

COVID-19 VACCINE ACCEPTABILITY AND ATTITUDE AMONG A SAMPLE OF SAUDI DENTAL STUDENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: Dental teams are high priority groups for early access to the COVID-19 vaccine because of close contact between dental teams and potentially infected patients. This study assessed COVID-19 vaccine acceptability, awareness, and attitudes among dental students in Saudi Arabia.

Materials and methods: We administered an anonymous cross-sectional survey to dental students. Our survey assessed factors related to COVID-19 vaccine acceptance.

Results: Among all dental students who received the survey, 247 were responded (40.8 %). 64 % reported high acceptability of the COVID-19 vaccine. Additionally, 27.1% were unsure, and 8.9% reported low acceptability. Using a stepwise model, we found a strong association with COVID-19 vaccine safety overall (OR=5.882, 95% CI: 1.675-20.408). [Write factors that contributed to low acceptability here] most contributed to low acceptability. Concern over vaccine safety due to quick manufacture (OR=2.353, 95% CI: 1.325-4.184) strongly contributed to dental students being unsure about the vaccine.

Conclusion: Our results indicate the importance of enhancing our dental educational curriculum with information about vaccine promoting the COVID-19 vaccine among dental students.

Keywords: Dental students, vaccine, attitudes, COVID-19, vaccine acceptance.

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Introduction

The dental field plays a critical role in contributing to the health care system in all countries. However, dentists are at high risk of infection when exposed to patients with an infectious disease, such as COVID-19, and then become at risk of transmitting the disease to other patients, and their own family members⁽¹⁾. The National Academies of Sciences, Engineering, and Medicine (NASEM) Framework for Equitable Allocation of COVID-19 Vaccine and the Centers for Disease Control and Prevention (CDC) Advisory Committee on

Immunization Practices in the United States (US) have decided that dentists, dental teams and dental students are high priority groups for the first doses of COVID-19 vaccines^(2, 3). Moreover, most other countries gave dental teams high priority for the COVID-19 vaccine. Dentists are 'second in line' in the first phase of the vaccine roll out in the UK^(2, 4). These measures will help to reduce the community spread of SARS-CoV-2 due to close contact of dental teams with potentially infected patients⁽²⁾. Although dentists are considered to be first-line workers who provide critical healthcare services along with other oral health professionals, a recent questionnaire

distributed by the FDI World Dental Federation (FDI) showed that only one-third of the participating countries prioritized vaccine administration for dentists and dental students. As a consequence, the FDI has encouraged more countries to accelerate and facilitate dentists taking the vaccines⁽²⁾.

Despite our growing knowledge related to the COVID-19 vaccines, limited information is known about the acceptability of the COVID-19 vaccine among dental students overall and Saudi Arabia in specific. A recent study suggested that only 56% of American dentists are willing to take a COVID-19 vaccine⁽⁵⁾, and several factors are associated with their vaccine acceptance such as trusting public health experts, potential side effects, and health policy regarding vaccine mandates⁽⁵⁾.

In Japan, 62.1% are willing to take the vaccine, and several psychological factors were associated with vaccine acceptance⁽⁶⁾. Therefore, in this study, we assessed COVID-19 vaccine acceptability, awareness, and attitude among a sample of dental students in Saudi Arabia.

Materials and methods

Study design

A cross-sectional study design was used for a sample of dental students (pre-doctoral and post-graduate students) at the Faculty of Dentistry at King Abdulaziz University. We distributed an anonymous web-based survey via Google Forms which took approximately 8 min to answer.

It was distributed between December 1, 2020 and February 28, 2021. The study was approved by the ethical research committee at King Abdulaziz University (#231-03-21), and STROBE checklist was followed. To recruit students, we sent out an email to all students with an explanation of the study aim, an electronic consent form, and a link to the online survey. A reminder email was sent three times to maximize the response.

Survey design

The primary outcome was self-reported COVID-19 vaccine acceptability. The survey had a 50-items, which were modified from a combination of validated general vaccine acceptability surveys⁽⁷⁾ and validated surveys on attitudes and behaviors about vaccination administered to medical students⁽⁸⁻¹⁰⁾. The combined survey was content validated by three experts, face validated by five dental students, and reliability tested before and after among another ten

dental students. Response to each item was evaluated on a 5-point Likert scale, where 1 indicated “strongly disagree” and 5 indicated “strongly agree.”

The survey collected demographic information such as age, gender, educational level, and several other domains such as:

- COVID-19 vaccine myths;
- General attitudes and perception of vaccines;
- Current knowledge/interest about COVID-19 vaccine;
- Awareness about vaccine types and techniques;
- Concern about potential vaccine side effects.

Data analysis

This is a pilot study of a convenient sample. The dataset was imported as an Excel file. Those who did not consent to the survey were excluded. Descriptive statistics included frequencies and percentages, or means and standard deviation for each individual question. The responses were then grouped to high acceptability, unsure, or low acceptability, based on their desire to take the vaccine.

Chi-square or Fischer exact tests were used to identify statistically significant differences between vaccine acceptability and several other factors. Multi-variables binary logistic regression was used to identify factors contributing to the desire to take the COVID-19 vaccine. The first model was comparing low acceptability to high acceptability and the second model was comparing unsure to high acceptability. The final model was using forward stepwise variable selection (variables with $p < 0.05$ were included, while those with $p > 0.10$ were removed). The performance of the selected models was assessed using C-index and the Hosmer-Lemeshow test. P values less than 0.05 were considered statistically significant. All analyses were performed using SPSS version 23 (SPSS, Chicago, IL).

Results

Among the 605 students, 247 were responded (40.8%). 64% stated a high desire for the COVID-19 vaccine, while 27.1% were unsure, and 8.9% expressed low desire when it becomes available (Table 1).

Respondents who stated high COVID-19 vaccine desire, compared to those who expressed low desire, were significantly more likely to be postgraduate level at the dental school (6.9% vs. 0%, $p = 0.004$). Those who were unsure about COVID-19 vaccine acceptability, compared to those who stated

low desire, were significantly less likely to have a vaccinated relative ($p=0.013$) or discussed the COVID-19 vaccine with a doctor/specialist (0.046) (Table 1).

(3.12 ± 1.11), followed by Pfizer-BioNTech vaccine (3.04 ± 1.23), and the least common were the Sinopharm vaccine (2.41 ± 0.92) and Sinovac vaccine (2.43 ± 0.90) (Figure 2). The most familial technique

	Total sample N=247	Low Vaccine Acceptability N=20	Unsure N=67	High Vaccine Acceptability N=160	p-value
Age (mean SD)	22.56±2.29	22.05±2.01	21.90±1.80	22.89±2.44	0.009*
Gender					0.876
Male	108 (44.1)	8 (42.1)	28 (41.8)	72 (45.3)	
Female	137 (55.9)	11 (57.9)	39 (58.2)	87 (54.4)	
Marital status					0.193
Single	235 (95.1)	20 (100)	66 (98.5)	149 (93.1)	
Married	12 (4.9)	0	1 (1.5)	11 (6.9)	
Level					0.004*
3 rd -4 th year	136 (55.3)	13 (68.4)	49 (73.1)	74 (46.3)	
5 th - 6 th year	97 (39.4)	6 (31.6)	16 (23.9)	75 (46.9)	
Postgrad	13 (5.3)	0	2 (3.0)	11 (6.9)	
One of my close relative (parents, spouse, sibling ..etc) already received the COVID-19 vaccine					0.013*
Yes	187 (75.7)	16 (80.0)	42 (62.7)	129 (80.6)	
No	60 (24.3)	4 (20.0)	25 (37.3)	31 (19.4)	
I am aware of COVID-19 vaccine					0.809
Yes	217 (88.9)	17 (85.0)	58 (87.9)	142 (89.9)	
No	27 (11.1)	3 (15.0)	8 (12.1)	16 (10.1)	
I have discussed COVID-19 vaccine with a doctor/specialist					0.046*
Yes	62 (25.2)	9 (45.0)	12 (17.9)	41 (25.8)	
No	184(74.8)	11(55.0)	55 (82.1)	118 (74.2)	

Table 1: Demographic characteristics of study sample.
*p value <0.05.

Dental students awareness about general information and myths

All three categories of respondents agreed that the vaccine is important to protect the community (4.23 ± 1.02) and that many individuals should be required to get the vaccination (3.97 ± 0.97) (Figure 1).

The same three groups were more likely to disagree on ignoring the mask if vaccinated (1.89 ± 0.95), the necessity of the vaccine if not at risk (2.19 ± 1.01), the danger of the vaccine (2.22 ± 0.90), and the possibility of infection after the vaccine (2.24 ± 1.02) (Figure 1).

Dental students awareness about vaccine types and techniques

The most common vaccine type that students were aware of was the Oxford-AstraZeneca vaccine

was the RNA or mRNA vaccine (2.80 ± 0.99), and the least was the protein subunit vaccine (2.44 ± 0.94) (Figure 2). There was statistical difference between the three groups (high acceptability, unsure, and low acceptability) regarding type of vaccine (Oxford-AstraZeneca vaccine ($p<0.001$), Pfizer-BioNTech vaccine ($p<0.001$), or Moderna vaccine ($p=0.039$), and vaccine technique (RNA or mRNA vaccine) ($p=0.002$) (Figure 2).

Dental students concerns about potential side effects, vaccine types, and techniques

All three categories of respondents were more likely to agree that vaccine potential side effects were fever (3.75 ± 0.87), followed by fatigue (3.67 ± 0.97), and muscle/joint pain (3.51 ± 0.90) (Figure 3). The same three groups were more likely

to disagree on the following side effects: infertility in men (2.35±0.91), infertility in women (2.37±0.88), DNA alteration (3.42±1.05) (Figure 3). There were statistical differences between the three groups (high acceptability, unsure, and low acceptability) regarding the following potential concerns: injection site pain and swelling (p<0.001), fatigue (p<0.001), headache (p < 0.001), muscle and joint pain (p<0.001), and fever (p<0.001) (Figure 3). In addition, they have a concern about the Oxford-AstraZeneca vaccine (p=0.018) (Figure 3).

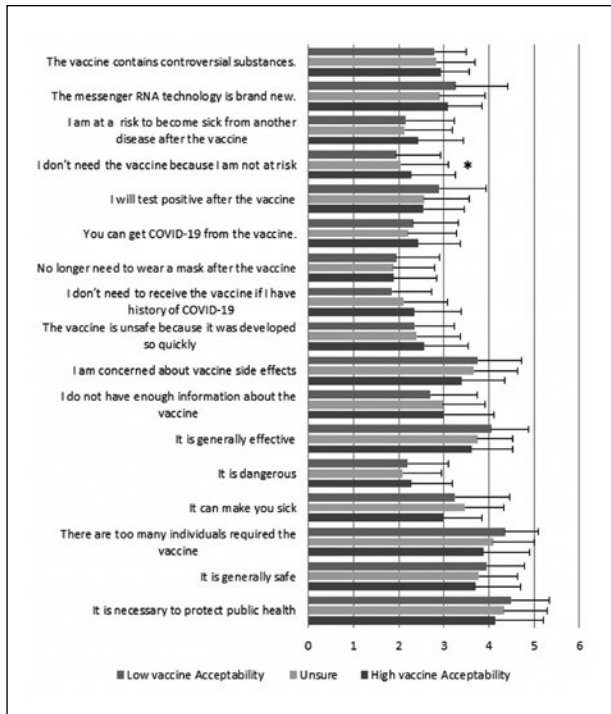


Figure 1: Dental students awareness about general information and myths related to the vaccine on 5-point Likert-like scales (1="Strongly disagree " to 5="Strongly agree").

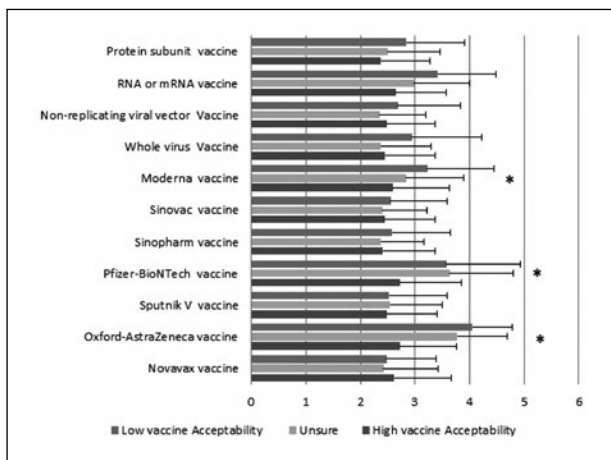


Figure 2: Dental students awareness about vaccine types and techniques on 5-point Likert-like scales (1="Strongly disagree" to 5="Strongly agree").

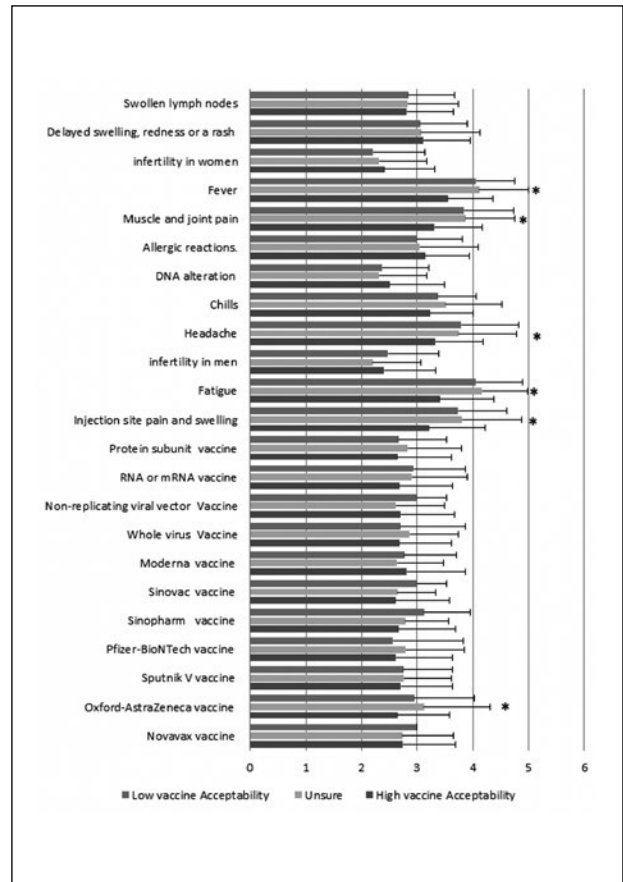


Figure 3: Dental students concerns about potential side effects, vaccine types and techniques on 5-point Likert-like scales (1="Strongly disagree" to 5="Strongly agree ").

Low and unsure COVID-19 acceptability

In the binary multivariable logistic regression (Table 2), using the high COVID-19 vaccine acceptability group as the referent category, the stepwise model suggested a strong association concerning that the COVID-19 vaccine is dangerous OR=5.882(95% CI: 1.675-20.408), and low recommendation of the vaccine to family members OR=0.701(95% CI: 0.592-0.828) was the factor that most contributed to low acceptability.

High recommendation of the vaccine to family members OR=1.352 (95% CI: 1.242-1.472), concern about vaccine safety due to quick manufacture OR=2.353 (95% CI: 1.325-4.184), and the potential pain and swelling at the injection site OR=1.838(95% CI: 1.187-2.846) were strongly associated with unsure status about the vaccine.

The model also suggested that concern over wearing a mask after the vaccine and the possibility of chills contributed to unsure status. However, it was not statistical significant OR=0.799 (95% CI: 0.489-1.305), and OR=0.925(95% CI: 0.523-1.636). (Table 2).

	Low Acceptability** AOR** [95% Confidence Interval]	Unsure Acceptability** AOR** [95% Confidence Interval]
I will recommend COVID-19 vaccine for my family	0.701 (0.592-0.828)*	1.352 (1.242-1.472)*
COVID-19 vaccine is dangerous	5.882 (1.675-20.408)*	-
The COVID-19 vaccine is unsafe because it was developed so quickly	-	2.353 (1.325-4.184)*
Once I receive the COVID-19 vaccine, I no longer need to wear a mask.	-	0.799 (0.489-1.305)
One of the COVID-19 vaccine side effect is Injection site pain and swelling	-	1.838 (1.187-2.846)*
One of the COVID-19 vaccine side effect is Chills	-	0.925 (0.523-1.636)

Table 2: Multivariable forward stepwise logistic regression model for predictors of COVID-19 vaccine acceptability, attitude and awareness among dental students.

Discussion

In this study of dental students, we assessed the prevalence of COVID-19 vaccine acceptability and sought to understand dental students' perceptions of the vaccine, especially since future dentists may play a critical role in stopping the spread of infection. In addition, dentists educate the patients and community about the necessity of the vaccine. Our data indicates that about two-thirds of the dental students were reported high acceptability of the COVID-19 vaccine (64%). These results were close to the Japan general population (62.1%)⁽⁶⁾, and Europe nation 62% to 80%⁽¹¹⁻¹⁹⁾. However, it was slightly higher than the US dental students (56%)⁽⁵⁾ and the US general population (61.9%)⁽⁵⁾. These could be due to general attitudes toward vaccines regarding effectiveness, potential side effects, and the availability of personal protective equipment in the dental field⁽⁵⁾. Moreover, many dentists did not consider themselves at risk of getting COVID-19 infection. Although several studies reported the prevalence of COVID-19 infection among dentists is overall low, it ranges between 0.9%-1.1% in the US, the Netherlands, and China (20-22), 5.3% in Seattle, Washington, and 11.79% in Jeddah, Saudi Arabia⁽²³⁾, which may be due to the time of conducting each study during the pandemic.

We note that all three categories (high acceptability, unsure, low acceptability) agreed that it was necessary to vaccinate the general public. This result is similar to another study which found that respondent's previous experience with COVID-19 was not a critical factor for vaccine acceptability and

in which all of the respondents agreed it is necessary to mandate vaccines to the general public⁽⁵⁾. These results confirmed the wide recognition of vaccinations as one of the most effective preventive measures in public health⁽²⁴⁾. However, the acceptance of a vaccine might be a problem for the general public, including the medical field depend on the timing of the vaccine, technique, and place of manufacture of vaccine, and other factors⁽²⁵⁻²⁷⁾.

As in the general public⁽²⁸⁻³⁰⁾, the perception of vaccine safety was around six times more likely to be low vaccine acceptability compared with high acceptance. These could be explained due to controversial opinions of trusted public health experts and social media, which may play a significant role in the vaccine image and dental students' perceptions⁽⁵⁾. As a consequence, they were less likely to recommend taking the vaccine to their families. Concerns about vaccine safety due to rapid development, uncertainty about mask-wearing after the vaccine, and potential side effects were contributing to the unsure status of the vaccine acceptability among dental students. However, those who were more likely to get the vaccine were less likely to be worried about the potential vaccine side effects. Our results indicated that we need to increase the focus on critical thinking in the dental curriculum. It was unsatisfactory that dental students had almost similar opinions to the general public because the Faculty of Dentistry at King Abdulaziz University is the first CODA-accredited outside the USA, and it follows their standards and recommendations. One of their standards is the ability of the graduates to use critical thinking and problem-solving in scientific inquiry⁽³¹⁾. Moreover, those students may have a positive impact on patient vaccination by sharing their good vaccination experiences with their relatives and patients, and encourage them to receive the vaccine^(8,9).

The enhanced and modified curriculum will help achieve this goal by enhancing dental students' knowledge, and increasing positive attitudes toward vaccines, and teaching them vaccine counseling skills with the highest available medical evidence. Similar studies with medical students have proven that the enhanced program curriculum with vaccine knowledge and skills were effective with other situations such as flu vaccine acceptance⁽³²⁾. The strengths of our study include a limited number of published studies and the selection of dental participants from the Middle East, which may help reform the dental curriculum. However, there

are some limitations that we need to consider. The sample size of 249 and the response rate (40.8%) is small, which might affect the confidence intervals of some confounders, and might underestimate the low acceptance of the vaccine. Another limitation is this study was conducted at one dental school, which might not be representative of all other dental schools. However, it can give an idea about dental attitudes toward the vaccine. Lastly, this study evaluated the acceptance and attitude toward the vaccine, which might be different from the actual behavior regarding the vaccine.

Conclusion

Although future dentists may play a critical role in controlling the spreading of the infection during the pandemic, they had concerns about vaccine safety and potential side effects similar to the general public. This raises the importance of revising the dental program curriculum to enhance student knowledge and consulting skills about vaccines overall, including the COVID-19 vaccine.

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Availability of data and materials:

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authorship:

Zuhair Natto conceptualised, designed, data analysed and wrote the paper. The author read the manuscript, made a substantial contribution to the revision and approved the final manuscript.

Ethical standards disclosure:

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the ethical research committee at King Abdulaziz University (#231-03-21). Written informed consent was obtained from all participants.

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