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# Perception and attitude of Sudanese dentists about COVID-19

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**The present study was conducted to give an insight into the level of perception, practice and attitude of Sudanese dentists in relation to infection control measures at the time of the 2020 outbreak of COVID-19 through an online survey. A sample of 315 participants was enrolled in the study. An online survey was conducted in August 2020, using the Google Form software. Data were analyzed using the statistical software for social science (SPSS). Mean scores of perceptions, practice attitude sections, were compared to some of the questions in general characteristics section using the Kruskal–Wallis and the Mann–Whitney U tests to derive a relationship. The most prevalent age group (49.4 %) was between the ages of 25-34. The female and male percentages were 70.2% and 29.8% respectively. A statistically significant difference was found when perception was compared based on years of practicing with the highest mean score (144.44) among those who were practicing more that 10 years (p=0.002). No significant difference was found in the mean score of perception among participants who received or did not received training in infection control (p=0.77). However, significant relationships were noted between the variables (dental professions, years of practicing and receiving lecture on infection control) and practice with p value of (0,0,0.001 respectively). Sudanese dentists showed adequate perception and attitude towards COVID-19 infection controls and measures in dental clinics. However, there was limited understanding by dentists of the extra precautionary measures to protect patients from COVID-19.**

**Key words:** Sudanese dentists, perception, practice, attitude, COVID-19.

## INTRODUCTION

The coronavirus disease (COVID-19) that started in China in 2019 has spread universally and is currently pronounced as a pandemic by the World Health Organization (WHO, 2020), with a significant number of cases and deaths reported in many countries. Amongst these nations, Italy, the United Kingdom and Spain had a high fatality rate of between 4%–8% (Zhong et al., 2003). COVID-19 is a member of the Coronavirus family. SARS-CoV and MERS-CoV viruses, which have spread in recent years but are less prevalent and less contagious

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than COVID-19, also belong to this family (Zhong et al., 2003).

Previous works showed that over 80% of the COVID-19 genome is identical to the SARSCoV genome Wu et al. (2020). COVID-19 represents a serious challenge to public health systems around the globe and as such has become a broadly discussed topic in the medical professional and in the clinical expert fields.

The coronavirus disease causes flu-like symptoms, and can cause severe and fatal pneumonia as well as acute respiratory distress syndrome. It is assumed that the respiratory droplets are primarily spread from individual to individual. In this way, close contact to individuals is along these lines seen as a hazard and recommended to be avoided. This situation makes the close proximity of dentists and their patients a conceivably risky setting (Meng et al., 2020).

Studies showed that, the primary target for the COVID-19 virus is the angiotensin-converting enzyme 2(ACE2) receptor of the salivary glands' epithelial cells. This receptor is concentrated in the tongue and suggests a strong risk of infection in the oral cavity (Vinayachandran and Saravanakarthikeyan, 2020).

Therefore, saliva plays a part in the entrance of COVID-19 into the body as well as in the dissemination of infection via the distribution of virus-infected droplets (To et al., 2020; Yan et al., 2018). The COVID-19 pandemic in Sudan is part of a global coronavirus pandemic in 2019.

On 12 March 2020, Sudan reported its first case of COVID-19 and as of 25 July 2020, Sudan Ministry of Health authorities have reported 11358 confirmed cases with 717 deaths and 5850 recovered cases. The capital of Sudan, Khartoum, reported 8001 confirmed cases of COVID-19 and 706 deaths by the same date (Covid-19 Sudan", Federal Ministry of Health, 2020).

In reaction to the pandemic, Khartoum the most populated state in Sudan immediately deployed a partial shutdown with a night curfew from 9 pm to 6 am and enforced a travel ban to limit the virus's spread. On April 18th after the registration of 10 confirmed cases of COVID-19 Khartoum was to go into full lockdown (Sudan: Full Lockdown in Khartoum, 2020).

As a profession, dentistry is listed as a high risk of COVID-19 transmission. The reason for this is that the main routes of infection are all highly relevant to daily dental practice procedures, with aerosol being the most debated issue. It is well understood that returning to practice as usual now requires to understand whether the authors can better protect ourselves, our staff and patients, not only for COVID-19 but for other remotely dangerous infectious agents. There are many aspects of COVID-19 that are related to dental practice in addition to infection control, including prevention and treatment (Peng et al., 2020; Wirthlin and Marshall, 2001).

Given that a virus-free atmosphere is considered to be the responsibility of a dentist, but this cannot be implemented because of the quick and rapid dissemination of COVID-19, in particular after dental procedures leading to the decision of closure of all of dental clinics during the crisis (Li et al., 2004).

Dental clinics have a tremendous potential to distribute and develop the infection from workers or people, but the dental clinic may be a more dangerous place for the transmission of the virus due to direct interaction with patients and the quality of the dental care (Zemouri et al., 2017).

Given the existence of preventive guidance and disease management protocols, many dental practices neglect the basic infection protection standards that arose from the poor interest in taking the required precautions (Matsuda et al., 2011).

This condition is true in many settings, including several Sudanese dental clinics, which is like many other countries, have a broad variety in dental facilities; from clinics that correctly administer infection control measures to clinics that neglect preventive measures (Khader et al., 2020).

As a consequence of a large volume of emergency patients in need of dental care, a need for situation analysis about the attitude of dentists and knowledge of this pandemic is necessary in order to create a strategy for efficient and effective recommendations that may be indicated in dental clinics.

It is necessary to introduce sound preventive measures in dental clinics and to increase the level of understanding among dentists in order to improve their prevention. Therefore, the aim of this study is to give an insight into the level of perception, practice and attitude of Sudanese dentists in relation to infection control measures at the time of the 2020 outbreak of COVID-19.

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## STUDY POPULATION AND METHODOLOGY

This is a cross sectional study that targeted all dentists practicing in

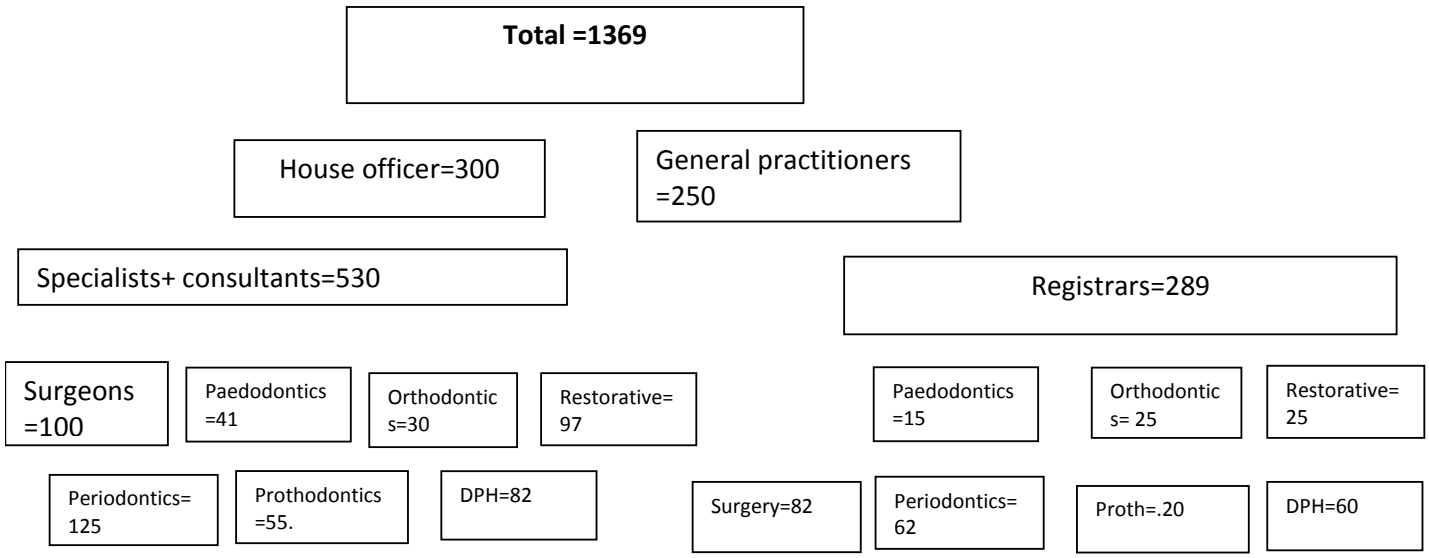


**Figure 1.** Depicts the overall number of dentists and the number of dentists in each specialty according to the Sudanese Medical Council (April 2020).

Sudan. According to the Sudanese Medical Council on April 2020, there were 1369 professionally active dentists in Sudan.

The sample size for this study was calculated by proportional allocation and was estimated to be around 315 dentists (Figure 1). Dentists were targeted mainly through social media (Facebook and WhatsApp professional groups) as well as by direct contact and phone calls. The main inclusion criterion was to be a practicing dentist in Sudan, whether in private or public sector.

The questionnaire adopted was a modified version of a tool published by Kader et al. (2020). The questionnaire's content validity was assessed by asking the opinion of three experts who were consulted to decide whether the questions represented all aspects of the given concept. After the validity assessment, out of thirty-four original questions, nine questions were modified by inserting or removing elements in some of the questions.

The questionnaire was then pilot tested for internal consistency. Fifteen dentists were engaged in this pilot, and the internal consistency of the questionnaire was evaluated using an intraclass correlation coefficient (Cronbach's alpha). All items were assessed and demonstrated a good internal consistency of 7.19. The final questionnaire was then used for the field testing. The process of validation is illustrated in Figure 2.

The questionnaire comprised of 34 questions, split into four sections: the first section includes general background questions about the participating dentists (10 questions), the second section covered their perceptions of COVID-19 (11 questions), the third section involved questions about their practice of infection control measures in dental clinics (8 questions), and the fourth section asked questions about their attitude when treating patients with COVID-19 (5 questions).

The first part were categorical data asking questions about age, gender, health sector, average patients seen during regular workday, professional title, whether dentist had received any training in infection control, whether the dentist attended a training or received lectures regarding COVID-19, whether the dentist saw or treated patients during the COVID-19 pandemic and whether the dentist knows whom to contact, if he/she in a situation where there is an unprotected exposure to a patient with known or suspected COVID-19.

Perception and attitude questions used agreement Likert scale (a scale between 1 and 5 where 1: strongly disagree and 5: strongly agree). Questions about infection control practice used frequency Likert scale (a scale between 1 to 4 where 0: never and 4: always). An online Google form was created and it is available at https://docs.google.com/forms/d/1kYN7LZGjNMHxOTU7J7IRdpq4opyi3LLIOegapnVVKIo/edit?ts=5f62333f. All participating dentists were invited to fill it out; assuring them that names would be kept anonymous and data will be used as aggregate only. The survey was completely voluntary and participants could withdraw at any time prior to the completion of the online survey by simply abandoning the questionnaire.

### Data analysis

Statistical Package for the Social Sciences (SPSS) version 20 was used to tabulate descriptive data including baseline characteristics and domains of the questionnaire (that is, the responses of dentists to the perception, practice and attitude questionnaire about COVID-19 infection).

Mean Rank of the study domain scores were calculated in relation to the baseline characteristics. To compare differences between two or more independent, non-parametric data, Mann-Whitney U and Kruskal-Wallis H tests were used.

Mean scores of participants' perceptions, practice of infection control measures, and attitude sections were calculated. The Kruskal–Wallis and the Mann–Whitney U tests were used to compare the mean score of each of these three domains (perception, practice of infection control measures and attitude) to examine relationship with professional titles, years of experience in dentistry, and whether question regarding previous knowledge of dentist in regards to infection control. Significance (p) was defined at $< 0.05$.

### Ethical considerations

The questionnaire was exempted from ethical application after contact with the Ethical committee of the medical campus at the

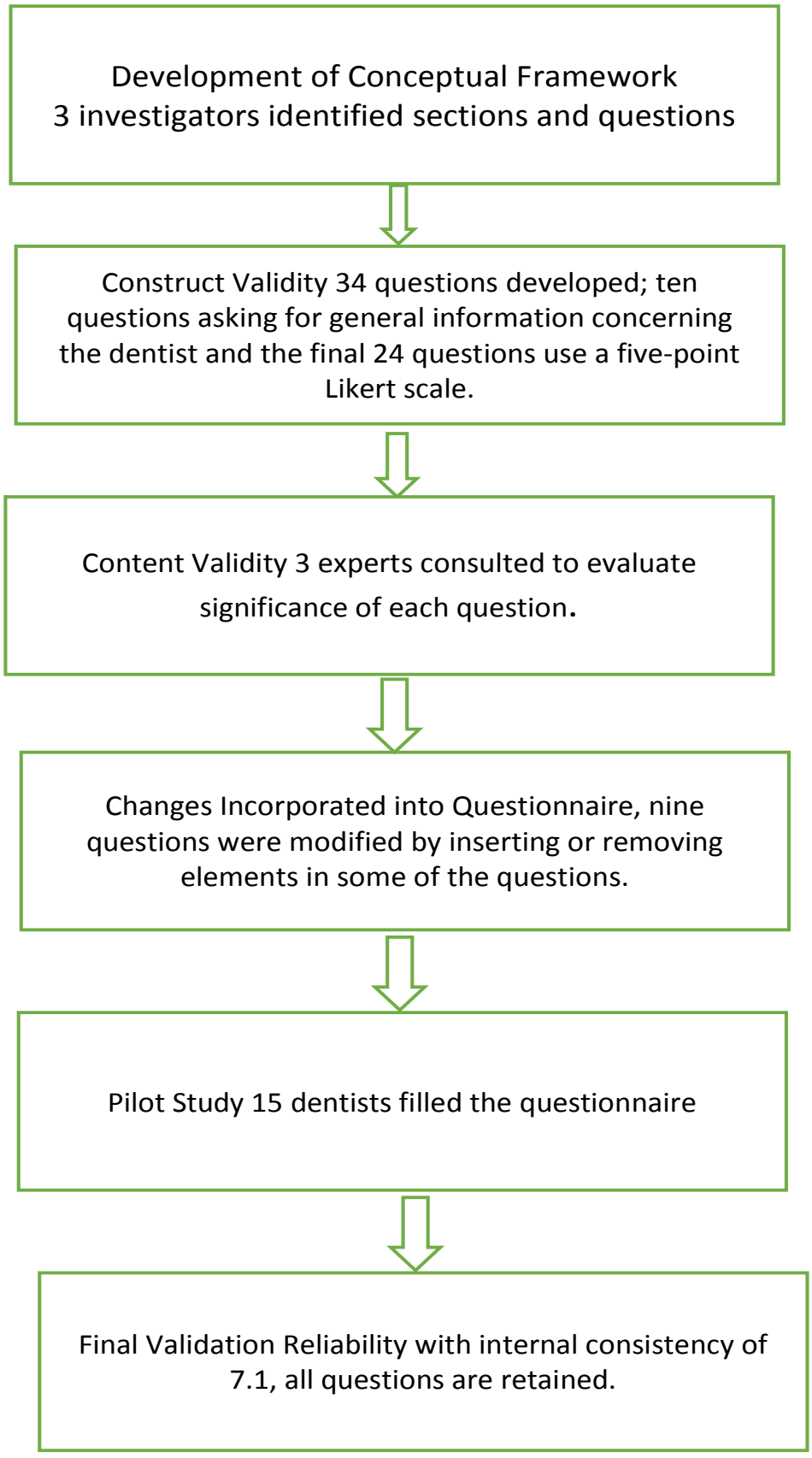


**Figure 2.** Illustration of the process of questionnaire validation.

**Table 1.** Baseline information of study participants.

| General questions | Values (N, %) |
|---|---|
| **Gender** | |
| Female | 181(70.2%) |
| Male | 77(29.8%) |
| | |
| **Age** | |
| <25 | 17(6.6%) |
| 25-34 | 128(49.4) |
| 35-44 | 83(32%) |
| 45-54 | 24(9.3%) |
| >54 | 7(2.7%) |
| | |
| **Years of practice** | |
| <5years | 79(30.5%) |
| 5-10 years | 86(33.3%) |
| >10 years | 94(36.3%) |
| | |
| **Average patients you see during a regular workday (pre- Covid-19)?** | |
| Less than 10 patients per day | 163(62.9%) |
| 10-20 patients per day | 74(28.6%) |
| 21-30 patients per day | 11(4.2%) |
| >30 patients per day | 11(4.2%) |
| | |
| **Professional title** | |
| Consultants | 34(13.2%) |
| Specialists | 75(29.2%) |
| Registrars | 70(27.2%) |
| General dental practitioners | 47(18.3%) |
| House officers | 31(12.1%) |
| | |
| **Did you receive any training in infection control in dentistry?** | |
| Yes | 179(69.1%) |
| No | 80(30.9%) |
| | |
| **Did you attend a training or received lectures regarding COVID-19 pandemic?** | |
| Yes | 82(31.7%) |
| No | 177(68.3%) |

**Table 1.** Contd.

| | |
|---|---|
| **Have you been seeing/treating patients during the COVID-19 pandemic?** | |
| No | 105(40.5%) |
| Yes, but only emergency patients | 101(39%) |
| Yes, I have been treating patients as usual. | 53(20.5%) |
| **Do you know whom to contact, if you are in a situation where there is an unprotected exposure to a patient with known or suspected COVID-19?** | |
| Yes | 199(77.1%) |
| No | 59(22.9%) |

University of Khartoum. The participation was voluntary and google form survey guaranteed the anonymity.

## RESULTS

### General description of the study participants

A group of 259 dentists submitted complete questionnaires; forming a response rate of about 82.2% (259 participated out of 315 invited dentists). The respondents' demographic characteristics are presented in Table 1.

The most predominant age group (49.4%) was f rom 25-34 years of age. Female participants were more than male participants (n=181, 70.2% and n=77,29.8%, respectively). Regarding length of dental practice, more than one third of the participants (n=94, 36%) were practicing dentistry for more than 10 years. More than two thirds of the participants (n=179, 69.1%) stated that they had received training in infection control in dentistry, but only one third of them (n=82, 31.7%) had attended training or received lectures regarding COVID-19 (Table 1).

### Participants' perception of the COVID-19 pandemic

The assessment of participants' perception of COVID-19 infection showed that almost half of the participants strongly agreed that COVID-19 is a dangerous infection and that dentists have a significant role in disseminating information and increasing awareness of this infection (n=127, 49% and n=127, 49.2%).

On the other hand, two thirds of the participants (n=158, 61.2%) strongly agreed that COVID-19 is a serious public health issue.

The vast majority of the participants (n=216, 83.4%) strongly agreed that dentists are at higher risk of getting COVID-19 from dental practice and that dental clinics can be a reason of spreading COVID-19 in the community. Moreover, (44.6%) of the participants agreed that COVID-19 will affect their future practice of dentistry.

Regarding patients flow and procedure restrictions imposed by COVID-19, 42.5% of the participants agreed that COVID-19 will decrease the number of patients they see in clinics. Only 5.8% of the participants disagreed with the question that COVID- 19 will restrict the types of dental procedures performed in their clinics while 41.9% agreed with this. Most of participants strongly agreed that the new infection control measures that are implemented by MOH will increase the expenses in their clinics (n=122,47%), and most of them (n=110, 42.6%%) also agreed that their income will be compromised due to COVID-19 pandemic. Furthermore, 51% agreed on that the number of dental auxiliaries in their practice will be affected post Covid-19 era. Figure 3 describes perception of participants regarding COVID- 19 infection in details.

### Participants' practice of infection control measures during COVID-19

Regarding dentists' cautionary actions in the dental clinic, the majority of the participants self-reported positive attitudes regarding practice of infection control measures during dental treatment. The majority (n=208,80.6%) reported that they always clean their hands with alcohol-based hand rub or soap and water and they always clean and disinfect the surfaces in their clinics (n=200, 79.7%). Moreover, the majority of the respondents self-reported that they always used Personal Protective Equipment (PPE) for themselves or their auxiliaries' staff (dentist: n=204, 79.7%, auxiliary staff: n=161, 63.9%).

However, the adherence to these protective measures was less evidently implemented among patients as less than half of the participants self-reported that they always ask their patients to put facemasks on or maintain social distance or wash their hands when in the clinical premises (facemask: n=101, 39.9%, social distancing: n=122,48.2%, washing hands: n=77, 31%).

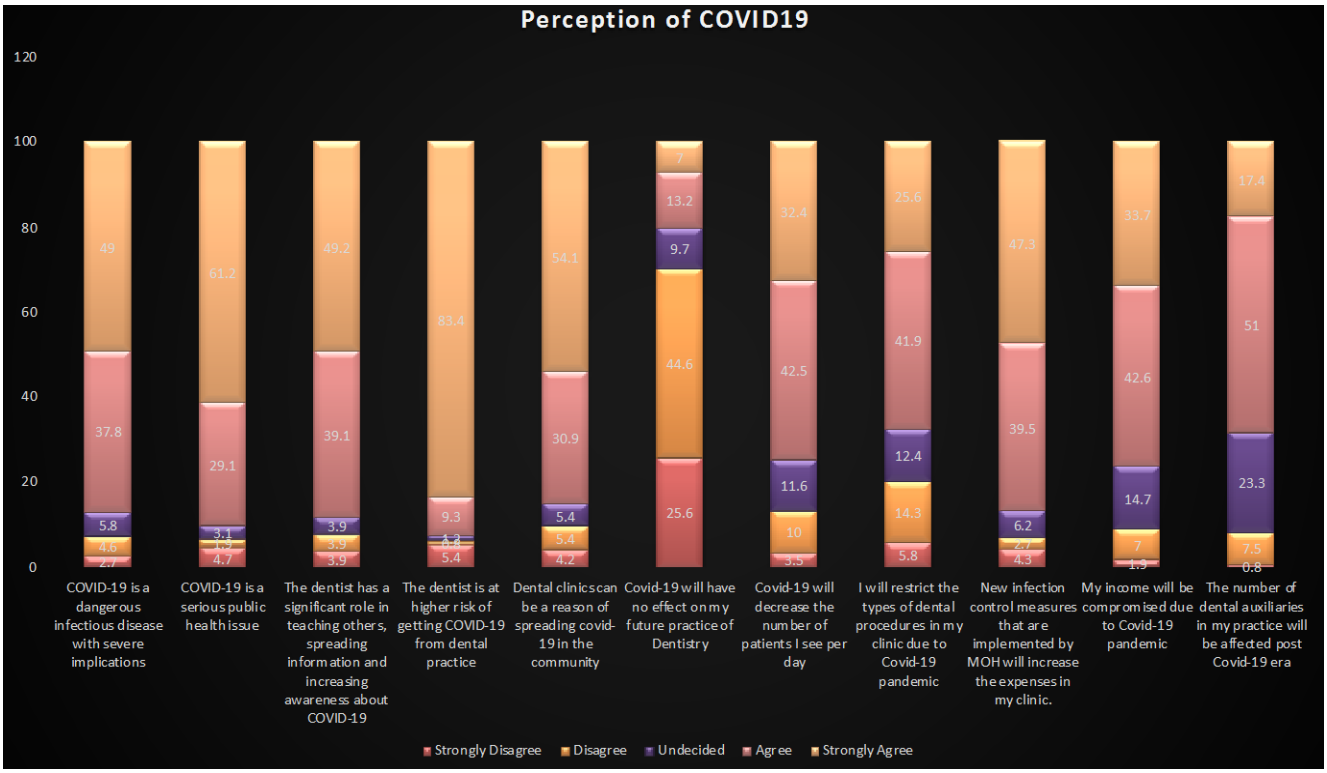


**Figure 3.** Number of dentists based on their perception towards COVID-19 infection.

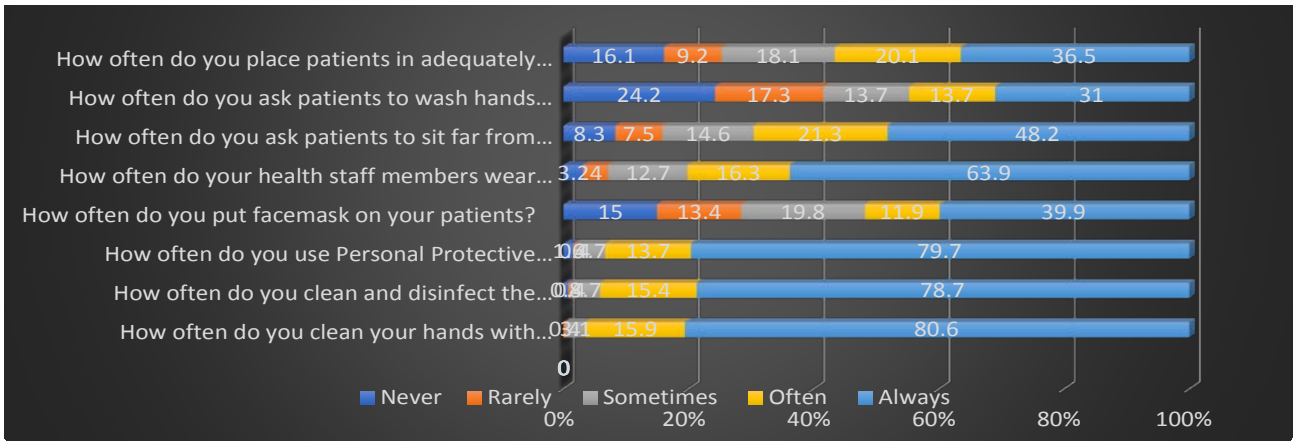


**Figure 4.** Number of dentists based on their practice during COVID-19 pandemic.

Figure 4 describes the practice of the of participants regarding COVID- 19 infection in detail.

## Participants' Attitude toward treatment of patients with COVID-19

Almost one fifth of the respondent dentists (n=67, 26%) disagreed that they should avoid seeing patients who were a suspected case of COVID-19, but slightly fewer number of participants (n=64, 24%) agreed with this view.

Participants registered varying attitudes towards a patient sneezing or coughing in their clinics: The highest number of participants (n=110, 43.1%) agreed that they should refuse treating the patient if the patient is sneezing or coughing in their clinics but slightly more than one Third (n=79, 30.9%) of the participants agreed that they should refer the patient to the hospital without treatment. On the other hand, the majority of the participants' (n = 120,46.7%) strongly agreed that dental

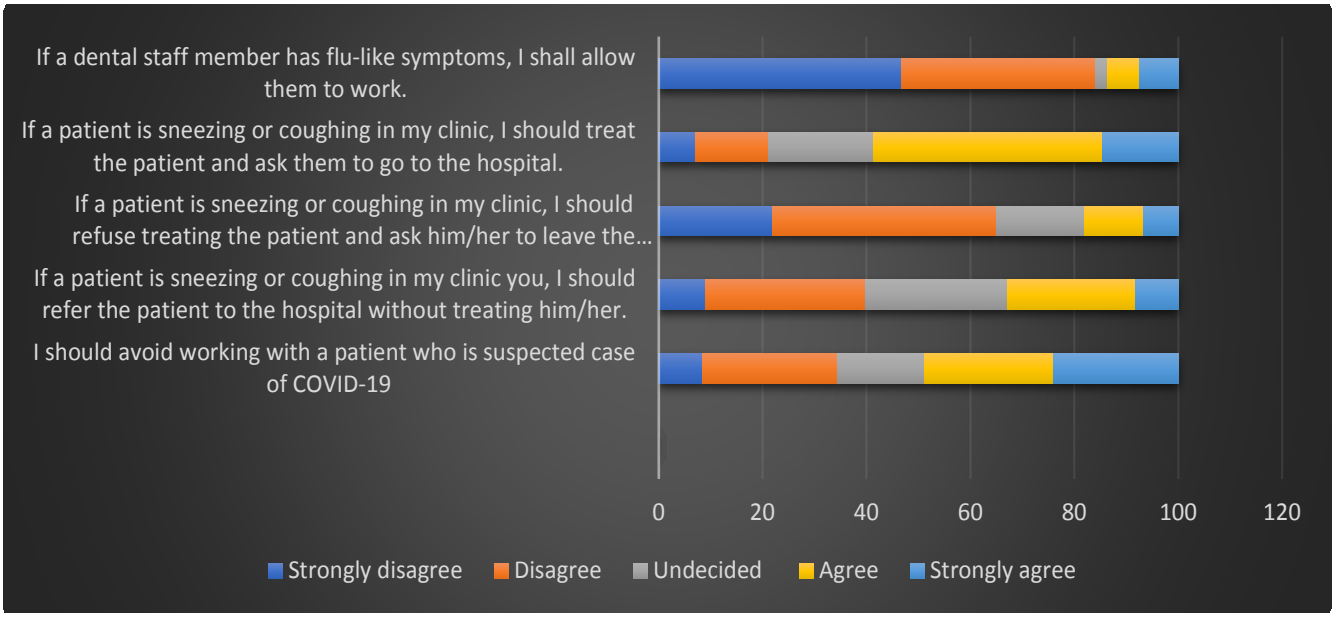


**Figure 5.** Number of dentists based on their attitude towards COVID.

staff members have flu-like symptoms, they shall allow them to work.

Figure 5 describes the attitude of the participants regarding COVID- 19 infection in details.

### Comparison of the mean score of perception, practice and attitude with the participants' baseline characteristics

Overall, the mean COVID-19 perception score of consultants was the highest among the other professional titles (137.3). However, the difference was not significant statistically (p=0.45).

A statistically significant difference was found when COVID-19 perception was compared based on years of practicing dentistry, with the highest mean score (144.44) among those who were practicing more that 10 years (p=0.002).

On the domain of COVID -19 perception, no significant difference was found in the mean score of perception regardless of the status of receiving a training in infection control (p=0.77).

However, the domain of practice of infection control measures had significant relationships with the dental profession title, the years of practicing dentistry, and status of receiving lecture on infection control (p<0.05).

On the domain of participants' attitude, no significant relationship of dental professional title and years of practicing dentistry were evident with the participants' attitude. However, a significant relation was found in attitude of dentists on the basis of receiving lecture in infection control (p = 0.04). Tables 2 display the comparison of the mean score of perception, practice and attitude with the participants' baseline characteristics.

## DISCUSSION

The COVID-19 pandemic has led to a global crisis. The exponential growth of the COVID-19 epidemic has posed global public health and economic issues, imposing tremendous pressure on socioeconomic cohesion and global health structures, and challenging health care staff, particularly dental care professionals (DCP) (Centers for Disease Control,2020)

The possibility of contracting COVID -19 among dental health professionals is accentuated as the distance between the working area and the dentist is approx. 35-40 cm (Meng et al., 2020; Pîrvu et al., 2014).

It is imperative, at the time of this global emergency, that ample evaluation of the healthcare workers' ability to tackle the epidemic is accessible and that appropriate information is relayed to dental professionals to ensure good preventive practices are implemented.

In this respect, the present research explored the perception, practice and attitude of Sudanese dentists towards COVID-19 pandemic. To date, only few studies have been published that have examined the understanding and attitude of dentists towards COVID-19 infection (Khader et al., 2020; Pîrvu et al., 2014).

This study included a group of Sudanese dentists who practiced dentistry exclusively in Sudan during the first wave of COVID-19. The majority of the respondent dentists perceived COVID-19 as dangerous disease and a serious public health issue, and knew whom to contact,

**Table 2.** Comparison of perception, practice and attitude with the baseline characteristics of participants.

| Variable | Perception (mean rank) | P value | Practice (mean rank) | P value | Attitude (mean rank) | P value |
|---|---|---|---|---|---|---|
| **Professional title** | | | | | | |
| Consultants | 33(137.3) | 0.45 | 32(145.7) | 0* | 33(116.77) | 0.5 |
| Specialists | 69(125.27) | | 69(139.4) | | 73(133.25) | |
| Registrars | 68(128.42) | | 66(109.14) | | 69(116.46) | |
| General dental practitioners | 46(117.84) | | 45(117.92) | | 46(130.51) | |
| House officers | 31(106.47) | | 26(63.48) | | 30(133.55) | |
| **Years of practicing** | | | | | | |
| <5 | 79(104.91) | 0.002* | 71(84.46) | 0* | 77(132.75) | 0.46 |
| 5-10 | 84(124) | | 79(127.92) | | 84(119.17) | |
| >10 | 86(144.44) | | 90(142.41) | | 92(129.34) | |
| **Did you receive any training in infection control?** | | 0.77 | | 0.001* | | 0.04* |
| Yes | 173(122.17) | | 170(128.92) | | 174(124.07) | |
| No | 76(131.44) | | 70(100.05) | | 79(133.46) | |

Kruskal-Wallis and Mann-Whitney Tests were used. level of significance $p < 0.05$.

if they were in a situation where there is an unprotected exposure to a patient with known or suspected COVID-19 infection.

Furthermore, the vast majority of dentists corresponded that it was important to educate people about COVID-19 to prevent its spread, agreeing to what was reported by Khader et al. (2020) in their study among Jordanian dentists (Khader et al., 2020).

The study found that about 39% of the participants terminated all elective dental operations and limited their practice to dental emergencies, and almost a comparable fraction terminated their dental services to the public in general during the first wave of the COVID-19 pandemic. This high responsiveness in complying with the government order mandating closing dental offices is most likely related to the respondents' perception that dental health professionals are at higher risk of getting COVID-19 from dental practice. However, this positive response to partial or complete closure of dental practices has been challenged during the second wave and dental offices remained open. This might have been mainly contributed to the economic burden encountered by dentists as a result of the first wave closure. In fact, more than 60% of respondent dentist disputed that statement that COVID-19 will not affect their future practice of dentistry and a higher proportion (70%) agreed that their income would be compromised as a result.

In general, the current study revealed adequate practice and positive attitude of Sudanese dentists towards COVID-19 infection. Most of the participants practiced good measures regarding personal protective equipment, hand hygiene, and surface disinfection, complying with WHO guidelines (WHO, 2020) (https://apps.who.int/iris/rest/bitstreams/1274340/retrieve) and consistent with other results in which health care personnel displayed a supportive attitude and adequate application of personal protective equipment and hand disinfection procedures when coping with SARS-CoV and MERS-CoV (Imai et al., 2005).

However, the study revealed that dentists' response to preventive measures were superior for their own compliance with personal protective equipment and hand sanitation procedures than for measures implemented to their patients. This is evident from the fact that less than half of the respondents consistently required their patients to implement protective measure as putting on face masks or washing their hands while in the dental

office premises. An acceptable explanation would be that respondent dentists might have inferred that COVID-19 infections occur largely by direct interaction through mucous membranes and infected hands and that patients-related preventive measure are redundant. Another explanation could actually be the difficulty of acquiring protective equipment during the COVID-19 pandemic, due to the growing demand and the increasing number of cases resulting in a shortage of PPE and an upsurge in the cost. While providing masks to patients might be affected by shortage and availability, however, our findings reported higher responsiveness to simple preventive measure that have less economic impact on the dentist like implementing social distancing in waiting rooms of dental offices, consistent with similar finding (Centers for disease control and prevention CDC).

One of the most important finding s of the study is that the dentists' practice and attitude mean scores were significantly higher among those who received lectures in infection control, thus reflecting the importance of knowledge in improving the level of practice and attitude of the dentists. Therefore, it is necessary to implement a series of continuous exposure control programs for dentists, to raise their level of practice and attitude (Eguchi and Wada, 2013).

Agreeing with similar results of Rabiee and Kazennezhad (2015) reporting a significant relationship between perception level and work experience, our finding showed that longer work experience was associated with higher mean scores of perception and practice among dentists towards COVID-19 infection.

However, the relationship of work experience and effect on attitude and practice has been refuted in other studies (Tabeshian, 2016; Rankin et al., 1993).

A significant difference was observed in the mean scores of practice among dental professions with the highest mean scores noted among consultants and this can be attributed to experience of senior members earned through years. However, contrary to our findings, Harapan et al. (2017) found that general practitioners had a higher and a good knowledge as compared to specialist doctors.

## Conclusion

The study found that most Sudanese dentists showed good perception, practice and attitude towards COVID-19 pandemic. Respondent dentists reported superior responsiveness with their own practice of infection control measures rather than implementing the measures on their patients. Respondent dentists who attended lectures showed better practice and attitude than those who didn't, signifying the importance of continuous education.

## CONFLICT OF INTERESTS

The authors have not declared any conflicts of interests.

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