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Knowledge and Attitude towards COVID-19 among dental students: A cross-sectional study.

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Abstract:
Aim*: The aim of the study was to assess the Knowledge and Attitude towards COVID-19 among dental students.*
Materials and Method*: An online questionnaire was distributed among undergraduate and postgraduate dental students across country using convenience and snowball sampling. The questionnaire was divided into 4 sections: the 1st one contained demographic information, whereas the 2nd, 3rd and 4th sections assessed knowledge (8 questions), attitudes (6 questions) and attitude towards practices modification (17 questions) of the dental students. The data was subjected to the one-way analysis of variance (ANOVA), students t-test, multivariate linear regression; 95% confidence interval (CI) was calculated. The analysis was done using IBM SPSS for Windows, v. 21.0.*
Result*: A total of 223 dental students responded the questionnaire, 65% females and 35% males. Out of 45.3% undergraduate students participated, 43% were interns. 54.7% post graduate students participated with majority from the prosthodontics and crown and bridge specialty (36%). 75.8% studied at a government institute. High knowledge and attitude score were seen in 64% and 50% dental students respectively. Knowledge scores were significantly associated with qualifications (p = 0.000), the year of study (p = 0.000) only whereas attitude scores were associated with qualifications(p=0.000), year of study(p=0.000) and subject specialty in MDS (p=0.018).*
Conclusion*: Most of the dental students were found to have good knowledge and positive attitude, which is important to combat COVID-19. They are advised to follow the Centers of Disease Control and Prevention (CDC) and World Health Organization (WHO) guideline so that no stone is left unturned in defeating this pandemic.*

Key words: *dental students, COVID-19, coronavirus disease, survey, questionnaire.*

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I. Introduction

In December, 2019, a pneumonia outbreak of unknown cause originated in Wuhan, Hubei province of China. The pneumonia spread rapidly to other provinces of China and other countries. On Jan 7, 2020, Chinese scientists had isolated a novel coronavirus from patients in Wuhan. World Health Organization (WHO) declared a public health emergency of international concern over the global outbreak of novel coronavirus on 30 January 2020.[1,2] The current outbreak of infections with SARS-CoV-2 is termed Coronavirus Disease 2019 (COVID-19) by the World Health Organization (WHO) on 11 February2020.[3]

Within less than 3 months since the discovery of the unknown pathogen, the infection spread to at least 114 countries and caused more than 4,000 deaths. On March 11, the WHO announced COVID-19 outbreak a pandemic.[4]

As of dated 8 June 2020, there have been 6,931,000 confirmed cases of COVID-19, including 400,857 deaths worldwide [5] and 256,611 confirmed cases of COVID-19 with 7,135 deaths in India, reported to WHO.[6]

The Coronavirus disease has become a major challenging public health problem for the world.

During the current pandemic, the Occupational Safety and Health Administration (OSHA.gov) classified dentists in the very-high-risk category because of the potential of exposure to coronavirus through aerosol-generating procedures.[7,8]

Government of India ordered a nationwide lockdown to just stay at home to avoid contacting with others hence to control the COVID-19 transmission.

Due to the COVID-19 pandemic, most of the schools have suspended clinical care by students except for dental emergencies for active patients that are seen by faculty or residents. Dental education is continued by online lectures and seminar so that students don't miss out on their academic year.

Standard precautions are not enough to prevent the spread of the coronavirus, especially during the incubation phase of COVID19.[9] Soon after the outbreak began in India, the DCI recommended that clinics suspend all routine or elective treatment, and manage dental emergencies and urgent care to mitigate the burden on the health care system. The first step is to screen the patients, to evaluate whether their case is in fact an emergency. The next step is to determine if the dental hospital is equipped with appropriate protective equipment to handle the procedures. [10]

Slowly there is unlocking of the stay-at-home orders and the colleges will open in future. The students should be aware of the transmission routes, its prevention and infection control, practice modifications in the clinics for protecting oneself and others while providing the best treatment possible to the patients. Therefore, this study is conducted the assess the knowledge and attitude towards Covid-19.

II. Materials and Method

A cross sectional Knowledge and Attitude study was conducted with undergraduate students and post graduate students regarding COVID-19.

Keeping in mind of the current situation an online questionnaire seemed apt. A pilot study of 10 students was conducted to ensure proper questionnaire design and validation and necessary changes were made. Ethical committee of the institute approved the study.

An online questionnaire was formed using google forms and the link was generated which was sent by Email and WhatsApp. The survey was distributed by a combination of convenience and snowball sampling so that maximum participation is ensured. The study population selected was undergraduate students from 3rd year,4th year and interns as they have more clinical exposure in the hospital compared to 1st year and 2nd year BDS students and postgraduate students of all specialty branches of MDS.

The first page explained the aim and objectives of the study.

The participation was voluntary and consent was implied when the participant pressed the next button on the form. The study duration was from 6 June 2020 to 18 June2020. The questionnaire was divided into 4 sections, 1st section collected demographic information (pursuing BDS/MDS, specialty, year of study, practicing in government/private institute), 2nd section consisted of 8 questions on knowledge regarding modes of transmission, nature of the disease, infection control, 3rd section consisted of 6 questions on attitude regarding COVID-19 and 4th section consisted of 17 questions regarding Attitude towards Practice modification due to COVID-19.

For assessing knowledge, correct answers were given a score of one whereas the incorrect answers and "I don't know" were given a score of zero. The answer to each question about attitude was rated on a five-point Likert scale (strongly agree, agree, neutral, disagree, and strongly disagree).

We categorized the total score of the 8 knowledge questions into two as high (median score and above) and low (below median score) knowledge and the total score of 23 attitude questions as positive (median score and above) and negative (below median score).

Data obtained was compiled on a MS Office Excel Sheet (v 2010, Microsoft Redmond Campus, Redmond, Washington, United States) and was subjected to statistical analysis using Statistical package for social sciences (SPSS v 21.0, IBM). Descriptive statistics like frequencies and percentage for categorical data has been depicted. Comparison of frequencies of categories of variables with groups was done using students t-test and one-way ANOVA, multivariate linear regression; 95% confidence interval (CI) was also calculated. A P value $< 0.05/<0.01$ was considered statistically significant.

III. Result

Demographic characteristics:

A total of 223 dental students responded the questionnaire, 65% females and 35% males. Out of 45.3% undergraduate students participated, 43% were interns. 54.7% post graduate students participated with majority from the prosthodontics and crown and bridge specialty (36%). 75.8% studied at a government institute. The demographic details of the study respondents have been presented in table 1.

Table no 1: shows demographic details of the study respondents.

Demographic characteristics		Frequency	Percent
Sex	Female	145	65.0
	Male	78	35.0
Qualification	postgraduate student	122	54.7
	undergraduate student	101	45.3
year are you currently studying	BDS3	30	13.5

	BDS4	28	12.6
	INTERN	43	19.3
	MDS1	40	17.9
	MDS2	42	18.8
	MDS3	40	17.9
Speciality in case of MDS	Conservative dentistry and Endodontics	16	7.2
	Oral and maxillofacial surgery	14	6.3
	Oral Pathology	12	5.4
	Oral Radiology and Medicine	1	.4
	Orthodontics	17	7.6
	Pedodontics	11	4.9
	Periodontics	19	8.5
	Prosthodontics and Crown and Bridge	36	16.1
Institute are you studying in	Government	169	75.8
	Private	54	24.2

Knowledge based questions

Table 2 shows knowledge-based questions and responses to each question in the form of percentage (%) and frequencies (n). 63% respondents gave all correct responses. 97% individuals knew about the common symptoms. 91% of the students were of the opinion that despite of no symptoms, an infected person with Covid-19 can spread the infection to others. All students (100 %) agreed that infection control is possible by maintaining good hand and respiratory hygiene and social distancing. Significant differences were observed when the dental students responded to questions regarding the spread via droplets ($p = 0.014$), viability of the Covid-19 virus on inanimate objects($p=0.039$) and treatment availability ($p=0.003$). 93.3% of students believed that most people will recover from Covid-19 ($p= 0.017$)

Table no2: shows knowledge-based questions and responses to each question in the form of percentage (%) and frequencies (n).

Question	Responses	Frequency	Percent
1.When there are no symptoms, the infected person with COVID-19 cannot spread the infection to others.	0	205	91.9
	1	17	7.6
	I don't know	1	.4
2.COVID-19's most common clinical symptoms are fever, dry cough, shortness of breath, tiredness.	0	4	1.8
	1	217	97.3
	I don't know	2	.9
3.COVID-19 virus is spread by infected individuals through airborne droplets.	0	5	2.2
	1	215	96.4
	I don't know	3	1.3
4.COVID-19 affects only old persons, children and people with chronic diseases.	0	196	87.9
	1	20	9.0
	I don't know	7	3.1
5.SARS-Cov2 stays on the inanimate surface contaminated by droplets for many hours to days.	0	7	3.1
	1	202	90.6
	I don't know	14	6.3
6.There is no specific treatment available for COVID-19 and only symptomatic treatment is rendered.	0	7	3.1
	1	207	92.8
	I don't know	9	4.0
7.Most of the people with COVID-19 will not recover.	0	208	93.3
	1	6	2.7
	I don't know	9	4.0
8.Infection control for COVID-19 is possible by maintaining good hand and respiratory hygiene, maintaining social distancing, avoiding unnecessary travel and gathering.	1	223	100.0

Attitude based questions and responses

Attitude based questions and responses to each question in the form of percentage (%) and frequencies (n) have been depicted in table 3.

86% and 94% of the respondents strongly agreed/agreed that practice cannot be continued as previously and each case should be considered as carrier respectively. 82% dental students agreed/strongly

agreed that only emergency treatment should be rendered. Statistically significant difference was observed for responses to the question 'the span of Covid-19 is indefinite and postponing all elective treatment is not a good solution' (p=0.006) and 'patient with systemic illness, children, elderly should not be called for routine procedures and consulted over phone' (p=0.019).

Table no3: Attitude based questions and responses to each question in the form of percentage (%) and frequencies (n).

Question	Responses	Frequency	Percent
1.COVID-19 has greatly affected dentistry today and the dental practice cannot be continued as previously.	Agree	116	52.0
	Disagree	15	6.7
	Neutral	14	6.3
	Strongly Agree	76	34.1
	Strongly disagree	2	.9
2.Dentists are at a high risk due to close proximity to oral cavity during treatment procedures.	Agree	101	45.3
	Neutral	1	.4
	Strongly Agree	117	52.5
	Strongly disagree	4	1.8
3.'Treating each case as a carrier ' should be the protocol for attending to any patient.	Agree	106	47.5
	Disagree	1	.4
	Neutral	9	4.0
	Strongly Agree	105	47.1
	Strongly disagree	2	.9
4.Only emergency treatment should be rendered and all elective procedures should be postponed.	Agree	106	47.5
	Disagree	10	4.5
	Neutral	29	13.0
	Strongly Agree	77	34.5
	Strongly disagree	1	.4
5.The span of COVID-19 is indefinite, postponing all elective treatment is not a good solution.	Agree	111	49.8
	Disagree	42	18.8
	Neutral	36	16.1
	Strongly Agree	28	12.6
	Strongly disagree	6	2.7
6.Patient with systemic illness, children, elderly should not be called for routine procedures and should be consulted over the phone.	Agree	115	51.6
	Disagree	13	5.8
	Neutral	23	10.3
	Strongly Agree	71	31.8
	Strongly disagree	1	.4

Attitude towards practice modification.

Attitude based questions towards practice modification and responses to each question in the form of percentage (%) and frequencies (n) have been depicted in table 4. Statistically significant difference is seen with responses to questions 'It is practically impossible to use PPE kit for every patient'(p=0.028) and 'Provision for sanitizers, soap and water should be made available easily in the department, both for the doctors and patients'(p=0.002). 95% respondents believed rinsing with povodine-iodine mouthwash helps in infection control and is also statistically significant(p=0.032). 90.1% students thought that high volume evacuation suction tips should be used during aerosol producing procedures(p=0.004).

Table no4: Attitude based questions towards practice modification and responses to each question in the form of percentage (%) and frequencies (n).

Question	Responses	Frequency	Percent
1.Thermal testing to be performed at the entrance of the hospital.	Agree	101	45.3
	Neutral	5	2.2
	Strongly Agree	113	50.7
	Strongly disagree	4	1.8
2.It is practically impossible to use PPE kit for every patient.	Agree	116	52.0
	Disagree	22	9.9
	Neutral	15	6.7
	Strongly Agree	67	30.0

	Strongly disagree	3	1.3
3.Treatment should be rendered only on appointment basis.	Agree	118	52.9
	Disagree	2	.9
	Neutral	11	4.9
	Strongly Agree	89	39.9
	Strongly disagree	3	1.3
4.History of symptoms of COVID-19, contact history, history of travel, gathering, information regarding the area of residence should be asked prior to screening of patient via telephone.	Agree	109	48.9
	Disagree	1	.4
	Neutral	2	.9
	Strongly Agree	109	48.9
	Strongly disagree	2	.9
5.Maintaining social distancing is mandatory in waiting area.	Agree	75	33.6
	Disagree	1	.4
	Neutral	1	.4
	Strongly Agree	144	64.6
	Strongly disagree	2	.9
6.For screening of the patient, 3-layer mask, face shield, eye protectors, gloves should be used.	Agree	84	37.7
	Strongly Agree	137	61.4
	Strongly disagree	2	.9
7.Provision for sanitizers, soap and water should be made available easily in the department, both for the doctors and patients.	Agree	77	34.5
	Neutral	3	1.3
	Strongly Agree	141	63.2
	Strongly disagree	2	.9
8.For treatment of patients involving the generation of aerosols, wearing a PPE kit is mandatory for both doctor and assistant.	Agree	80	35.9
	Neutral	2	.9
	Strongly Agree	139	62.3
	Strongly disagree	2	.9
9.The sterilization of the room is to be done after every patient by using defogger machine or UV radiation.	Agree	110	49.3
	Disagree	1	.4
	Neutral	14	6.3
	Strongly Agree	96	43.0
	Strongly disagree	2	.9
10.Air ventilation should be employed for airborne contamination by using HEPA filters, having sufficient windows, avoiding the use of A/C.	Agree	110	49.3
	Neutral	13	5.8
	Strongly Agree	98	43.9
	Strongly disagree	2	.9
11.Patients are asked to rinse with povodine-iodine mouthwash before starting the treatment.	Agree	112	50.2
	Neutral	9	4.0
	Strongly Agree	100	44.8
	Strongly disagree	2	.9
12.Dental chairs, x-ray viewer, spotlight handle, handpiece, triple syringe body, tip of the suction units should be covered with PVC films/ plastic sheets.	Agree	102	45.7
	Disagree	1	.4
	Neutral	16	7.2
	Strongly Agree	102	45.7
	Strongly disagree	2	.9
13.The 3-ply mask should be changed every 3 hours and N-95 mask after 6 hours.	Agree	102	45.7
	Disagree	1	.4
	Neutral	13	5.8
	Strongly Agree	105	47.1
	Strongly disagree	2	.9
14.The surfaces should be cleaned with 0.1-1% sodium hypochlorite, 70 %alcohol, 7-9% quaternary ammonium.	Agree	102	45.7
	Neutral	4	1.8
	Strongly Agree	115	51.6
	Strongly disagree	2	.9
15.The use of high-volume evacuation suction tips should be use with aerosol producing procedures.	Agree	99	44.4
	Disagree	7	3.1
	Neutral	12	5.4
	Strongly Agree	102	45.7
	Strongly disagree	3	1.3
16.Chemical inactivator solution like 0.01% sodium hypochlorite should be in handpiece splatter.	Agree	112	50.2
	Disagree	8	3.6
	Neutral	20	9.0
	Strongly Agree	81	36.3
	Strongly disagree	2	.9
17.All the impressions and casts should be disinfected for the	Agree	98	43.9

safety of laboratory technicians and doctors.	Neutral	2	.9
	Strongly Agree	121	54.3
	Strongly disagree	2	.9

The multiple linear regression model to analyze the knowledge and attitude scores in relation to demographic variables revealed that knowledge scores were significantly associated with qualifications (p = 0.000) and the year of study (p = 0.000) only whereas attitude scores were associated with qualifications(p=0.000) and year of study(p=0.000) and subject specialty in MDS(p=0.018) as shown table no 5&6

Table no5: Association between demographic variables and the participants' knowledge using the multivariate linear regression analysis**.**

Independent variables	Coefficients	(95% CI) Lower bound	(95% CI) upper bound	T value	p value
sex	-1.334	-5.054	2.386	-.707	.480#
Qualification	10.147	6.842	13.452	6.051	.000**
year of study	2.845	1.836	3.853	5.559	.000**
specialty	.763	-.202	1.727	1.565	.120#
Institute	2.893	-1.235	7.021	1.381	.169#

Table no6: Association between demographic variables and the participants' attitude using the multivariate linear regression analysis**.**

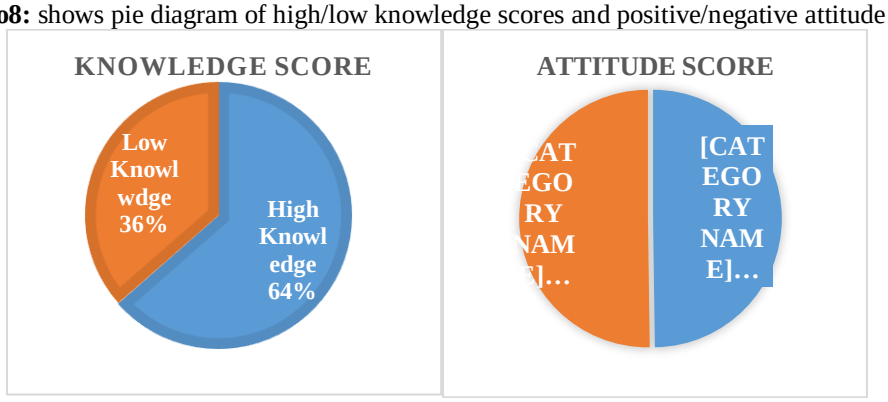
Independent variables	Coefficients	(95% CI) Lower bound	(95% CI) upper bound	T value	p value
Sex	-1.684	-4.465	1.098	-1.193	.234#
Qualification	9.647	7.300	11.995	8.099	.000**
Year of study	2.687	1.963	3.411	7.317	.000**
Specialty	.828	.144	1.512	2.397	.018*
Institute	3.046	-.034	6.126	1.949	.053#

Based on the median of the scores obtained, the cut-off points for the knowledge (maximum score 8) and attitude (maximum score 115) scores were 8 and 99 respectively (table no7). High knowledge and positive attitude scores were seen in 64% and 50% of the participating students, respectively (Table 8).

Table no7: shows knowledge and attitude scores of the respondents.

Characteristics		Value
Knowledge	Range of scores achieved	4-8
	Mean±SD	7.50±0.74
	Median (cut-off point)	8
Attitude	Range of scores achieved	115
	Mean ±SD	99.31±10.25
	Median (cut-off point)	99

Table no8: shows pie diagram of high/low knowledge scores and positive/negative attitude scores.



IV. Discussion:

Dental students should have adequate knowledge of covid-19 disease and should have positive attitude in order to treat patients in clinics. Good knowledge and professional attitude prepare the students to handle situations better, safeguard oneself and others including staff and patients, to be able to give good treatment to patients while taking utmost care regarding safety and prevention of spread. Knowledge score of the current study is lesser (63%) compared to other similar studies conducted by Kamate et al (92% knowledge score in

dentists)[11]. Ahmed et al carried out a study on fear and practice modification in covid times[12]. Similarly attitude and professional approach of dentist were studied by Mista et al [13]. The practical guidelines recommended by the Centers for Disease Control and Prevention (CDC), the American Dental Association (ADA), and the World Health Organization to control the spread of COVID-19, Dental council of India (DCI), Ministry of Health and Family Welfare Directorate General of Health Services (mohfw) acts a source of information for the dentist, dental students and staff. [10]

92.8% participants knew that there is no specific antiviral treatment recommended for COVID-19. The treatment is symptomatic, and oxygen therapy represents the first step for addressing respiratory impairment. Preventive measures are the current strategy to limit the spread of cases. [14]

Patients with systemic illnesses, elderly and children should not be called for the treatment and should be consulted over the phone. Patients with COVID-19 disease who have comorbidities, such as hypertension or diabetes mellitus, and older patients above 65 years are more likely to develop a more severe course and progression of the disease. [15]

Disease seems to be milder in children, but situation appears to be changing. Infants and young children had relatively more severe illness than older children.[16]

Telecommunication and consultation over the phone should be done to reduce the exposure of such patients and in turn preventing it further spread. [17]

Dental care settings invariably carry the risk of 2019-nCoV infection due to the specificity of its procedures, which involves face-to-face communication with patients, and frequent exposure to saliva, blood, and other body fluids, and the handling of sharp instruments.[18] 96.3% students knew that covid-19 spreads via droplets and the pathogenic microorganisms can be transmitted in dental settings through inhalation of airborne microorganisms that can remain suspended in the air for long periods, direct contact with blood, oral fluids, or other patient materials, contact of conjunctival, nasal, or oral mucosa with droplets and aerosols containing microorganisms generated from an infected individual and propelled a short distance by coughing and talking without a mask and indirect contact with contaminated instruments and/or environmental surfaces.[19]

90.6% students responded that 2019-nCoV can survive in the air and on surfaces between several hours to several days. Study conducted by van Doremalen N reported that 2019-nCoV is viable up to 72 hrs. on plastics, 48 hrs. on stainless steel ,24 h on cardboard and 4hrs on copper surfaces. Also, SARS-CoV-2 remained viable in aerosols for a duration of 3 hours. [20]

Dental professionals should take strict personal protection measures and avoid or minimize operations that can produce droplets or aerosols. 90% students agreed that use of high-volume evacuation suction tips should be use with aerosol producing procedures**.** The use of saliva ejectors with low or high volume can reduce the production of droplets and aerosols.[21,22,23] The use of face shield and goggles become necessary in protection from spatter and aerosol.

Disinfection of frequent touch surfaces with 62–71% ethanol, 0.1% sodium hypochlorite, 0.5% hydrogen peroxide can be considered effective against 2019-nCoV as other coronaviruses become ineffective with 1 min exposure time. [24]

Use pre-procedural povodine-iodine mouthwash was recommended by the 94.8% participants. Although SARS-CoV-2 was not studied, WHO recommends that mouth rinsing with an antimicrobial product like chlorhexidine gluconate, essential oils, povidone-iodine or cetylpyridinium chloride may reduce the level of oral microorganisms in aerosols and spatter generated during dental procedures.[25]

Practicing hand hygiene, which includes the use of alcohol-based hand rub or handwashing, is a simple yet effective way to prevent the spread of pathogens and infection in dental settings**.** Hand washing mechanically removes pathogens. Laboratory data demonstrate that alcohol-based hand rub formulations in the range 60% ethanol or 70% isopropanol as active ingredients recommended by CDC, inactivate SARS-CoV-2. [26]

Specifically, the oral professionals should wash their hands before patient examination, before dental procedures, after touching the patient, after touching the surroundings and equipment without disinfection, and after touching the oral mucosa, damaged skin or wound, blood, body fluid, secretion, and excreta. Since airborne droplet transmission of infection is considered as the main route of spread, particularly in dental clinics and hospitals, barrier-protection equipment, including protective eyewear, masks, gloves, caps, face shields, and protective outwear, is strongly recommended for all healthcare givers in the clinic/hospital settings during the epidemic period of 2019-nCoV. Although a patient with 2019-nCoV infection is not expected to be treated in the dental clinic, in the unlikely event that this does occur, and the dental professional cannot avoid close contact, special protective outwear is needed. [18]

82% believed that it is practically impossible to use personal protective equipment (PPE) kit for every patient. Provision of PPE kit for every patient seems bleak in these challenge times due to limited availability of resources and increased number of patients. All elective and non-urgent procedures and appointments for which a gown is typically used should be cancelled and prioritized during care activities where splashes and sprays are anticipated, which typically includes aerosol generating procedures and surgical procedures. Consideration can

be made to re-use of cloth isolation gowns as disposable gowns are not typically amenable to being doffed and reuse. [27]CDC has recommended guidance on implementation of extended use of N95 respirators in healthcare settings. When practicing extended use of N95 respirators, the maximum recommended extended use period is 8–12 hours. [28]

82% of the participants disagreed inspite of the guidelines that only emergency treatment should be given to the requiring patients. Postponement of all other treatment is not a good solution and adapting the dental practice to the current situation is the need of the hour. Easy availability and cost effective covid testing kit and vaccination remains the ray of hope.

It was observed that the dental students with higher qualifications (postgraduates) reported better and significant knowledge and attitude scores as compared to undergraduate students. The MDS 3rd years had better knowledge and attitude compared to their 1st and 2nd year students. The possible explanation might be that postgraduate studies involve performing some kind of research (thesis). Different authors have documented similar findings during the ZIKV and Ebola hemorrhagic fever pandemics.[29,30]

The study is prone to few limitations one being small sample size, the other being sampling technique, the self- selection bias on the side of the participants could have occurred.

V. Conclusion

Most of the dental students were found to have good knowledge and positive attitude, which is important to combat COVID-19. They are advised to follow the Centers of Disease Control and Prevention (CDC) and World Health Organization (WHO) guideline so that no stone is left unturned in defeating this pandemic. We must be constantly aware of infectious threats that may challenge the current infection control regimen, especially in dental hospitals and take necessary precautions to curb its spread.

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