Risk Perception and Hesitancy of Dental Health Professionals towards COVID-19 Vaccine in Riyadh Region, Saudi Arabia-A Web-based Survey

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Authors’ contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Vaccine hesitancy is a common phenomenon due to its unknown long term side effects. Data regarding the same is scanty in the Saudi Arabia region hence the purpose of this study was to assess the safety concerns and reasons for vaccine hesitancy and acceptance among dental health professionals in Saudi Arabia.

Materials and Methods: A total of 138 dental health professionals serving in a Riyadh region of Saudi Arabia were studied using an online-based structured, close-ended, and self-administered questionnaire developed by Paudel et al consisting of three sections: demographics, experiences, and willingness to get the vaccination, and perception of COVID-19, and COVID-19 vaccine safety. It was a cross sectional study where convenience sampling technique was employed. The total perception score was calculated by adding respondents’ agreement with a set of eleven items using a Likert-type scale. Non-parametric tests (Mann–Whitney U and Kruskal–Wallis) were used for analysis (p<0.05).

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Results: A total of 18.1% of respondents were diagnosed COVID-19 positive before the study. Many (71.7%) considered themselves at increased risk of contracting COVID-19. More than half (55.6%) of the participants believed the increased risk is due to their job type. Nevertheless, a considerable proportion of dental health professionals (89.9%) were willing to be vaccinated. The most common reason for hesitancy was the government approval of the safe and effective vaccine. The nationality, marital status, and type of dental professionals showed a statistically significant difference in vaccine safety perception and effectiveness concerns (p<0.05).

Conclusion: The COVID-19 vaccination is well accepted by dental professionals in the Riyadh region of Saudi Arabia. However, vaccine hesitancy is mainly related to the safety and effectiveness of the vaccine and government approval of the vaccine.

Keywords: Acceptance; COVID-19; dental health professional; risk perception; safety.

1. INTRODUCTION

Coronavirus disease 2019 (COVID-19) is continually taking a toll worldwide. As of June 04, 2021, there were 3,698,621 deaths and 171,782,908 confirmed cases globally were reported by WHO. Many remedial measures have been tried with limited success since the pandemic’s beginning [1,2]. Several vaccines have recently been developed to combat the virus. Currently, vaccines may be the best way to reduce disease transmission when more aggressive mutant strains are discovered regularly. Some vaccines are already on the emergency use list, while others are still being reviewed. However, a study conducted among dental and medical students has highlighted the need for profession-specific curricula to enhance knowledge about vaccines and vaccine counseling skills. In their research, Walker et al. (2021) reported that the international students demonstrated a low level of acceptance of the vaccine [3]. On the contrary, attitude towards getting vaccinated and consequences of infection, and doubts towards efficacy and vaccine potential side effects were found to depend on age and health care professional status [4]. Various studies conducted to assess the vaccination hesitancy and perception have demonstrated different outcomes [4–8].

Since dental health care professionals are directly involved in diagnosing, treating, and taking care of patients, they are at high risk of contracting COVID-19 infection [9]. Most countries, including Saudi Arabia, have started their vaccination programs. Vaccination has been demonstrated to help lower the severity of consequences to varying degrees. However, research has reported that 70% of the population needs to be vaccinated to obtain herd immunity to mitigate COVID-19 [1]. The vaccine skeptics for COVID-19 can deter vaccination drive by creating and spreading speculation. Acceptance of misguided information regarding the COVID-19 vaccine by the public is likely to develop hesitancy among the public to be vaccinated [10]. In Saudi Arabia, frontline health care workers have been given priority for COVID-19 vaccination. Since vaccination of health care practitioners including dental practitioners will ensure to deal effectively with infected patients.

The information gathered from this study aid in identifying potential concerns of the vaccine among dental health professionals that must be addressed to ensure adequate immunization of COVID-19. It also helps develop educational programs to teach dental professionals how to provide vaccine recommendations and counsel vaccine-hesitant patients. Hence this web-based survey aimed to assess the safety concerns and reasons for vaccine hesitancy among dental health professionals in Saudi Arabia.

2. MATERIALS AND METHODS

2.1 Study Design

A cross-sectional descriptive study was conducted among dental health professionals, including dentists and dental auxiliaries in the Riyadh region of Saudi Arabia.

2.2 Study Questionnaire

This research used an English version of the questionnaire developed by Paudel et al. [11]. The questionnaire consisted of section 1, demographics; section 2, experiences, and perception of COVID-19; and section 3, vaccine safety perception and effectiveness concerns. A dental public health expert established the questionnaire’s face validity. The questionnaire was pilot tested among 20 participants, and the reliability of the questionnaire was determined.
using Cronbach's alpha (0.78%). Adults aged >18 years working as dental professionals (dentists, dental assistants, dental technicians, and dental hygienists) in the Riyadh region and having consented to participate included in the study.

2.3 Sample Size Calculation

The sample size was calculated as per Cochran's formula: \( N = \frac{Z^2pq}{e^2} \). Where \( Z = \) value is obtained from the Z table at a given value of precision, 1.96. \( p = \) estimated proportion of the population which has the attribute in question; for our heterogeneous group of population, we assumed greater variability of 50%, so \( p = 0.5, q = 1 - p = 1 - 0.5 = 0.5, e = \) desired level of precision (i.e., the margin of error) = 5% = 0.05. Including these values in the formula resulted in a sample size of \( N=384 \). However, only 138 dental health professionals responded to the online questionnaire.

2.4 Questionnaire Administration

An online English version of the questionnaire was prepared using Google Forms. In addition, the questionnaire links were shared with prominent dental professionals' social media platforms (WhatsApp, Twitter, and Snapchat). A convenience sampling design was employed for data collection.

2.5 Statistical Analysis

All the completed questionnaires were coded, entered, and analyzed using IBM SPSS version 25.0 (Armonk, NY, USA). Categorical variables were analyzed descriptively using frequency distribution and percentages. In addition, a multiple response analysis was carried out to identify the reasons for the increased risk of COVID-19 among study participants and the reason to become eligible for taking the vaccine. Finally, the total perception ranks of COVID-19 vaccines safety perception and effectiveness concern scores were calculated by noting the respondents' agreement (strongly agree and somewhat agree scored =1, and neutral, strongly disagree, and disagree =0 with a set of 11 statements. The data showed non-normal distribution; hence the mean ranks were compared using the Mann-Whitney U test and Kruskal-Wallis test across different demographic characteristics of the study participants. A p-value under 0.05 was considered significant for all the statistical tests.

3. RESULTS

A total of 138 dental professionals participated in this study. The demographic characteristics of the study participants are shown in (Table 1). The majority of the study participants were male (56.5%), Saudi nationals (68.1%) with a monthly income of up to 10,000 SAR (48.6%). In addition, more than half of the study participants were single (55.8%) having a bachelor's level of education (63.8%). More dentists (84.1%) than dental auxiliaries (15.9%) participated in the study. Most dental health professionals worked in urban areas (64.5%) of the private sector (51.4%), and less than half of the participants took the influenza vaccine (48.6%).

When enquired about the COVID-19 infection (18.1%) of the study participants tested positive, 37.7% of the dental health professionals mentioned that their family members with whom they are staying tested positive for the COVID-19. Nearly half of the study participants were quite worried about themselves and their family members contracting COVID-19. Almost 71.7% of the participants identify themselves at the increased risk of COVID-19, and 59.4% perceive pandemic severity as moderate. Nearly 96.4% of the study participants were eligible to receive the vaccine, and 89.9% were willing to get vaccinated. However, 40.6% were highly concerned if the vaccine was not offered to them (Table 2).

A multiple response analysis indicated that (55.6%) of study participants viewed job types involving high contact with people as the reasons for increased risk of COVID-19, followed by other reasons, as shown in (Fig. 1).

When asked about acquiring vaccination, 41.6% said they were a health care professional, 26% said everyone should have access to vaccines, and 24% said they work in a job with high contact with people (Fig. 2).
Table 1. Demographic characteristics of the study participants (N=138)

| Characteristics          | n    | %   |
|--------------------------|------|-----|
| Gender                   |      |     |
| Female                   | 60   | 43.5%|
| Male                     | 78   | 56.5%|
| Nationality              |      |     |
| Saudi                    | 94   | 68.1%|
| Non-Saudi                | 44   | 31.9%|
| Monthly income (SAR)     |      |     |
| Upto 10000               | 67   | 48.6%|
| 10000-20000              | 40   | 29.0%|
| >20000                   | 31   | 22.5%|
| Marital status           |      |     |
| Married                  | 61   | 44.2%|
| Single                   | 77   | 55.8%|
| Education                |      |     |
| Diploma                  | 7    | 5.1% |
| Bachelors                | 88   | 63.8%|
| Masters                  | 28   | 20.3%|
| Ph.D/Saudi Board         | 15   | 10.9%|
| Profession               |      |     |
| Dental Auxiliary         | 22   | 15.9%|
| Dentist                  | 116  | 84.1%|
| Work Area                |      |     |
| Rural                    | 49   | 35.5%|
| Urban                    | 89   | 64.5%|
| Work Sector              |      |     |
| Government               | 67   | 48.6%|
| Private                  | 71   | 51.4%|
| Influenza Vaccine        |      |     |
| Yes                      | 67   | 48.6%|
| No                       | 71   | 51.4%|

Table 2. COVID-19 related information of the respondents

| COVID-19 Related Information                                      | n    | %   |
|-------------------------------------------------------------------|------|-----|
| Have you been diagnosed to be COVID-19 positive?                  |      |     |
| Yes                                                               | 25   | 18.1%|
| No                                                                | 113  | 81.9%|
| Have any of your family members staying with you been diagnosed COVID-19 positive? | | |
| Yes                                                               | 52   | 37.7%|
| No                                                                | 86   | 62.3%|
| How much worried you were about you or family member contracting COVID-19? | | |
| Extremely worried                                                | 40   | 29.0%|
| Quiet worried                                                    | 69   | 50.0%|
| Little worry                                                     | 19   | 13.8%|
| No worry                                                         | 10   | 7.2% |
| Do you identify yourself at increased risk of infection with COVID-19? | | |
| Yes                                                               | 99   | 71.7%|
| No                                                               | 29   | 21.0%|
| Don't know                                                       | 10   | 7.2% |
| What is your perception of pandemic severity?                     |      |     |
| Mild                                                              | 13   | 9.4% |
| Moderate                                                         | 82   | 59.4%|
| Severe                                                           | 43   | 31.2%|
| Do you think you are eligible to receive the vaccine?            |      |     |
| Yes                                                               | 133  | 96.4%|
| No                                                               | 5    | 3.6% |
| Are you willing to be vaccinated if a vaccine is offered to you? |      |     |
| Yes                                                               | 124  | 89.9%|
| Undecided                                                        | 6    | 4.3% |
| Will get Vaccinated                                              | 4    | 2.9% |
| No                                                               | 4    | 2.9% |
| Will you be concerned if the vaccine is not offered to you?      |      |     |
| Extremely concerned.                                             | 56   | 40.6%|
| Quite concerned.                                                 | 45   | 32.6%|
| Little concerned.                                                | 16   | 11.6%|
| Not concerned                                                    | 12   | 8.7% |
| Don't know                                                       | 9    | 6.5% |
Although nearly 73.20% agreed that the vaccine is safe, 22.50% reconsider getting vaccinated even after they had a bad reaction or know about someone having a bad reaction. While 80.40% agreed to receive if the vaccine is safe, effective, and offered free. Similarly, 89.80% were prepared to get the vaccine if approved by the government and comply with the employer's recommendation. Nearly half (50.8%) of the participants reconsider choosing vaccination after reading/hearing about the safety of vaccines through media or social media. Similarly, half (50.70%) of the participants were ready to share their vaccine safety information on their social media. Almost (66.60%) agreed that the health care workers provide sufficient information on side effects that follow vaccination, and (68.80%) mentioned that the pharmaceutical and biotech companies provide safe vaccines. Moreover, (29.7%) participants agreed that vaccines made in Europe or America are safer than those in our region, and (38.40%)
believed that vaccines overload the immune system. However, (37.60%) dental health professionals agree that the excipients used in vaccines can cause side effects (Table 3).

When mean ranks of vaccine safety perception and effectiveness concerns were compared across different demographic variables using Mann-Whitney U test and Kruskal-Wallis tests indicated statistically significant differences. A significantly higher mean rank was observed among Saudi dental professionals (74.70) compared to the non-Saudi professionals (58.40) (p=0.023). In addition, dental professionals who were single (76.95) showed a significantly higher mean rank than married (60.10) (p=0.012). Similarly, dentists (73.65) demonstrated a significantly higher mean rank of vaccine safety perception and effectiveness concerns than the dental auxiliaries (47.61) (p=0.004). However, other demographic variables did not show any significant differences in vaccine safety perception and effectiveness concerns, as shown in (Table 4).

Table 3. Vaccine safety perception and effectiveness concerns among study participants (N=138)

| Vaccine safety perception                                                                 | Strongly Agree | Somewhat Agree | Neutral/no opinion | Somewhat disagree | Strongly disagree |
|-----------------------------------------------------------------------------------------|----------------|----------------|--------------------|-------------------|-------------------|
| COVID 19 vaccine is safe                                                                  | 34.8%          | 38.4%          | 22.5%              | 2.2%              | 2.2%              |
| Myself or someone I know previously had a bad reaction to a vaccine which makes me reconsider getting vaccinated | 8.7%           | 13.8%          | 30.4%              | 19.6%             | 27.5%             |
| I will receive a COVID-19 vaccine if it is proven safe and effective and is offered to me free of charge | 68.8%          | 11.6%          | 15.2%              | 2.9%              | 1.4%              |
| If the government has approved a COVID-19 vaccine safe and effective, I am ready to comply with my employer's recommendation | 71.7%          | 18.1%          | 8.0%               | 1.4%              | 0.7%              |
| The information about safety I heard/read in the media/social media makes me reconsider the choice to be vaccinated | 31.2%          | 19.6%          | 18.1%              | 11.6%             | 19.6%             |
| I share information related to vaccination safety within my social media network         | 24.6%          | 26.1%          | 31.9%              | 6.5%              | 10.9%             |
| Health care workers provide sufficient information on side effects that follow vaccination | 36.2%          | 30.4%          | 20.3%              | 8.7%              | 4.3%              |
| Pharmaceutical and biotech companies provide safe vaccines                               | 30.4%          | 38.4%          | 27.5%              | 2.2%              | 1.4%              |
| Vaccines made in Europe or America are safer than those made in our region               | 13.0%          | 16.7%          | 40.6%              | 8.0%              | 21.7%             |
| I believe vaccines overload the immune system                                            | 10.9%          | 27.5%          | 35.5%              | 13.0%             | 13.0%             |
| Excipients (medium for a vaccine) used in vaccines can cause side effects                | 10.1%          | 27.5%          | 50.7%              | 8.0%              | 3.6%              |
Table 4. Vaccine safety perception and effectiveness concerns and demographic variables

| Variables               | Mean rank | P       |
|-------------------------|-----------|---------|
| Gender                  |           |         |
| Female                  | 68.95     | 0.885*  |
| Male                    | 69.92     |         |
| Nationality             |           |         |
| Saudi                   | 74.70     | 0.023*  |
| Non-Saudi               | 58.40     |         |
| Monthly income          |           |         |
| Upto 10000              | 67.21     | 0.400¶  |
| 10000-20000             | 76.48     |         |
| >20000                  | 65.45     |         |
| Marital status          |           |         |
| Married                 | 60.10     | 0.012*  |
| Single                  | 76.95     |         |
| Education               |           |         |
| Diploma                 | 60.29     | 0.437¶  |
| Bachelors               | 71.44     |         |
| Masters                 | 60.95     |         |
| Ph.D./Saudi Board       | 78.40     |         |
| Professional            |           |         |
| Dental Auxiliary        | 47.61     | 0.004*  |
| Dentist                 | 73.65     |         |
| Work Area               |           |         |
| Rural                   | 61.65     | 0.081*  |
| Urban                   | 73.82     |         |
| Work Sector             |           |         |
| Government              | 67.48     | 0.555*  |
| Private                 | 71.41     |         |

*Mann-Whitney U test, ¶ Kruskal-Wallis test, Bold letter indicate p<0.05

4. DISCUSSION

Because COVID-19-related illness and death are on the rise globally, immunization is gaining traction among health care professionals as a means of prevention and control. In addition, dental professionals are at significant risk of cross-infection while treating the patients within the clinical setup. Therefore, the vaccination remains the most often prescribed preventive intervention in dentistry, despite vaccine hesitancy, rumors, and misinformation driving a rising public concern that may even influence the dental health professionals [12–14].

Previous research has focused on the general population’s acceptance of COVID-19 vaccination in Saudi Arabia [15–17], and considering the scarcity of similar studies among dental health professionals, and we decided to survey dental professionals risk perception and hesitancy of COVID-19 vaccination in Riyadh region. Due to the lack of similar studies among dental health professionals, our study findings are compared with general health professionals.

In this study, (89.5%) dental health professionals were willing to get vaccinated, indicating their acceptance of the COVID-19 vaccine. This finding is similar to that observed in a previous studies among dental professionals [18,14]. While Papagiannis reported that dentists’ vaccine acceptance rate was 82.5% amongst healthcare workers [19]. However, vaccine acceptance among health care workers in Saudi Arabia ranged between 53-67% [20–23]. Another study conducted by Kelekar reported that 45% of dental students and 23% of medical students were hesitant about receiving the COVID-19 vaccine [24].

The study findings revealed a high percentage of acceptance, which might be attributed to several variables—first, being part of the high-risk health care group of getting COVID-19. The Ministry of Health in Saudi Arabia has now licensed three COVID-19 vaccines (Pfizer/BioNTech, Astra Zeneca, and Moderna) for distribution from over 100 immunization centers around the country [23]. This free availability of high efficacious and safe vaccines could have positively influenced dental professionals to have COVID-19 vaccination acceptance. Moreover, the death of the health care workers, including dental health professionals, during the peak of the COVID-19 pandemic may have resulted in anxiety and fear, which have favorably affected the acceptance of the vaccine [14]. Several personalized digital platforms were used to track the spread of COVID-19 and immunization. Tawakkalna, a GPS-enabled app, was launched by the Saudi Data and Artificial Intelligence Authority to monitor and limit persons’ mobility during curfew hours, with the ability to give permits for
exceptions [25]. Moreover, it was updated with the individual's vaccination status.

Past studies found demographic differences in COVID-19 vaccine acceptance among healthcare workers [22,23]. Gender differences were evident with regards to vaccine acceptance. Male healthcare workers are more likely to accept vaccines than female healthcare workers. It could be due to the reported higher risks for COVID-19 hospitalization, infection, and death among males [26]. In the case of general health care workers with less education may be more receptive to a COVID-19 vaccination since they are less likely to deliver health care services through telecommuting than the physicians [23].

Moreover, younger health care workers were more receptive to the vaccine than the older age health care workers. On the contrary, our study found significant differences in vaccine safety perception and effectiveness concerns across nationalities, marital statuses, and types of dental professionals. Again, it could be attributed to the nature of the job and knowledge of the COVID-19 vaccine.

The present study found that adequate COVID-19 vaccination information and job contacting many people were related to vaccine acceptance among study participants. Additionally, dental professionals with higher safety perceptions and concerns might have less hesitancy to receive the vaccine, which could be a positive indicator of vaccine acceptance.

5. LIMITATIONS OF THE STUDY

The study sample was small, and only 36% of all the calculated subjects participated in the study. Moreover, the study sample was selected only from one region of Saudi Arabia. The use of non-probability sampling methodology may have created a selection bias. Therefore, study findings cannot be generalizable to all the dental professionals working in Saudi Arabia.

Moreover, the web-based surveying method, limited to computerized and internet users, had created a selection bias. Dental professionals having access to social media and the internet may be better knowledgeable regarding COVID-19 vaccination information and higher health literacy. In addition, the rate of vaccination acceptance may be overstated since dentists who were not interested in being vaccinated were unlikely to participate in this study. Furthermore, since our research was done at a time when Saudi dental professionals began to get vaccinated, encouragements among colleagues to receive vaccination may have had a favorable influence on improving acceptance rates.

6. CONCLUSION

The study results showed that COVID-19 vaccination is well accepted by the dental professionals in the Riyadh region of Saudi Arabia. Furthermore, the high acceptance of COVID-19 vaccination among dental professionals is predicted to significantly influence other healthcare workers and the public.

Therefore, we recommend that knowledge of the COVID-19 vaccine should be improved to address the vaccine hesitancy among dental health professionals. The implications of the study includes further nationwide research needed to assess the real vaccination rate among dental health professionals in Saudi Arabia.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

The purpose of the study was explained to the dental health professionals, and online consent to participate in the study was obtained. In addition, all the study participants were assured of confidentiality, as data was collected anonymously without personal identifiers. CHERRY's checklist was followed while conducting the study. The data collection was carried out in June and July 2021.
ETHICAL APPROVAL
A study proposal was submitted to the research center of Riyadh Elm University, Riyadh, Saudi Arabia and ethical approval was obtained ("SRP/2021/64/461/431").

COMPETING INTERESTS
Authors have declared that no competing interests exist.

REFERENCES
1. Sanders JM, Monogue ML, Jodlowski TZ, Cutrell JB. Pharmacologic Treatments for Coronavirus Disease 2019 (COVID-19): A Review. JAMA. 2020;323(18):1824–36.
2. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. N Engl J Med. 2020;382(8):727–33.
3. Walker AN, Zhang T, Peng X-Q, Ge J-J, Gu H, You H. Vaccine Acceptance and Its Influencing Factors: An Online Cross-Sectional Study among International College Students Studying in China. Vaccines. 2021;9(6):585.
4. Guljaš S, Bosnić Z, Salha T, Berecki M, Krivdić Dupan Z, Rudan S, et al. Lack of Information about COVID-19 Vaccine: From Implications to Intervention for Supporting Public Health Communications in COVID-19 Pandemic. Int J Environ Res Public Health. 2021;18(11):6141.
5. Ciardi F, Menon V, Jensen JL, Shariff MA, Pillai A, Venugopal U, et al. Knowledge, Attitudes and Perceptions of COVID-19 Vaccination among Healthcare Workers of an Inner-City Hospital in New York. Vaccines. 2021;9(5):585.
6. Costantino A, Topa M, Roncoroni L, Doneda L, Lombardo V, Stocco D, et al. COVID-19 Vaccine: A Survey of Hesitancy in Patients with Celiac Disease. Vaccines. 2021;9(5):511.
7. Temsah M-H, Barry M, Aljamaan F, Alhuzaimi A, Al-Eyadhy A, Saddik B, et al. Adenovirus and RNA-based COVID-19 vaccines’ perceptions and acceptance among healthcare workers in Saudi Arabia: a national survey. BMJ Open. 2021 Jun 21;11(6):e048586.
8. Rayani M, Rayani S, Najafi-Sharjabad F. COVID-19-related knowledge, risk perception, information seeking, and adherence to preventive behaviors among undergraduate students, southern Iran. Environ Sci Pollut Res Int; 2021 Jun 20.
9. Ali S, Noreen S, Farooq I, Bugshsan A, Vohra F. Risk Assessment of Healthcare Workers at the Frontline against COVID-19. Pak J Med Sci. 2020;36(COVID19-S4):S99–103.
10. Su Z, Wen J, Abbas J, McDonnell D, Cheshmezhangi A, Li X, et al. A race for a better understanding of COVID-19 vaccine non-adopters. Brain Behav Immun - Health. 2020;9:100159.
11. Paudel S, Palaian S, Shankar PR, Subedi N. <p>Risk Perception and Hesitancy Toward COVID-19 Vaccination Among Healthcare Workers and Staff at a Medical College in Nepal</p>-. Risk Manag Healthc Policy [Internet]; 2021;14:2253–61. [Cited 2021 Jun 5] Available:https://www.dovepress.com/risk-perception-and-hesitancy-toward-covid-19-vaccination-among-health-peer-reviewed-fulltext-article-RMHP
12. Baghizadeh Fini M. What dentists need to know about COVID-19. Oral Oncol. 2020; 105:104741.
13. Fontanet A, Autran B, Lina B, Kiyen MP, Karim SSA, Sridhar D. SARS-CoV-2 variants and ending the COVID-19 pandemic. Lancet Lond Engl. 2021 Mar 13;397(10278):952–4.
14. Nasr L, Saleh N, Hleyhel M, El-Outa A, Noujeim Z. Acceptance of COVID-19 vaccination and its determinants among Lebanese dentists: a cross-sectional study. BMC Oral Health. 2021;21(1):484.
15. Alghamdi AA, Aldosari MS, Alsaeed RA. Acceptance and barriers of COVID-19 vaccination among people with chronic diseases in Saudi Arabia. J Infect Dev Ctries. 2021;15(11):1646–52.
16. Antulahi N, Ainuaim S, Albudlqader A, Alkharashi A, AImalki A, AlSiari F, et al. Willingness, beliefs, and barriers regarding the COVID-19 vaccine in Saudi Arabia: a multiregional cross-sectional study. BMC Fam Pract. 2021;22(1):247.
17. Narapureddy BR, Muzammil K, Alshahrani MY, Alkhathami AG, Alsaabaani A, AlShahrani AM, et al. COVID-19 Vaccine Acceptance: Beliefs and Barriers Associated with Vaccination Among the Residents of KSA. J Multidiscip Healthc. 2021;14:3243–52.
18. Zigron A, Dror AA, Morozov NG, Shani T, Haj Khalil T, Eisenbach N, et al. COVID-19
Vaccine Acceptance Among Dental Professionals Based on Employment Status During the Pandemic. Front Med. 2021;8:618403.

19. Papagiannis D, Rachiotis G, Malli F, Papathanasiou IV, Kotsiou O, Fradelos EC, et al. Acceptability of COVID-19 Vaccination among Greek Health Professionals. Vaccines. 2021;9(3):200.

20. Alamer E, Hakami F, Hamdi S, Alamer A, Awaf M, Darraj H, et al. Knowledge, Attitudes and Perception toward COVID-19 Vaccines among Adults in Jazan Province, Saudi Arabia. Vaccines. 2021 Nov 1;9(11):1259.

21. Al-Mohaithef M, Padhi BK, Ennaceur S. Socio-Demographics Correlate of COVID-19 Vaccine Hesitancy During the Second Wave of COVID-19 Pandemic: A Cross-Sectional Web-Based Survey in Saudi Arabia. Front Public Health. 2021;9:698106.

22. Barry M, Temsah M-H, Aljamaan F, Saddik B, Al-Eyadhy A, Alenezi S, et al. COVID-19 vaccine uptake among healthcare workers in the fourth country to authorize BNT162b2 during the first month of rollout. Vaccine. 2021;39(40):5762–8.

23. Elharake JA, Galal B, Alqahtani SA, Kattan RF, Barry MA, Temsah M-H, et al. COVID-19 Vaccine Acceptance among Health Care Workers in the Kingdom of Saudi Arabia. Int J Infect Dis IJID Off Publ Int Soc Infect Dis. 2021;109:286–93.

24. Kelekari AK, Lucia VC, Afonso NM, Mascarenhas AK. COVID-19 vaccine acceptance and hesitancy among dental and medical students. J Am Dent Assoc 1939. 2021;152(8):596–603.

25. Hassounah M, Raheel H, Alhefzi M. Digital Response During the COVID-19 Pandemic in Saudi Arabia. J Med Internet Res [Internet]. 2020 Sep [cited 2021 Dec 25];22(9). Available:https://www.ncbi.nlm.nih.gov/labs/pmc/articles/PMC7473704/

26. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet Lond Engl. 2020;395(10223):507–13.

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