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Infection control procedures applied by trainee dentists against COVID-19 before and after vaccination

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Aim: this study aimed to conduct a questionnaire evaluation to investigate previously used prevention methods by dentists in major dental centers in Mosul, and whether the level of these precautions has been affected, If the dentist has ever had an infection, or if he or she has received a vaccine against the disease.
Materials and methods: This community-based study (cross-sectional study) conducted a comprehensive questionnaire to evaluate precautions and means of self-protection taken against infection by 165 trainee dentists working in the major specialized dental centers in the city of Mosul using a form a special questionnaire for this purpose was designed by the researchers themselves.
Results: Highly significant number of participants 61.8% had a knowledge of the 7 steps hand hygiene procedure. However, around half of the participants 43.6% did not routinely hand wash/ gel with alcohol gel before and after wearing the gloves, yet, this was not statistically significant. Liquid soap was agreed to be the main type provided for the trainees/staff. The 69.5% of staff were significantly committed to single use of disposable gloves, not tempted to disinfect/reuse them with
Conclusion: most of the dental staff has knowledge of hand hygiene, PPE, vaccine and other protective guidelines against the infection, but not all the facilities present and there is shortage in patient education about the infection and the procedures to avoid it.

Keywords: infection control measures, trainee dentists, COVID-19

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Introduction

Corona virus infection, known as COVID19 still very critical concern associated to the public health, despite it initiated in china in late 2019, it spread to more than 200 countries in short time and became a pandemic, it leads to massive consequences in public heath, economy and social life around the world.[1-3] It transmits through respiratory droplets or aerosol during sneezing or coughing that enter the lung by breath. As there is long period between infection and isolation of the people, it has been found that isolation, reviewing and following the activities of the infected individuals would be inadequate to control the pandemic within 3 months, Therefore, application of preventive measures, especially isolation and lockdown, would be essential.[4]

COVID19 virus present in saliva and transmitted by aerosol, so dental health care workers include dentist, dental assistant, instrument processing and administration staff even dental laboratory staff are at high risk of infection as the dental procedures generate aerosols that distribute microbes from the patient's mouth to them in both infectious and carrier condition. Also intimate contact of dental workers with tools, devices and environmental surfaces that could be contaminated make it obligatory to follow a firm and adequate infection control strategies against infection.[5,6] Furthermore, they can spread the infection to their families if the control procedures not taken seriously.[2]

During the pandemic, dental practices become restricted to the emergency situations and several dental services has been provided under firm sterile protocol, although this is not true for all countries and many gaps in the use of infection control routine have been reported due to numerous factors like specific condition, medical system organization and financial resources of each country in addition to knowledge among dental professionals, full awareness of latest recommendations which need constant learning and resource support to increase the efficacy of these guidelines.[1,7]

Infection control measures include doing only emergency treatment on high-risk patients, admission to staff and patients who have not any symptoms and have 2 doses of vaccine, keep social distances, ventilated and disinfected waiting zone, checking body temperature, adequate cough manners, appropriate discarding of polluted substances, enough spaces between dental chairs. Dental staff should use hand hygiene, surgical scrub, face mask and PPE kit(face shield, gown, gloves and goggles)with correct donning and doffing sequence method, sterilize of the instrument and disinfect all the surfaces and materials after every patient, suitable ventilated system, disinfectant mouth rinse of patient, rubber dam and high volume vacuum should be used.[8]

In Iraq, first COVID 19 infection was come from Iran to Najaf city on 22 February 2020. Like other countries in the world the need and efficiency of isolation and protective procedures were constantly debated and criticized by Iraqi people, and the outcomes were observed differently by everyone. Thus, the evaluation of this policy effectiveness is very difficult, leading to mistrust between publics and managers, causing thousands of deaths. On 30 April 2021, more than one million infection cases and more than 50,000 deaths were recorded in Iraq.[9] There is not enough information related to the incidence of coronavirus infection among dentist, nor sufficient and adequate studies on dental infection control methods has been performed in Iraq, because of many reasons, like awareness, educational background and motivation deficiency, in addition to financial factor, professional and sociodemographic variables, presence of

suitable facilities, all affect performance of active infection control measures by dental healthcare workers.[9,10]

This study aimed to conduct a questionnaire evaluation to investigate previously used prevention methods by dentists in major dental centers in Mosul, Iraq and whether the level of these precautions has been affected, If the dentist has ever had an infection, or if he or she has received a vaccine against the disease.

Materials and methods

The study was performed as a descriptive survey of infection control measures in the dental practices of Iraqi trainee dentists working in the major specialized dental centers in Mosul city. A self-administered questionnaire was formatted to evaluate the knowledge, attitude, and practices of infection control measures by dentists. The questionnaire was pretested, reviewed, and retested before use. The questionnaires distributed to 165 trainee dentists and 3 researchers collected the data by face to-face interviews. Tracking system was not employed to detect who replied to confirm secrecy. The questionnaire of this study was a special formula, costumed by the researchers themselves. 48 questions involved in the questionnaire, contain following sections: Part 1 encompassed general information about gender (female/male) and age. Part 2 infection control measures adapted at work during the pandemic which embrace (evaluation of the effectiveness of hand hygiene (HH) procedures include HH routines applied by trainee and knowledge about it, type of HH solutions and disinfectant available in the center, evaluation of the effectiveness of personal protective equipment (PPE), using patient protective measures or not with knowledge about the method of using and discarding it, and protective facilities available at work as type of protective facial masks, early diagnosis of the disease, limited appointments, social distance application, educational posters and others). Part 3 infection control measures performed after COVID infection (applied by the previously infected dentists only) and assess they experience about the virus and the signs and symptoms of the disease, increase the assurance about immunity they gain after infection.. Part 4 protective measures used once taking vaccine of COVID-19 (applied by vaccinated dentists only), evaluation of participant information about the vaccine, type of vaccine they received, amount of the trust about the effectiveness and safety of the vaccine. Questionnaire data were collected and analyzed using SPSS software version 25/. The validity of the designed questionnaire was tested using Cronbach's Alpha reliability test, the value was found to be acceptable (0.729). To evaluate staff members' questionnaire responses, significance was computed using Chi square test to compare percentile frequencies ($P \leq 0.05$ for significance, $P \leq 0.01$ for high significance).

Results

A total of 165 participants took part in this questionnaire, with 45 males (28%), 54 females (32.7%). In 64 of responses (38.8%) the gender identity value was missing.

With regards to the participants' age category, 127 participants (77%) were dental trainees or junior general dentists, with an age range of 25-35 years. More senior age categories were 35-45 years (n=23/13.9%) and over 45 years (n=15/9.1%).

1. Evaluation of the effectiveness of hand hygiene (HH) procedures

Highly significant number of participants had a knowledge of the 7 steps hand hygiene procedure (n=102, 61.8%; P was found to be $0.002 \leq 0.010$). However, around half of the participants (n=72/ 43.6%) did not routinely hand wash/ gel with alcohol gel before and

after wearing the gloves, yet, this was not statistically significant (P was found to be 0.102 ≥ 0.05). Liquid soap was agreed to be the main type provided for the trainees/staff (n=114/ 69.1%; P was found to be 0.000 ≤ 0.010 which is of high significance). The staff were significantly committed to single use of disposable gloves, not tempted to disinfect/reuse them (n=108/ 69.5%; P was found to be 0.000 ≤ 0.010 which is highly significant). Table 1 summarizes staff responses to HH procedures evaluation questionnaire.

Table 1: Summary of staff responses to HH procedures evaluation questionnaire. Significance was computed using Chi square test to compare percentile frequencies, *P≤ 0.05 for significance, **P≤ 0.01 for high significance. Blue highlighted rows represent the positively significant findings.

Hand hygiene evaluation criterion	n	%	Chi square significance (*P≤ 0.05,**P≤ 0.01)
What are your routine hand hygiene measures?			
Gloves only	72	43.6	0.102
Hand wash/ alcohol gel + Gloves	93	56.4	
Do you know the 7 steps hand hygiene method?			
Yes	102	61.8	0.002**
No	63	38.2	
What soap type is available in the center?			
Liquid soap	114	69.1	0.000**
Bar soap	51	30.9	
Have you ever attempted to disinfect/ reuse gloves for more than one patient?			
No	108	69.5	0.000**
Yes	57	34.5	

2. Evaluation of the effectiveness of personal protective equipment (PPE)

Highly significant number of participants make sure to use face shields and full gowns when doing AGPs (n=121, 73.3%; P was found to be 0.000 ≤ 0.010). However, the mask type that was of a high significance use among the staff was the simple surgical mask, whether they performed a non-aerosol generating procedure (non AGP) (n=150/ 90.9%) or an AGP (n=140/ 84.8%) (Both P values were found to be 0.000 ≤ 0.010 which are of high significance). None of the participants considered the use of the reusable stealth respirator for any dental procedure. Table 2 summarises staff responses to PPE evaluation questionnaire.

Table 2: Summary of staff responses to PPE evaluation questionnaire. Significance was computed using Chi square test to compare percentile frequencies, *P≤ 0.05 for significance, **P≤ 0.01 for high significance. Blue highlighted rows represent the positive significant findings. Pink highlighted rows represent the negative significant findings

Personal Protective Equipment (PPE)	N	%	Chi square significance (*P≤ 0.05,**P≤ 0.01)
Do you use similar/ different PPE when doing AGPs vs non AGP procedures?			
Make sure to use face shield and full gown when doing AGPs	121	73.3	0.000**
I use face cover and scrubs for both AGPs and non AGPs	44	26.7	
What type of mask do you use for routine non AGP dental work?			
Simple surgical mask	150	90.9	0.000**
Fitted filtered face mask	5	3	
Stealth respirator	0	0	
Mask type doesn't matter	10	6.1	
What type of mask do you use for AGPs?			
Simple surgical mask	140	84.8	0.000**
Fitted filtered face mask	12	7.3	
Stealth respirator	0	0	
Mask type doesn't matter	13	7.9	

3. Evaluation of the infection control policies across the center

Significantly high number of participants did not ask their patients about possible COVID symptoms prior to dental treatment (n=120, 72.7%; P was found to be 0.002 ≤ 0.010). Social distancing was reported to be insufficiently applied among patients/ staff (n=137/ 83%) and this was of a high significance (P value was found to be 0.000 ≤ 0.010). The center has no policy of limiting patient's appointments seen on daily basis during the pandemic (n=106/ 64.2%) and this was of a high significance (P value was found to be 0.000 ≤ 0.010). No alcohol gel hand sanitiser stations were provided for the patients (n=99, 60%; P was found to be 0.01 ≤ 0.010). One hundred twenty nine participants (78.2%) reported disinfecting

headpieces with alcohol spray rather than autoclaving them (P value was found to be 0.000 ≤ 0.010 which is of high significance).

The center provides patients with disposable aprons and the dental chairs are whipped with a disinfectant after each patient. Both of these criteria were highly significant (P values were found to be 0.000 and 0.006 respectively; both ≤ 0.010). The participants reported the availability educational posters for patients about COVID infection awareness (n=105, 63.6%; P was found to be 0.000 ≤ 0.010). It was also reported that the center does hold regular meetings, seminars or CPDs to keep the staff up to date with COVID protection global protocols (n=116, 70.3%; P was found to be 0.000 ≤ 0.010) . Table 3 summarises staff responses to infection control policies evaluation questionnaire.

4. Evaluation of COVID- infection casualties among staff members

As reported by our designed questionnaire, 46.1% of staff members have not had COVID infection before, 50.3% have had the infection once before, and 3.6% have had a recurrent COVID infection.

Around half of the casualties (n=48/ 53.3%) have had the infection through contact with an infected patient/ colleague at work environment, yet this was not statistically significant (P was found to be 0.527 ≥ 0.05). It was reported that 79 cases (88.8%) were mild- moderate which was highly significant (P was found to be 0.000 ≤ 0.010). Highly significant number of these casualties (54/60.6%) never actually confirmed having COVID by any clinical diagnostic test, merely relying on their symptoms, weather was mild or sever (P was found to be 0.000 ≤ 0.010); despite that, highly significant number of them still had a formal sick leave from work (n=65/ 73%, P was found to be 0.000 ≤ 0.010). Table 4 summarises the statistics for staff responses regarding their personal experience with COVID infection.

Table 3: Summary of staff responses to infection control policies evaluation questionnaire. Significance was computed using Chi square test to compare percentile frequencies, *P≤ 0.05 for significance, **P≤ 0.01 for high significance. Blue highlighted rows represent the positive significant findings. Pink highlighted rows represent the negative significant findings

Infection control policies	n	%	Chi square significance (*P≤ 0.05,**P≤ 0.01)
Do you ask your patient about COVID symptoms before starting the treatment?			
Yes	45	27.3	0.000**
No	120	72.7	
Is social distancing applied properly among patients/ staff in the center?			
Yes	28	17	0.000**
No	137	83	
Does the center limit the received patients' appointments seen daily?			
Yes	59	35.8	0.000**
No	106	64.2	
Does the center provide PPE for the patients?			
Disposable apron only	145	87.9	0.000**
No PPE provided	20	12.1	
Does the center provide alcohol hand sanitizer stations for the patients?			
Yes	66	40	0.010**
No	99	60	
How often are the dental units wiped/ disinfected?			
After each patient	100	60.6	0.006**
Once a day	65	39.4	
What do you usually sterilise the headpieces (slow/ high speed)			
Autoclave	36	21.8	0.000**
Alcohol spray	129	78.2	
Are there any educational posters for patients about COVID infection awareness?			
Yes	105	63.6	0.000**
No	60	36.4	
Does the center hold regular meetings, seminars or CPDs to keep the staff up to date with COVID protection global protocols?			
Yes	116	70.3	0.000**
No	49	29.7	

Table 4: Summary of staff responses to infection control policies evaluation questionnaire. Significance was computed using Chi square test to compare percentile frequencies, *P≤ 0.05 for significance, **P≤ 0.01 for high significance. Blue highlighted rows represent the positive significant findings. Pink highlighted rows represent the negative significant findings

COVID- infected staff casualties evaluation criterion	n	%	Chi square significance (*P≤ 0.05,**P≤ 0.01)
What do you think the infection source was?			
From work environment, infected patient/colleague	48	53.3	0.527
Socially, from outside work environment	42	46.7	
How was the COVID diagnosis confirmed?			
Nasal/ Pharyngeal swap	23	25.8	0.000**
IgG antibody blood test	12	13.5	
Never checked, through symptoms only	54	60.6	
How sever your symptoms were?			
No symptoms	5	5.6	0.000*
Mild-moderate	79	88.8	
Sever/ required hospitalisation	5	5.6	
Did you have a sick leave when you had the infection?			
Yes	65	73	0.000**
No	24	27	
When did you get back to work?			
Immediately/ little while after the symptoms settle	74	83.1	0.000**
After getting -ve COVID test	15	16.6	
Were you committed to use PPE around the time you had the infection?			
Yes	62	68.9	0.000**
No	28	31.1	
If your answer was no, what was the reason?			
PPE were no sufficiently provided by the center	13	44.4	0.121
I am immune, I have had COVID infection before	4	14.8	
I don't believe PPE help to reduce infection	11	40.7	

5. Evaluation of staff commitment to PPE measures before and after getting COVID infection

A Wilcoxon signed ranks test indicated that staff commitment to PPE measures before getting the actual infection was rated higher than commitment after getting COVID infection (mean ranks were found to be 30.13, 29.57 respectively), Z=-3.593; and P was found to be 0.000 ≤ 0.010 that is of a high significance. Figure 1 shows differences in staff commitment to PPE measures before and after getting infected with COVID.

6. Evaluation of COVID vaccination trends among staff members

Results showed that 60% of the staff were not vaccinated (n=99), as only 66 staff members received the anti COVID vaccine (40%); this was of a high statistical significance (P was found to be 0.010 ≤ 0.010). A highly significant number of staff (n=40, 41%) reported that they were waiting to receive a specific type of vaccine rather than others.

Among the vaccinated staff, 72.7% (n=48) already completed their vaccine doses, while the rest 27.3% (n=18) were still waiting for their appointments. Pfizer was the most popular anti COVID vaccine received (n=42/ 64.6%) compared to other available vaccine types which was highly significant (P was found to be 0.000 ≤ 0.010).

Participants reported that they do count on different resources to seek information about COVID virus infection and vaccine, including released documents, the guidelines updates from the Iraqi ministry of health, social media and personal life experiences (n=66/42.3%; P value of 0.000 ≤ 0.010). Table 5 summarises the statistics for staff responses regarding anti COVID vaccine evaluation.

Table 5: Summary of staff responses staff responses regarding anti COVID vaccine evaluation questionnaire. Significance was computed using Chi square test to compare percentile frequencies, *P≤ 0.05 for significance, **P≤ 0.01 for high significance. Blue highlighted rows represent the positive significant findings. Pink highlighted rows represent the negative significant findings

Staff vaccination evaluation criterion	N	%	Chi square significance (*P≤ 0.05,**P≤ 0.01)
Have you received an anti COVID vaccine?			
Yes	66	40	0.010**
No	99	60	
Give a reason if your answer was "No"			
Waiting for specific vaccine type	40	41	0.000**
I had previous infection, believe I am immune	19	19.8	
I don't believe in vaccine	18	18.8	
I believe vaccine is harmful	19	19.8	
If you are vaccinated, have you completed the required doses?			
Yes	48	72.2	0.000*
No	18	27.3	
What anti COVID vaccine type did you receive?			
Pfizer	42	64.6	0.000**
Sinopharm	12	18.5	
Astrazeneca	12	16.9	
Do you believe that vaccine can prevent future COVID infection?			
No, but reduced symptoms severity	105	63.6	0.000**
Yes, of course	12	7.3	
I don't know	48	29.1	
What resources do you use to seek information about COVID virus and vaccine?			
WHO documents, Iraqi Ministry of health guidelines	39	25	0.000**
Social media	37	23.7	
PPE were no sufficiently provided by the center	14	9	
All the above applies	66	42.3	

7. Evaluation of staff commitment to PPE measures before and after receiving anti COVID vaccine

A Wilcoxon signed ranks test indicated that staff commitment to PPE measures before receiving anti COVID vaccine was rated higher than commitment after receiving the vaccine (mean ranks were found to be 17.77, 12.70 respectively), Z=-3.977; and P was found to be 0.001 ≤ 0.010 that is of a high significance. Figure 2 shows differences in staff commitment to PPE measures before and after receiving anti COVID vaccine.

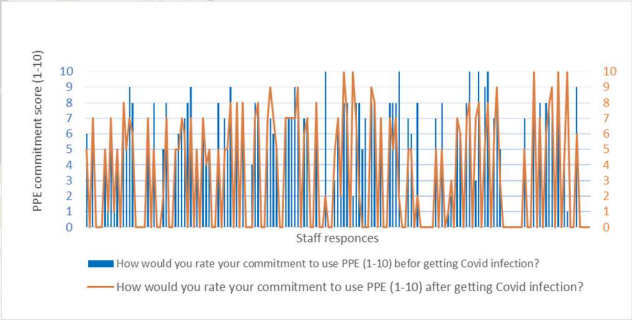

Figure 1: Differences in staff commitment to PPE measures before and after getting infected with COVID, on a scale (1-10). It is noticed that the blue stacked bars (PPE scoring before COVID) have higher trends (mean rank of 30.13) compared to the orange stacked line (PPE scoring after COVID) (mean rank of 29.57); this was significant statistically (Wilcoxon signed ranks test P value was found to be 0.000 ≤ 0.010, Z= -3.593)

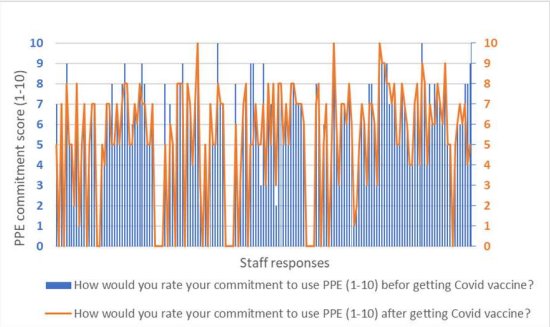

Figure 2: Differences in staff commitment to PPE measures before and after getting vaccinated against COVID, on a scale (1-10). Blue stacked bars represent PPE scoring before COVID vaccine, it has a higher mean rank (17.77) compared to PPE scoring after COVID vaccine, represented by the orange stacked line, with a mean rank of 12.70; this was found to be significant statistically (Wilcoxon signed ranks test P value was found to be 0.001 ≤ 0.010, Z= -3.977)

Discussion

All patient care actions that comprise dealing with patients or their body fluids are at risk of microbial contamination. Hand hygiene (HH) has been acknowledged as one of the main simple ways to control the spread of infections. Effective performance of (HH) is very crucial as it is basic principle of infection control policy and one of the most efficient method to inhibit infections of healthcare workers. The awareness level and rate of amenability about (HH) during pandemic period influenced by numerous aspects involve low educational backgrounds, insufficient training, shortage in resources, time and patient overload, so it is important to assess health workers' awareness level and attitude about it.[11-13]

In our study, the awareness and knowledge of HH procedure according to WHO guidelines among participant was accepted, as significant number of participants already had a knowledge of the 7 steps hand hygiene procedure, and this not seen in many of previous studies as in Chakma et al 2024 who stated that the level of knowledge and compliance increased only after training and education of the participants.[12]

For any dental procedure routine HH include washing with water and plain or disinfectant soap.[14] This seen in our study which shows that liquid soap was agreed to be the main type provided for the trainees/staff in the centers for HH. Though, a number of studies showed that using alcohol-based hand rub reduce time, raise the acquiescence and decrease bacterial collections better than other HH process.[15,16] This contrary to our study which appears around half of the participants did not routinely hand wash/ gel with alcohol gel before and after wearing the gloves.

As the medical gloves synthesized from vinyl or nitrile material, it is found that disinfectants cause minor deformations in surfaces morphology involve voids, microcracking, and swelling of the gloves' surfaces, in addition bleach and ethanol can effect on the thermal stability, and are not advised as a disinfectant for glove reuse, as well the reusing of the gloves is discouraged [17], this goes with our results that reveal the staff were significantly committed to single use of disposable gloves, not tempted to disinfect/reuse them.

PPE is fundamental for infection control, according to WHO guidelines using PPE kit is obligatory for any practice produce aerosol or in contact with body fluid this including dental processes and dental staff should be familiar with using conventional PPE.[18] Our study showed that almost dentists were aware of the correct components of PPE kit, and Highly significant number of participants make sure to use face shields and full gowns when doing aerosol generating processes (AGPs). This matches with T.M. Cook 2019 who found that adequate use of PPE prevents the risk of contamination in healthcare professionals.[19]

One of the PPE kit is surgical mask, although it have been confirmed that it

inhibit disease transmission and decrease risk of infection, yet it is important to distinguish between respirator as (N95), and surgical masks as the first prevent inhalation and protect from exposure to airborne threats while the other protect mucous membrane of nose and mouth during fomite produce process.[20,21] Our results revealed that the mask type that was of a high significance use among the staff was the simple surgical mask, whether they performed an AGP or a non- AGP. None of the participants considered the use of the reusable stealth respirator for any dental procedure.

All international guidelines(CDC, WHO, ECDC, DHA, BDPCC, and PHE) approved on the essential principles about dental work during pandemic which comprise performing emergency procedures only, screening all the patients, body temperature taking before dental visit, rapid diagnosis and isolation of infected patients, nasal swab or antibody analysis pre-visit also suggested, the positive testing, or potential previous exposure are deferred for at least 2 weeks.[22,23] In our study, significantly high number of participants did not ask their patients about possible COVID symptoms prior to dental treatment and this contrast to Caggiano M et al 2023 who found that all interviewed dentists in his study were checked patient's body temperature pre-visit, and when the temperature was higher than 37.5 °C, the appointment was postponed.[24] The reason behind our results may be due to the nature of infection can be asymptomatic or associated with multiple symptoms that differ from patient to another which may not include high body temperature and confused with other microbial infections make rapid diagnosis difficult. Also, some studies reported that body temperature is ineffective in about one-third of COVID-19 infected patients, and the most of non-contact measuring devices are influenced by environmental factors like measurement location, temperature, and humidity which contributed to the failure to prevent infection.[25]

Another risk factor of infection is social distance, the guidelines recommended distance between 1 and 2 m; yet, a current study has shown that COVID-19 can travel more than 4 m.[26] In our study, social distancing was reported to be insufficiently applied among patients/ staff and this was of a high significance, this contrary to Kurogi K. et al 2023 who identified that rate of infection is low among participants working in workplaces that restricted social gatherings than those working in workplaces that did not.[27] Other suggestion of WHO is to limit the appointments to emergency ones only [22] but, Our results reveals that the center has no policy of limiting patient's appointments seen on daily basis during the pandemic, and the is contrast to Wahdan Y et al 2023 who stated that only urgent dental care was performed during the pandemic by the a majority of dentists.[28]

Insufficient disinfection of surfaces or hidden contamination of dental supply (secretions, aerosol) is another unanticipated hazard of COVID-19 transmission, and find effectual method for it is crucial owing to adverse effect of it and high resistant of antibiotics.[29,30] Our participant reported that dental chairs were whipped with a disinfectant after each patient, but 129 participants reported disinfecting headpieces with alcohol spray rather than autoclaving them.

Patient considered as one of the most essential factor for spread of the infection, so it is important to provide mask and gloves for each patient in waiting room which should have sufficient ventilation, using tissues during coughing or sneezing and discard it quickly and adequately with hand hygiene performance.[31] In our study we found that the center not provide alcohol gel hand sanitizer stations for the patients, although it

provides disposable aprons for them, the participants reported the availability of educational posters for patients about COVID infection awareness. It was also reported that the center does hold regular meetings, seminars or CPDs to keep the staff up to date with COVID protection global protocols. This highlights the significance of continuing education that the dental associations and organizations should provide for dental professionals and members, especially through the pandemic, to ensure that they are still updated about infection control strategies and policies and can handle all the challenges.

Healthcare workers have more risk of COVID-19 infection than the normal population, prevalence among dentists were reported as 1.9% in France , 2.6% in the USA , and 4% in Argentina[9]. In Iraq many researches revealed that high rate of infection among dental workers present this could be due to lack in the following of the basic international guidelines and the deficiency of Iraq's medical organization like in any developing countries.[32] The present study provides good vision into the infection status of dentists in Mosul city in Iraq during the COVID-19 pandemic, which shows that 46.1% of staff members have not had COVID infection before, 50.3% have had the infection once before, and 3.6% have had a recurrent COVID infection.

Li et al.2020 reported only 4% of the 370 hospitalized patients were severe or critical cases from Wuhan Hospital.[33] Also our study found that highly significant number of dentists never actually confirmed having COVID by any clinical diagnostic test, merely relying on their symptoms, weather was mild or sever, despite that, highly significant number of them still had a formal sick leave from work. This may be due to inability to perform the test because of insufficiency in test kits particularly through the peak of the 1st and 2nd waves of the infection, and they do accept and adapt with the idea of "the infection will affect everyone sooner or later," that become common thought at that time. While Chu et al. reported that 54 hospital staff infections include 40 severe and 3 critical cases 79% in total.[34]

Froum S. 2020 stated that prevalence of infections transmitted during dental procedures from patient to dental worker were rare, and there are few researches have studied the frequency of COVID-19 transmission in a dental setting.[35] While our results which appear that around half of the casualties have had the infection through contact with an infected patient/ colleague at work environment, yet this was not statistically significant. This contrary to Sakai et al 2023 who revealed in his an online questionnaire-based survey on infection transmission between patient and dentist or vice versa during pandemic that no any case was recorded [36], and Tanaka H et al 2020 results revealed that 14 of 51 his participant who treated patients with COVID-19, but no transmissions were detected from infected patients to the medical staff.[37]

Vaccination against COVID-19 decrease the frequency of the infection and increase herd immunity. In Iraq the first group of people who received the vaccine was health workers involving physicians, dentists, pharmacists, professionals, physician assistants, and nurses as they are at risk of infection more than normal people because of the nature of their work [38,39]. Wassihun et. al., 2024; Okpani et.al, 2024 [40,41] showed in their study that in spite of positive opinion of 45.4% of the participants about the vaccine there was some fear from it is possible side effect in the future prevent taking vaccine. This is familial with participants in our study, 60% of them were not vaccinated while 40 % receive vaccine and most of them reported common Pfizer anti COVID

vaccine received compared to other available vaccine types. Decision of taking the vaccine by health worker influenced by awareness and understanding of properties and action of both infection and vaccine [41], our participants reported that they do count on different resources to seek information about COVID virus infection and vaccine, including released documents, the guidelines updates from the Iraqi ministry of health, social media and personal life experiences.

It is essential to employ PPE by health workers to avoid exposure to and transmission of the disease in workplaces.[42] In our study most of the participants wear a simple surgical mask as one of PPE equipment's after getting infection. This goes with Shibani et. al., 2022 who stated that about 87.3% of the contributors were dedicated to using face masks in open areas.[43]

Vaccination effectiveness in preventing COVID19 spreading is widely differs, relying not just on effect and coverage, but also on simultaneous adherence to non-pharmaceutical interferences which mean reduce in personal protective measures applied by the public lead to increase in the infection cases widely Tabur et. al., 2023; Oni et. al., 2024 [44,45]. In our study the commitment of participants higher before getting vaccine, this may be due to false idea of vaccinated participants about their long-term immunity after vaccination, which give them false impression that infection never affect them. This results also seen by Karayürek et al. 2021, who testified that the vaccine decrease the level of anxiety and apprehension of the dentists, lead to reduce in the protective methods like the use of PPE and pre-operative mouth rinsing.[46]

Conclusion

Most of the dental staff has knowledge of hand hygiene, PPE, vaccine and other protective guidelines against the infection, but not all the facilities present and there is shortage in patient education about the infection and procedures to avoid it.

limitations to the study

This study was performed on specific area and in major specialized dental centers only, so it cannot give full coverage to private dental clinics, and it focused on just dental trainee, therefore it cannot provide information about all groups of dental workers.

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