

Evaluation of knowledge and attitude of dental students regarding COVID-19: A multicentric study

ABSTRACT

Background: Despite the life-threatening risk that corona virus disease (COVID-19) poses to dentists, their role in suppressing its transmission and the need to deliver dental care to the patients is inevitable. In this regard, it is essential to determine the awareness and knowledge among Indian dental students regarding COVID-19 and to assess their preparedness to handle the current situation.

Methods: This cross-sectional study enrolled 408 dental undergraduate (UG) and postgraduate (PG) students from private and government dental teaching hospitals. A closed-ended online questionnaire containing crucial elements of COVID management during dental procedures was given to the participants assessing their knowledge and perception pertaining to COVID-19 regarding dental practice. Chi-square, Mann-Whitney U, and Kruskal-Wallis tests were employed for statistical analysis. $P \leq 0.05$ was considered statistically significant.

Results: The study consisted of 64.71% UG and 35.29% PG dental students, with a mean age of 25.75 ± 3.69 years and M: F ratio of 0.5:1. COVID-19 knowledge increased significantly with age ($P = 0.0055$) and educational level ($P < 0.01$). Awareness was also significantly greater in students from government institutions in comparison with private colleges ($P < 0.001$), with 91.67% of participants being aware of the transmission routes. However, familiarity with survival of virus in aerosols, considerations regarding the use of masks, and strategies for confirmed/suspected COVID-19 health-care workers to return to work after recovery were seen in only 35%, 53.9%, and 38.9% of the students, respectively.

Conclusion: COVID-19 awareness among Indian dental students is significantly related to their education level. The lacunae in this knowledge need to be filled by adequate training by incorporating it as a part of their education.

Keywords: Coronavirus disease 2019, dental students, health personnel, surveys and questionnaires

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an ongoing pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).^[1] First identified in China in December 2019, the outbreak has now engulfed 213 countries and territories around the globe.^[2,3] The World Health Organization (WHO) declared this outbreak to be a public health emergency of international concern on January 30, 2020, and recognized it as a pandemic on March 11, 2020.^[4,5] As of October 8, 2020, more than 21.9 crore cases of COVID-19 have been reported globally, resulting in more than 45.5 lac deaths.^[6] India is the third most affected country with a total of over 3.3 crore cases and nearly 4.47 lac deaths.^[7] Although mostly mild in nature with ambiguous symptoms such as dry cough, fever, breathlessness, and fatigue, COVID-19 can also present with

an atypical manifestation including headache, confusion, muscle pain, sore throat, vomiting, and diarrhea.^[8]

The outbreak of COVID-19 puts health-care workers at an alarmingly risk of cross infections.^[9] Dentists have a higher risk of contracting and spreading this infection owing to their

PRAGYA PANDEY, SAUMYA JOHRI

Department of Conservative Dentistry and Endodontics, King George's Medical University, Lucknow, Uttar Pradesh, India


Address for correspondence: Dr. Saumya Johri, Department of Conservative Dentistry and Endodontics, Faculty of Dental Sciences, King George's Medical University, Chowk, Lucknow - 226 003, Uttar Pradesh, India.
E-mail: saumya.johry@gmail.com

Received: 27 September 2021, **Revised:** 29 December 2021, **Accepted:** 10 January 2022, **Published:** 10 December 2022

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Pandey P, Johri S. Evaluation of knowledge and attitude of dental students regarding COVID-19: A multicentric study. *Natl J Maxillofac Surg* 2022;13:462-70.

Access this article online	
Website: www.njms.in	Quick Response Code 
DOI: 10.4103/njms.njms_472_21	

close proximity to the patients while performing their duties and exposure to aerosols and droplets splashing out of the patient's oral cavity.^[10] In this regard, it may be natural for dentists, especially young dental students, to develop a fear of being infected by their patients. In this regard, students should be well trained to strongly face the dual challenges of protecting themselves and their patients from community transmission and at the same time provide continuous access to urgent and emergency dental care to the patients.^[10]

Patients who seek dental care could be in the prodromal or the carrier phase of the novel coronavirus, without presenting any symptoms.^[2] Thus, practicing strict and effective infection control protocols, beyond those that already exist, is extremely important, now more than ever, particularly for controlling droplet and aerosol transmission.^[8-10] These practices need to be inculcated from early years of dental education in order to translate them into safe and effective treatment.^[8]

In this regard, it is a prerequisite to evaluate the awareness among dental students about COVID-19 as well their preparedness for treating patients during and post-COVID-19 period, especially in the Indian health-care scenario. The study outcomes will be instrumental in development of preventive training program for dental care providers against the novel coronavirus but also assure preparedness for any future epidemics or pandemics.

Hence, the present study was aimed at determining the awareness and knowledge among Indian dental students regarding COVID-19 as well as its diagnosis and prevention.

METHODS

The current cross-sectional questionnaire-based survey was conducted at multiple tertiary care dental colleges/hospitals from April 26, 2020, to May 10, 2021. The study centers comprised 1 government and 5 private sector setups in Lucknow, Uttar Pradesh, India. The study was initiated after obtaining ethical clearance (Approval No.: 290/Ethics/2020) from the Institutional Ethics Committee and is in accordance with the tenets of the Helsinki Declaration. The required sample size was found to be 408 and was calculated at 99% confidence interval, with 5% margin of error and 50% proportion among 1110 students in the selected tertiary dental care centers.

The students who were in their 3rd year or 4th year and interns of undergraduate (UG) course as well as students pursuing postgraduate (PG) dental courses (1st, 2nd, and 3rd years)

were included in the study. The 1st- and 2nd-year students were excluded, as they were not a part of treatment setup in India. After obtaining informed consent electronically, the responses were collected by random sampling technique wherein each student was assigned a randomized table number and selected through a blind draw of numbers by the computer system. Considering a nonresponsiveness rate of 20%, the questionnaire was sent to 490 students. On achieving the required sample size of 408 responses, the data collection was not proceeded further.

A closed-ended online questionnaire was administered to the participants via a link specially established for the purpose of data collection. It consisted of two sections: Section 1 obtained information regarding the demographic characteristics of the study group such as age, gender, e-mail, academic year, and health-care setup (government/private), while Section 2 assessed the knowledge and perception of participants pertaining to COVID-19 in regard to dental practice using 24 questions. Questions were configured and casted from the current interim guidelines and information for health-care workers by the Centers for Disease Control and Prevention, updated on April 13, 2020; international and national dental regulatory bodies; and WHO and best modified according to the present study in terms of the dental equipment, techniques, and procedures employed during practice and the potential routes of COVID-19 exposure possible. The questionnaire was validated, and comprehensibility of the questions was checked before administering by the subject experts. One point was given for correct response, and no points were awarded for wrong response. Those respondents who scored ≥ 12 points were considered as knowledgeable, while those who scored < 12 were considered to be short on knowledge regarding COVID-19 [Annexure 1].^[11]

Statistical analysis

Data were compiled using statistical software R 4.0.1 and Microsoft Excel. Categorical variables are represented by frequency tables. Continuous variables are represented by mean \pm standard deviation form. Chi-square, Mann-Whitney U, and Kruskal-Wallis tests were used to analyze the association between attributes. $P \leq 0.05$ was considered statistically significant.

RESULTS

The study included 408 dental students with a mean age of 25.75 ± 3.69 years and a male: female ratio of 0.58:1. Table 1 presents the summary statistics of different variables. The study consisted of 257 (62.99%) females and 151 (37.01%) males as well as 264 (64.71%) UG and 144 (35.29%) PG students.

Of these, 60 (14.71%) were in 3rd-year undergraduation, 133 (32.6%) were in final-year undergraduation, 76 (18.63%) were interns, 37 (9.07%) were 1st-year PGs, 47 (11.52%) were 2nd-year PGs, and 55 (13.48%) were final-year PGs.

Table 2 presents the comparison of responses to different questions with academic year. Out of 408 respondents, 32.11% were aware that the SARS-CoV-2 virus is the cause of the current COVID-19 pandemic. Only 21.05% of final-year UG respondents and 63.83% of the 2nd-year PGs were familiar with the nomenclature of the virus. Using Chi-square test, significant differences were observed between different education levels in that the distribution of respondents who were knowledgeable about the name of the virus causing the current pandemic, its genomic constitution, associated symptoms, possible transmission routes, preventive measures like correct time and sequence for hand hygiene (according to WHO), preferred method of hand hygiene for visibly soiled hands, dental equipment/settings that help in reducing the risk of contracting COVID-19 virus, use of masks in personal protective equipment (PPE), correct method of taking off PPE, imaging techniques to be avoided in order to minimize infection risk, difference between dental emergency and nonurgent dental condition, and different risk categories ($P < 0.05$).

The comparison of knowledge scores over other variables is presented in Table 3. Fisher–Pitman permutation test reveals significant differences in the distribution of knowledge scores among the respondent of different age groups ($P = 0.0055$). Applying Mann–Whitney U -test, it

was noted that the respondents belonging to government dental institutions were significantly more knowledgeable than those from private ones ($P < 0.001$), and PG students were significantly more knowledgeable than UG respondents ($P < 0.001$). Significant differences in the distribution of knowledge scores among the respondents of different academic years were also observed from Kruskal–Wallis test ($P < 0.001$).

The results from *post hoc* analysis [Table 4] showed a significant difference in COVID-19 knowledge between the respondents of 1st-year PG and 3rd-year UG ($P < 0.001$), 1st-year PG and final-year UG ($P = 0.002$), 1st-year PG and intern ($P < 0.001$), final-year UG and 2nd-year PG ($P < 0.001$), final-year UG and 3rd-year PG ($P = 0.004$), 2nd-year PG and 3rd-year UG ($P < 0.001$), 2nd-year PG and intern ($P < 0.001$), 3rd-year PG and 3rd-year UG ($P < 0.001$), 3rd-year PG and intern ($P < 0.001$), as well as between 3rd-year PG and 2nd-year PG ($P = 0.033$).

From the multiple logistic regression model [Table 5], it was evident that the odds of being knowledgeable about COVID-19 is 0.57 time more for males compared to females ($P = 0.0219$), 0.43 time more for respondents from private dental institutions compared to those from government dental institutions ($P < 0.001$), and 2.11 times more for final-year UG students compared to 3rd-year UG students ($P = 0.0244$).

DISCUSSION

COVID-19 has become a global pandemic causing significant morbidity and mortality.^[4-6] Considering the high risks of transmissions to dental care professionals and their role in suppressing its transmission, the present study was conducted to assess the awareness of Indian dental students regarding COVID-19 and its management.

In the current study, only 32% of the students knew the name of the virus responsible for this pandemic and only 55.4% were aware of the terms defining a close contact.^[12] However, nearly 90% of them were aware of the routes of virus transmission.^[13,14] Modi *et al.* conducted a similar research on dental students and faculty in Mumbai, India, and found that only 4.9% of the participants were aware of the virus name, 45.8% knew the definition of a close contact, and 54.2% had knowledge regarding its transmission routes.^[9] Nearly 85% of the study population were aware of the hand hygiene requirements for preventing the spread of the virus, and were in agreement with the present research (88.48%).^[9] However, over 90% of the participants had knowledge about PPE

Table 1: Summary statistics of different variables

Variables	Subcategory	Number of subjects, n (%)
Age (years)	10-19	2 (0.49)
	20-29	356 (87.25)
	30-39	47 (11.52)
	40-49	3 (0.74)
Gender	Female	257 (62.99)
	Male	151 (37.01)
Institutional setup	Government	184 (45.1)
	Private	224 (54.9)
Graduation status	PG	144 (35.29)
	UG (including interns)	264 (64.71)
Current academic year	3 rd -year UG	60 (14.71)
	Final-year UG	133 (32.6)
	Intern	76 (18.63)
	1 st -year PG	37 (9.07)
	2 nd -year PG	47 (11.52)
	3 rd -year PG	55 (13.48)
Electronic consent	No	2 (0.49)
	Yes	406 (99.51)

PG: Postgraduate, UG: Undergraduate

Table 2: Comparison of responses to different questions with academic year

Question number	Response	Current academic year							P
		3rd-year UG (n=60), n (%)	Final-year UG (n=133), n (%)	Intern (n=76), n (%)	1 st -year PG (n=37), n (%)	2 nd -year PG (n=47), n (%)	3 rd -year PG (n=55), n (%)	Total (n=408), n (%)	
Q1	Wrong	39 (65)	105 (78.95)	56 (73.68)	18 (48.65)	17 (36.17)	42 (76.36)	277 (67.89)	<0.001 ^{C,*}
	Correct	21 (35)	28 (21.05)	20 (26.32)	19 (51.35)	30 (63.83)	13 (23.64)	131 (32.11)	
Q2	Wrong	13 (21.67)	34 (25.56)	25 (32.89)	8 (21.62)	4 (8.51)	8 (14.55)	92 (22.55)	0.0262 ^{C,*}
	Correct	47 (78.33)	99 (74.44)	51 (67.11)	29 (78.38)	43 (91.49)	47 (85.45)	316 (77.45)	
Q3	Wrong	20 (33.33)	32 (24.06)	27 (35.53)	9 (24.32)	11 (23.4)	15 (27.27)	114 (27.94)	0.0651 ^C
	Correct	40 (66.67)	101 (75.94)	49 (64.47)	28 (75.68)	36 (76.6)	40 (72.73)	294 (72.06)	
Q4	Wrong	3 (5)	15 (11.28)	6 (7.89)	2 (5.41)	0 (0)	0 (0)	26 (6.37)	0.0245 ^{MC,*}
	Correct	57 (95)	118 (88.72)	70 (92.11)	35 (94.59)	47 (100)	55 (100)	382 (93.63)	
Q5	Wrong	5 (8.33)	11 (8.27)	14 (18.42)	4 (10.81)	0 (0)	4 (7.27)	38 (9.31)	0.0195 ^{MC,*}
	Correct	55 (91.67)	122 (91.73)	62 (81.58)	33 (89.19)	47 (100)	51 (92.73)	370 (90.69)	
Q6	Wrong	47 (78.33)	107 (80.45)	57 (75)	25 (67.57)	35 (74.47)	46 (83.64)	317 (77.7)	0.4788 ^C
	Correct	13 (21.67)	26 (19.55)	19 (25)	12 (32.43)	12 (25.53)	9 (16.36)	91 (22.3)	
Q7	Wrong	30 (50)	63 (47.37)	39 (51.32)	14 (37.84)	13 (27.66)	22 (40)	181 (44.36)	0.1043 ^C
	Correct	30 (50)	70 (52.63)	37 (48.68)	23 (62.16)	34 (72.34)	33 (60)	227 (55.64)	
Q8	Wrong	39 (65)	84 (63.16)	51 (67.11)	21 (56.76)	32 (68.09)	28 (50.91)	255 (62.5)	0.3953 ^C
	Correct	21 (35)	49 (36.84)	25 (32.89)	16 (43.24)	15 (31.91)	27 (49.09)	153 (37.5)	
Q9	Wrong	55 (91.67)	107 (80.45)	57 (75)	24 (64.86)	21 (44.68)	32 (58.18)	296 (72.55)	<0.001 ^{C,*}
	Correct	5 (8.33)	26 (19.55)	19 (25)	13 (35.14)	26 (55.32)	23 (41.82)	112 (27.45)	
Q10	Wrong	57 (95)	107 (80.45)	58 (76.32)	24 (64.86)	24 (51.06)	29 (52.73)	299 (73.28)	<0.001 ^{C,*}
	Correct	3 (5)	26 (19.55)	18 (23.68)	13 (35.14)	23 (48.94)	26 (47.27)	109 (26.72)	
Q11	Wrong	23 (38.33)	59 (44.36)	30 (39.47)	9 (24.32)	18 (38.3)	14 (25.45)	153 (37.5)	0.1101 ^C
	Correct	37 (61.67)	74 (55.64)	46 (60.53)	28 (75.68)	29 (61.7)	41 (74.55)	255 (62.5)	
Q12	Wrong	49 (81.67)	104 (78.2)	54 (71.05)	26 (70.27)	31 (65.96)	27 (49.09)	291 (71.32)	0.0012 ^{C,*}
	Correct	11 (18.33)	29 (21.8)	22 (28.95)	11 (29.73)	16 (34.04)	28 (50.91)	117 (28.68)	
Q13	Wrong	18 (30)	39 (29.32)	28 (36.84)	9 (24.32)	7 (14.89)	12 (21.82)	113 (27.7)	0.13 ^C
	Correct	42 (70)	94 (70.68)	48 (63.16)	28 (75.68)	40 (85.11)	43 (78.18)	295 (72.3)	
Q14	Wrong	42 (70)	87 (65.41)	51 (67.11)	17 (45.95)	19 (40.43)	33 (60)	249 (61.03)	0.0062 ^{C,*}
	Correct	18 (30)	46 (34.59)	25 (32.89)	20 (54.05)	28 (59.57)	22 (40)	159 (38.97)	
Q15	Wrong	14 (23.33)	17 (12.78)	9 (11.84)	1 (2.7)	3 (6.38)	5 (9.09)	49 (12.01)	0.0315 ^{MC,*}
	Correct	46 (76.67)	116 (87.22)	67 (88.16)	36 (97.3)	44 (93.62)	50 (90.91)	359 (87.99)	
Q16	Wrong	13 (21.67)	16 (12.03)	7 (9.21)	1 (2.7)	1 (2.13)	4 (7.27)	42 (10.29)	0.0085 ^{MC,*}
	Correct	47 (78.33)	117 (87.97)	69 (90.79)	36 (97.3)	46 (97.87)	51 (92.73)	366 (89.71)	
Q17	Wrong	13 (21.67)	23 (17.29)	20 (26.32)	7 (18.92)	5 (10.64)	6 (10.91)	74 (18.14)	0.1723 ^C
	Correct	47 (78.33)	110 (82.71)	56 (73.68)	30 (81.08)	42 (89.36)	49 (89.09)	334 (81.86)	
Q18	Wrong	43 (71.67)	68 (51.13)	46 (60.53)	13 (35.14)	15 (31.91)	26 (47.27)	211 (51.72)	<0.001 ^{C,*}
	Correct	17 (28.33)	65 (48.87)	30 (39.47)	24 (64.86)	32 (68.09)	29 (52.73)	197 (48.28)	
Q19	Wrong	7 (11.67)	15 (11.28)	14 (18.42)	2 (5.41)	2 (4.26)	7 (12.73)	47 (11.52)	0.1819 ^{MC}
	Correct	53 (88.33)	118 (88.72)	62 (81.58)	35 (94.59)	45 (95.74)	48 (87.27)	361 (88.48)	
Q20	Wrong	54 (90)	117 (87.97)	67 (88.16)	34 (91.89)	36 (76.6)	46 (83.64)	354 (86.76)	0.2614 ^{MC}
	Correct	6 (10)	16 (12.03)	9 (11.84)	3 (8.11)	11 (23.4)	9 (16.36)	54 (13.24)	
Q21	Wrong	40 (66.67)	51 (38.35)	38 (50)	11 (29.73)	5 (10.64)	10 (18.18)	155 (37.99)	<0.001 ^{C,*}
	Correct	20 (33.33)	82 (61.65)	38 (50)	26 (70.27)	42 (89.36)	45 (81.82)	253 (62.01)	
Q22	Wrong	36 (60)	82 (61.65)	47 (61.84)	17 (45.95)	32 (68.09)	33 (60)	247 (60.54)	0.4724 ^C
	Correct	24 (40)	51 (38.35)	29 (38.16)	20 (54.05)	15 (31.91)	22 (40)	161 (39.46)	
Q23	Wrong	45 (75)	72 (54.14)	45 (59.21)	22 (59.46)	32 (68.09)	33 (60)	249 (61.03)	0.1202 ^C
	Correct	15 (25)	61 (45.86)	31 (40.79)	15 (40.54)	15 (31.91)	22 (40)	159 (38.97)	
Q24	Wrong	24 (40)	56 (42.11)	47 (61.84)	14 (37.84)	11 (23.4)	36 (65.45)	188 (46.08)	<0.001 ^{C,*}
	Correct	36 (60)	77 (57.89)	29 (38.16)	23 (62.16)	36 (76.6)	19 (34.55)	220 (53.92)	

*Significant at 5% level of significance. C: Chi-square test, MC: Chi-square test with Monte Carlo simulation, PG: Postgraduate, Q: Question, UG: Undergraduate

requirements in such cases in Modi *et al.*'s study, compared to only 62.5% in the present research.^[9] Knowledge regarding

recommended infection control measures needed upon arrival of a suspected COVID-19 patient into the dental clinic

was seen in 72.3% of the students in the present study but only 60.6% of the dental professionals by Modi *et al.*^[9]

Singh *et al.* conducted a survey on the knowledge and hygiene practices among dental health professionals in an Indian scenario and reported that awareness regarding COVID-19

Table 3: Comparison of knowledge scores over other variables

Variables	Subcategory	Knowledge score (mean±SD)	P
Age (years)	10-19	7±0	0.0055 ^{FPTT,*}
	20-29	13.35±3.4	
	30-39	14.4±3.28	
	40-49	11±0	
Gender	Female	13.47±3.16	0.9505 ^{MW}
	Male	13.34±3.81	
Institutional setup	Government	14.49±3.19	<0.001 ^{MW,*}
	Private	12.54±3.34	
Graduation status	PG	15.26±3.05	<0.001 ^{MW,*}
	UG (including Intern)	12.42±3.18	
Current academic year	3 rd -year UG	11.85±3.24	<0.001 ^{KW,*}
	Final-year UG	12.94±3.39	
	Intern	12.25±2.74	
	1 st -year PG	15.03±3.1	
	2 nd -year PG	16.04±2.72	
	3 rd -year PG	14.58±3.27	

*Significant at 5% level of significance. FPTT: Fisher-Pitman permutation test, MW: Mann-Whitney U test, KW: Kruskal-Wallis test. PG: Postgraduate, UG: Undergraduate, SD: Standard deviation

Table 4: Result of post hoc analysis

Academic year	3 rd -year UG	Final-year UG	Intern	1 st -year PG	2 nd -year PG
Final-year UG	0.053	-	-	-	-
Intern	0.641	0.118	-	-	-
1 st -year PG	<0.001*	0.002*	<0.001*	-	-
2 nd -year PG	<0.001*	<0.001*	<0.001*	0.168	-
3 rd -year PG	<0.001*	0.004*	<0.001*	0.562	0.033*

*Significant at 5% level of significance. PG: Postgraduate, UG: Undergraduate

Table 5: Result of multiple logistic regression model

Variable	Coefficient	OR (CI)	P
Constant	2.5999	13.46 (1.58-199.24)	0.0365*
Gender (reference: Female)			
Male	-0.5694	0.57 (0.35-0.92)	0.0219*
Institution setup (reference: Government)			
Private	-0.835	0.43 (0.26-0.71)	<0.001*
Graduation status (reference: PG)			
UG (including intern)	-1.788	0.17 (0.01-1.35)	0.13998
Current academic year (reference: 3 rd -year UG)			
Final-year UG	0.7485	2.11 (1.1-4.07)	0.0244*
Intern	0.5323	1.7 (0.83-3.52)	0.1464
1 st -year PG	0.0227	1.02 (0.07-10.53)	0.9857
2 nd -year PG	1.9926	7.33 (0.44-222.61)	0.1837
3 rd -year PG	-0.4284	0.65 (0.04-6.27)	0.7375

*Significant at 5% level of significance. PG: Postgraduate, UG: Undergraduate, OR: Odds ratio, CI: Confidence interval

symptoms, transmission, and required PPE was noted in 87%, 82.5%, and 66% of the participants, respectively.^[15] They also found that the education level of the participants was significantly associated with the mean knowledge score ($P = 0.018$), and is in agreement with the present research ($P < 0.05$).^[16] Furthermore, in concordance with the present study, Quadri *et al.* also observed that COVID-19 knowledge was significantly related to the qualification level ($P < 0.05$).^[16]

Pandemics like COVID-19 also necessitate modifications in the current dental treatment protocols.^[17] It is important to identify dental emergencies and prioritize them over nonurgent dental care, something that nearly 87%–89% of the dental students were able to do in the present study.^[17] However, only 53.9% of the students were insightful of the considerations regarding the use of masks in PPE, only 38.9% were familiar with the strategies to be utilized in order to determine when a health-care personnel with confirmed/suspected COVID-19 could return to work in health-care settings after recovery, and only 39.4% were aware of the considerations regarding waste disposal in COVID times.

Ghai reported similar lacunae in the dental curriculum, citing lack of adequate infection control training, especially in resource-constrained nations.^[18] The study recommended purposeful training of dental students to help them adopt sufficient and appropriate knowledge and attitudes in preparation for facing such widespread infectious outbreaks as COVID-19, as was the case in the present study.^[18]

Although this research has its limitations in being a locally focused study with a limited sample, it is instrumental in identifying the existing lacunae in our COVID-19 information and management strategies for further fine-tuning of health-care setting protocols. The study recommends to

design curriculums accordingly and to certify students who are adequately trained for better infection control. Nevertheless, prerequisite precautions should be taken by the clinicians in dental health care to protect themselves and they should not transmit the infection.

CONCLUSION

COVID-19 awareness among Indian dental students is significantly related to their education level. The lacunae in this knowledge need to be filled by adequate training. In addition, we recommend a training on COVID precautionary measures to the dental health-care specialists should be mandatory, considering the high risk of transmission during dental procedures.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Casella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. Features, Evaluation and Treatment Coronavirus (COVID-19). Treasure Island, FL: StatPearls Publishing; 2020.
- Chan JF, Kok KH, Zhu Z, Chu H, To KK, Yuan S, *et al*. Genomic characterization of the 2019 novel human-pathogenic coronavirus isolated from a patient with atypical pneumonia after visiting Wuhan. *Emerg Microbes Infect* 2020;9:221-36.
- Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, *et al*. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *N Engl J Med* 2020;382:1199-207.
- Mahase E. China coronavirus: WHO declares international emergency as death toll exceeds 200. *BMJ* 2020;368:m408.
- Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, *et al*. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). *Int J Surg* 2020;76:71-6.
- Tracking Coronavirus Global Spread. Available from: <https://www.cnn.com/interactive/2020/health/coronavirus-maps-and-cases/>. [Last accessed on 2021 Sep 11].
- Ministry of Health and Family Welfare, Government of India. COVID-19 India. Available from: <https://www.mohfw.gov.in>. [Last accessed on 2021 Sep 20].
- Meng L, Hua F, Bian Z. Coronavirus disease 2019 (COVID-19): Emerging and future challenges for dental and oral medicine. *J Dent Res* 2020;99:481-7.
- Modi PD, Nair G, Uppe A, Modi J, Tuppekar B, Gharpure AS, *et al*. COVID-19 awareness among healthcare students and professionals in Mumbai metropolitan region: A questionnaire-based survey. *Cureus* 2020;12:e7514.
- Zhang Z, Liu S, Xiang M, Li S, Zhao D, Huang C, *et al*. Protecting healthcare personnel from 2019-nCoV infection risks: Lessons and suggestions. *Front Med* 2020;14:229-31.
- Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, *et al*. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: A quick online cross-sectional survey. *Int J Biol Sci* 2020;16:1745-52.
- Centers for Disease Control and Prevention. Coronavirus Disease 2019 (COVID-19). Available from: <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/appendix.html#contact>. [Last accessed on 2020 Aug 13].
- Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci* 2020;12:9.
- Wadia R. Transmission routes of COVID-19 in the dental practice. *Br Dent J* 2020;228:595.
- Singh Gambhir R, Singh Dhaliwal J, Aggarwal A, Anand S, Anand V, Kaur Bhangu A. Covid-19: A survey on knowledge, awareness and hygiene practices among dental health professionals in an Indian scenario. *Rocz Panstw Zakl Hig* 2020;71:223-9.
- Quadri MF, Jafer MA, Alqahtani AS, Al Mutahar SA, Odabi NI, Daghriiri AA, *et al*. Novel corona virus disease (COVID-19) awareness among the dental interns, dental auxiliaries and dental specialists in Saudi Arabia: A nationwide study. *J Infect Public Health* 2020;13:856-64.
- Zhang W, Jiang X. Measures and suggestions for the prevention and control of the novel coronavirus in dental institutions. *Front Oral Maxillofac Med* 2020;2:4.
- Ghai S. Are dental schools adequately preparing dental students to face outbreaks of infectious diseases such as COVID-19? *J Dent Educ* 2020;84:631-3.

Annexure 1: Study questionnaire

Question number	Question	Response options	Correct response
1	What is the name of the virus causing the current pandemic?	A. 2019-nCoV B. SARS-CoV-2 C. MERS-2 D. Both a and b E. All of the above F. Don't know	D
2	What is the genomic constitution of the virus causing COVID-19?	A. Double-stranded, positive-sense RNA virus B. Single-stranded, positive-sense RNA virus C. Single-stranded, positive-sense DNA virus D. Double-stranded, negative-sense DNA virus E. Don't know	B
3	What are the various types of diseases caused by coronavirus?	A. COVID-19 B. SARS C. MERS D. All of the above E. Don't know	D
4	What are the primary symptoms of a person having COVID-19?	A. Dry cough, high fever, shortness of breath, myalgias B. Low-grade fever, itching, and frequent sputum C. Productive cough, high-grade fever, purple body rashes D. All of the above E. Don't know	A
5	What are the possible transmission routes of COVID-19 in dental clinics?	A. Face-to-face communication with patients B. Exposure to saliva, blood, and other body fluids C. Contact with contaminated instruments D. Aerosols and droplets produced by dental procedures E. All of the above F. Don't know	E
6	What is the range for the basic reproductive number (R0) of COVID-19?	A. 1.6-2.4 B. 2.6-4.7 C. 5.6-6.8 D. None of the above E. Don't know	B
7	Which of the following best describes a "close contact?"	A. Being within 6 feet (2 m) of a patient with COVID-19 for a prolonged period of time B. Being within 10 feet (3 m) of a patient with COVID-19 disease for a prolonged period of time C. Having direct contact with patient's infectious secretions like blood, sputum, cough, etc. D. Both B and C E. Both A and C F. Don't know	E
8	How long can the virus survive in aerosols produced by dental procedures?	A. 7 days B. 3 days C. 7-14 days D. 14-28 days E. Don't know	B
9	Which one of the following describes the correct sequence and time for hand hygiene according to WHO?	A. Palm to palm; back of the hand; palm to palm with fingers interlaced; backs of fingers to opposing palms with fingers interlocked; rotational rubbing of each thumb; rotational rubbing with clasped fingers of one hand in opposite palm; entire procedure for 20-30 s B. Palm to palm; back of the hand; rotational rubbing of each thumb; rotational rubbing with clasped fingers of one hand in opposite palm; backs of fingers to opposing palms with fingers interlocked; entire procedure lasting 10-30 s C. Palm to palm; back of the hand; rotational rubbing with clasped fingers of one hand in opposite palm; backs of fingers to opposing palms with fingers interlocked; rotational rubbing of each thumb; palm to palm with fingers interlaced; entire procedure lasting 40-60 s D. Don't know	B
10	Which dental equipment/settings may help in reducing the risk of contracting COVID-19 virus?	A. Anti-retraction handpieces B. Rubber waterline systems C. Three-way syringe D. Sonic oral prophylaxis unit E. All of the above F. Don't know	A

Contd...

Annexure 1: Contd...

Question number	Question	Response options	Correct response
11	Which PPE are advisable for dental professionals while performing a dental procedure on a suspected or positive COVID-19 patient?	A. Wearing disposable working cap, disposable surgical mask, and working clothes, using protective goggles, and disposable latex gloves or nitrile gloves if necessary B. Wearing disposable doctor cap, disposable surgical mask, protective goggles, face shield, and working clothes with disposable isolation clothing or surgical clothes outside, and disposable latex gloves C. Wearing disposable doctor cap, respirator N-95 mask, protective goggles, face shield, surgical clothes, disposable gown, protective shoe cover, and disposable latex gloves D. Any of the above E. Don't know	C
12	Which one of the following describes a correct method of doffing (taking off) of PPE?	A. Remove gloves, perform hand hygiene, remove face shield or goggles, remove gown, remove respirator or facemask, perform hand hygiene B. Remove gloves, remove gown, remove respirator or face mask, perform hand hygiene, remove face shield or goggles, perform hand hygiene C. Perform hand hygiene, remove gloves, remove gown, remove respirator or facemask, remove face shield or goggles, perform hand hygiene D. Remove gloves, remove gown, perform hand hygiene, Remove face shield or goggles, remove respirator or facemask, Remove and discard respirator or facemask E. Don't know	C
13	Which of the following are recommended infection control measures upon arrival of a patient suspected with COVID-19 infection in the dental clinic?	A. Have a separate well-ventilated room that allows symptomatic patients to be at a distance of 6 feet or more from unaffected patients seeking care B. Rapid triage of patients C. Providing facemask to the patients, if already not there D. All of the above E. Don't know	D
14	What is the preferred method of hand hygiene for visibly soiled hands?	A. Hand rub for 30-40 s B. Hand wash for 40-60 s C. Use of 70% alcohol-based sanitizer D. Any of the above	B
15	Which conditions can be labeled as dental emergencies?	A. Hot and cold sensitivity in teeth B. Diffuse Intra or Extra oral swelling compromising airway and having systemic manifestations C. Halitosis or bad breath D. Dislodgement of temporary filling done on endo-access, asymptomatic E. All of the above F. Don't know	B
16	Which conditions can be categorized as nonurgent dental conditions?	A. Tooth fracture resulting in pain or causing soft tissue trauma B. Surgical postoperative osteitis, dry socket dressing changes C. Diffuse intra- or extraoral swelling compromising airway D. Loss of restoration with no pain E. Not sure	D
17	What are the factors determining the COVID-19 risk categories?	A. Stage of disease spread B. History of exposure C. Respiratory illness symptoms (any) D. All of the above E. None of the above F. Don't know	D
18	Categorize a patient with a history of travel to a country with 2 community spread and 2 respiratory illness symptoms but positive history of exposure	A. Low COVID-19 risk category B. Moderate COVID-19 risk category C. High COVID-19 risk category D. Depends on many other factors E. Don't know	C
19	When should hand hygiene be performed?	A. Before patient examination B. After touching the patient C. If gloves are torn or compromised during dental procedures D. All of the above E. None of the above F. Don't know	D
20	What is the preferred agent for preprocedural mouthrinse?	A. 1% hydrogen peroxide B. 0.2% povidone-iodine C. 0.12% chlorhexidine D. A or B E. Any of the above F. None of the above	D

Contd...

Annexure 1: Contd...

Question number	Question	Response options	Correct response
21	Which dental imaging techniques should be avoided for minimizing infection risk?	A. Intraoral radiographs B. Panoramic radiography C. CBCT D. All techniques possess equal risk E. Not sure	A
22	What are the considerations concerning waste disposal in respect to COVID-19?	A. Medical waste (trash) coming from health-care facilities treating COVID-19 patients is no different than waste coming from facilities without COVID-19 patients B. Use of dedicated trolleys and collection bins in COVID-19 isolation wards with a label "COVID-19 Waste" pasted on them C. Bio medical workers should be provided with adequate PPEs including three-layer masks, splash proof aprons/gowns, nitrile gloves, gum boots, and safety goggles while collecting and transporting waste D. Containers carrying biomedical waste should be treated with 1% sodium hypochlorite after each trip E. All of the above F. Don't know	E
23	Which strategies should be utilized to determine when a health-care personnel with confirmed/suspected COVID-19 may return to work in health-care settings?	A. Resolution of fever without the use of fever-reducing medications along with improvement in respiratory symptoms (e.g., cough, shortness of breath) plus two negative swab specimens collected ≥ 24 h apart B. At least 3 days (72 h) passed since recovery (defined as resolution of fever without the use of fever-reducing medications) and improvement in respiratory symptoms (e.g., cough, shortness of breath); and, at least 7 days have passed since symptoms first appeared C. For those who have not had any symptoms should not return to work until 10 days have passed since the date of their first positive COVID-19 diagnostic test assuming they have not subsequently developed symptoms since their positive test D. A, B, and C E. Should not be allowed to return to work until the pandemic is over F. Don't know	D
24	What are the considerations regarding the use of masks in PPE?	A. A triple-layered surgical mask can be worn by all health-care providers, when within 1-2 m of patient B. Particulate respirators (N95 or FFP2) standard masks are recommended for routine dental practice C. FFP3 standard mask is essential treating in COVID-19-positive patients D. All of the above E. Don't know	D

COVID-19: Coronavirus disease 2019, PPE: Personal protective equipment, WHO: World Health Organization, CBCT: Cone-beam computed tomography, SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2, MERS: Middle East respiratory syndrome