate uptake amongst these groups and enable the development of educational programs to teach these students skills to provide vaccine recommendations and counsel vaccine hesitant patients. This paper also compares the

attitudes, perceptions, and hesitancy of these two populations of health professional students to the COVID-19 vaccine.

Methods

This study was approved by Oakland University and Nova Southeastern University Institutional Review Boards. The study was conducted at three dental schools in Michigan, Florida, and Utah and a single allopathic medical school in Michigan. All students at these schools were emailed a link to the online survey on qualtrics[XM]. MS completed the survey in September 2020 and DS completed the survey in November-December 2020. Informed consent was obtained at the beginning of the survey.

Survey items for the anonymous online assessment were developed based on past research involving attitudes and behaviors about vaccination[3-5] and included 4-point Likert scale (strongly disagree to strongly agree) and dichotomous (yes/no) items. The survey assessed (1) previous immunization behavior; (2) general attitudes and perceptions of vaccines; (3) current knowledge/interest about the COVID-19 vaccine; (4) perceived likelihood of COVID-19 infection; and (5) personal experience with illness caused by COVID-19. Demographic information was also collected such as gender, race/ethnicity, and year in the program. MS and DS in years 1 and 2 were designated as preclinical while MS and DS in years 3 and 4 were designated as clinical.

Data Analysis

The data analyses were performed in Epi Info™ Version 7.2.4.0. Likert scale items were recategorized as strongly agree/agree and strongly disagree/agree. Descriptive statistics included frequencies, percentages, and means to describe the distributions of responses to demographic and individual questions in the survey. Odds ratios with 95% confidence intervals and chi-square was used to identify statistically significant differences between DS and MS, students who would agree to take or disagree to take (accept or decline) the COVID-19 vaccine upon US Food and Drug Administration (FDA) approval. Variables that were statistically significant in the bivariate analyses were included in the multiple logistic regression models to identify predictors of willingness to take the COVID-19 vaccine and reporting COVID-19 vaccination should be mandatory for all HCPs. If variables were multicollinear, only one was included in the model. All authors reviewed free-text comments for emerging themes and patterns.

Results:

The surveys were sent out to 494 MS and 1481 DS, with a response rate of 34% and 18% respectively.

Demographically, DS and MS were similar in gender, but there were more underrepresented minorities (African American and Hispanic) in the DS group (21.3%, Hispanic: n=44, African American: n=8) compared to the MS group (7.36%, Hispanic: n=10, African American: n=2). Overall similarities and differences in attitudes, perceptions, and hesitancy to the COVID-19 vaccine between MS and DS are presented in Table 1

Forty-five percent of DS and 23% of MS were hesitant to receive the COVID-19 vaccine ($p<0.0001$). A higher proportion of DS (11%) compared to MS (3%) reported having had COVID-19 and a very high proportion of DS (90%) compared to MS (76%) reported personally knowing someone who had COVID-19 ($p<0.01$).

MS and DS were statistically significantly ($p<0.05$) different on the following, with MS more likely than DS to report: COVID-19 vaccination should be mandatory for the general public, COVID-19 vaccination should be mandatory for HCPs, the importance of COVID-19 vaccination for themselves as HCPs, and willingness to be involved in a COVID-19 vaccine trial. Additionally, MS were more likely to express concerns about the effectiveness of a COVID-19 vaccine and to trust the information received about the COVID-19 vaccine from public health experts. DS were more likely to have decided not to get vaccines in general as an adult for reasons other than illness or allergies and agreed that people get more vaccines than are good for them. DS were also more likely to indicate that the only reason they will get a COVID-19 vaccine is if it is mandated by health systems/school.

On vaccine hesitancy, in those that reported they were not willing to take the COVID-19 vaccine, similar associations were seen as is reported above with overall results, as seen in Table 1.

In those that reported they were willing to take the COVID-19 vaccine, bivariate analyses show that MS were more likely than DS to report: COVID-19 vaccination

should be mandatory for HPCs and concern that a COVID-19 vaccine may not be effective ($p<0.05$). MS were less likely to personally know someone who had COVID-19 ($p<0.05$). No state effect was observed since the responses of the Michigan DS mirrored those of the DS in the other states. In addition, no assocations were seen between Michigan MS and DS.

In logistic regression analyses, after controlling for demographic variables, experience with COVID-19, and personal vaccination behaviors, those who thought the COVID-19 vaccine was important to them as HCPs, trusted COVID-19 information received from public health experts, and thought the COVID-19 vaccination should be mandatory for the general public were statistically significantly more likely to report willingness to get the COVID-19 vaccine ($p<0.01$). Those concerned about serious side effects from a COVID-19 vaccine and reported willingness to get a COVID-19 vaccine only if it is mandated by health systems/school were less likely to report willingness to get the COVID-19 vaccine upon FDA approval ($p<0.0001$) (Table 2). Being a MS or DS was no longer predictive of willingness to get the COVID-19 vaccine. However, underrepresented minority students were 2.7 times more likely to report willingness to get the COVID-19 vaccine compared to white students (95% CI 1.03, 7.26).

In modeling if the COVID-19 vaccination should be mandatory for all HCPs (Table 2), MS, those willing to take the COVID-19 vaccination, and trusted COVID-19 information received from public health experts were more likely to agree or strongly agree that the COVID-19 vaccination should be mandatory for all HCPs ($p<0.001$). Those concerned

about serious side effects from a COVID-19 vaccine and reported previously having decided not to get a vaccine for reasons other than illness or allergy were less likely to report vaccination should be mandatory for all HCPs ($p<0.05$).

Themes identified in the comments reflected concerns about vaccine safety/efficacy, rapid development/implementation, trust in regulatory agencies, politicization, and resources and education for the public amongst both groups. Some DS comments minimized the severity of COVID-19 illness and more anti-COVID-19 vaccine comments were noted among this group compared to MS (Table 3).

Discussion

It has been hoped that vaccine acceptance by HCPs will enhance vaccine uptake by the public, as research has shown that patients are more likely to accept vaccination when they receive a strong recommendation from their HCP.[6] Dentists were prioritized for vaccination since they account for one of the groups of HCPs most susceptible to this disease. The close proximity of the practitioner to the patient during a dental visit and the length of the visit, as well as the established evidence of transmission of virus through aerosols and droplets make dentists fall in the very high-risk category for potential exposure to the SARS-CoV-2 virus.[2,7] Additionally, some states have authorized dentists to administer the vaccine to their patients.[8] The above factors highlight the significance of dentists in not only accepting COVID-19 vaccination but also serving as advocates for the vaccine to their patients.

In this study, comparing the attitudes and perceptions of MS and DS to the COVID-19 vaccines, several differences have become apparent. Despite an almost universal personal belief by both groups of students that they would be exposed to COVID-19, more than four out of every 10 DS compared to two out of every 10 MS were hesitant to get vaccinated with the COVID-19 vaccine. There are no previous studies that have evaluated COVID-19 perceptions in these two groups of health professional students.

There may be several factors playing a role in the lower acceptance of the vaccine among DS. It is possible there may be a perception among DS students that they would not likely be taking care of patients who were SARS-CoV-2 positive or that the infection control procedures currently in place are sufficient to protect them from acquiring the virus from a patient. A similar finding was reported by Dror et al who found that Israeli healthcare staff involved in the care of COVID-19 positive patients, and individuals considering themselves at risk of disease, were more likely to self-report acquiescence to COVID-19 vaccination.[9] In contrast, Dror et al, also reported that parents, nurses, and medical workers not caring for SARS-CoV-2 positive patients expressed higher levels of vaccine hesitancy. Similarly, discrepancies between professions were noted in a study of French HCPs' intention to get vaccinated against COVID-19, with physicians and pharmacists most inclined to get vaccinated as compared to other hospital workers.[10]

Although the MS in our study were not directly involved in the care of COVID-19 patients due to pandemic restrictions, it is possible that COVID-19 vaccination

acceptance rates were higher because they identify with residents and physicians actively involved in the care of critically ill COVID-19 patients. Education about vaccines may also play a role in the higher observed acceptance in MS as compared to DS, since vaccine education is incorporated in the curriculum throughout the continuum from medical school to residency, whereas dental school curricula does not have a similar focus.

Vaccine acceptance in DS appears to be closer to that of the US general population. A Pew Reseach Center survey conducted around the same time DS completed our survey, found that 60% of Americans would definitely or probably get a vaccine for the coronavirus.[11]

MS were more likely to be concerned that a COVID-19 vaccine may not be effective. This finding may be reflective of the fact that the MS were surveyed earlier in the course of vaccine development when data about vaccine efficacy was not yet available. In spite of this finding, MS were more accepting of the vaccine, felt more strongly about the importance of the COVID-19 vaccine to HCPs, the need for it to be mandatory for HCPs, and were better advocates for vaccination of the general public. MS were also more likely to volunteer for a vaccine trial.

More DS reported a personal experience with COVID-19 infection – either from having had the illness themselves or personally knowing someone who had COVID-19. However, their comments about their personal experience with COVID-19 infection

indicated that COVID-19 is a trivial illness with a quick recovery and absence of long-term sequelae. Furthermore, several DS felt that younger, healthy people like themselves are at lower risk of acquiring severe COVID-19 infection and this may have impacted their views on COVID-19 vaccination. A previous study by Betch et al in MS showed risk perception to be a central predictor of intention to vaccinate and preventive health behaviors.[12]

The underrepresented minority students were more likely to accept the vaccine, contrary to what is in the news regarding the general US population and has been the historical trend with minority populations, particularly African Americans. However, in our sample, the larger proportion of underrepresented minority students were actually Hispanic students (13.3%) and could have accounted for the difference in the results compared to that seen in the general public. African American students were only (2.5%) of the sample.

Nearly one-half of DS and approximately one-quarter of MS were hesitant to receive the COVID-19 vaccine. These results highlight the need for a profession-specific curriculum designed to enhance student knowledge about the COVID-19 vaccine and also teach them vaccine counseling. It is hoped that vaccinated students will share their experiences with their patients and encourage vaccine uptake. Medical schools need to expand their existing curriculum relating to vaccine hesitancy and counseling and train future physicians to make strong vaccine recommendations and respond effectively to vaccine hesitant persons.

Recently, the 2020 American Dental Association House of Delegates, at its meeting in October 2020, passed Resolution 91H-2020 and several states now support dentists administering vaccines, including the COVID-19 vaccine. However, before a dentist is allowed and willing to administer the vaccines to their patients, they should be knowledgeable about the vaccine and agree to take a vaccine themselves. Our study's results show that DS did not meet these criteria. As DS are future dental professionals, training should be added to their curriculum to improve their knowledge and attitudes, making them better advocates for vaccines, including the influenza vaccine as has been previously demonstrated in MS.[13]

Limitations of the study:

Our study has some limitations. First, as with any survey-based study, participants who did not respond might have been hesitant to be vaccinated, which may underestimate the true prevalence of vaccine hesitancy among this group of students. Data collection was done at a single medical school and three dental schools. Hence the differences seen may not be generalizable. The wide confidence intervals for some of the variables could be considered a limitation of this study. Potential reasons for the wide confidence interval are the sample size or the lack of variability when the categories of strongly agree/agree and strongly disagree/agree were collapsed. Survey respondents may also have been predominantly influenced by exposure to COVID-19 vaccine related topics in the media and politics, as this was not a topic formally incorporated into the medical or dental curricula. The surveys were administered to the two groups of students over two-months apart, MS in September and DS in late November/early December, which could

have biased findings as results of the COVID-19 vaccine trials were being reported in the media and in the scientific literature. However, it is surprising that, although there was more vaccine information available, the DS were still more hesitant to receive the vaccine suggesting that these are unbiased results. Finally, intentions are not the same as behavior, so we cannot predict if those who indicated they would take the vaccine will actually follow through.

Conclusions:

In general, one of the strongest correlates of vaccine acceptability among patients is a recommendation from the HCP. There is an urgent need to get all healthcare students vaccinated to demonstrate their own confidence that the benefits of vaccination outweigh the risks. As pointed out by Schaffer DeRoo et al, HCP's should be taught how to make a strong vaccine recommendation including sharing their own personal experiences with COVID-19 vaccination.[14] Dentists can play a critical role in advocating for and providing vaccination to their patients and thereby contributing to the achievement of widespread vaccine delivery to the public.

References:

1. CDC COVID Data Tracker. Centers for Disease Control and Prevention website. https://covid.cdc.gov/covid-data-tracker/#cases_casesinlast7days. Updated January 21, 2021. Accessed January 21, 2021.

2. National Academies Release Framework for Equity Allocation of a COVID-19 Vaccine for Adoption by State, Tribal, Local, and Territorial Authorities. National Academies website. https://www.nationalacademies.org/news/2020/10/national-academies-release-framework-for-equitable-allocation-of-a-covid-19-vaccine-for-adoption-by-hhs-state-tribal-local-and-territorial-authorities. Updated October 2, 2020. Accessed January 22, 2021.

3. Larson HJ, Jarrett C, Schulz WS, et al; SAGE Working Group on Vaccine Hesitancy. Measuring vaccine hesitancy: The development of a survey tool. *Vaccine*. 2015;33(34):4165-75.

4. Kernéis S, Jacquet C, Bannay A, et al. Vaccine education of medical students: A nationwide cross-sectional survey. *Am JPrev Med*. 2017;53(3):e97-e104.

5. Afonso NM, Kavanagh MJ, Swanberg SM, Schulte JM, Wunderlich T, Lucia VC. Will they lead by example? Assessment of vaccination rates and attitudes to human papilloma virus in millennial medical students. *BMC Pub Health*. 2017;17(1):35.

6. Lau M, Hua L, Flores G. Factors associated with human papillomavirus vaccine-series initiation and healthcare provider recommendation in US adolescent females: 2007 National Survey of Children's Health. *Vaccine*. 2012;30:3112-8.

7. U.S. Department of Labor, Occupational Safety and Health Administration. Guidance on preparing workplaces for COVID-19. OSHA 3990-03 2020. https://www.osha.gov/Publications/OSHA3990.pdf. Accessed January 21, 2021.

8. COVID-19 Vaccine Allocation and Administration Status for Dentists. ADA Center for Professional Success. https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map. Accessed January 22, 2021.

9. Dror AA, Eisenbach N, Taiber S, et al. Vaccine hesitancy: The next challenge in the fight against COVID-19*. Eur J Epidemiol*. 2020;35(8):775-779.

10. Gagneux-Brunon A, Detoc M, Bruel S,et al. Intention to get vaccinations against COVID-19 in French healthcare workers during the first pandemic wave: A cross sectional survey. *J Hosp Infect*. 2020 Nov 28;108:168–73. doi: 10.1016/j.jhin.2020.11.020. Epub ahead of print. PMID: 33259883; PMCID: PMC7699157.

11. Funk C, Tyson A. Intent to get a COVID-19 vaccine rises to 60% as confidence in research and development process increases. https://www.pewresearch.org/science/2020/12/03/intent-to-get-a-covid-19-vaccine-rises-to-60-as-confidence-in-research-and-development-process-increases. Published December 3, 2020. Accessed January 22, 2021.

12. Betsch C, Wicker S. E-health use, vaccination knowledge and perception of own risk: Drivers of vaccination uptake in medical students. *Vaccine*. 2012;30(6):1143-8.

13. Afonso N, Kavanagh M, Swanberg S. Improvement in attitudes toward influenza vaccination in medical students following an integrated curricular intervention. *Vaccine.* 2014;32(4):502-6.

14. Schaffer DeRoo S, Pudalov NJ, Fu LY. Planning for a COVID-19 vaccination. program. *JAMA.* 2020;323(24):2458–2459.

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Abstract

Background

Dental students (DS) and medical students (MS) are exposed to COVID-19. It is important to achieve high COVID-19 vaccination coverage rates in both these groups. We developed a survey to assess the vaccine hesitancy amongst MS and DS to COVID-19 vaccination.

Methods

The study was conducted at three U.S. dental schools and a medical school using an online survey which assessed (1) previous immunization behavior; (2) attitudes and perception of COVID-19 vaccines; (3) personal experience with COVID-19.

Results

248 DS and 167 MS completed the survey. 45% of DS and 23% of MS were hesitant to receive the COVID-19 vaccine. In bivariate analyses, MS were 2.7 times more likely than DS to take the vaccine (OR 2.74, 95% CI 1.76, 4.31, p=0.0001). Although DS were more likely than MS ($p<0.05$) to have had COVID-19 and to personally know someone who had COVID-19, MS were more likely to agree with mandates and trust information about the vaccine. In multivariable analyses, after controlling for demographic variables, experience with COVID-19 and personal vaccination behaviors, being a MS or DS was no longer predictive of willingness to get the vaccine.

Conclusions

These results highlight the need for profession-specific curriculum designed to enhance student knowledge about the vaccine and vaccine counseling skills.

Practical Implications

The ADA supports dentists administering vaccines, including the COVID-19 vaccines. Dentists and DS should be willing to take the vaccine themselves. Education on the vaccine is needed to improve uptake.

Key Words

COVID-19 vaccine, vaccine hesitancy, vaccine adoption, dental students

Table 1. Survey responses by profession: overall and for vaccine hesitant and accepting medical (MS) and dental (DS) students

	Overall			Vaccine Hesitant Students			Vaccine Accepting Students		
	Participants that responded affirmatively (agree/strongly agree)			Participants that responded affirmatively (agree/strongly agree)			Participants that responded affirmatively (agree/strongly agree)		
Survey Item	MS (n=163) (%)	DS (n=245) (%)	OR (95% CI)	MS (n=37) (%)	DS (n=108) (%)	OR (95% CI)	MS (n=126) (%)	DS (n=135) (%)	OR (95% CI)
General attitudes to vaccine									
People get more vaccines than are good for them	6.1	18.0	0.30 (0.14, 0.60)*	10.8	26.8	0.33 (0.08, 1.06)*	4.8	11.1	0.40 (0.14, 1.05)
Vaccines are important for me to stay healthy as a future HCP	99.4	97.6	4.06 (0.49, 188.20)	100.0	94.4	----	99.2	100.0	----
It is my role as a future HCP to learn about vaccines for myself and my patients	99.4	98.8	2.01 (0.16, 106.07)	100.0	97.2	----	99.2	100.0	----
COVID-19 vaccine - general opinions									
The COVID-19 vaccination should be mandatory for the general public	67.9	40.3	3.12 (2.06, 4.76)*	48.6	8.3	10.18 (4.03, 27.19)*	73.6	65.9	1.44 (0.84, 2.47)
The COVID-19 vaccination should be mandatory for all HCPs	85.9	53.9	5.18 (3.15, 8.76)*	64.9	16.7	9.04 (3.93, 21.65)*	92.1	83.7	2.25 (1.03, 5.17)*
Personal views – COVID-19 and vaccine									
I am likely to be exposed to COVID-19 as a future HCP	98.2	95.1	2.74 (0.72, 15.37)	97.3	93.5	2.48 (0.30, 115.53)	98.4	96.3	2.38 (0.38, 25.40)
COVID-19 vaccination is important for me as a HCP	98.2	78.8	14.31 (4.50, 72.96)*	94.6	52.8	15.43 (3.65, 138.94)*	99.2	99.3	0.03 (0.01, 73.80)
I would like to be involved in	52.8	32.6	2.30 (1.53, 3.47)*	10.8	0.9	12.69 (1.20, 644.44)*	65.1	58.2	1.34 (0.81, 2.22)

a COVID-19 vaccine trial									
I will take the COVID-19 vaccine as soon as an FDA approved vaccine is available	77.3	55.1	2.72 (1.75, 4.28)*	----	----	----	----	----	----
I am concerned that a COVID-19 vaccine may not be effective	76.7	54.1	2.78 (1.80, 4.36)*	83.8	68.5	2.36 (0.93, 6.74)	74.6	42.2	4.00 (2.37, 6.83)*
I am concerned about serious side effects from a COVID-19 vaccine	54.6	63.9	0.68 (0.45, 1.02)	89.2	92.6	0.66 (0.16, 3.20)	44.4	40.7	1.16 (0.71, 1.91)
I need more information about the COVID-19 vaccine	94.5	90.2	1.86 (0.86, 4.33)	100.0	96.3	----	92.9	85.2	2.25 (0.9962, 5.40)
I trust the information I am receiving about the COVID-19 vaccine from the public health experts	87.0	65.6	3.51 (2.09, 6.08)*	67.6	33.3	4.12 (1.87, 9.41)*	92.8	91.1	1.26 (0.51, 3.21)
The only reason I will get a COVID-19 vaccine is if it is mandated by health systems/ school	14.7	31.6	0.38 (0.22, 0.62)*	37.8	64.8	0.33 (0.15, 0.72)*	7.9	5.2	1.57 (0.57, 4.51)
Experience with COVID-19	**Participants that responded affirmatively (yes)**			**Participants that responded affirmatively (yes)**			**Participants that responded affirmatively (yes)**		
I had COVID-19 infection	3.1	10.6	0.27 (0.08, 0.73)*	2.7	17.0	0.14 (0.003, 0.93)*	3.2	5.4	0.57 (0.12, 2.32)
I personally know someone who has had COVID-19 infection	75.5	89.8	0.35 (0.20, 0.60)*	70.3	92.4	0.20 (0.07, 0.54)*	77.0	87.6	0.48 (0.24, 0.92)*
I personally know someone who has died from COVID-19 infection	20.9	24.6	0.81 (0.50, 1.31)	16.2	24.5	0.60 (0.21, 1.55)	22.2	24.8	0.87 (0.48, 1.55)
Personal Vaccination Behavior									
As an adult, have you ever delayed getting a vaccine for reasons other than illness or allergy?	24.1	21.6	1.15 (0.71, 1.85)	33.3	30.2	1.16 (0.50, 2.59)	21.4	14.7	1.58 (0.83, 3.05)
As an adult, have you ever decided not to get a vaccine	11.1	23.3	0.41 (0.23, 0.73)*	13.9	40.6	0.24 (0.07, 0.69)*	10.3	9.3	1.12 (0.48, 2.61)

for reasons other than illness or allergy?									
Do you plan on getting a flu vaccine this flu season (2020-2021)?	100.0	72.5	-----	100.0	52.8	----	100.0	88.4	----

Table 2. Logistic regression analyses and models

	Participants that responded affirmatively (agree/strongly agree)	
Survey Item	**Willing to take COVID-19 vaccine when FDA approved**	**COVID-19 vaccine should be mandatory for health care providers**
Demographics		
Profession: Medical Student	NS	3.67 (1.78, 7.56)*
Gender: Male	NS	NS
Race†: Underrepresented Minorities	2.73 (1.03, 7.26)*	NS
Other	NS	NS
Student Status: Clinical	NS	NS
General attitudes to vaccine		
People get more vaccines than are good for them	NS	NS
COVID-19 vaccine - general opinions		
The COVID-19 vaccination should be mandatory for the general public	3.13 (1.53,6.44)*	----
Personal views – COVID-19 and vaccine		
COVID-19 vaccination is important for me as a health care provider	12.77 (2.33, 69.90)*	----
I will take the COVID-19 vaccine as soon as an FDA approved vaccine is available	----	4.73 (2.21, 10.14)*
I am concerned that a COVID-19 vaccine may not be effective	NS	NS
I am concerned about serious side effects from a COVID-19 vaccine	0.09 (0.03, 0.22)*	0.38 (0.17, 0.83)*
I trust the information I am receiving about the COVID-19 vaccine from the public health experts	4.54 (2.00,10.32)*	6.43 (3.10, 13.34)*
The only reason I will get a COVID-19 vaccine is if it	0.09 (0.04, 0.20)*	NS

is mandated by health systems/medical school		
Experience with COVID-19		
I had COVID-19 infection	NS	NS
I personally know someone who has had COVID-19 infection	NS	NS
Personal Vaccination Behavior		
As an adult have you ever decided not to get a vaccine for reasons other than illness or allergy	NS	0.35 (0.16, 0.80)*

†Reference Group: White
* p,0.05

Table 3. Comments provided by medical and dental students

Theme	Representative Quotes (MS)	Representative Quotes (DS)
Personal concern about vaccine safety/efficacy	"Personally, I would like to see the vaccine in the market for several years before receiving the vaccine, as I am concerned about possible congenital defects in newborns born to mothers who received the new vaccine." "I would rather wait a little bit longer for a better crafted vaccination with fewer side effects (if any) than a rushed vaccination that ends up dissuading more people from getting it. It should be released with the knowledge of exactly how it will adversely affect people if at all. "	"I still don't feel it is safe, as there has not been time to study the side effects, and possible complications of getting inoculated with it. " "Since it is the first mrna vaccine, I along with many others are less likely to get it because of this reason. I need more information on how the mrna vaccine works. " "Personally, I would only take this particular vaccine after the first phase of patients take it and the second, third or even fourth batch is on the market. Under no circumstances am I going to take the first batch."
Rapid development/implementation of vaccine	"I think it is important to not release a vaccine before it has been thoroughly vetted and tested for both efficacy and safety." "I am concerned with the rapid development and push to create a vaccine that it will not be safe - I would want to hear about all the measures that were taken to ensure the vaccine is safe and any corners that were cut to create it more quickly." "Furthermore, reading about how some vaccine trials skipped certain phases of testing makes me feel uncomfortable with taking the vaccine immediately after FDA approval."	"There is no way I would trust a vaccine that took only 6 months to make." "I feel that due to the pandemic the COVID vaccine has been developed in a rush, and even when health specialists are recommending the vaccine, I still don't feel it is safe." "Past educational experience has taught me that it takes years or decades for new vaccines or medications to go through many failed attempts and trials to even get to the clinical trial stage and with the talk of a COVID vaccine already in clinical trials and possibly soon to be offered to the public makes me very skeptical."
Politicization	"Many people don't trust the CDC and the FDA because President Trump	"NO WAY DO I SUPPORT MANDATING A CHINESE VIRUS VACCINE."

	might be pressuring these institutions to rush out a vaccine for his own political gain." "I am concerned about the efficacy and safety of a purported vaccine by our country's government, especially in regards to admitted "downplaying of the severity" by the current leadership."	" The public control by government regulations has been absolutely ridiculous." "How is it 2 days after they declare Biden as new president he saves the day with vaccine announcements." "The vaccine should be encouraged, but cannot be made mandatory. This would be a major breach of citizens' rights and an overreach of government."
Trust in regulatory agencies	"As a future provider, I believe it to be my obligation to my future patients to not only understand the benefits but also the risks of the disease, and the simple word of the CDC is not currently a trustable one."	"The school or the CDC or any other reputable source could send information to health care professionals concerning the vaccine and the virus that contained peer reviewed papers and studies with the most up to date news on this devoid of political agenda or rumours."
Education for public	"Easy to understand information that is written for the general public, based on reputable resources that are linked, that is easy to digest but also informative and can be shared easily on social media." "I think this knowledge needs to get out there to the general public and students, that speedy science doesn't equal bad science. Once we understand this we can educate patients."	"I believe if questions are answered with legitimate and persuasive facts then people will be more accepting of this vaccine." "Get a clear idea of potential risks and benefits, inform the public on both and probability of each." "Accessibility is huge- the easier it is to get the vaccines the more people will get them."
Anti-COVID vaccine	"Take advice from other medical professionals who have different experiences with treating COVID patients in the US and other COVID diseases around the world to get a better understanding of treatments other than the vaccine."	"I will NOT get a COVID-19 vaccine for ANY REASON!" "We are young and healthy and it is a violation of our rights to be demanded to take a vaccine that is largely untested and effects largely unknown. I will not take the vaccine no matter what the school decides to mandate." "There is such a risk forcing people to

		take a vaccine for a virus that has a 96% survival rate”
Minimization of severity of COVID infection		“My age demographic is not at risk. All my friends who had it said it was like having a cold and now they are fine with no residual effects.” “COVID in healthy individuals does not possess a risk of death (just like with the flu or influenza). A healthy individual's immune system is capable of getting rid of the virus. Getting the disease does not put you at risk of having long term disorders, disability or death.” “Covid-19 is not much more serious than the common cold or flu viruses.”