Dental practice closure during COVID-19 and associated professional, practice and structural determinants: a multi-country survey

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Abstract

Background: The outbreak of the novel coronavirus disease (COVID-19) in China has influenced every aspect of life worldwide. Due to the characteristics of dental settings, the risk of cross-infection is high between dental practitioners and patients and dentists may develop severe anxiety about the current pandemic. In addition, the limited provision of services and closure of dental practices raised concerns among dental professionals about the financial consequences of this closure. This study assessed the frequency of dental practice closure in several countries, the factors associated with this closure and whether closure and associated factors differed between private and non-private sectors.

Methods: From April to May 2020, an electronic survey was sent to dentists in several countries. The survey assessed professional factors, practice factors and country-level structural factors. Multilevel logistic regression was used to assess the association between practice closure and these factors. Effect modification by type of sector was also assessed.

Results: Dentists (n= 3243) participated from 29 countries. The majority (75.9%) reported practice closure with significantly higher percentage in the private sector than the non-private sector. Pandemic- related fears were associated with significantly higher likelihood of practice closure in private (OR= 1.54, 95%CI= 1.24, 1.92) and non-private sectors (OR= 1.38, 95%CI= 1.04, 1.82). Dentists in non-private, governmental sector (OR= 0.54, 95%CI= 0.31, 0.94), those in rural areas (OR= 0.58, 95%CI= 0.42, 0.81) and those in hospitals (overall OR= 0.60, 95%CI= 0.36, 0.99) reported low likelihood of closure. High likelihood of closure was reported by those in academia (OR= 2.13, 95%CI= 1.23, 3.71). More hospital beds at country-level were associated with lower likelihood of closure in the non-private sector (OR= 0.65, 95%CI= 0.46, 0.91). Private sector dentists in high income countries (HICs) reported less closure than in non-HICs (OR= 0.55, 95%= 0.15, 1.93).

Conclusions: Most dentists reported practice closure because of COVID-19 with greater impact in the private than non-private sectors. Closure was associated with factors at professional, practice, and country-level.

Background

On January 8th 2020, the Chinese Center for Disease Control and Prevention declared that a novel coronavirus caused COVID-19 [1]. Since that time, COVID-19 has become a major public health problem in all countries globally, changing all aspects of life [2]. As of 19 June, COVID-19 cases have been reported in 47 countries in Africa, 15 countries in the Western Pacific region, 53 countries in Europe, 10 countries in South East Asia, 21 countries in the Eastern Mediterranean region and 35 countries in the region of Americas with a total of 8.7 million laboratory-confirmed cases and about half a million deaths [3].

Transmission of COVID-19 occurs interpersonally via respiratory droplets [4], inhalation, ingestion, or direct mucous contact with saliva droplets [5]. The virus can survive on hands, objects, or surfaces previously

exposed to infected saliva [5]. COVID-19 incubation period is reported to range from 5 to 14 days [1,6]. The clinical manifestations may present as mild, flu-like symptoms, including fever (98%) and dry cough (76%). Patients may develop respiratory failure and multiple organ failure leading to death. Lymphocytopenia is observed, and chest CT examination usually shows ground-glass appearance of the lungs. No vaccine or specific antiviral therapy is available and supportive treatment, with organ support in intensive care units, remain the clinical management strategies [7].

Healthcare professionals are at the forefront of the fight against COVID-19 with number of infected cases and fatalities varying between countries [8]. Due to the unique nature of dental practice, the risk of cross-infection is higher among dentists than other healthcare professionals [9,10]. In addition, the virus was identified in the saliva of infected patients [11]. These factors increase COVID-19 related fear and anxiety among dentists compared to the general public [12].

During the pandemic, routine dental services were restricted to help flatten the curve and protect patients and dental personnel against infection. Urgent care was delivered using personal protective equipment (PPE) with additional precautions including taking patients' recent travel history, recording patients' body temperature, using 1% hydrogen peroxide as pre-procedural mouth rinse, using a rubber dam and high volume suction and frequent cleaning and disinfection of public contact areas including door handles, chairs and washrooms [13]. The reduced availability of dental care might have increased the demand on the already burdened emergency departments in hospitals [14], with potential impact on oral health and quality of life. In addition, the closure of dental practices raised concerns among dentists about the financial consequences of this closure [15]. Reports showed that the economy of the dental and other health care sectors was at a virtual standstill because of the pandemic [15,16].

The disruption of dental care delivery may affect dentists, other healthcare personnel, and the general public. Assessing the extent of dental practice closure and its determinants is important to help mitigate its impact and plan supportive measures. The present study assessed the extent of dental practice closure as reported by dentists from countries all over the world, the factors associated with this closure and whether closure, and associated factors differed between the private and non-private sectors. The null hypothesis of the study was that dental practice closure was affected by neither professional attributes of dentists (COVID-19 knowledge and fears), dental practice attributes (private or non-private sectors, in urban or rural areas and solo or group practices) nor country attributes (country-level number of hospital beds representing a country's ability to mobilize resources to control the disease and country-level income indicating the potentially available financial support for dentists in case of practice closure).

Methods

Design

A cross-sectional, multi-country, electronic survey was conducted from April to May 2020. The Ethics Review Committee of the Faculty of Dentistry, Alexandria University approved the study, and it was carried

out in agreement with the Declaration of Helsinki.

Participants and sample size

The target population was dentists of various specialties across the globe. The study recruited specialists and non-specialists who were practicing in various sectors during the study period. Dental students and interns were excluded. The sample size was estimated based on a conservative estimate that 50% of dentists at a global level would report practice closure. Thus, based on a margin of error= 5% and a 95% confidence level, the sample size was calculated [17] to be 377 dentists. A greater number of participants was included because of the multi-country nature of the study and because it was not possible to limit the number of participants on social media once the link was posted.

Questionnaire design and pilot testing

The questionnaire (Additional file 1) was designed based on information in the websites of the World Health Organization (WHO), American Dental Association, and Center for Disease Control about dental settings and considerations for treatment during the COVID-19 outbreak in addition to existing literature [18]. A group of experts evaluated the original English questionnaire and confirmed its content validity and the logical structure of the questions. The questionnaire was further tested among 15 dentists, and few modifications for clarification were done. In addition, the survey was translated into German and Italian by two independent bilingual dentists. Using back translation, the translated questionnaires were compared with the original English version to identify discrepancies and resolve vagueness. The German version was pilot-tested by 14 dentists and 11 dentists tested the Italian version. Pilot testing results were not included in the analysis.

At the beginning of the survey, a short introduction described the study purpose and assured participants of the confidentiality of their responses. There were 31 close-ended questions in three sections. Section 1 was about the sociodemographic and practice characteristics of participants, including age, gender, country of practice, specialty, area of practice (rural or urban), and type of practice (private, governmental or academic sectors, solo, group or hospital practices). Section 2 included 8 items assessing dentists' fears regarding COVID-19, with responses on a 5-point Likert scale ranging from strongly agree (code 5) to strongly disagree (code 1). Section 3 consisted of 15 questions assessing knowledge about measures to control the transmission of COVID-19 with possible responses being yes, no and do not know. The last question asked whether dental practice was closed at the time of the survey.

Data collection

A link to the electronic survey was created using the online survey platform "Survey Monkey". Respondents were allowed to change their responses before submission and no duplicate entries were allowed. The questionnaire took 5-7 minutes. The link was sent to collaborators and convenience and snowball sampling were used to promote the link via dentists' groups on Facebook, Instagram, LinkedIn, Twitter and WhatsApp. Participants were asked to share the survey with their dental contacts.

Statistical Analysis

The overall score of fears and threats was the average of the 8 items' scores and it ranged from 1 to 5. The overall knowledge score was created by assigning one point for each correct answer and adding the points of the 15 items and it ranged from zero to 15. Cronbach's alpha was used to assess the internal consistency of the items about fears and those about knowledge [19].

Multilevel logistic regression analysis was used to assess the association between the dependent variable (practice closure with yes/ no responses) and the independent variables that were introduced as fixed effects. These were level 1 dentist and practice factors obtained from the survey in addition to level 2 country-level structural factors. The latter factors included the country-level number of beds per 1000 population obtained from the World Bank Databank [20]. In the absence of multi-country data about the number of intensive care units needed to care for patients with COVID-19 complications, we used the number of beds per 1000 population as an indicator of the availability of inpatient services [21]. Country-level factors also included income level based on the World Bank classification into high income countries (HICs) with gross national income (GNI) > 12,375 US$, upper middle income countries (UMICs) with GNI between 3,996 and 12,375 US$, lower middle income countries (LMICs) with GNI between 1,026 and 3,995 US$ and low income countries (LICs) with GNI<1,026 US$ [22]. These were recoded into HICs and non-HICs. Country was included as random effect factor. Robust estimation was used to handle violations of model assumptions. A model was developed for the whole sample and two additional models were developed for participants working in the private sector and those working in the non-private sector. Odds ratios and 95% confidence intervals (CIs) were calculated. Effect modification by sector (private and non-private) was assessed and p values were computed for interaction. Significance level was set at 5%. SPSS version 23.0 [23] was used for statistical analysis.

Results

A total of 3243 dentists responded from 29 countries (Additional file 2). Of these, 49.2% were 20–30 years old, 56.8% were females and 70.6% were specialists. Also, 65.6% worked in the private sector, 52.3% were in group practice and 81.8% worked in urban locations. The mean (SD) number of beds/ 1000 population was 1.70 (0.99) and 71.7% of dentists were from non-HICs. Most participants (75.9%) reported that their practices were closed because of the pandemic (Table 1). Significantly higher percentage of dentists working in the private sector than non- private sector reported practice closure (78.3% and 71.3%, $P < 0.0001$).

Table 1
Distribution of personal, professional and practice and structural factors among the study participants (n = 3243)

Factors		**N (%)**
Personal		
Age	20–30	1597 (49.2)
	31–40	986 (30.4)
	41–50	420 (13)
	51–60	193 (6.0)
	61+	47 (1.4)
Gender	Males	1401 (43.2)
	Females	1842 (56.8)
Professional and Practice		
Specialty	Specialists	2290 (70.6)
	General practitioners	953 (29.4)
Practice characteristic	Private sector	2123 (65.6)
	Governmental clinic	1263 (38.9)
	Clinics in an academic institution	528 (16.3)
	Solo practice	1129 (34.8)
	Group practice	1697 (52.3)
	Hospital	998 (30.8)
	Urban location	2653 (81.8)
	Rural location	590 (18.2)
Structural		
Number of beds/ 1000 population	Mean (SD)	1.70 (0.99)
High income countries	Yes	917 (28.3%)
	No	2326 (71.7%)
Practice closed because of the pandemic	Yes	2461 (75.9)
	No	782 (24.1)

Table 2 shows the underlying causes of fear due to COVID-19. The greatest fear was of family members catching infection (mean = 4.36) and the high infection risk among healthcare personnel (mean = 4.21). Cronbach alpha for the internal consistency of fear items was 0.70. The mean fear score was 4.14 out of 5, SD = 0.54. Figure 1 shows that > 95% of dentists had correct knowledge about COVID-19 symptoms, transmission through respiratory secretions, specific training being needed to prevent infection and precautions needed against droplet, contact and airborne infections. Cronbach alpha for the internal consistency of knowledge items was 0.62. The mean knowledge score was 13.08 out of 15, SD = 1.89.

Table 2
Levels of fears and perceived threat because of the COVID-19 pandemic reported by participating dentists

Item	Mean (SD)
I am afraid of working in places where patients suspected of COVID-19 infection are treated.	4.08 (0.99)
I am afraid of providing dental care for patients infected with/ suspected of COVID-19.	4.14 (1.00)
In spite of PPE and infection prevention precautions, the risk of COVID-19 infection is high among health care personnel.	4.21 (0.89)
Equipment and facilities required to protect HCP from COVID-19 infection are not adequately provided in healthcare facilities	4.13 (0.92)
Healthcare personnel should be paid more when treating patients infected with/ suspected of COVID-19 infection	3.91 (1.13)
I am afraid that a family member may be affected by COVID-19 infection	4.36 (0.90)
I am worried that my patients will not be receiving adequate care because of the outbreak.	4.08 (0.79)
I am worried that my practice income would be affected because of the outbreak	4.16 (0.92)

Table 3 shows the factors associated with practice closure and how they differed between the private and non-private sectors. Regarding dentist factors, greater fear was associated with significantly higher likelihood of reporting closure by dentists in the private sector (OR = 154, 95%CI = 1.24, 1.92) and not in the private sector (OR = 1.38, 95%CI = 1.04, 1.82) with no significant difference between groups (P = 0.21). There was a significant difference between private sector and non-private sector dentists (P = 0.03) in the association between practice closure and specialization. In the private sector, there was a significantly greater likelihood of reporting closure by general practitioners than specialists (OR = 1.38, 95%CI = 1.04, 1.95). This association was not statistically significant in the non-private sector (OR = 1.08, 95%CI = 0.77, 1.53).

Table 3
Factors associated with practice closure because of COVID-19 in multilevel regression in private and non-private sectors

Factors	Private sector N = 2123	Non-private sector N = 1120	All participants N = 3243	P of interaction
	OR (95% CI)			
Professional factors				
GP vs specialist	**1.38 (1.04, 1.85)***	1.08 (0.77, 1.53)	1.14 (0.82, 1.59)	0.03*
Fear score	**1.54 (1.24, 1.92)***	**1.38 (1.04, 1.82)***	1.28 (0.97, 1.67)	0.21
Knowledge score	1.05 (0.98, 1.12)	1.03 (0.96, 1.11)	1.01 (0.94, 1.09)	0.21
Practice factors				
Clinic in an academic institution	1.37 (0.93, 2.03)	1.81 (1.04, 3.15)*	**2.13 (1.23, 3.71)***	0.13
Solo practice	1.45 (1.00, 2.10)	1.14 (0.66, 1.97)	1.13 (0.65, 1.94)	0.50
Group practice	0.88 (0.60, 1.29)	0.79 (0.49, 1.28)	0.80 (0.49, 1.29)	0.85
Hospital	0.55 (0.41, 0.75)*	0.58 (0.35, 0.97)*	**0.60 (0.36, 0.99)***	0.64
Rural vs urban	1.29 (0.91, 1.82)	0.58 (0.42, 0.81)*	**0.58 (0.42, 0.81)***	**0.001***
Structural factors				
Beds/ 1000 population	1.01 (0.72, 1.41)	**0.65 (0.46, 0.91)***	0.94 (0.65, 1.37)	0.96
HICs vs non- HICs	0.55 (0.15, 1.93)	2.00 (0.60, 6.69)	0.60 (0.19, 1.90)	0.64
The models are adjusted for gender and age. OR: odds ratio, CI: confidence interval, GP: general practitioner, HICs: high income countries				
Figure				

Regarding practice factors, working in hospitals was associated with significantly lower likelihood of closure in the private (OR = 0.55, 95%CI = 0.41, 0.75) and non-private sectors (OR = 0.58, 95%CI = 0.35, 0.97) with no significant difference between groups (P = 0.64). Also, in both groups alike (P = 0.13), there was a significantly higher likelihood of reporting closure by dentists working in academia (OR = 2.13,

95%CI = 1.23, 3.71). On the other hand, there was a significant difference between private and non-private sectors (P = 0.001) in the association between practice closure and practice location (urban or rural). Dentists in the private sector reported non significantly higher likelihood of practice closure in rural than urban locations (OR = 1.29, 95%CI = 0.91, 1.82). However, dentists in the non-private sector reported significantly lower likelihood of practice closure in rural than in urban areas (OR = 0.58, 95%CI = 0.42, 0.81). Overall, dentists in solo practice were more likely to report practice closure than those not in solo practice (OR = 1.13, 95%CI = 0.65, 1.94) with no significant difference between groups (P = 0.50). On the other hand, dentists in group practice were less likely to report practice closure than those not in group practice (OR = 0.80, 95%CI = 0.49, 1.29) with no significant difference between groups (P = 0.85).

Regarding country-level structural factors, there were no significant differences between private and non-private sectors in the association between practice closure and the number of hospital beds (P = 0.96) or country high income (P = 0.64). More hospital beds were associated with significantly lower likelihood of practice closure among dentists in the non-private sector (OR = 0.65, 95%CI = 0.46, 0.91). Dentists in the private sector who practiced in HICs were non-significantly less likely to report practice closure than those from non-HICs (OR = 0.55, 95%CI = 0.15, 1.93).

Discussion

The study showed that from April to May 2020, 75.9% of dentists reported practice closure with a higher percentage in the private than the non-private private sector. Dentists in the private sector, who were general practitioners, in solo practices, in rural areas and with greater COVID-19 fears were more likely to report practice closure. Country-level determinants were also associated with practice closure: better-prepared healthcare systems were associated with less closure in the non-private sector while the private sector was less likely to close in rich countries than in less affluent countries. The null hypothesis was, thus, be rejected. The study provides evidence of the impact of COVID-19 on dental practice closure which jeopardizes the provision of dental care. These findings have implications for planning support packages for the profession and for programs to maintain oral health for the public.

In the present study, 75% of dentists reported practice closure. International guidelines about the provision of dental care during the pandemic varied from allowing only public dental and general hospitals to deal with emergency cases in China [24], urging practitioners to shut their practices in California, USA [25]; decreasing the number of examined patients in the UK [26] to no guidance [27]. The frequency of dental practice closure in the present study was higher than that reported for other, non-dental specialties in a WHO survey of 155 countries where 53% of participating countries reported disruption of treatment for hypertension, 49% for diabetes, 42% for cancer and 31% for cardiovascular emergencies [28]. However, the frequency of closure was similar to that reported in the USA where 79% of dental practices were closed except for emergency care [29]. The impact of practice closure and the suspension of dental care on oral health is yet to be quantified.

In the present study, fear of income reduction because of COVID-19 was among the three top fears reported by dentists. Similarly, reports showed lower patient volume attributed to avoidance of healthcare facilities due to fear of COVID-19 with financial losses in dental practices and reduced ability to pay employees. A US survey conducted in March 2020 reported that 28% of dentists were unable to pay their staff and 45% made partial payments [30,31]. It was estimated that if the current lockdown continued to September 2020, 46% of dentists may need to file for bankruptcy [29]. This financial crisis is not likely to end in the coming period with a potentially huge impact on the profession. In addition, the present study showed that fear of infection was one of the factors associated with practice closure among dentists in the private sector which agrees with a study reporting that a high level of anxiety was associated with more dentists indicating a desire to close their practices [32].

In the present study, dentists in academia were more likely to report practice closure. This agrees with previous data from North America indicating that dental care in teaching clinics was suspended and only emergency treatment was offered [30]. The present study also showed that dentists working in hospitals were less likely to report practice closure. This may be attributed to the high level of preparedness of hospitals. For example, hospitals are more likely than other healthcare facilities to be equipped with high-level PPE to protect against aerosol-generating dental procedures, [33,34] to have strict infection control measures and more dental units to meet patients' need for emergency dental services [27,35,36].

The study showed less closure in group practices and more closure in solo practices. Group practices may be more resilient at times of financial hardship than solo practices because they are more likely to have reserves and can afford to pool resources to bridge crises. On the other hand, small-scale health care providers tend to be less profitable which may increase their vulnerability to financial threats [37].

The current study showed that compared to urban practices, practices in rural areas had more closure if they were in the private sector but less closure if they were in the non-private sector. Private sector rural healthcare facilities usually operate on thin profit margins and have a small number of staff which puts them at greater risk of closure to reduce financial and infection risks [38–40]. Consequently, non-private sector rural practices may be the only type of facility left to provide care for the local population and hence the reported lower likelihood of closure.

The present study showed that practice closure was also associated with country-level determinants. More hospital beds were associated with less closure in the non-private sector. Countries with high-resources and well-prepared healthcare systems are likely to have better capacity to manage COVID-19 complications resulting in lower mortality rates, panic and anxiety with less chances of dental practice closure [41,42]. In addition, the study showed less private practice closure in HICs. This agrees with reports that some HICs provided financial support for dental practices to avoid closure due to economic losses; offering funds, loans and credits to help with payment of salaries and supplies [31,43–46]. In addition, dentists in HICs would have higher per capita income ensuring financial stability in spite of decreased

revenues and reducing the need for practice closure. No such measures were reported in less affluent countries where no economic support plans were made to help the dental industry despite their needs.

The study is limited by its cross-sectional design which cannot prove causality and by convenience sampling which cannot support statistical representativeness. However, it included a large number of dentists from many countries all over the world with different professional backgrounds and healthcare systems characteristics and this increases the generalizability of findings. The study estimated the frequency of practice closure which is important to assess the pandemic impact on oral health with implications for dental education. Providing support to dentists in the private sector may help retain skillful personnel and reduce the devastating impact of the pandemic on dental services. Future studies are needed to assess the long-term impact of practice closure on the financial, psychologic, and professional outcomes of dentists.

Conclusions

COVID-19 had a considerable impact on dental practice around the globe. Most dentists reported practice closure because of COVID-19 with greater impact in the private sector than in the non-private sector. Personal, professional, and country-level factors were associated with practice closure. The findings help provide a profile of dentists with practices at greater risk of closure to plan for support packages.

Abbreviations

PPE
Personal Protective Equipment
WHO
World Health Organization
HICs
High Income Countries
GNI
Gross National Income
UMICs
Upper Middle Income Countries
LMICs
Lower Middle Income Countries
LICs
Lower Income Countries
CIs
Confidence Intervals
SPSS
Statistical Package for Social Sciences
SD

Standard Deviation
OR
Odds Ratio

Declarations

Ethics approval and consent to participate

The Ethics Review Committee of the Faculty of Dentistry, Alexandria, Egypt approved the study (IRB No: 00010556-IORG 0008839) which was conducted in agreement with the Declaration of Helsinki. In the introduction to the survey, the purpose of the study was explained and participants were assured of the confidentiality and anonymity of their responses. They were invited to respond to the survey and their consent was implicitly assumed when their answers were submitted.

Consent for publication

Not applicable.

Availability of data and materials

The dataset used during the current study is available from the corresponding author.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

HA, SA, MI and MET conceptualized and designed the study, coordinated data collection in Egypt, conducted the analysis, interpreted the results and drafted the original version of the manuscript. MN, DAM, AR, MS, KS, SB, AS and LB contributed to data collection in their respective countries and reviewed the manuscript. All authors contributed to the final approval of the paper.

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Tables

Table 1: Distribution of personal, professional and practice and structural factors among the study participants (n= 3243)

Factors		N (%)
Personal		
Age	20-30	1597 (49.2)
	31-40	986 (30.4)
	41-50	420 (13)
	51-60	193 (6.0)
	61+	47 (1.4)
Gender	Males	1401 (43.2)
	Females	1842 (56.8)
Professional and Practice		
Specialty	*Specialists*	2290 (70.6)
	General practitioners	953 (29.4)
Practice characteristic	Private sector	2123 (65.6)
	Governmental clinic	1263 (38.9)
	Clinics in an academic institution	528 (16.3)
	Solo practice	1129 (34.8)
	Group practice	1697 (52.3)
	Hospital	998 (30.8)
	Urban location	2653 (81.8)
	Rural location	590 (18.2)
Structural		
Number of beds/ 1000 population	Mean (SD)	1.70 (0.99)
High income countries	Yes	917 (28.3%)
	No	2326 (71.7%)
Practice closed because of the pandemic	Yes	2461 (75.9)
	No	782 (24.1)

Table 2: Levels of fears and perceived threat because of the COVID-19 pandemic reported by participating dentists

Item	Mean (SD)
I am afraid of working in places where patients suspected of COVID-19 infection are treated.	4.08 (0.99)
I am afraid of providing dental care for patients infected with/ suspected of COVID-19.	4.14 (1.00)
In spite of PPE and infection prevention precautions, the risk of COVID-19 infection is high among health care personnel.	4.21 (0.89)
Equipment and facilities required to protect HCP from COVID-19 infection are not adequately provided in healthcare facilities	4.13 (0.92)
Healthcare personnel should be paid more when treating patients infected with/ suspected of COVID-19 infection	3.91 (1.13)
I am afraid that a family member may be affected by COVID-19 infection	4.36 (0.90)
I am worried that my patients will not be receiving adequate care because of the outbreak.	4.08 (0.79)
I am worried that my practice income would be affected because of the outbreak	4.16 (0.92)

Table 3: Factors associated with practice closure because of COVID-19 in multilevel regression in private and non-private sectors

Factors	Private sector N= 2123	Non-private sector N= 1120	All participants N= 3243	P of interaction
	OR (95% CI)			
Professional factors				
GP vs specialist	**1.38 (1.04, 1.85)***	1.08 (0.77, 1.53)	1.14 (0.82, 1.59)	0.03*
Fear score	**1.54 (1.24, 1.92)***	**1.38 (1.04, 1.82)***	1.28 (0.97, 1.67)	0.21
Knowledge score	1.05 (0.98, 1.12)	1.03 (0.96, 1.11)	1.01 (0.94, 1.09)	0.21
Practice factors				
Clinic in an academic institution	1.37 (0.93, 2.03)	1.81 (1.04, 3.15)*	**2.13 (1.23, 3.71)***	0.13
Solo practice	1.45 (1.00, 2.10)	1.14 (0.66, 1.97)	1.13 (0.65, 1.94)	0.50
Group practice	0.88 (0.60, 1.29)	0.79 (0.49, 1.28)	0.80 (0.49, 1.29)	0.85
Hospital	0.55 (0.41, 0.75)*	0.58 (0.35, 0.97)*	**0.60 (0.36, 0.99)***	0.64
Rural vs urban	1.29 (0.91, 1.82)	0.58 (0.42, 0.81)*	**0.58 (0.42, 0.81)***	**0.001***
Structural factors				
Beds/ 1000 population	1.01 (0.72, 1.41)	**0.65 (0.46, 0.91)***	0.94 (0.65, 1.37)	0.96
HICs vs non- HICs	0.55 (0.15, 1.93)	2.00 (0.60, 6.69)	0.60 (0.19, 1.90)	0.64

The models are adjusted for gender and age. OR: odds ratio, CI: confidence interval, GP: general practitioner, HICs: high income countries

Figures

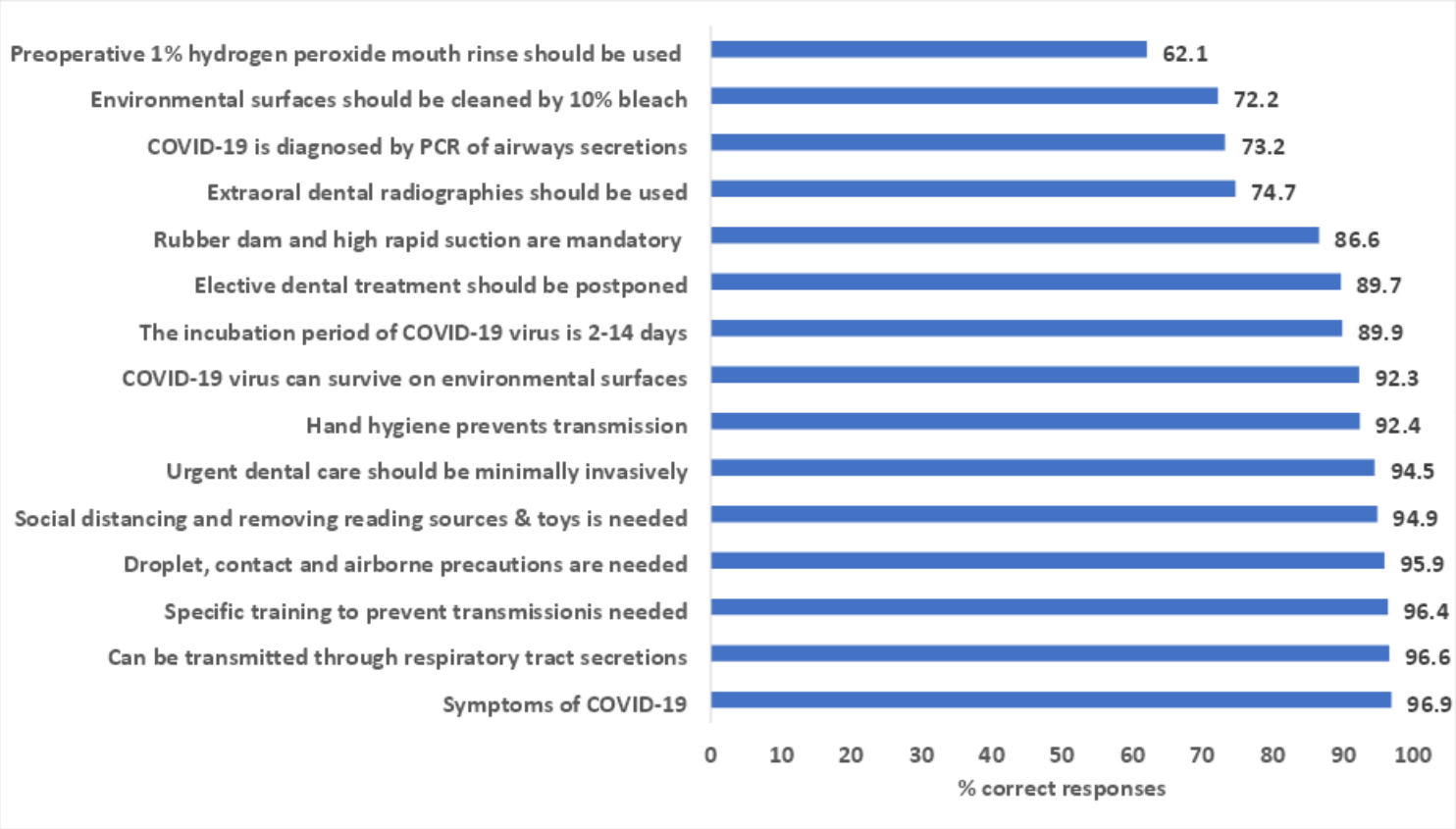

Figure 1

Correct responses regarding knowledge about COVID-19 pandemic

Supplementary Files

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- Appendix.docx