# Acceptance of SARS-CoV-2 vaccination and the associated factors among dental health care professionals: A cross-sectional survey

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## Abstract

**Background.** One of the greatest inventions of the 21st century is the development of vaccines against the life-threatening pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Whenever a new medication or treatment modality is introduced globally, it is accompanied by anxiety in the general public and among health care professionals.

**Objectives.** The aim of the study was to explore factors that may influence the acceptance of COVID-19 vaccination among dental health care professionals, as they are the first subgroup in the population to receive the vaccine.

**Material and methods.** A survey-based cross-sectional study was conducted on 164 health care professionals (general dentists, dental specialists with 2 years of experience after graduation and dental assistants). Data was collected by sending a URL link to the hard- and soft-copy questionnaire on Google Forms through all social media platforms. The questionnaire had 2 sections – the 1st part concerned the demographic details and the 2nd part was designed to assess the acceptance of SARS-CoV-2 vaccination among dental health care professionals and the related factors. The normality of the data was assessed with the Shapiro–Wilk test. The Cox regression algorithm was applied to evaluate the factors associated with the acceptance of SARS-CoV-2 vaccination.

**Results.** Out of 164 participants, 85.37% showed a positive attitude toward vaccination and only 7.32% of dental health care professionals were not willing to get vaccinated; out of them, 5 were males and 7 were females. Those who refused to get vaccinated included 3.6% of general dentists, 21.1% of dental specialists and 11.7% of dental assistants. The complications of major concern were fever, myalgia and the lethargic condition immediately after vaccination.

**Conclusions.** A small percentage of health care professionals declined to get vaccinated against COVID-19 and the main reason was uncertainty about the associated side effects. The respondents were mostly concerned about such side effects as fever, myalgia and the lethargic condition immediately after vaccination.

**Keywords:** SARS-CoV-2, dentist, vaccine, acceptance, health care professional

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## Introduction

December 2019 brought along a global humanitarian crisis due to the rapid spread of a disease caused by different variants of coronavirus – coronavirus disease 2019 (COVID-19) – with 87% chances of cross-infection and a 4% mortality rate.[1] Policy-making organizations and health care setups declared an emergency situation to avoid the spread of the infection.[2] Every country imposed strict guidelines and protocols to control the transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Wearing a face mask and social distancing were made elemental protocols worldwide to minimize the rate of spread of the coronavirus through airborne droplets.[3] Despite all these preventive measures, SARS-CoV-2 spread rapidly in 2020 and policy-making organizations were worried about halting this viral web.[4] Hence, the development and deployment of COVID-19 vaccines was considered to be the most promising health care fortification step to mitigate the rapid spread of the SARS-CoV-2 infection.[5]

One of the greatest inventions of the 21st century is the development of vaccination against life-threatening COVID-19.[6] Current research is focused mainly on the trials of the newly developed vaccines against this deadly virus and their effects on the overall human health.[7] Whenever a new medication or treatment modality is introduced globally, it is accompanied by anxiety in the general public and among health care professionals.[8] The situation is quite challenging in the case of SARS-CoV-2 vaccines due to an already heightened level of stress and apprehension.[9] This anxiety is associated with the alarming spread of the infection and a gradual increase in the mortality rate associated with the disease. At the end of December 2020, a mass vaccination program was initiated. The World Health Organization (WHO) collaborated with different companies worldwide to complete the critical steps of manufacturing safe and efficacious vaccines.[10] One of the factors that greatly influenced the attitude of the general population toward COVID-19 vaccines was the misinformation being spread by anti-vaccination activists.[11] Approximately 7% of the population of Saudi Arabia did not get vaccinated against influenza due to the fear of getting sick.[6] This rate of acceptance was attributed to a multitude of factors, including location, the educational status and social behaviors.[6]

A survey conducted by Thunström et al. to explore the acceptance of vaccination revealed that around 20% of the population in the USA declined a COVID-19 vaccine.[12] The most valid reasons for this non-acceptance were the possible side effects and vaccine ineffectiveness against the disease. Thus, it is imperative to explore factors that may influence the acceptance of vaccination among dental health care professionals, as they are highly exposed to SARS-CoV-2, working close to the oral cavity. Also, health care professionals along with the elderly population are among the initial subsets of the population to receive the vaccine allocated by the WHO.[10]

Therefore, this study aimed to assess the rate of acceptance of COVID-19 vaccination and the factors affecting the acceptance among dental health care professionals.

## Material and methods

An analytical survey-based cross-sectional study was conducted after obtaining an approval from the institutional Research Ethics Committee (No. of approval: 2021-6233-17837). Data was collected by sending a URL link to the questionnaire on Google Forms through all the approachable social media platforms (e-mail, WhatsApp and Facebook Messenger). A modified version of the validated questionnaire of Posse et al.[13] was used in this study. It comprised 2 sections. The 1st section was based on informed consent and concerned the demographic information about the study participants. The 2nd section was framed to assess the acceptance of COVID-19 vaccination among dental health care professionals along with its associated factors. The questionnaire was then assessed by 3 dental health care professionals for its face validity.

The sample size of the study was calculated with the OpenEpi software, v. 3.01 (https://www.openepi.com/Menu/OE_Menu.htm). Since, according to the findings of Wang et al.,[11] the anticipated proportion of the acceptance of vaccination among dental health care professionals was kept at 89.5%, and a level of significance was set at 5%, precision at 5% and a design effect at 1, a sample size of 160 dental health care professionals was required for this study with an inflation of 10%.

The study questionnaire was sent to general dentists, dental specialists with 2 years of experience after graduation and dental assistants. Five reminders were sent to the non-responders before excluding them from the study. Moreover, the participants were asked to forward the Google form link to other dental health care professionals; in this way, data was collected by means of a simplified snowball sampling technique.

### Statistical analysis

The data was analyzed using the statistical software for data science Stata®, v. 12.0 (StataCorp, College Station, USA). Descriptive statistics for continuous variables were reported as mean and standard deviation ($M \pm SD$), as the data was normally distributed. Nominal data was reported as percentage frequency or as number and percentage ($n$ (%)). The unadjusted and adjusted prevalence ratios of the factors influencing the acceptance of vaccination were assessed using the Cox regression algorithm with a 95% confidence interval (*CI*).

# Results

## Demographics

A summary of the descriptive analysis with the percentage frequencies of the participants' responses is shown in Table 1. Our sample included 81 males and 83 females, with 28 general dentists, 76 dental specialists and 60 dental assistants. Among a total of 164 participants, 85.37% showed a positive attitude toward vaccination. Only 7.32% of dental health care professionals were not willing to get vaccinated; out of them, 5 were males and 7 were females. Among health care professionals, we found that 3.6% of general dentists, 21.1% of dental specialists and 11.7% of dental assistants refused vaccination (Table 2). Overall, 32.5% of the participants were concerned about fever, myalgia and lethargy, 28.0% were anxious about an allergic reaction to SARS-CoV-2 vaccination, 26.5% were worried about headaches and neurological complications, and the remaining 13.0% of the respondents were worried about respiratory complications (Table 1).

**Table 1.** Acceptance of vaccination among 3 groups of dental health care professionals ($N = 164$)

| Factors influencing the acceptance of SARS-CoV-2 vaccination | | | Dental health care professionals | | |
|---|---|---|---|---|---|
| | | | general dentists | dental specialists | dental assistants |
| Q.1 | Do you want to receive the vaccine as soon as it becomes available? | yes | 96.4 | 78.9 | 88.3 |
| | | no | 3.6 | 21.1 | 11.7 |
| Q.2 | If not, what is your reason for not getting vaccinated? | not an effective option | 21.1 | 10.3 | 8.6 |
| | | unsafe | 31.6 | 30.8 | 8.6 |
| | | vaccine created in rush | 31.6 | 43.6 | 40.0 |
| | | immunity will develop | 15.8 | 0.0 | 34.3 |
| | | other | 0.0 | 15.4 | 8.6 |
| Q.3 | Where did you get information on SARS-CoV-2 vaccination? | electronic/social media | 85.7 | 73.7 | 70.3 |
| | | publications/conferences/seminars | 10.7 | 21.0 | 29.7 |
| | | people/relatives | 3.6 | 5.3 | 0.0 |
| Q.4 | How would you rate your knowledge about the COVID-19 pandemic? | good | 7.1 | 61.8 | 55.0 |
| | | moderate | 35.7 | 36.8 | 43.3 |
| | | poor | 57.2 | 1.3 | 1.7 |
| Q.5 | How much has this pandemic affected your daily routine? | significantly | 92.9 | 82.5 | 91.7 |
| | | insignificantly | 7.1 | 17.5 | 8.3 |
| Q.7 | Do you think you will get infected with the virus after getting vaccinated? | yes | 46.4 | 59.2 | 56.7 |
| | | no | 3.6 | 9.2 | 8.3 |
| | | not sure | 50.0 | 31.6 | 35.0 |
| Q.8 | Did you ever refuse any vaccination in the past? | yes | 0.0 | 7.9 | 6.7 |
| | | no | 100.0 | 92.1 | 93.3 |
| Q.9 | Do you think SARS-CoV 2 vaccination will be an effective way to minimize and control this infection? | yes | 46.4 | 59.2 | 56.7 |
| | | no | 3.6 | 9.2 | 8.3 |
| | | not sure | 50.0 | 31.6 | 35.0 |
| Q.10 | Is the price of the vaccine an important factor in deciding whether to get vaccinated or not? | yes | 50.0 | 28.9 | 35.0 |
| | | no | 50.0 | 63.2 | 53.3 |
| | | not sure | 0.0 | 7.9 | 11.7 |
| Q.11 | Is the vaccination schedule an essential factor in making a decision regarding getting vaccinated? | yes | 50.0 | 52.6 | 65.0 |
| | | no | 50.0 | 42.1 | 16.7 |
| | | not sure | 0.0 | 5.3 | 18.3 |
| Q.12 | Do you think the SARS-CoV 2 vaccine will have specific side effects? | yes | 96.4 | 68.3 | 68.4 |
| | | no | 3.6 | 13.3 | 10.5 |
| | | not sure | 0.0 | 18.3 | 21.1 |
| Q.13 | Which side effects are you particularly worried about? | allergic reaction | 21.4 | 38.2 | 18.3 |
| | | neurological disturbances | 14.3 | 22.4 | 10.0 |
| | | respiratory disturbances | 28.6 | 13.0 | 6.7 |
| | | fever/myalgia/lethargy | 35.7 | 26.4 | 65.0 |

Data presented as percentage values. SARS-CoV-2 – severe acute respiratory syndrome coronavirus 2; COVID-19 – coronavirus disease 2019.

**Table 2.** Descriptive statistics ($N = 164$)

| Dental health care professionals | Gender *n* (%) | | Age [years] (*M* ±*SD*) | Experience [years] (*M* ±*SD*) | Percentage of acceptance [%] | Percentage of unacceptance [%] |
|---|---|---|---|---|---|---|
| | male | female | | | | |
| General dentists | 9 (32.1) | 19 (67.9) | 31.05 ±6.56 | 4.87 ±3.34 | 96.4 | 3.6 |
| Dental specialists | 37 (48.7) | 39 (51.3) | 36.09 ±8.14 | 8.48 ±6.31 | 78.9 | 21.1 |
| Dental assistants | 35 (58.3) | 25 (41.7) | 31.32 ±4.87 | 8.47 ±5.65 | 88.3 | 11.7 |

M = 81; F = 83; M – males; F – females; *n* – number; *M* – mean; *SD* – standard deviation.

## Acceptance of SARS-CoV-2 vaccination

Using the Cox regression algorithm, we found a statistically non-significant difference in the acceptance of vaccination between general dentists, dental specialists and dental assistants. As many as 96.4% of general dentists, 78.9% of dental specialists and 88.3% of dental assistants were willing to receive the vaccine. However, 3.6% of general dentists, 21.1% of dental specialists and 11.7% of dental assistants refused to be vaccinated. Among those who refused to get vaccinated, 50.0% were not sure if the vaccination was safe and 33.3% had doubts as to the development of vaccines; they were not sure if the regulatory bodies had approved the vaccine after the required research trials, as shown in Table 3. We found that there was a statistically non-significant difference in the acceptance of vaccination between genders (Table 3).

**Table 3.** Factors influencing the acceptance of vaccination among dental health care professionals ($N = 164$)

| Variable | | Hazard ratio | 95% *CI* | *p*-value | $R^2$ |
|---|---|---|---|---|---|
| Male gender | | 1.05 | 0.75, 1.46 | 0.750 | 0.75 |
| Designation (general dentists as reference) | dental specialists | 0.80 | 0.54, 1.19 | 0.290 | 0.57 |
| | dental assistants | 0.86 | 0.55, 1.34 | 0.510 | |
| If you don't want to receive the vaccine, what is the reason? | not an effective option | 1.26 | 0.85, 1.88 | 0.230 | 0.68 |
| | unsafe | 1.26 | 0.66, 2.43 | 0.470 | |
| | vaccine created in rush | 0.90 | 0.51, 1.61 | 0.730 | |
| | immunity will develop | 1.01 | 0.57, 1.77 | 0.950 | |
| Where did you get information on SARS-CoV-2 vaccination? | electronic/social media | 1.41 | 0.57, 3.46 | 0.440 | 0.67 |
| | publications/conferences/seminars | 1.28 | 0.49, 3.31 | 0.610 | |
| How would you rate your knowledge about the COVID-19 pandemic? | moderate | 0.82 | 0.29, 2.28 | 0.710 | 0.16 |
| | poor | 0.86 | 0.31, 2.35 | 0.770 | |
| How much has this pandemic affected your daily routine? | insignificantly | 1.08 | 1.02, 1.20 | 0.050* | 1.08 |
| Do you think you will get infected with the virus after getting vaccinated? | no | 1.02 | 0.71, 1.45 | 0.910 | 0.35 |
| | not sure | 1.20 | 0.65, 2.21 | 0.550 | |
| Did you ever refuse any vaccination in the past? | no | 1.06 | 0.53, 2.07 | 0.870 | 0.03 |
| Do you think SARS-CoV 2 vaccination will be an effective way to minimize and control this infection? | no | 1.13 | 0.67, 1.91 | 0.630 | 0.30 |
| | not sure | 1.31 | 0.38, 4.50 | 0.660 | |
| Is the price of the vaccine an important factor in deciding whether to get vaccinated or not? | no | 1.79 | 0.81, 0.71 | 0.140 | 0.27 |
| Is the vaccination schedule an essential factor in making a decision regarding getting vaccinated? | no | 1.08 | 0.59, 1.99 | 0.780 | 0.10 |
| Do you think the SARS-CoV 2 vaccine will have specific side effects? | no | 0.82 | 0.54, 1.25 | 0.360 | 0.66 |
| Which side effects are you particularly worried about? | allergic reaction | 1.05 | 0.61, 0.51 | 0.850 | 0.79 |
| | neurological disturbances | 0.93 | 0.51, 1.71 | 0.830 | |
| | respiratory disturbances | 0.88 | 0.46, 1.69 | 0.720 | |
| | fever/myalgia/lethargy | 1.99 | 0.57, 2.05 | 0.790 | |

Cox regression algorithm model; *CI* – confidence interval; * statistically significant ($p \leq 0.05$).

## Discussion

Since the outbreak of COVID-19, efforts have been constantly made to control the pandemic and curb the rapid spread of coronavirus,[12–14] and since the advent of vaccines against SARS-CoV-2 to limit cross-infection, many surveys have been performed to assess the acceptance of vaccination.[15] The majority of those surveys focused on the general population.[16,17] On the Asian continent, the vaccine was first introduced to the subset of health care professionals. Hence, health care professionals can be an authentic source of evidence regarding factors that influence the acceptance of SARS-CoV-2 vaccination.[18] Therefore, a survey like this may provide essential information to policy-making organizations and institutions to target the apprehension and motivate the rest of the population for vaccination.

In this survey, we found that only 7.32% of the participants were not willing to get vaccinated, 7.31% were hesitant about getting vaccinated, while as many as 85.37% of the participants accepted the vaccine. The present results are in contrast to a survey-based study conducted by Murhekar et al. in the USA, where 33.3% of the participants refused SARS-CoV-2 vaccination.[19] The initial survey conducted in May 2020 reported a 47% rate of vaccination refusal.[19] This gradual decrease in the percentage of health care professionals refusing SARS-CoV-2 vaccination may be due to the fact that awareness is increasing. The decreasing percentage also reflects the motivation of health care professionals to play a role in limiting the spread of cross-infection.[20] Hesitation about getting vaccinated was found to be multifactorial. The cultural fears, side effects and general myths related to this disease make people uncertain about vaccination. According to the findings of Cascini et al., attitudes toward vaccination were also closely related to the initiatives taken by the government and the awareness campaigns conducted by the doctors.[21] Health care professionals base their decisions on scientific evidence and the results of trials. These long-term trials have increased trust in the safety and effectiveness of vaccination.[21]

It is perceived that the acceptance of SARS-CoV-2 vaccination increases along with the level of experience and designation, as specialists were more willing to get vaccinated as compared to dental assistants.[22] This may be due to the fact that dental assistants and dental staff with less experience lack valid information on vaccination.[22] However, it is undeniable that overall, health care professionals faced a wave of uncertainty in this pandemic, which may have led them to spread rumors and myths regarding SARS-CoV-2 vaccination.

This survey found that almost 73% of the participants gained awareness with regard to SARS-CoV-2 vaccination via electronic and social media. Hence, electronic and social media may also be helpful in disseminating authentic information on SARS-CoV-2 vaccination. The WHO has taken an important initiative to address the myths regarding vaccination by answering the most commonly asked queries of the general population and uploading them on its website.[23] We suggest that policy-making organizations should make use of electronic and social media, and take key steps to clear up misinformation among the population. This would increase the number of vaccinated people and eventually limit the spread of cross-infection.

### Limitations

The limitations of this study are a survey-based cross-sectional study design with a non-probability snowball sampling technique and a small sample size. However, we believe that a long-term study should be conducted.

## Conclusions

There was a small percentage of health care professionals refusing SARS-CoV-2 vaccination. The main reason was uncertainty about side effects, the most expected being fever, myalgia and lethargy following vaccination.

### Ethics approval and consent to participate

The ethical approval was obtained from the institutional Research Ethics Committee (No. of approval: 2021-6233-17837). The respondents provided informed consent prior to completing the questionnaire.

### Data availability

All data generated and/or analyzed during this study is included in this published article.

### Consent for publication

The subjects understood that their names and initials would not be published, and due efforts would be made to conceal their identity**,** but anonymity could not be guaranteed.


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