

Original Article

Knowledge and Practice of Hand Hygiene during COVID-19 Pandemic among Dental Students in a Tertiary Care Centre: A Cross-Sectional Survey

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ABSTRACT

Background: COVID-19, a respiratory disease caused by severe acute respiratory syndrome coronavirus 2 affecting more than a hundred countries has become a global health emergency. An understanding of the disease and basic preventive measures specifically among the healthcare workers is essential to curtail the spread of infection.

Objectives: To assess the knowledge and practice of dental undergraduate students about COVID-19 and basic hand hygiene measures.

Method: A cross-sectional study using a 34-item questionnaire was conducted on dental undergraduate students during the third week of March 2020. Chi-square test was used to describe the proportion of participants in each year. Post-Hoc pairwise comparison was done to compare the scores among different year groups. Multiple regression analysis using all demographic variables as independent variables and knowledge and practice score as the outcome variable was conducted. Logistic regression analysis was used to ascertain the effect of demographic variables on the source of knowledge and educational need related questions.

Results: A total of 232 responses were received. Approximately, one-third of the participants had good knowledge and practice score depicted by more than 10 score in the knowledge and practice section each. The mean score of first-year students was significantly lower than that of the other years. Internet was found to be the frequent source of knowledge followed by social media sites.

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Conclusion: The knowledge and practice regarding hand hygiene among dental undergraduate students in a tertiary care center were found to be short of optimal and requires strengthening through structured training programs.

Keywords: coronavirus, infection control, dental education, hand hygiene, hand disinfection

Introduction

The recent outbreak of Coronavirus disease 2019 named COVID-19 has become a major public health challenge.¹ Since the detection of the first case, the disease has shown exponential growth affecting a majority of the countries. Hence, it was declared a pandemic by the World Health Organization (WHO) on 11th March 2020.² According to the WHO situation report, the disease has resulted in 106,125,682 confirmed cases of infection and 2,320,497 deaths by 9th February, 2021.³ In India, the first case was reported on 30th January 2020 and by 9th February 2021, 10,692,146 individuals were confirmed positive for COVID-19 disease (143625 active cases) according to the Ministry of Health and Family Welfare (MOHFW) with 155,158 deaths.⁴

The dentists are most likely to get infected among the healthcare workers due to close contact with the patient, aerosol generation in the operatory, and direct contact with the mucous membrane and saliva.^{5,6} The clear treatment modalities have not been established as yet however, there are clear suggestions about effective preventive measures. One of the simplest, effective, and non-pharmaceutical practice measures is hand hygiene. Hand hygiene practice among healthcare workers is one of the best approach that helps in minimization of health care workers associated infections and also limit the spread of microorganism as healthcare sector embraces almost all the highly contaminated surface by microbes and patient too.⁷ The critical factor about hand hygiene is the technique of hand washing, frequency, duration of each wash, and the agents used with water for washing.

The dental undergraduate students routinely interact with the patients during observing, assisting, and treating or in the clinical setting. The gap in the knowledge and practice of hand hygiene can serve to break the chain of preventive efforts. Hence, in the wake of COVID-19 disease, the assessment of knowledge of COVID-19 disease, and their practice regarding basic protective measures were planned along with a secondary objective to find out whether there is a difference in the knowledge and practice level depending on the duration of training.

Method

Study setting

Across-sectional questionnaire-based survey using a self-administered questionnaire was carried out in the biggest dental institute in the North-Western state of India in the government sector associated with the medical university. It was conducted from 14th March 2020 to 19th March 2020. A convenient sampling method including all the dental undergraduate students was included in the study.

The study included all the dental undergraduate students of the institute where the study was conducted irrespective of the year of study. The students were well informed about the study and only those who consented to participate submitted the duly filled questionnaire.

Questionnaire development

A literature review was done regarding the existing knowledge of COVID-19 disease and the various safety measures to prevent the

transmission of the virus. The questionnaire was prepared in the English language. Two dental specialists from the dental faculty designed the questionnaire based on the WHO advice for the public in the context of COVID-19.⁸

For the content validation, the questionnaire was distributed to the expert panel consisting of two members from the dental faculty, two from the medical faculty, and one statistician. They were asked to grade each question as very good, good, fair, average, and poor. Consequently, the required modifications were done in the questionnaire. A pilot study was conducted including 40 dental undergraduate students. The internal consistency was measured using Cronbach's alpha and was observed to be 0.829. The students who participated in the pilot study were not considered for the main study to prevent possible bias.

The final questionnaire was divided into four sections. The first section elicited information on the demographic attributes of the students including gender and year of study. The second section consisted of 16 questions and assessed the participant's knowledge of COVID-19 disease and its basic preventive measures. Each question had four options with two incorrect responses, one correct response, and one option as don't know. The third section consisted of 16 questions and assessed the practice concerning COVID-19 disease. The response to this section was recorded based on a three-point Likert scale with options including never, sometimes, and always. The last section consisted of a single question to assess the educational need of dental students regarding COVID-19 disease with yes or no response options.

All the questions in the questionnaire were multiple-choice questions in which the students were instructed to choose only one appropriate response from the provided list of options except one question from the

knowledge section. The last question in the knowledge section was related to the source of their information regarding COVID-19 disease and hand hygiene. The students were instructed that they may choose more than one option for this question.

Data collection

An online survey tool (Google forms) was used for providing the questionnaire to the participants. To collect the data, all the students were first informed about the study and how to proceed if they wanted to participate. It was voluntary participation and they were informed that their response would remain anonymous. The consent to participate was deemed to have been given if they proceeded to complete the questionnaire. An email invitation letter containing a personalized active link to a web-based version of the questionnaire was mailed to the participants once. No repeat invitations were sent. One observer sent the mail to the students from first to the third year, and the other observer sent the mail to students in the fourth year and interns to avoid duplication.

Statistical analysis

All the data were analyzed using SPSS software version 21. The participating proportion of males and females students from each year was described using Chi-square analysis test. For each correct response in the knowledge section and correct response in the practice section (depicted by always), one score was given. Based on the score, the assessment of the knowledge and practice section was done as poor (0-5), fair (6-10), and good (>10) separately. Post-Hoc pair wise comparison was done to compare the knowledge and practice scores among different year groups. Multiple regression analysis using all demographic variables as independent variables and knowledge score as the outcome variable was conducted.

Similarly, multiple regression analysis with practice score as the outcome variable was conducted. Logistic regression analysis was used to ascertain the effect of demographic variables as independent variables on the source of knowledge related questions and the question related to educational needs. A P-value of 0.05 or less was considered statistically significant.

Results

A total of 232 responses were received out of 250 (Table 1) including 89 students from first-year, 51 students from second-year, 23 students from third-year, 42 students from fourth-year, and 27 interns. 19.8% of males and 80.2% of females responded to the questionnaire. Table 2 shows the distribution of the correct responses to each question of the knowledge section. The first six questions in the knowledge section specifically about COVID-19 showed less than 50 % response in two questions related to aetiology (48.7%) and the incubation period (41.8%) of the virus. The next eight questions related to hand hygiene in this section showed less than 50 % response in three questions related to the duration of handwashing (39.7%), the effectiveness of hand sanitizer in wet and sweaty hands (27.6%) and the recommended minimum alcohol content of the sanitizer (43.1%)

Overall, the highest number of correct response was observed for the symptoms of COVID-19 disease (85.8%). Table 3 shows the distribution of the correct responses to each question of the practice section. More than 50% response concerning practising hand hygiene measure was observed in only 5 out of 12 questions in the practice section. The lowest response rate (13.8%) was observed when participants were asked whether they disinfect the daily touched surfaces such as touchscreens and doorknobs followed by a 28.9% score for the assessment of duration of handwashing (Table 3).

Based on the scoring criteria mentioned in the methodology section, the result showed that approximately two-thirds of the participants had knowledge and practice scores between poor to fair (n=145 and n=162 respectively). While slightly greater than one-third of the participants gave more than 10 correct responses in the knowledge section (37.5%), slightly less than one-third of participants showed more than 10 correct responses in the practice section (30.2%). (Table 4)

Post-hoc pairwise comparison for the knowledge and practice section among different year groups showed that the mean knowledge and practice score of first-year students was significantly lower than

Table 1: Chi-square test for the distribution of study population among different years

		Gender				Total	
		Males		Female			
		n	%	n	%	n	%
Year of study	First	16	18.0%	73	82.0%	89	100.0%
	Second	9	17.6%	42	82.4%	51	100.0%
	Third	5	21.7%	18	78.3%	23	100.0%
	Fourth	6	14.3%	36	85.7%	42	100.0%
	Fifth	10	37.0%	17	63.0%	27	100.0%

*p value = 0.182 (Non-significant)

Table 2: Distribution of correct answers for the Knowledge section

Knowledge items	Correct answer	
	n	%
The etiological agent of COVID-19	113	48.7
Symptoms of COVID-19	199	85.8
People with pre-existing medical conditions are more vulnerable to the disease?	168	72.4
Source of transmission of COVID-19	127	54.7
The main route of transmission of COVID-19	158	68.1
Incubation period of COVID-19	97	41.8
Does frequent washing of the hands with water effectively prevent transmission of the virus	125	53.9
Does Hand-washing with soap and water effectively prevent transmission of the virus?	140	60.3
Do you need only anti-bacterial soap for proper cleaning?	130	56.0
What should be the total duration of washing, rubbing and rinsing the hands?	92	39.7
If soap and water are not available, can a hand sanitizer be used as a preventive measure against the virus?	173	74.6
Is the hand sanitizer effective in removing the virus even if hands are wet or sweaty?	64	27.6
What type of hand sanitizer should be used if required?	183	78.9
Minimum alcohol content if alcohol-based hand sanitizer is used to destroy the virus?	100	43.1
Minimum distance to be maintained from the person who is coughing or sneezing to prevent the transmission of the virus	151	65.1

that of the other years. (Table 5) Multiple regression analysis showed that among the two independent variables, the year of the study added significantly to the prediction statistically (Table 6). With one year increase in the year of study, there was an increase in the knowledge and practice score. The proportion of subjects who felt the need for training was not found to be significantly different among different years of study. A logistic regression analysis on the question related to the frequent sources of knowledge about COVID-19 and

its preventive measures showed that males were 2.482 times more likely to acquire knowledge from more than 2 sources. Also, second-year students were found to be 3.445 times more likely to acquire knowledge from more than 2 sources. Internet (65.8%) and social media sites (65.4%) were the most frequent source of knowledge among the participants followed by, newspapers (29.4%) and, television (26.4%). Regarding the educational needs, 89.2% of the participants agreed that they feel the need for education on COVID-19.

Table 3: Distribution of correct answers for the Practice section

Practice items	Always	
	n	%
How often do you practice hand hygiene measures?	148	63.8
How often do you assess the duration of your handwashing?	67	28.9
Do you clean and disinfect daily touched surfaces such as the touchscreen of your phone, doorknobs and light switches every day?	32	13.8
How often do you practice respiratory hygiene measures?	151	65.1
Do you discard the used tissues immediately after use?	174	75.0
Do you discard the used tissues as per biomedical waste management rules?	100	43.1
Do you carry a hand sanitizer with you?	118	50.9
Do you take the history of the patient regarding cold, cough or recent travelling history in the wake of coronavirus?	112	48.3
In recent days, have you refrained from being close to those people who have a cough or cold in the wake of coronavirus?	93	40.1
In recent days, have you refrained from shaking hands with those people who have cough or cold in the wake of coronavirus?	110	47.5
In recent days, have you refrained from touching eyes, nose or mouth with potentially contaminated hands in the wake of coronavirus?	79	34.1
Do you wash your hands before touching a patient?	135	58.2
Do you wash your hands before putting on a mask?	90	38.8
In recent days, have you used a mask while travelling on public transport?	81	34.9
In recent days, have you avoided social gatherings, crowded places or travelling due to fear of getting infected by the COVID-19 virus?	102	44.0
Have you provided information regarding COVID-19 to your family members or your patients?	164	70.7

Table 4: Distribution of Knowledge and Practice score

	Poor (0-5)		Fair (6-10)		Good (>10)		Total	
	n	%	n	%	n	%	n	%
Total score for Knowledge section	37	15.9%	108	46.6%	87	37.5%	232	100.0%
Total score for Practice section	71	30.6%	91	39.2%	70	30.2%	232	100.0%

Table 5: Post-Hoc comparison of mean Knowledge and Practice score among different year groups

	Year of study	N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Knowledge score	First (a)	89	6.6517	4.40584	5.7236	7.5798
	Second (b)	51	10.9020	4.54865	9.6226	12.1813
	Third (c)	23	10.9130	1.70329	10.1765	11.6496
	Fourth (d)	42	10.7143	3.32240	9.6790	11.7496
	Fifth (e)	27	11.3333	3.35123	10.0076	12.6590
	*p value<0.00001 (Significant) a<b,c,d,e					
Practice score	First (a)	89	5.2697	4.00784	4.4254	6.1139
	Second (b)	51	10.0196	4.24966	8.8244	11.2148
	Third (c)	23	8.3478	3.79723	6.7058	9.9899
	Fourth (d)	42	10.0238	4.71370	8.5549	11.4927
	Fifth (e)	27	10.3333	4.48073	8.5608	12.1059
	*p value<0.0001 (Significant) a<b,c,d,e					

Table 6: A multiple regression analysis to predict Knowledge and Practice scores from gender & year of study

Model		Unstandardized Coefficients		Standardized Coefficients	t	P-value
		B	Std. Error	Beta		
Knowledge score	Gender	0.239	0.703	0.021	.340	0.734,
	Year of study	1.157	0.192	0.375	6.022	<0.0001*
Practice score	Gender	1.161	0.752	0.096	1.544	0.124,
	Year of study	1.334	0.208	0.398	6.417	<0.0001*

*Significant difference

Discussion

An uphill rise in the number of novel corona viruses is observed across most countries. International and national advisory bodies including WHO,⁸ Centre for Disease Control

and Prevention,⁹ MOHFW India,¹⁰ and Indian Council of Medical Research¹¹ have released advisory regarding hand hygiene and respiratory hygiene to prevent the transmission of the virus. Washing hands frequently is the first instruction in every

guideline issued by these bodies to flatten the curve of the spread of this infection. Hand hygiene becomes paramount specifically in healthcare settings due to interaction with more number of patients and asymptomatic carriers.

Given the above facts, there was a need to assess the knowledge and practice of these preventive measures against COVID-19 disease in a developing country like India with more than 1.3 billion population concentrated in a density of 459.6 per Km².¹²

Among students in different years of study, first-year undergraduate students had a lower level of knowledge and practice response. The proportion of correct response to the knowledge and practice section increased with the duration of training reflected by the year of study. This difference can be explained by the fact that with an increase in the duration of the training, the clinical exposure to patients, and opportunities to improve knowledge and practice related to potentially infectious diseases increase. Poor to fair knowledge and practice score in two-third of the participants were also observed in the study done by Thakker V.S et al which showed poor knowledge level concerning hand hygiene methods among dental, nursing, and medical students.¹³ Less than 40% of the participants in their study were aware that the minimum duration required for an effective alcohol-based hand rub is 20 seconds as per hand hygiene guidelines by WHO.¹⁴ Similar result was found in the present study (39.7%). While more than 70% of students knew that hand sanitizers can be used if soap and water are not available and the type of sanitizer to be used, but less than one-third of students (27.6%) knew the effectiveness of hand sanitizer in wet and sweaty hands. Few other studies^{15, 16, 17} have also shown poor knowledge of hand hygiene and infection control.

In the practice section, less than 50% of correct responses were observed for the

majority of the questions. In view of the coronavirus pandemic, only 40.1%, 47.5%, and 34.1% proportion of the students answered that they refrain from being close to people having a cold or cough, refrain from shaking hands with these people and refrain from frequently touching their eyes, nose or mouth respectively. An alarming response was observed when students were asked about wearing masks while travelling in public transport and whether they wash their hands before putting on a mask, it showed even less than a 40% response rate (38.8% and 34.9%). This study was conducted after the disease was declared a global threat and pandemic and repeated advisory regarding preventive measures were continuously advocated, but the practice score among the dental students was disappointing. This emphasizes the need to reinforce the infection control measures among the students in the healthcare sector. In the study done by Alzoubi H et al¹⁸ on COVID-19, 96.8% of the participants agreed on avoiding handshaking and 64.7% agreed on using masks. Although the use of tissue or handkerchief while sneezing and discarding the tissues immediately after use was positively responded by 65.1% and 75% of the participants of our study, it was still less than the response of the participants of the study done by Alzoubi H et al¹⁸ (95.8%).

The result of the present study is different from other studies on COVID-19 and is thus, a matter of serious concern. A study on COVID-19 awareness among healthcare students and professionals from the Mumbai metropolitan region has shown adequate awareness with 71.2% of correct answers.¹⁸ Another study on knowledge, attitude, and practice towards COVID-19 among Chinese residents also showed good results.²⁰ A study done by Minghe Z et al²¹ on healthcare workers showed sufficient knowledge in 89% of participants and correct practices regarding COVID-19 in 89.7% of participants. A study on medical

and non-medical university students in Jordan by Alzoubi H *et al*¹⁸ showed a good knowledge of COVID-19 in more than 90% of the students and an overall good practice towards the disease preventive measures. This study was conducted prior to taking any step specifically directed towards education about this particular pandemic. This lag in the knowledge of students could account for the difference observed in the present study and the other studies.

The existing literature on this pandemic has explored other aspects of this disease. Hand hygiene has remained a relatively less explored aspect. However, the small sample size and inclusion of only one dental teaching institute are the limitations of the present survey. Further studies using a larger sample size including multiple dental healthcare service providers might be useful to assess the knowledge and practice related response and to plan interventional methods needed to reinforce the implementation of preventive steps.

Conclusion

The current study regarding hand hygiene measures and COVID-19 revealed a definite gap between the knowledge and practice among dental undergraduate students who are at the peak of vulnerability in healthcare settings. Hence, there is a serious need for more training programs to improve hand hygiene practices among dental students. This requirement is even more important in the wake of the COVID-19 pandemic. Also, such programs are required frequently and to be strengthened through performance feedback for implementation compliance.

Key message

The knowledge gap regarding significance of hand hygiene at the learning phase of professional career in dentistry has crucial

consequences as it may lead to immense adverse effect. It is to be assessed at an early stage and remedial steps need to be taken to ward off any later detrimental outcome.

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