

# Infection Control Practices at the Dental Clinics in Jeddah, Saudi Arabia

Zuhair S Natto   
Mohammed Muslih Alshehri  
Faisal Khalid Alghamdi

Department of Dental Public Health,  
Faculty of Dentistry, King Abdulaziz  
University, Jeddah, Saudi Arabia

**Purpose:** The aims of this study were to determine the rate of compliance of infection control and estimate the incidence of COVID-19 in dental clinics in Jeddah, Saudi Arabia.

**Materials and Methods:** This is an ecological correlational study of randomly sampled dental clinics in the city of Jeddah. The 32-question survey used in the study was constructed based on the infection control guidelines/protocols during the COVID-19 pandemic released by the ADA, CDC, and SMOH. A sample of clinics from a dental clinic list in Jeddah city, using a simple random technique.

**Results:** Fifty-three dental clinics consented to participate in our study, while ten refused. Most of the dental clinics checked their patients' temperature (30.2%) and strictly required them to wear a surgical mask before entering the clinic (58.5%). Glove, gown, and face mask were the most common methods of infection control used during all dental procedures (98.1%, 96.2%, and 94.3%, respectively). Moreover, the incidence of COVID-19 was the highest among receptions/security (18.70%), followed by nurses (14.3%) and dentists (11.79%).

**Conclusion:** As the incidence of COVID-19 among dental staff will continue to increase in the future, it is highly recommended that infection control guidelines are followed in all dental clinics.

**Keywords:** COVID-19, infection control, incidence, dental clinics, Saudi Arabia

## Introduction

The outbreak of coronavirus in 2019 (COVID-19) was identified as a pandemic by the World Health Organization (WHO) on January 30, 2020.<sup>1</sup> COVID-19 is an illness initiated by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)<sup>2</sup> that originated in Wuhan City, Hubei Province, China, and spread throughout the world via contaminated subjects and airborne transmission.<sup>3,4</sup> Over 4.7 million deaths have occurred due to COVID-19 up to September 22, 2021.<sup>5</sup>

All health practitioners who potentially come into contact with COVID-19 patients are at risk of infection.<sup>6</sup> This includes dentists practicing dentistry in pandemic areas, especially when dealing with asymptomatic or pre-symptomatic patients.<sup>7</sup> In addition, airborne transmission dynamics inside hospitals creates further risk of infection.<sup>8,9</sup>

Dental practitioners are at high risk of facing diseases and infections due to their close contact with patients' oral cavity and exposure to aerosols that might potentially contain a high number of bacteria and viruses.<sup>10</sup> Several protective measures and infection control protocols have accordingly been suggested to protect dental practitioners from infection.<sup>9</sup>

Correspondence: Zuhair S Natto  
Department of Dental Public Health,  
Faculty of Dentistry, King Abdulaziz  
University, Jeddah, Saudi Arabia  
Tel +966 50 36 200 37  
Email znatto@kau.edu.sa

The current pandemic necessitates dentists' strict adherence to established guidance to maintain the safety of practitioners, staff members, and patients. By following the infection control guidelines provided by the American Dental Association (ADA), the Centers for Disease Control and Prevention (CDC), or the Saudi Ministry of Health (SMOH), the risk of disease transmission and increased precaution measures can be substantially minimized.<sup>2,10,11</sup> However, COVID-19 continues to be prevalent in the dental field worldwide, particularly in Saudi Arabia. Moreover, there is limited information about the extent and nature of dental clinics' adherence to the modified infection control protocols to minimize the spread of COVID-19 infection. Therefore, this study aims to determine the rate of overall compliance with infection control, compare between public and private clinics in infection control practice, and estimate the incidence of COVID-19 in dental clinics in Jeddah, Saudi Arabia.

## Materials and Methods

This is an ecological correlational study of a random sample of dental clinics in Jeddah city, Saudi Arabia, which was conducted between November 15 and December 18, 2020. During this time period, the COVID-19 vaccine was not yet available in Saudi Arabia. Any dental center/poly-clinic was eligible for inclusion in the study if they signed the consent form. The study was approved by the ethics committee at the Faculty of Dentistry, King Abdulaziz University (#122-11-20), and STROBE Statement for observational studies was followed. All participants (dental clinics) were informed about the purpose of the study, and that they all provided informed consent.

## Survey

A 32-question questionnaire was constructed for this research based on the infection control guidelines/

protocols addressing the COVID-19 pandemic that were released by ADA, CDC, and SMOH. The survey took about 9–10 minutes to complete and was validated by three experts in infection control (contents validation) and three clinics (face validation). The validated survey was divided into several parts, consisting of the type of clinic; its infection prevention and control efforts before attending to the patient (15 questions), during any dental procedure (9 questions), and after dismissing the patient (7 questions); and the total number of dental clinic staff and the self-reported number of individuals diagnosed with SARS-CoV-2 test (confirmed case).

## Sample Size and Statistical Analysis

This is a pilot study for which we randomly selected around one-third (53) clinics from a list of dental clinics in Jeddah city with 159 dental clinics and centers, using a simple random sampling technique. Descriptive statistics (frequency and percentage) was used. Chi-square and Fischer's tests were used to compare between different variables, such as type of institute governmental vs private and all other variables. P value <0.05 was considered statistically significant. All analyses were performed using SPSS V.26 for Windows (IBM).

## Results

Fifty-three dental clinics agreed to participate in our study after excluding ten clinics in which they refused to participate, stating the unavailability of staff to answer the questions as the reason for their refusal.

These clinics contained 1087 individual staff members. Dentists comprised the largest proportion (45.3%), followed by nurses (39.3%), reception/security staff (11.3%), and dental lab technicians (Table 1). The incidence of COVID-19 was the highest among reception/

**Table 1** Prevalence of COVID-19 Among Dental Clinics

Types of Dental Work	Overall	Diagnosed with COVID-19 in the Selected Clinics N (%)		X <sup>2</sup> Statistics	p value***
		Yes	No		
	N (%)*	N (%)**	N (%)**		
Dentist	492(45.3)	58(11.79)	434(88.21)	6.144	0.105
Nurses	427(39.3)	61(14.29)	366(85.71)		
Lab technician	45(4.1)	3(6.67)	42(93.33)		
Receptions/security	123(11.3)	23(18.70)	100(81.3)		
Total	1087(100)	143(13.16)	944(86.84)		

**Notes:** \*Column percentage. \*\*Raw percentage. \*\*\*p value using Chi-square test.

security staff (18.70%), followed by nurses (14.3%) and dentists (11.79%). However, the result was not statistically significant ( $p=0.105$ ).

The majority of participating dental centers/polyclinics were in the private sector (69.8%). Most clinics had an estimated average of one appointment every 30 minutes (30.2%), although some had an appointment every ten minutes (Table 2). The majority of the private clinics had 30 minutes, while the public clinics had 60 minutes appointment ( $p=0.001$ ). Most of the clinics checked the patients' temperature at the clinic entrance (30.2%) and used an infrared thermal sensor (20.8%). Most clinics strictly required staff to wear a surgical mask before entering the dental clinic (58.5%), maintain an interpersonal distance of at least 2 meters (77.4%), and use hand sanitizer before meeting with any patient (77.4%). However, it seems that public clinics are more restricted regarding the interpersonal distance compared with the private clinics ( $p<0.001$ ).

Glove, gown, and face mask were the most common infection control efforts used during any dental procedure (98.1%, 96.2%, and 94.3%, respectively) (Table 3). Some clinics allowed for overlapping dental appointments (double-booked) (35.8%). Private clinics are more restricted regarding the double booked appointment compared with the public clinics ( $p=0.042$ ). The estimated time for any procedure was less than 30 minutes (43.4%). The preferred method of limiting the spread of aerosols was partial isolation (69.8%) followed by rubber dam (18.9%),  $p$  value = 0.023, and 0.039, respectively.

Disinfecting the clinic; changing gloves, mask, and gown; and washing hands after dismissing each patient was the most common method of infection control (20.8%), followed by disinfecting the clinic and changing gloves only (17.0%) or hand washing (17.0%) (Table 4). However, it was not statistically significant between public and private clinics ( $p=0.334$ ). The length of time between each hand-washing action was less than 20 minutes (84.9%).

**Table 2** Frequency and Percentage of Infection Control Practice Before Any Dental Procedure

Infection Prevention and Control Efforts	Total N=53 N (%)	Private N=37 N (%)	Public N=16 N (%)	X <sup>2</sup> Statistics	p value*
Type • Governmental • Private	16(30.2) 37(69.8)	37(100) –	– 16(100)		NA
Estimated average length of the appointment • 90 minutes • 60 minutes • 45 minutes • 30 minutes • 25 minutes • 20 minutes • 15 minutes • 10 minutes	5(9.4) 9(13.2) 3(5.7) 16(32.1) 1(1.9) 3(5.7) 7(13.2) 9(18.9)	2(5.4) 2(5.4) 0 13(35.1) 1(2.7) 2(5.4) 7(18.9) 10(27.0)	3(18.8) 5(31.2) 3(18.8) 4(25) 0 1(6.2) 0 0	19.202	0.001**
Actively check temperature in the clinic entry	51 (96.2)	35(94.6)	16(100)	1.000	0.903
Checking body temperature using cameras infrared thermal sensors	11 (20.8)	8(21.6)	3(18.8)	0.056	0.813
Postpone dental appointment for about 2 weeks if patients had fever (38C) respiratory symptoms or need elective treatment	12 (22.6)	6(16.2)	6(37.5)	2.889	0.089
Patients should be wear a surgical mask before come to the dental clinics	31 (58.5)	21(56.8)	14(87.5)	4.707	0.030**
Patients in the waiting room respected the interpersonal distance ( $\geq 2m$ )	33 (62.3)	36(97.3)	8(50.0)	17.724	<0.001**
Patients must always wear a surgical mask inside the dental center unaccompanied by partners relatives.	41 (77.4)	6(16.2)	6(37.5)	2.889	0.089
Operators must sanitize their hands before seeing any patient.	41 (77.4)	26(70.3)	15(93.8)	3.516	0.061

**Notes:** \*p value using Chi-square or Fischer's tests \*\*p value < 0.05.

**Table 3** Frequency and Percentage of Infection Control Practice During Any Dental Procedure

Infection Prevention and Control Efforts	Total N=53 N (%)	Private N=37 N (%)	Public N=16 N (%)	X <sup>2</sup> Statistics	p value*
Protection used during dental procedures the following					
• Glove	52 (98.1)	36(96.3)	16(100)	1.000	0.903
• Gown	51 (96.2)	35(94.6)	16(100)	1.000	0.764
• Face Mask	50 (94.3)	35(94.6)	15(93.8)	0.015	0.534
• Face Shield	24 (45.3)	17(45.9)	7(43.8)	0.022	0.883
• Google	10 (18.9)	6(16.2)	4(25.0)	0.563	0.453
• Head cover	6 (11.3)	4(10.8)	2(12.5)	0.032	0.858
Cloth face coverings should not be worn instead of a respirator or face mask.	29 (54.7)	19(51.4)	10(62.5)	0.560	0.454
Patients can wait outside the dental facility where they can be contacted by mobile phone when it is their turn for dental care.	23 (43.4)	13(35.1)	10(62.5)	3.405	0.065
Mobile phone when it is their turn for dental care					
No overlapping dental appointments.	34 (64.2)	27(72.9)	7(43.8)	4.148	0.042**
The estimated time of any procedure				0.713	0.700
• Depend on the case	10 (18.9)	8(21.6)	2(12.5)		
Less than 30	23 (43.4)	16(43.2)	7(43.8)		
More than 30	20 (37.7)	13(35.1)	7(43.8)		
Minimizing the use of intraoral X-ray techniques	48 (90.6)	37(100)	11(68.8)	0.001	0.003**
The clinic door must be closed during interventions to avoid any aerosol spreading	43 (81.1)	32(86.5)	11(68.8)	2.295	0.129
The used method to minimize the spreading of aerosols and potentially infected biologic material if applicable					
Biologic material if applicable					
• Rubber dam	10 (18.9)	4(10.8)	6(37.5)	5.198	0.023**
• Partial isolation	37 (69.8)	29(78.4)	8(50.0)	4.268	0.039**
• None	6 (11.3)	4(10.8)	2(12.5)	0.032	0.859

Notes: \*p value using Chi-square or Fischer's tests. \*\*p value < 0.05.

## Discussion

To our knowledge, our article is the first to calculate the estimated incidence of SARS-CoV-2 infections in dental practice and evaluate the actual infection prevention and control efforts at the level of dental centers in Saudi Arabia during the pandemic. This will be useful in future studies on the dental response to any pandemic and how to protect dental staff and prevent the spread of infection. We have reported the infection incidence of SARS-CoV-2 in Jeddah as 11.79%, which is higher than the figures reported in the US (0.9%),<sup>12</sup> the Netherlands (0.9%),<sup>13</sup> China (1.1%),<sup>14</sup> and Seattle, Washington (5.3%).<sup>15</sup> This could be due to the fact that the study was conducted at the end of 2020, whereas the other studies were

conducted earlier. Moreover, receptions/security were the highest at risk. This could be due to lack of proper knowledge on the infection control guidelines/protocols during the COVID-19 released by SMOH or because receptions/security were not wearing PPE. Reception/security are the least likely dental staff in the dental clinics to perform dental procedures. However, the rate of COVID-19 incidence was still high among them as reported in the study. Nonetheless, they are equally exposed to COVID-19.

The responses to our study demonstrate that 96.2% of the participating dental clinics were checking temperature before entry to the clinic centers have established temperature monitoring, which has been proven as

**Table 4** Frequency and Percentage of Infection Control Practice After Any Dental Procedure

Infection Prevention and Control Efforts	Total N=53 N (%)	Private N=37 N (%)	Public N=16 N (%)	X <sup>2</sup> Statistics	p value*
Methods of infection control after patient visit				8.661	0.334
• Change gloves and hand wash only	6 (11.3)	4(10.8)	2(12.5)		
• Change gloves only	10 (18.9)	8(21.6)	2(12.5)		
• Disinfect all the clinic and change gloves	•9 (17.0)	5(13.5)	4(25.0)		
• Change gloves and masks	4 (7.5)	4(10.8)	0		
• Disinfect all the clinic and change gloves, masks, gown, hand wash	11 (20.8)	6(16.2)	5(31.2)		
• Disinfect all the clinic and change gloves, hand wash	9 (17.0)	8(21.6)	1(6.3)		
• Change gloves, mask and gown	2 (3.8)	1(2.7)	1(6.3)		
• Change gloves and gown	1 (1.9)	1(2.7)	0		
• Disinfect all the clinic and change gloves, mask	1 (1.9)	0	1(6.3)		
Length of hand hygiene wash between patients				0.120	0.729
• Less than 20	45 (84.9)	31(83.8)	14(87.5)		
• more than 20	8 (15.1)	6(16.2)	2(12.5)		
Patients must remove their masks at the beginning of the procedure and wear them again at the end	34 (64.2)	25(67.6)	9(56.3)	0.622	0.430

**Note:** \*p value using Chi-square or Fischer's tests.

effective strategy to prevent infection.<sup>16,17</sup> Most of the clinics – at least 94% – were using gloves, masks, and gowns to enhance infection control practices during the dental procedure. However, the combined use of surgical masks and respirators might not follow the current CDC recommendations regarding personal protection. The estimated number of patients, which in June 2020 was at about 70% of pre-COVID-19 levels, has since continued to steadily increase.<sup>18</sup> Clinics may require a larger amount of disposable personal protection products for infection control to meet the demands of the rising number of patients; however, the capacity for these products to be provided remains uncertain, depending on their availability and cost.<sup>19–23</sup>

Availability and effectiveness of protection methods is a critical factor for dental health care staff. These methods include sterilization, hand washing, and the use of personal protective equipment.<sup>24,25</sup> Basic personal protective equipment includes gloves, face masks, gowns, and eye protection goggles, all of which are commonly used in most dental clinics and create a safer environment for dental staff and patients alike.<sup>26</sup> However, the moderate use of face shields (45%) has also been noted; the use of face shields has been shown to provide additional protection to the facial area and all potential entry points, such as the mucous membranes of the mouth, eyes, nose, in addition to respiratory protection.<sup>27</sup> Moreover, the face area is the most contaminated area during

dental treatment. A face shield can protect this area from any splashes or spatters of bodily fluids or aerosols generated during dental procedures.<sup>28,29</sup> For these reasons, the use of face shields is recommended rather than face masks to minimize the spread of COVID-19 and virus exposure in the community.<sup>30</sup> Therefore, dentists should use face shields as part of their standard personal protection in dental clinics, especially during the pandemic. Moreover, no one reported to use the N95 or PFF2/3 or equivalent mask, which were highly recommended for any dental procedure due to loose fit between the surface of the regular mask and the face.<sup>31,32</sup>

Therefore, dentists should use face shields as part of their standard personal protection in dental clinics, especially during the pandemic. However, these findings contain some limitations. There is a risk of selection bias regarding the participating clinics sample, which might lead to an underestimation of the COVID-19 incidence or severity due to the possibility that the clinics that refused to participate had more COVID-19 cases. Although a simple random sample of all dental clinics helps to minimize this risk of bias, it does not totally exclude it. Also, some dentists may have been asymptomatic and might have had undiagnosed infections. Furthermore, these findings are self-reported, making clinics and staff potentially subject to inaccurate results. However, this is a pilot study, which we can use to build our knowledge for future research. Lastly, this study was



conducted in Jeddah only which may not represent the whole kingdom of Saudi Arabia.

There is a general sense of lack of sufficient infection control practice at the public dental clinics compared with the private clinics due to daily number of patients, patient preferences, and repeated visits of dental licensing officers to the private clinics.<sup>30,33</sup> However, we found several items that could be improved overall, such as average length and overlap dental appointment, interpersonal distance, minimizing intra-oral X-rays and methods of infection control. Moreover, the majority of the dental centers were following the guidelines and were comparable to the clinics in Europe and North America.<sup>12,34</sup> To the statistical significant differences between private versus public did not necessarily reflect better or worse infection control practices since it evaluates the dental center overall and it could varied between clinics at the participated dental center.

## Conclusion

The incidence of COVID-19 among dental staff is about 13% and will increase more in the future. It is therefore highly recommended that all dental clinics adhere to the infection control guidelines, which will help to reduce the risk of infection spreading both during the delivery of oral healthcare and subsequently throughout the community.

## Disclosure

The authors report no conflicts of interest in this work.

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