Assessment of Dental Practitioners' Knowledge and Performanceregarding Coronavirus Disease-19 Pandemic Infection Prevention and Control Measures

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1.ABSTRACT

Coronavirus Disease (COVID-19) pandemic is an international public health emergency in many countries all over the world that affects millions of people. The rapid spread of the COVID-19 pandemic declares great challenges for healthcare workers, especially dental practitioners. Thus, the current study aimed to assess dental practitioners' knowledge and performance regarding coronavirus-19 pandemic infection prevention and control measures at Mansoura Specialist Hospital. Through a descriptive cross-section study design; 25 dental practitioners were involved conveniently. The researcher collected their socio-demographic and occupational characteristics, assessed their knowledge with two self-administrated structured questionnaires, and observed performance through an observational checklist. Results declare that 92.0% and 44% of the dental practitioners had an incompetent level of knowledge and performance respectively regarding the COVID-19 pandemic infection prevention and control measures. The researcher concludes that; incompetence is the dominant level in most and less than half of dental practitioners' knowledge, and performance respectively; regarding infection prevention and control measures during the COVID-19 pandemic. And finally recommends performing scheduled on-job training programs for dental practitioners on infection prevention and control measures regarding the COVID-19 pandemic to update their knowledge and performance.

***Keyword**s: Coronavirus-19 Pandemic, Dental Practitioners, Knowledge, Performance, Prevention*

2.Introduction

In the dental setting, the patient and the dental healthcare workers (DHCW) face a high risk of exposure to coronavirus disease-19 (COVID-19) infection either via direct or indirect contact between them. Cross-infection control in dental settings is a critical issue that should be practiced daily by applying the recommendations and guidelines given by "The Centers for Disease Control and Prevention (CDC)" and "Occupational Safety and Health Administration" (ALOsaimi, Almeslet & Wisali, 2022).

The nosocomial transmission of the COVID-19 pandemic occurs mostly through infectious saliva-associated respiratory tract secretions in two ways either direct or indirect. Direct transmission could be through a cough, sneeze, or droplet inhalation, but indirect transmission could be through contact with oral, nasal, or eye mucous membranes. Thus, DHCWs are at extremely high risk for infection. Routine dental treatment mostly involves the use of ultrasonic scalers, air-water syringes, and air turbine headpieces that become infected with the patient's saliva and blood, and generating infectious aerosols and droplets in the workplace (Peng et al., 2020).

For these reasons, the usual protective measures used in routine clinical practice are not effective enough to face the spread of COVID-19, and strict and effective infection control protocols are highly required in dental settings where a large number of droplets and aerosols could be generated, especially if patients were in the incubation period and are asymptomatic or prefer to conceal their infection (Aly & Elchaghaby, 2020).

Thus CDC, the American Dental Association(ADA), and the World Health Organization (WHO) were recommending dental professionals do the following: personal protective equipment usage, hand washing, detailed patient assessment, rubber dam isolation, anti-retraction handpiece, mouth rinsing before dental treatment, and disinfection of the dental setting regularly (Aly

& Elchaghaby,2020). Thus, strict infection control protocols in dental settings are urgently needed to ensure a safe working environment and to prevent transmission of COVID-19 in dental practice (Nasser, Fares, Daoud & Abou‑Abbas, 2020).

ADA also recommends dentists divide dental treatments into urgent, emergency care, and routine procedures to reduce the contact as possible and prevent spread of the COVID-19 in dental care settings. Dental emergencies include uncontrolled bleeding, swelling, and fractures while urgent dental care to control infection, suture removal, replacing fillings, and adjusting orthodontic appliances to prevent trauma. The non-urgent routine care like routine dental cleaning and preventive therapies, cosmetic procedures, and extraction of asymptomatic teeth (Atukorallaya & Ratnayake, 2021).

Since dentists work in an environment of aerosol and splatter, the airborne material can spread at a distance of eighteen inches from the operator site. Hence to protect the dental community, the ADA has given guidelines to suspend elective or planned dental treatment and carry out only emergency procedures. To have minimal or no contact with patients, telemedicine or telephonic communication is advised. Dentists are in a state of psychological stress and fear while working in such non-faced situation (Arora et al., 2020).

2.1 Aim of the Study

This study aimed to assess dental practitioners' knowledge and performance regarding coronavirus-19 pandemic infection prevention and control measures at Mansoura Specialist Hospital.

2.2 Research Questions

1. What is the dental practitioners' knowledge of coronavirus-19 pandemic infection prevention and control measures at Mansoura Specialist Hospital?
2. What are dental practitioners' performance regarding pandemic coronavirus-19 infection prevention and control measures at Mansoura Specialist Hospital?

3. Method

3.1 Research Design

A descriptive cross-section study design was used to accomplish this study.

3.2 Setting

The study was carried out at the dental clinic, Mansoura Specialist Hospital, affiliated with the Ministry of Health and Population (MOHP)

presenting extraction, filling restorations, and minor oral surgeries. One dental practitioner was committed to treating about five patients per day.

3.3 Participants

Dental practitioners of both genders, recently graduated (up to one-year experience), and on duty during the period of data collection.

3.4 Sample Size and Technique

Dental practitioners of both genders recently graduated (up to one-year experience), and were on duty during the period of data collection.

3.5 Tools for Data Collection

The researcher developed four tools for data collection after reviewing the related literature.

Tool I. Dental practitioners' demographic and occupational characteristics self-administrated structured questionnaire. The researcher used this questionnaire to collect demographic and occupational characteristics of dental practitioners such as age, gender, residence, qualification, work setting, source of knowledge regarding the COVID‑19 pandemic, training courses, and history related to infection with the pandemic COVID‑19, and its vaccine.

Tool II. Dental practitioners' knowledge self-administrated structured questionnaire. The researcher developed this questionnaire based on Brian and Weintraub (2020) from 23 questions to examine dental practitioners' knowledge regarding infection prevention and control measures related to the COVID‑19 pandemic.

Dental practitioners' knowledge scoring system. The researcher awarded one mark for each correct answer as the following: category of the pandemic COVID‑19 (included 1 item), mode of transmission (included 8 items), high-risk group and most affected sex, and age (included 7 items), incubation period (included 1 item), diagnostic measures (included 5 items), signs and symptoms (included 19 items), prognosis and complications of infected cases (included 8 items), treatment and its side effect (included 14 items), vaccines effect and duration of its immunity (included 2 items), survival on different surfaces (included 3 items), infection prevention and control measures in the dental clinic (included 12 items), infection prevention and control measures in the dental clinic with confirmed cases (included 10 items). The researcher formulated a rubric format that provides specific expectations for three dental practitioners' knowledge levels. The total score of knowledge was 90 marks. Based on the researcher cut of

points, knowledge levels were categorized into three levels:

Incompetent scores. Less than 60% of the total scores (< 54 marks)

Need improvement. Scores from 60% to less than 85% of the total score (54   to < 76.5 marks)

Competent Scores. Scores from 85% and more of total scores (≥ 76.5 marks)

Tool III. Dental practitioners' performance observational checklist. The researcher developed this tool based on CDC and WHO (2020). The researcher observed dental practitioners' performance regarding infection prevention and control measures during the COVID‑19 pandemic disease. This section included 10 categories with 93 items.

Dental practitioners' performance scoring system. The researcher awarded one mark for each correct step as the following: suitable PPE: (included 7 items), before, during, after, and in between dental treatment (included 22 items), general measures for dental practitioners (included 5 items), and aerosol-generating procedures for suspected/confirmed the COVID‑19 patients (included 16 items), donning and doffing of PPE (included 43 items). The total score of dental practitioners' performance regarding infection prevention and control measures during the COVID‑19 was 93 marks. Based on the researcher cut off points, dental practitioners' performance levels were categorized into three levels:

Incompetent. Scores less than 60% of total scores (< 55.8 marks)

Need improvement. Scores from 60% to less than 85% of the total score (55.8 to < 79 marks)

Competent. Scores from 85% and more of total scores (≥ 79 marks)

3.6 Procedure

Preparatory phase. It included the following:

Administrative phase. Faculty of Nursing, Mansoura University issued an official letter to the manager of Mansoura Specialist Hospital, affiliated with MOHP to permit the researcher conducting this study.

Ethical considerations. The researcher obtained approval from Research Ethics Committee, Faculty of Nursing, Mansoura University (No. P. 1102). The researcher obtained approval from each participant before the start of the study after an explanation of the aim of the study. The researcher emphasized that the study causes no physiological or psychological harm to the participants. Privacy and confidentiality of the collected data were assured and used only for research purposes. Any participant had the right to withdraw from the study at any time without any responsibility.

Literature review. A review of national and international literature regarding infection prevention and control measures in the coronavirus disease 19 pandemic, textbooks, and scientific revealed articles were a guide for developing the study tools.

Development of the study tools. The researcher developed tools for data collection supported by reviewing the relevant literature.

3.8 Face and content validity. Content validity pertains to the degree to which the instrument fully assesses or measures the construct of interest. Study tools were tested for appropriateness and relevant items, by three experts (the head of the dental department, highly qualified dentists within the hospital, and a professor of community health nursing) and the required modifications were carried out. Face validity was carried out by conducting a pilot study on 10% of the study participants (three of the dental practitioners) who were selected conveniently from the same setting. The required modifications were done. The aim of this pilot study was to check the appropriateness and clarity of the questionnaire and identify any unexpected obstacles in data collection. (Litwin & Fink, 1995; Maruish, 2011, Miller, 2010; Polit & Beck, 2006; Tavakol & Dennick, 2011). Dental practitioners included in the pilot study were excluded from the main study sample.

3.9 Tools reliability. The reliability of the study tools was tested by Cronbach's coefficient alpha for performance the results were as the following: The reliability of dental practitioners' knowledge and performance tools was 0.93. It was the acceptable measure for the internal consistency of the tool (Tavakol & Dennick 2011; Vaske, Beaman, & Sponarski, 2017). Table 1 clarified this.

Table 1. Cronbach's Coefficient Alpha (α) Measure for Internal Consistency

Cronbach's coefficient alpha (α)	Internal consistency
α ≥ 0.9	Excellent
0.9 > α ≥ 0.8	Good
0.8 > α ≥ 0.7	Acceptable
0.7 > α ≥ 0.6	Questionable
0.6 > α ≥ 0.5	Poor
0.5> α	Unacceptable

3.9Field work phase. The researcher attended the dental clinic, Mansoura Specialist Hospital, affiliated with the MOHP three days a week to collect the data. The researcher distributed tools I, and II to determine dental practitioners' socio-demographic and occupational characteristics, and knowledge, and came back to collect them. Furthermore, the researcher observed the dental practitioners' performance by tool III. Data collection took place from July to October 2021.

3.10Statistical analysis

The collected data were organized, tabulated, and statistically analyzed using SPSS software version 26/International Business Machines/IBM. Com, U.S.A, and were presented by simple frequency tables. The normality of data was assessed through the Kolmogorov-Smirnov test and shapiro-wilk test, the normality assumption was rejected. Therefore, categorical variables were represented as frequency and percentage. Continuous variables were represented as the median and interquartile range (IQR).

4.Results

Table 1 shows that the mean age of the dental practitioners was 24.68 (1.06) with 72.0% aged 23-25 years, 68.0% being women, and 76.0% living in urban areas. Regarding qualifications, 52.0% of dental practitioners had postgraduate's studies.

Table 2 illustrates that all the dental practitioners worked in governmental settings and only 20% worked also in private settings. The most reported source of knowledge about the COVID-19 pandemic was social media which represented 92%. Related to attending training courses about the COVID-19 pandemic 24.0% of the dental practitioners had a course. Regarding previously diagnosed with the COVID-19 pandemic, 44.0 % of the dental practitioners had done it without recurrences and 36% predicted that the work setting was the source of infection. Only32 % and 28% of the dental practitioners were vaccinated with one and two doses respectively.

Table 3 reveals that the dental practitioners' total knowledge domains score regarding infection prevention and control measures during the COVID-19 pandemic was 38.0 (18.5).

Table 4 declares that incompetent was the total knowledge score belonged to 92.0% of the dental practitioners regarding infection prevention and control measures during the COVID-19 pandemic.

Table 5 demonstrates that the dental practitioners' total performance domains score regarding infection prevention and control measures during the COVID-19 pandemic was 58.0 (23.0).

Table 6 shows that incompetent was the total knowledge score belonged to 44.0% of the dental practitioners regarding infection prevention and control measures during the COVID-19 pandemic.

Table 1. Dental practitioners' demographic

Items	n=(25)	%
Age (in years)		
23-25	18	72.0
>25	7	28.0
x̄ (SD) 24.68 (1.06)		
Gender		
Man	8	32.0
Woman	17	68.0
Residence		
Urban	6	24.0
Rural	19	76.0
Qualifications		
Graduates	12	48.0
Postgraduates	13	52.0

Table 2. Dental practitioners' occupational characteristics

Items	n=(25)	%
Work setting [a]		
Private	5	20.0
Governmental	25	100.0
Sources of knowledge about the COVID-19 pandemic [a]		
CDC	5	20.0
Training and educational courses of MOHP	11	44.0
WHO	13	52.0
Televisions (TV)	18	72.0
Social media	23	92.0
Number of attended training courses of the COVID-19 pandemic		
Two courses	3	12.0
One course	6	24.0
Previously diagnosed with the COVID-19 pandemic	11	44.0
Number of recurrences of infection with coronavirus disease [a]		
None	11	44.0
Predicted source of infection with the COVID-19 pandemic [b]		
Home	2	8.0
Work	9	36.0
Vaccination against the COVID-19 pandemic	15	60.0
Received dosages number of the COVID-19 pandemic [c]		
Two dosages	7	28.0
One dosage	8	32.0

Note. MOHP =Ministry of Health and Population. [a] More than one answer. [b] n=11. [c] n=15.

Table 3. Dental practitioners' knowledge domains regarding infection prevention and control measures during the coronavirus disease-19 pandemic

Knowledge domains	Median (IQR)
Type and mode of transmission	4.0 (5.0)
High-risk group and most affected sex, and age	4.0 (2.0)
Incubation period and survival time on different surfaces	1.0 (1.5)
Diagnostic measures	3.0 (1.5)
Signs and symptoms	7.0 (3.0)
Prognosis, and complications of infected cases	5.0 (5.0)
Treatments and vaccines	4.0 (4.0)
Infection prevention and control measures in dental clinic	10.0 (7.5)
Total knowledge domains scores	38.0 (18.5)

Table 4. Dental practitioners' total levels of knowledge regarding infection prevention and control measures during the coronavirus disease-19 pandemic

	Levels of knowledge					
	Incompetent (<60%)		Need for improvement (60 %- < 85%)		Competent (≥85%)	
	n	%	n	%	N	%
Total knowledge	23	92.0	2	8.00	0	0.00

Table 5. Dental practitioners' performance domains regarding infection prevention and control measures during the coronavirus disease 19-pandemic

Performance domains	Median(IQR)
Wear suitable PPE in the dental clinic	4.0 (3.0)
Performing precautions before entering a patient care area	2.0 (0.0)
Performing precautions during routine dental treatment	5.0 (3.5)
Performing precautions after routine dental treatment	6.0 (3.0)
Performing precautions between patients	1.0 (1.0)
Precautions measures for suspected/confirmed patients	7.0 (10.0)
Donning of PPE	17.0 (4.0)
Doffing of PPE	13.0 (3.0)
Total scores	58.0 (23.0)

Table 6. Dental practitioners' total levels of performance regarding infection prevention and control measures during the coronavirus disease-19 pandemic

	Levels of performance					
	Incompetent (<60%)		Need for improvement (60 %- < 85%)		Competent (≥85%)	
	n	%	n	%	n	%
Total performance score	11	44.0	10	40.0	4	16.0

5.Discussion

Egypt was the first country in Africa to report a confirmed COVID-19 pandemic case on February 14, 2020. Time from February 14, 2020, to April 9, 2021, there were about 208,876 laboratory-confirmed cases, having 12,362 deaths. This data was according to the Egyptian MOH official website (Saied et al., 2021).

Egypt ranks the 7th country in case fatality rate with the COVID-19 pandemic by mid-March 2020. And if we compare Egypt and China (the Center of the COVID-19 pandemic), the USA, Brazil, India, Italy, and France, Egypt will be the 4th after China, India, the USA, and Brazil. According to the infected case percentage to population, Egypt was second-to-last after China. But, this did not reflect the whole picture of the epidemic in these countries (Saied et al., 2021).

The mortality rate of the virus in Egypt wasn't high due to the lower average age of the population, shorter life expectancy, and a few cardiovascular disease patients .On the other hand, milder cases were undetected, and death is delayed that making it difficult to detect the case fatality risk accurately (Saied et al., 2021).

The COVID-19 pandemic has a high risk of transmission in dental clinics via aerosol-producing procedures. Therefore dental practitioners' knowledge and performance regarding the disease are pivotal to ensure a cut chain of infection transmission. Accordingly, the results of the current study discuss dental practitioners' knowledge and performance regarding the COVID-19 pandemic to infection prevention and control measures with other published research.

The current study reveals that less than half of dental practitioners have once been diagnosed with the COVID-19 pandemic and more than one-third predict that the work setting is the source of infection. Less than two-thirds of the dental practitioners are vaccinated and about one-third of them are vaccinated with one dose.

These findings are in contrast to another study conducted by Lin et al. from March 2020 to October 2021 to detect dental students' and dental practitioners' acceptance of the COVID-19 vaccine where Middle East dental practitioners had a higher acceptance rate of vaccination compared to other regions because of the increase in mortality rate and their fear of being infected with the virus that might be a co-factor to accept more the vaccination.

On the opposite side, an Iran study by Etebarian et al. (2023) used an online developed and validated questionnaire to assess the Alborz dental students' knowledge, attitudes, and practices most of them had received two doses of vaccine, and about two-thirds of DHCW in a Vietnam study by Tran et al. (2022) from 21 August to 9 September 2021 to assess the DHCWs compliance to COVID-19 preventive measures during the pandemic took one dose.

The present study illustrates that most dental practitioners have an incompetent level of

knowledge regarding the COVID-19 pandemic for infection prevention and control measures. This result is similar to the Indian study carried out from June 1, 2020, to June 8, 2020, by Arora et al. (2020) used an online questionnaire to assess those doing post-graduation studies, general and specialist dentist working knowledge, attitude, and preparedness of COVID-19 pandemic in government and private sectors, in which only 45% knew about different types of coronavirus. On the opposite side a study by ALOsaimi et al (2022) at Riyadh Elm University, most participants had good knowledge about infection control measures.

The researcher argued this result in light of; first, the dominant dental practitioners' sources of knowledge about the COVID-19 pandemic are TV and social media, in contrast, fewer numbers rely on the scientific source of knowledge ad WHO, and CDC. Second, slightly more than one-third of dental practitioners have attended dental practitioners' training and educational courses in MOHP.

These findings are in agreement with a Saudi Arabian study by Mustafa, Alshali and Bukhary, (2020) done via an online questionnaire for assessing dentists' knowledge, attitude, and preparedness during the pandemic where their participants were collecting their knowledge from social media and internet As well a Vietnam study by Tran et al. (2022) where 81.5% depend on TV and radio, 81.3% depend on MOHP website, 86.8% depend on social networks, and 68% received training to improve knowledge and skills regarding COVID-19 preventive measure.

On the other hand, the majority (73.7%) of participants in an online cross-sectional Lebanese survey was depending mainly on the WHO as a main knowledge source, 52.8% were depending on the MOPH, and 44.7% on TV with the least percentage (19%) source was CDC (Nasser et al., 2020).

The findings of the current study demonstrate that less than half of dental practitioners have an incompetent level of performance regarding the COVID-19 pandemic for infection prevention and control measures. Meisha (2021) in King Abdul-Aziz University Faculty of Dentistry observed dental students' compliance regarding COVID-19 infection control measures during two consecutive academic years 2019 and 2020; participants were wearing gowns routinely with any dental procedures.

Atukorallaya and Ratnayake, (2021) recommended DHCW use goggles or face shields,

masks, gowns, and gloves regularly in dental practice with immediate discard or proper disinfection in between patients. Also, good ventilation, regular and profound surface disinfection before and after procedures with diluted chlorine, and the proper handling of saliva-contaminating waste for preventing COVID-19 spread in the dental setting.

The promising point from the present study's results; although most dental practitioners have an incompetent level of knowledge this percentage is reduced in performance, and this may arise from the confusion that occurred as a novel experience of facing the COVID-19 pandemic. Thus it is pivotal to conduct on-job training to ensure dental practitioners fit in with all required tasks.

6. Conclusion

The researcher concludes that; incompetence is the dominant level in most and less than half of dental practitioners' knowledge, and performance respectively; regarding infection prevention and control measures during the COVID-19 pandemic.

7. Recommendations

- Scheduled on-job training programs for dental practitioner on infection prevention and control measures regarding to COVID-19 pandemic to update their knowledge and performance.
- Equip, and supply healthcare settings with all necessary supplies to apply, and to ensure strict adherence to infection prevention and control measures.
- Carry out further research to explore factors that contribute to dental practitioner' adherence to infection prevention and control measures.

8. Acknowledgements

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