Coronavirus Pandemic

COVID-19 infection among dentists in Iraqi Kurdistan Region

Salih Hosoglu[1,2], Mo Barzinji[3,4]

[1] University Hospital Cologne, Department of Internal Medicine, Cologne, Germany
[2] Tishk International University, Erbil, Iraq
[3] Said Sadiq Oral and Dental Hospital, Sulaymaniyah, Kurdistan, Iraq
[4] Marseille University, Health, and Biomedical Sciences Department, Marseille, France

Abstract

Introduction: COVID-19 incidence was relatively high among dentists in Iraq, reflecting the high number of cases in the community. Therefore, possible epidemiological features of COVID-19 infection were investigated among dentists in Iraqi Kurdistan Region.

Methodology: A cross-sectional study has been conducted among dentists using a structured questionnaire. The questionnaire included demographic and working characteristics, self-reported COVID-19 history, and prevention practices toward SARS-CoV-2 during the pandemic. An online questionnaire was developed and spread with a snowball method among dentists.

Results: We analyzed the responses of 83 participants (31 women and 52 men, mean age 33.8 ± 6.8 years). They had a mean of 10.6 ± 6.5 years of work experience and 20.2 ± 12.6 hours of weekly working time. In total, 46 (55.4%) of the participants reported COVID-19 infection. Only 29 (34.9%) participants always followed the hygiene rules. The most common personal precautions were mask-wearing (98.8%) and hand hygiene as a part of institutional protective precaution (51.8%). Of the infected dentists, 24 (52.2%) did not know the source of infection. Of the remaining 16 (34.8%) were infected from family and/or friends circle, and five (10.9%) from patients. Eleven of them (23.9%) reported transmitting the infection to at least one person. In the multivariate analyses, working in Sulaymaniyah Province ($p = 0.031$) and working only in a public hospital ($p = 0.029$) were significant risk factors for COVID-19 infection.

Conclusions: The high risk of COVID-19 infection among dentists in the Iraqi Kurdistan Region relates to their family and friends rather than their occupation.

Introduction

After the Spanish flu outbreak of 1918, the emergence of a new virus (SARS-CoV-2) from Wuhan, China, on 31 December 2019 became the next worldwide pandemic affecting the entire globe [1–6]. SARS-Cov-2 is a highly contagious virus and can be transmitted person-to-person through aerosols during speaking, laughing, sneezing, coughing, handshaking, and contact with contaminated surfaces. Nobody knew the dangers, magnitude, and exact prevention measures at the pandemic's beginning [1]. Before effective public awareness, some symptomatic and asymptomatic cases quickly carried the virus from China to other countries. On 22 February 2020, an Iranian student traveling to Najaf city was recorded as the first coronavirus case in Iraq. Immediately, Kurdistan Regional Government tried to exert a total lockdown as a prevention strategy against the epidemic. However, social pressure forced the authorities to release the quarantine in the following days. As elsewhere in the world, the necessity and

effectiveness of preventive measures and quarantine practices in Iraq and the Iraqi-Kurdistan Region were always publicly discussed and criticized. The results of these practices were perceived differently by everyone. Therefore, it is hard to evaluate the usefulness of this strategy, especially causing distrust between the people and the administrators, resulting in thousands of deaths [7,8]. As of 30 April 2021, more than 1 million cases and more than fifteen thousand deaths due to coronavirus infection were reported in Iraq [9].

The contamination of SARS-CoV-2 is very easy in dental medicine, and dentists are at high risk. The transmission of the virus depends mainly on airborne dissemination and the vulnerability of dental practitioners [2,10,11]. It was shown that healthcare workers, especially dentists, should be considered in high-risk groups worldwide [12]. However, little is known about the epidemiology of COVID-19 among dentists in developing countries such as the Iraqi Kurdistan Region. This study aimed to investigate the

prevalence of COVID-19 infection, self-protection means, preventive attitudes, epidemiological characteristics, and possible routes of transmission among dentists.

Methodology

According to the Kurdistan Regional Dental Association, approximately 600 dentists in the region are actively working (official letter from the association). Therefore, we calculated the minimum sample size with a 95% confidence interval, a 35% population proportion, and a 10% margin error using an online sample size calculator (https://www.calculator.net/sample-size-calculator.html?).

Participants

An online questionnaire was prepared using the Google Form platform. The questionnaire was spread with a snowball method among dentists working in different cities of the region (Sulaymaniyah, Erbil, Halabja, and Duhok) in April 2021.

Questionnaire

During the questionnaire development, the experiences of local healthcare workers were considered, and guidelines and evidence from the literature were collected. The questionnaire draft was discussed with experts and local general practitioners and was developed according to their recommendations to verify validity, reliability, and clarity (Supplement 1). In addition, in the beginning, a pilot study was conducted with 15 participants (18% of the total sample) to see the possible areas of improvement.

The questionnaire was designed in English and was composed of three parts. The first part comprised the following independent variables: gender, age, place of work, sector of practice (public, private, both of them), number of years in clinical practice, comorbidities, number of patients seen in a week, and weekly working hours. Additionally, the participants were asked how they protect themselves from COVID-19, which protective measures they follow, the infection control measures against COVID-19 at the workplace, and the availability/quality of personal prevention equipment (PPE) supplies in their practice. The second part questioned the personal history of COVID-19 infection. Finally, in the third part of the questionnaire, only infected participants were surveyed on their illness course and possible transmission routes.

The monthly distribution of infections among dentists was evaluated and compared with the waves of COVID-19 in Iraq.

Statistical Analysis

Data analysis was performed with the SPSS 20 software (SPSS Inc., Chicago, IL, USA). The results were presented as frequencies, percentages, means, and standard deviations (SD). Independent variables included gender, age, workplace, working province, duration of occupation, number of weekly patients, weekly working hours, comorbidities, following the protection rules against COVID-19, personal prevention measures, workplace prevention measures, PPE availability, and quality of PPE. Univariate analysis was performed by calculating the incidence rate for each exposure category.

Variables associated with the risk of contracting COVID-19 (with a significance level of 0.1) were included in the multivariate logistic proportional hazard regression model using the stepwise forward method. For analytical purposes, variables with three categories in the univariate analysis were merged into two. A p-value of < 0.05 was considered statistically significant.

Ethical approval

Ethics committee approval is not required as the personal information of the participants was not collected in the study.

Results

Epidemiological Features

The minimum sample size was calculated as 77. The questionnaires were completed by 83 participants (31 women and 52 men). The participants' mean age ($\pm$ SD) was 33.8 ± 6.8 years (range 23-59). In total, 46 (55.4%) participants reported that they became ill with COVID-19 infection since the beginning of the epidemic. However, only 21 participants (25.3%) stated a positive PCR test. The remaining 25 (30.1%) did not undergo a test but said they had experienced typical COVID-19 symptoms.

The mean working time as a dentist was 10.6 ± 6.5 years, and the mean weekly working time was 20.2 ± 12.6 hrs. Participating dentists served an average of 25.8 ± 18.1 patients per week. Of the participants, 14 (16.9%) worked only in public hospitals, 29 (33.9%) only in private practice, and 40 (48.2%) in both private and public hospitals. Geographically, 46 (55.4%) of the participants were from Sulaymaniyah, 29 (35.0%) from Erbil, five (6.0%) from Duhok, and three (3.6%) from Halabja. Only eight of the participants (9.6%) reported

comorbid diseases. Among those variables, in univariate analysis, only working in a state hospital, working in Sulaymaniyah Province, and having fewer weekly working hours were risk factors for COVID-19 infection (Table 1).

In Iraq, the first COVID-19 wave was effective between June and December 2020, and the maximum monthly cases were seen in August, September, and October. In this study, seven participants (15.2%) were infected in June, one (2.2%) in July, nine (19.6%) in August, 14 (30.4%) in September, six (13.1%) in October, and two (4.3%) in November. Thus, only seven (15.2%) were infected out of the period when the epidemic rate was high.

Preventive Measures

Twenty-nine (34.9%) of the participants always followed the protection rules against COVID-19 infection. The most common personal precautions against COVID-19 contamination were wearing masks (82; 98.8%), gloves (80; 96.4%), and handwashing after patient care (76; 91.6%). The most common protective measures against COVID-19 in the workplace were hand hygiene supplies (43%; 51.8%), patients'

obligation to wear masks (35%; 42.2%), and infection control team activities (33%; 38.8%). There was no statistically significant relationship between compliance with preventive measures against COVID-19 and contracting COVID-19 infection ($p > 0.05$) (Table 1).

COVID-19 Infection Course

Among the infected dentists, the most common complaints were headache (40; 87.0%), fever (37; 80.4%), and myalgia (34; 73.9%). The mean duration of symptoms due to COVID-19 was 10.2 ± 6.8 days. Of the infected participants, 16 defined the course of infection as mild, 20 as moderate, and ten as severe. One (2.2%) of those with severe illness was hospitalized. Of the infected dentists, 24 (52.2%) did not know the source of infection. As sources of infection in the remaining infected participants, family members and/or friends were reported in 16 participants (34.8%), patients in five (10.9%), and a health institution in one (2.2%). Of the infected participants, 11 reported transmitting the infection to at least one person, 18 of the remaining were unsure about infecting others, and 17 were sure of no transmission.

Table 1. The main findings of the participants in the study.

Variable	Covid-19 Positive (N = 46), n (%)	Covid-19 Negative (N = 37), n (%)	Total N = 83) n (%)	*p* -value
Gender (male, n = 52)	26 (56.5)	26 (70.3)	52 (62.6)	0.145
Age (years ± SD)	33.2 ± 5.5	34.7 ± 8.2	33.8 ± 6.8	0.291
Duration of the occupation (years ± SD)	9.7 ± 5.0	11.8 ± 7.9	10.6 ± 6.5	0.160
Workplace (public hospital)	12 (26.1)	2 (4.3)	14 (16.9)	0.012
Working Province (Sulaymaniyah)	32 (69.6)	14 (37.8)	46 (55.4)	0.014
No. of weekly patients	27.5 ± 18.7	23.5 ± 17.8	25.8 ± 18.1	0.366
Weekly working hours	17.3 ± 11.0	23.8 ± 13.7	20.2 ± 12.6	0.020
Comorbidities	4 (8.7)	4 (10.8)	8 (9.6)	0.515
Following the rules				
Always	15 (32.6)	14 (37.8)	29 (34.9)	0.395
Mostly	27 (32.5)	17 (46.0)	44 (53.0)	0.175
Occasionally	4 (8.7)	6 (16.2)	10 (12.1)	0.239
Personal prevention measures				
Glasses	34 (73.9)	27 (73.0)	61 (83.6)	0.559
Avoid contact	26 (56.5)	18 (48.7)	44 (53.0)	0.311
Hand washing	41 (89.1)	35 (94.6)	76 (91.6)	0.316
Workplace prevention measures				
Infection control team activities	17 (37.0)	16 (43.2)	33 (39.8)	0.360
Mask wearing obligation for the patients	21 (45.7)	14 (37.8)	35 (42.2)	0.312
Hand hygiene supply	26 (56.5)	17 (46.0)	43 (51.8)	0.231
Well-occupied room	11 (23.9)	11 (29.7)	22 (26.5)	0.363
PPE availability				
Always	21 (45.7)	21 (56.8)	42 (50.6)	0.216
Mostly	17 (37.0)	12 (32.4)	29 (34.9)	0.423
Occasionally	8 (17.4)	4 (10.8)	12 (14.5)	0.300
Quality of PPE				
Good	20 (43.5)	20 (54.1)	40 (48.2)	0.231
Moderate	21 (45.7)	15 (40.5)	36 (43.4)	0.404
Low	5 (10.9)	2 (4.3)	7 (8.4)	0.316

Risk Factors for COVID-19 Infection

Gender, age, workplace type, province of work, and variables of compliance with preventive measures were entered into the logistic regression model. As a result, working in Sulaymaniyah Province (OR: 2.852, CI: 1.098-7.408, $p = 0.031$) and working only in a public hospital (OR = 6.761; CI = 1.215-37.610; $p = 0.029$) were found as significant risk factors for COVID-19.

Discussion

This study showed us that the incidence of COVID-19 among dentists in the Iraqi Kurdistan Region is remarkably higher than expected. The attitude of the dentists toward self-protection from COVID-19 infection is relatively poor since only one-third always followed the prevention rules. The majority reported that the origin of the infection was family members or friends circle rather than their patients. Working at a public hospital and in Sulaymaniyah province were significant risk factors for COVID-19 infections.

Healthcare workers have more risk of encountering infectious diseases such as COVID-19 than the normal population. However, this study showed us that sometimes relatives and friends could be more dangerous than occupational hazards. The incidence of COVID-19 infection among dentists is hugely higher than most previous reports from other countries. Incidences among dentists were reported as 1.9% in France [13], 2.6% in the USA [14,15], and 4% in Argentina [16]. There are only a few studies assessing the impact of COVID-19 among dentists from neighboring countries to compare our results.

Nevertheless, several reports showed that the pandemic strongly affected dental practice [17,18]. The cause of this high prevalence could be the failure to respond to the pandemic on a national basis and the insufficiency of Iraq's medical infrastructure. In addition, during the peaks of the epidemic, the virus spread quickly without any serious obstacles [7].

We have found that dentists in the Sulaymaniyah province were at a significantly higher risk for infection. This could be related to the higher incidence of COVID-19 in Sulaymaniyah province than in other regions in the following period. For this Province, the neighborhood and close relations with Iran could be an essential infection source during the pandemic [19]). Besides the inadequacy of the healthcare system of Iraq and the Kurdistan Region, the public awareness and communal preparedness against the pandemic are far from what they should be. Furthermore, the restrictions and public closures against the pandemic were not sustainable because of public pressures [20]. More

likely, the overcrowded and intensive work led to more infections among the dentists who work there.

Most participants were not always followers of the prevention rules in their work praxis. Compared to American dentists' data, the compliance rate was low [10]. Similarly, they were not keen on personal protection in their work. Approximately half of the participants stated that PPEs were always available. However, only 48.2% of the participants described the quality of this equipment as 'good.' All these insufficient prevention measures also may have contributed to the high prevalence of infection among these dentists. In addition, several studies showed that the lack of PPEs contributes to the anxiety of health care workers [21,22].

A remarkable finding is that only 21 out of 46 positive cases reported having a positive COVID-19 test. In contrast, the other 25 cases said they had experienced consistent symptoms with COVID-19 without testing. These dentists may not have been able to have a test due to the lack of sufficient test kits, especially during the peak periods of the first and second waves. In addition, it may depend on the fact that they accept the opinion that "everyone will get sick sooner or later," which was the dominant thought in society, and adapt to the new situation quickly and thus cope with it easily [8].

The main symptoms were headaches, fever, myalgia, loss of smell, and loss of taste. The main presenting symptoms of our participants have shown concordance with other studies from different countries [23–26]. In addition, the mean duration of symptoms is similar to previous studies [17,18].

Regarding the onset time of the symptoms, a precise curve was seen. The monthly distribution of infected participants has shown a concordance with the maximum COVID-19 patients in Iraq during the first wave of the pandemic. Furthermore, the infection curve is parallel to the prevalence of the virus in public. This finding could support that the dentist participants were getting the virus in a household-related environment rather than a work-related environment. Indeed, a significant percentage declared that they became infected by family members or friends.

We should mention some limitations of this study. One of the limitations is the low number of participants. Their representation is statistically enough, but this number limits the variables' statistical significance. The other limitation is the diagnosis of COVID-19 in some participants. Twenty-five participants had no PCR test for COVID-19, but they had typical symptoms and

clinical course. However, this disadvantage could be negligible because of the participant's occupation.

Conclusions

During the pandemic, dentists in Iraq-Kurdistan Region encountered extremely high COVID-19 infections. In addition, they had to work with insufficiently equipped hospital conditions. This study has shown that the increased risk of COVID-19 infection among dentists relates to their family and friends rather than their occupation. The majority of dentists did not follow preventive measures in their daily routines. Additionally, they could also be an infection source for others.

Authors' Contributions

The authors confirm their contribution to the paper as follows: literature search: SH, MB, study conception and design: SH, MB; data collection: MB; analysis and interpretation of results: SH, MB; draft manuscript preparation: SH, MB. Both reviewed the results and approved the final version of the manuscript.

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Corresponding author

Prof. Salih Hosoglu,
Department of Internal Medicine,
University Hospital Cologne,
Kerpenerstraße 62, 50931 Cologne, Germany
Tel: +49 221 478-97347
Email: hosoglu@hotmail.com

Conflict of interests: No conflict of interests is declared.

Annex – Supplementary Items

Supplementary Table 1. Questionnaire for Dentists about COVID-19 in Kurdistan Region-Iraq.

Please mark the appropriate choices:

Gender?	□M	□F	Age: ....years	
Graduation year				
Working City				
Workplace (All that apply)			□Public	□Privat
How many patients do you care for per week? (approximately)				
How many hours do you work and treat patients in a week? (approximately)				
Do you have the following comorbidities? (All that apply)			□Diabetes Mellitus □Arterial Hypertension □Cancer □Hearth disease □Renal disease □Others (please specify if available):	
During the Corona Pandemic, how do you protect yourself from contamination?			□ I never follow the rules □ I occasionally follow the rules □ I mostly follow the rules □ I always follow the rules	
Which of the following prevention measures do you follow? (All that apply)			□Mask　　　　□Gloves □Glasses　　　□Hand washing □Avoiding contact in the community □Apron + face shield	
How are infection control measures against COVID-19 at your workplace? (All that apply)			□Workplace prevention measures □Infection control team activities □ Mask-wearing obligation for the patients □Hand hygiene supply □Well-organized room	
Availability of Personal Protective Equipment (PPE) supplies in your workplace?			□Always □Mostly □Occasionally	
How is Personal Protective Equipment (PPE) quality at your workplace?			□Good □Moderate □Low	

Have you been infected with COVID-19?	□Yes, with symptoms and a positive PCR test
	□Yes, without PCR test, only with the typical clinical picture
	□ No with negative PCR test and no symptoms
When did the symptoms start? (d/m/y)	........../.........../............
Which symptoms did you have? (All that apply)	□ Fever or chills
	□Headache
	□Couch
	□Myalgia or body aches
	□Shortness of breath or difficulty breathing
	□Fatigue
	□New loss of taste or smell
	□Sore throat
	□Congestion or runny nose
	□Nausea or vomiting
	□Diarrhea
	Others (....................................)
Duration of the symptoms (days)	........................days
How do you describe the severity of your symptoms?	□Asymptomatic
	□Mild
	□Moderate
	□Severe
Regarding the source of the infection, which scenario best fits you?	□From a patient
	□From a friend
	□From a medical staff
	□From household
	□Not sure/Unknown source
Do you think that you have transmitted your disease to someone else?	□Yes
	□No
	□Not sure