



Vaccine Hesitancy among Dentists towards COVID-19 Vaccination: A Cross-Sectional Study

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Abstract

Introduction: COVID-19 remains persistent in its spread and dentists are at high risk of disease transmission. This study aims to assess the level of COVID-19 vaccine hesitancy among dentists, their knowledge and attitude regarding the vaccine, and the factors contributing to COVID-19 vaccine hesitancy and acceptance.

Method: An anonymous online questionnaire containing 24 items was circulated *via* the various social media platforms to dentists worldwide. Responses were analyzed using t-test analysis for continuous variables and chi-square for categorical variables.

Results: Among 612 respondents, 34% expressed hesitancy towards the COVID-19 vaccine. This hesitancy was significantly higher in the younger age groups and progressed to subside with age. The main motives for taking the vaccine were fear of transmitting COVID-19 to family members and patients, and the main deterrents were insufficient knowledge of the COVID-19 vaccine and fear of possible long-term side effects.

Conclusion: The results suggest high levels of COVID-19 vaccine hesitancy among dentists and a possible presence of innate general vaccine hesitancy. Targeted plans are recommended to increase COVID-19 vaccine acceptance and demand.

Keywords: COVID-19; Vaccine; Hesitancy; Dentists; Coronavirus

Introduction

COVID-19, a highly infectious respiratory disease, started to spread in Wuhan, China in December 2019 and progressed to a pandemic within three months. The World Health Organization (WHO) declared in January 2020 that SARS-CoV-2 was the pathogen that caused COVID-19 and was an international public health emergency [1].

According to research, people infected with SARS-CoV-2 can spread it to others within 3 meters of proximity; mainly through the release of respiratory droplets by coughing, sneezing, and talking. During dental appointments, the virus can be further transmitted between infected patients and dentists through (1) saliva, (2) gingival fluid, (3) instruments that create aerosol droplets, and (4) contaminated instruments and surfaces [2,3]. This, along with the potential of SARS-CoV-2 transmission from asymptomatic or mildly symptomatic patients, puts dentists at the greatest risk of being affected by COVID-19, even more than nurses and general physicians [3,4].

To ensure the safety of both patients and dental staff, strict guidelines were issued by different health regulatory bodies early on in the pandemic [5]. These guidelines, however, caused a great negative impact on dental care, so much that it has been the second most disrupted service in 122 countries this past year. This can be attributed to (1) the significant reduction in the hours spent at the office, in patient visits, and procedures being performed, (2) the frequency with which guidance is issued, and restrictions are imposed on the scope of the practice, and (3) the notable increase in PPE expenses [3,6].

The size and speed of the SARS-CoV-2 spread have made it brutally clear that immediate interventions should be taken to minimize the aftermath of the pandemic. Up to this point, there has been no effective treatment for COVID-19, thus our only hope is in achieving herd immunity [7].

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There are two ways in doing so; a large percentage of the population either gets infected or gets immunized; the latter being the safer and only possible option [8,9]. Just recently, several COVID-19 vaccines have been authorized worldwide. However, vaccine hesitancy, defined as “the delay in acceptance or refusal of vaccines despite availability of vaccine services”, could hinder the collective efforts to achieve herd immunity [1,10].

Vaccine hesitancy has been recognized by the World Health Organization (WHO) as one of the top ten most important health threats in the world [11]. The causes behind it are various and somehow unclear. According to the literature, some of the contributing factors to COVID-19 vaccine hesitancy, specifically, include: (1) Worries about the safety and efficacy of a rapidly developed vaccine, (2) worries about both short-term and long-term side effects, (3) worries about the duration of the acquired immunity against SARS-CoV-2, and (4) mistrust towards the healthcare system [10,12,13].

A variety of studies have concentrated on COVID-19 vaccine hesitancy. However, there appears to be a lack of emphasis on dentists in particular. Dentists are at high risk of disease transmission, are suffering from adverse effects on their practice, and have the potential to increase much-needed awareness among colleagues and the public about the COVID-19 vaccine. Therefore, we should understand the degree of COVID-19 vaccine hesitancy among dentists and the contributing factors behind it to be able to successfully address the issue and achieve the most satisfying and reliable results from the available vaccines.

Materials and Methodology

Study design, setting, and participants

A cross-sectional research design using an online questionnaire was used to collect data from dentists worldwide. The questionnaire was available from January 16th through February 22nd, 2021, and all participating dentists were invited to participate *via* e-mail and the various social media platforms. The purpose of the study was set out in a brief statement at the beginning of the questionnaire, and agreement to participate was considered as consent. No incentives were provided for any of the participants. The questionnaire was anonymous; no personal or identifying information was sought or recorded. This research study was approved by the Institutional Research Board (IRB approval number: 261/2020) at the Jordan University of Science and Technology. The minimum sample size necessary for $p=0.5$ variability, 95% confidence level and $\pm 5\%$ precision was determined to be 400 [14].

Measures and data collection

The (n=24) item questionnaire was developed using Google forms and contained 2 open-ended questions, and 22 close-ended questions formatted in tick boxes; 8 of which were measured on a Likert scale of 1 to 5 ((1) strongly agree; (2) agree; (3) neither agree nor disagree; (4) disagree; (5) strongly disagree). The first part of the questionnaire consisted of 9 questions aimed to gather demographic data (including age (23-30, 31-40, 41-50, 51-60, ≥ 61 years), sex (male, female), country of practice, country of degree, scope of practice (general dentist, specialist), employment status (full time, part time), and experience (<1, 2-5, 6-10, >10 years)), and data on whether the influenza vaccine was taken last winter and whether it would be taken this coming winter. The second part consisted of 15 questions aimed to (1) assess the level of COVID-19 vaccine hesitancy, (2) assess the knowledge and attitude regarding the COVID-19 vaccine, and (3)

assess the factors contributing to COVID-19 vaccine hesitancy and acceptance.

Statistical analysis

All questionnaire responses were transcribed in an Excel spreadsheet, and variables were reported in descriptive statistics; categorical variables were described as frequencies and percentages and continuous variables as means and standard deviations. Differences in responses between the vaccine hesitant and vaccine acceptant groups were evaluated using t-test analysis for continuous variables, and chi-square for categorical variables. Psychometric properties were evaluated for the eight Likert-scale items. Bivariate analysis was used to determine the empirical relationship between each set of two Likert-scale items. Internal consistency reliability of the scale was measured using Cronbach's alpha. For a scale to be reliable, Cronbach's alpha needs to be >0.7 [15]. Exploratory factor analysis was performed to evaluate the underlying factors for the scale. Scree plot analysis was conducted to determine the number of factors to be extracted. Factor loadings should be more than 0.4 for an item to be considered in that factor. R (version 4.0) was used for data analysis. All tests were two-sided and a p-value <0.05 was considered significant.

Results

A total of 612 dentists participated in this study. Participant characteristics are shown in Table 1. Of the study sample, two thirds (66%) reported willingness to take the COVID-19 vaccine, and 71% reported willingness to take more than one dose if required. Figure 1 shows the motives and deterrents to taking the vaccine as reported by the participants.

The main motives for the participants willing to take the vaccine were their fear of transmitting COVID-19 to their family members (40%), and to their patients (37%). Conversely, the main deterrents for the participants not willing to take the vaccine were their insufficient knowledge of the COVID-19 vaccine (50%), followed by their fear of possible long-term side effects (26%).

There was no significant difference between the COVID-19 vaccine acceptant and hesitant groups in terms of sex ($P=0.059$), scope of practice ($P=0.78$), employment status ($P=0.88$), and experience ($P=0.14$). However, as demonstrated in Figure 2, there was a significant difference between the COVID-19 vaccine hesitant and acceptant groups in terms of age ($P=0.005$). Hesitancy was more perceived with younger age groups, and it evidently subsided with age.

With regard to the influenza vaccine, there was a significant difference between the COVID-19 vaccine hesitant and acceptant groups ($P<0.001$). More COVID-19 vaccine acceptant responders took the influenza vaccine last year (30.7%) and intend to take it this year (40%), whereas, only 10.2% of the COVID-19 vaccine hesitant responders took the influenza vaccine last year, and 11.7% intend to take it this year. Also, the perceived increase in influenza vaccine intake intent was 6 times greater in the COVID-19 vaccine acceptant group (9.3% increase), as opposed to the COVID-19 vaccine hesitant group (1.5% increase).

Finally, regarding the eight Likert-scale items, the Cronbach's alpha coefficient was 0.83, suggesting that the items have a relatively high internal consistency. Moreover, the scree plot for those items indicated the presence of two factor; concerns and attitudes towards

Table 1: Demographic data of the respondents.

Variable	NO. (%)
Age (years)	
23-30	391 (64.3)
31-40	116 (19.1)
41-50	67 (11.0)
51-60	27 (4.4)
61 and above	7 (1.2)
Sex	
Male	203 (33.5)
Female	403 (66.5)
Country of practice	
East Asia and Pacific	14 (2.3)
Europe and Central Asia	32 (5.4)
South Asia	13 (2.2)
Middle East and North Africa	497 (83.1)
Sub-Saharan Africa	4 (0.7)
North America	26 (4.3)
Latin America and Caribbean	12 (2.0)
Scope of practice	
General dentist	365 (60.2)
General dentist in specialty training	58 (9.6)
Specialist	183 (30.2)
Employment status	
Full time	361 (60.5)
Part time	236 (39.5)
Experience (years)	
Less than 1 year	168 (28.0)
2-5 years	220 (36.7)
6-10 years	70 (11.7)
More than 10 years	142 (23.7)

COVID-19 vaccination, which are demonstrated in Figure 3. All factor loadings were above 0.4.

Overall, both the COVID-19 vaccine acceptant and hesitant groups were concerned about the long-term side effects, the duration of the acquired immunity, and their knowledge of the COVID-19 vaccine. The COVID-19 vaccine hesitant group’s results further established concerns regarding the short-term side effects, the overall safety, and the efficacy of the COVID-19 vaccine. Except for the duration of the acquired immunity, all the concerns were significantly higher in the hesitant group compared to the acceptant group.

Additionally, the COVID-19 hesitant group’s results demonstrate a significant attitude of being against vaccinations in general ($P < 0.001$). And according to the Pearson correlation ($r = 0.59$), both the previous notion and the preference for getting COVID-19 immunity by getting infected rather than getting vaccinated were found to be strongly correlated.

Discussion

Main finding of this study

A study done in the US estimated that if 17% of the population

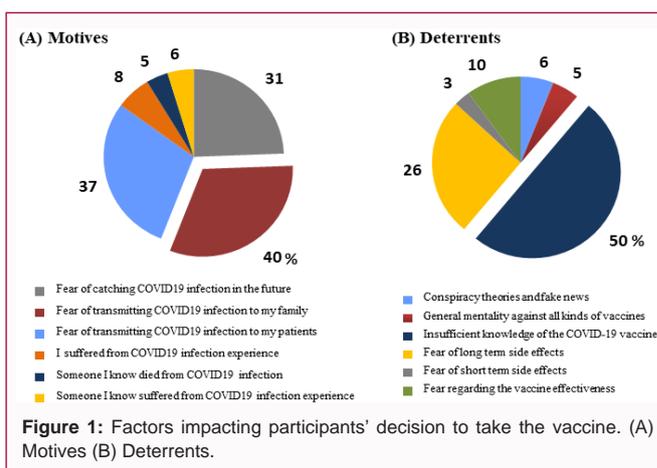


Figure 1: Factors impacting participants' decision to take the vaccine. (A) Motives (B) Deterrents.

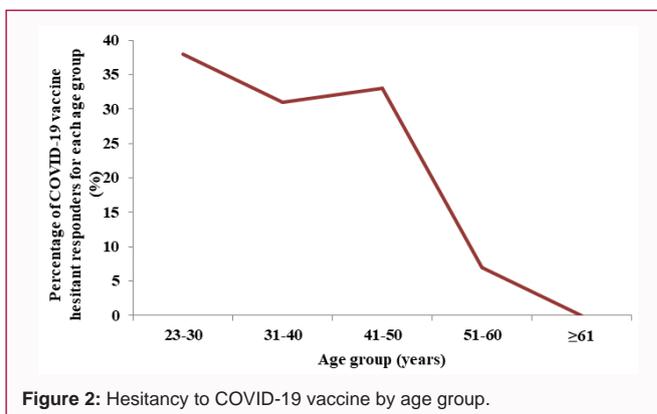


Figure 2: Hesitancy to COVID-19 vaccine by age group.

(the baseline) regularly wears face masks in public, herd immunity against COVID-19 requires about 82% of the population to be vaccinated [16]. However, considering that a sizable proportion of any population will be ineligible to receive the COVID-19 vaccine due to age and pre-existing medical conditions, any significant vaccine hesitancy will play a major role in impeding the collective efforts to put a stop to this pandemic. Therefore, 34% hesitancy among dentists, who are educated on vaccinations and vaccine-preventable infections, is highly concerning.

Our data revealed a link between age and COVID-19 vaccine hesitancy. Although it was at its highest among the youngest age group (38%), COVID-19 vaccine hesitancy proceeded to subside with age. This provides support for a previous study, which found that older healthcare workers generally exhibit an increased willingness to get vaccinated against COVID-19 than younger healthcare workers [17].

This significant increase in COVID-19 vaccine acceptance with age is only to be expected. COVID-19 has an estimated infection fatality ratio of 0.3% to 1.3%, and it is well-known that age is one of the leading risk factors for increased COVID-19 related complications [18]. Therefore, the older the dentists, the more likely they are to take the vaccine in self-preservation. Nonetheless, it is also plausible that the hesitancy among the younger age groups, precisely, may result from their increased engagement in social media, thus they are more likely to be influenced by the circulating vaccine hesitancy propaganda [19].

What is already known on this topic?

The few previous studies that included dental professionals in their evaluation of the reasons behind COVID-19 vaccine hesitancy

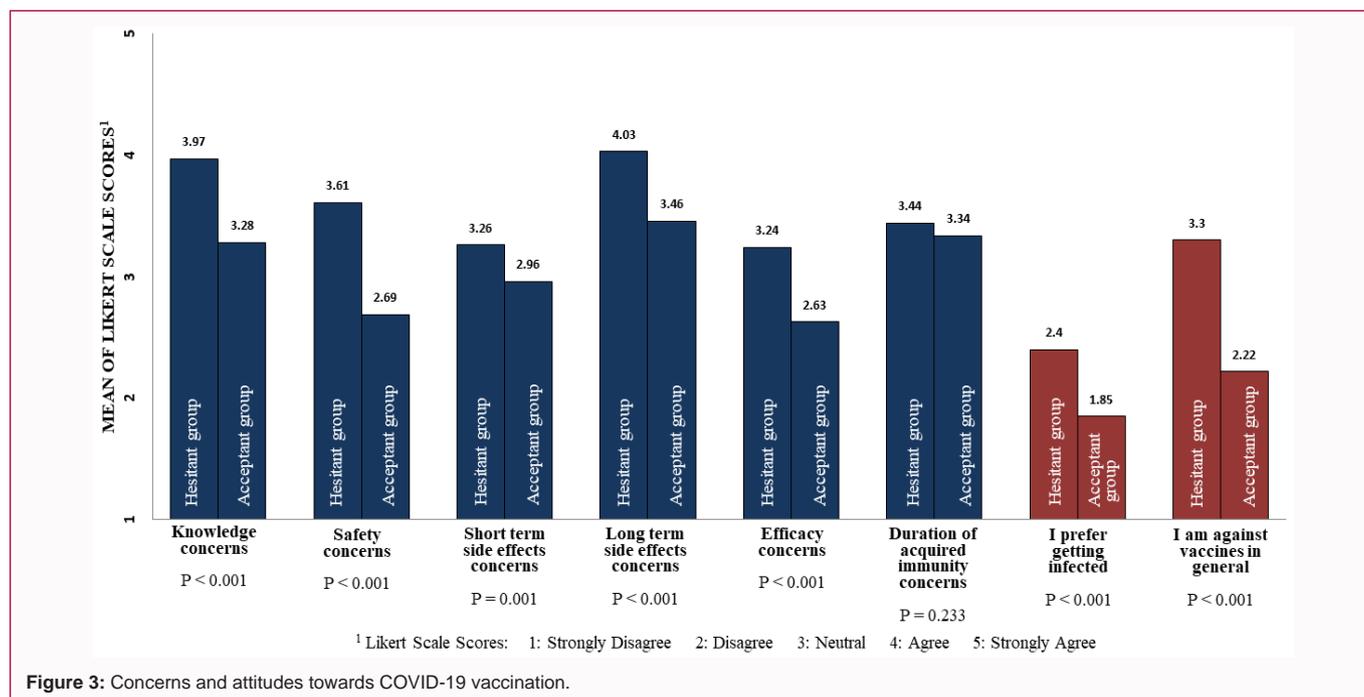


Figure 3: Concerns and attitudes towards COVID-19 vaccination.

found that insufficient knowledge of the COVID-19 vaccine and safety concerns, mainly regarding the possible long-term side effects, to be among the top factors relating to said hesitancy [20,21]. This study, which mainly focused on dental professionals, found consistent similarities with the literature. The 50% of the vaccine hesitant group reported concerns of insufficient knowledge regarding the vaccine to be the main reason they refuse taking the vaccine, while 26% reported concerns of possible long-term side effects to be their main reasons.

What this study adds

This study also found that the preference to getting COVID-19 immunity by getting infected rather than getting vaccinated to be strongly related to the attitude of being against vaccines in general. This suggests an innate hesitancy towards vaccines in general and not a mere reluctance towards the newly developed COVID-19 vaccine itself. This is further reinforced by the finding that there is a positive association between taking the influenza vaccine and COVID-19 vaccine acceptance, so much that the likelihood of influenza vaccine intake this year as opposed to last year was six times greater in the COVID-19 vaccine acceptant group (9.3% increase) compared with the COVID-19 vaccine hesitant group (1.5% increase).

Limitations of this Study

The limitation of this study stem from its cross-sectional design and the sampling technique that is based on a questionnaire, randomly distributed as an online link via e-mail and the various social media platforms. This sampling technique affected the country representations in the sample and thus the generalizability of the findings.

Conclusion

Dentists are the working group at the greatest risk of COVID-19 disease transmission. Our results suggest high levels of COVID-19 vaccine hesitancy among dentists and a possible presence of innate general vaccine hesitancy. Targeted plans are recommend to increase COVID-19 vaccine acceptance and demand. The plans

should encourage trust-building, active hesitancy prevention, and national assessment of vaccine concerns. Additionally, more targeted information in dental school courses might be needed to increase the awareness, knowledge, and confidence in the safety and effectiveness of vaccines.

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