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Original Research Article

Infection control awareness and compliance among dental students and dentists in India: a cross-sectional study

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ABSTRACT

Background: A major cause of death and morbidity linked with clinical, diagnostic, and therapeutic procedures, healthcare associated infections (HAI) are a global health problem. In the context of patient safety, HAI is a crucial component of iatrogenic hazards. Dental professionals around the world are especially concerned about the spread of infection between patients and healthcare personnel in healthcare settings. Exposure to blood borne, aerogenic, and droplet associated microorganisms produced during clinical procedures can result in infections in dental practice. Direct contact with blood or fluids can result in transmission. Additionally, the possible transmission may be caused by inhaling aerosols containing oral fluids, droplet spatter, or indirect contact with infected equipment.
Methods: A cross-sectional study was done among dental students and dentists across Karnataka state in India. Convenience sampling technique was used and a minimum of 100 participants were required for this study. Totally 113 participants were enrolled in this study.
Results: Majority of the participants 62 (54.9%) were in the age group between 25 and 30 years. Based on gender the majority 71 (62.8%) were males and 42 (37.2%) were females. The majority of dentists, 112 (99.1%) believed that ineffective sterilization during clinical practice can transmit infection from one patient to another.112 (99.1%) dentists believed that apart from instrument sterilization, disinfection of dental chair, clinic, dental office is required.
Conclusions: Dentists have to be regularly updated regarding latest measures for infection control and adoption of latest technologies and techniques.

Keywords: Infection control, Dentists, Healthcare associated infections, Dental students

INTRODUCTION

A major cause of death and morbidity linked with clinical, diagnostic, and therapeutic procedures, Healthcare associated infections (HAI) are a global health problem. In the context of patient safety, HAI is a crucial component of iatrogenic hazards. Dental professionals around the world are especially concerned about the spread of infection between patients and healthcare personnel in healthcare settings. Exposure to blood borne, aerogenic, and droplet associated microorganisms produced during clinical procedures can result in infections in dental practice. Direct contact with blood or fluids can result in transmission. Additionally, the possible transmission may be caused by inhaling aerosols containing oral fluids, droplet spatter, or indirect contact. With infected equipment.[1] For healthcare workers, the COVID 19 pandemic has been linked to a high level of occupational risk. Dentists are the front-line healthcare professionals most at risk of catching COVID 19 due to direct patient

contact, inhalation of aerosols generated during dental procedures, and contact with contaminated surfaces. Dental care providers reported feeling confused, afraid and anxious in addition to a sharp decline in the number of dental treatments completed. Strict infection control procedures must be implemented because there is a significant risk of infection during dental practice. Adopting appropriate infection control throughout all dental operations helps reduce airborne contamination, underscoring its significance during the Covid 19 epidemic.[2] Healthcare workers are responsible for 39% of cases of hepatitis C virus (HCV), 37% of cases of Hepatitis B virus (HBV) and 4.4% of cases of Human immunodeficiency virus (HIV), all of which are linked to occupational exposure in clinical settings, according to the World Health Organization (WHO).

Needle stick injury can cause severe emotional suffering and financial hardship with long lasting detrimental repercussions. Dental healthcare workers and students are often exposed to bloodborne infections through direct and indirect contact with sharp equipment during clinical procedures due to the oral cavity's propensity to house infectious germs. They are therefore vulnerable to NSIs and spread of infectious diseases.[3] The WHO declared that "clean care is safer care" when it introduced the "Global challenge for patient safety" in 2005. This campaign emphasized the importance of hand cleanliness for patient safety in medical environments, with the slogan "Save lives: Clean your hands," the WHO launched a new campaign in 2009 under the "Patient safety program: highlighting the significance of the "Five moments for hand hygiene: model, (before touching a patient; before clean/aseptic procedures, after body fluid exposure risk, after touching a patient, after touching the patients' surroundings) which turned into a tactic with a major worldwide influence.[4] With potential uses in infection prevention and control, Artificial intelligence (AI) is becoming a revolutionary force in a number of industries, including dentistry and medicine. AI is utilized in dentistry for prognosis, prediction, clinical decision making, treatment planning, and diagnosis, AI has potential to improve hand hygiene procedures, diagnose illness, and identify high risk patients during epidemics. In healthcare settings, AI driven technologies with high quality data sets for hand hygiene teaching and auditing could greatly increase compliance and promote behavior change.[5]

Dentists, dental assistants, dental hygienists, and administrative staff are all considered dental personnel, everyone may come into contact with potentially harmful bacteria, including Mycobacterium tuberculosis, hepatitis B and Hepatitis C viruses, staphylococci and other pathogens that colonize the upper respiratory tract and oral cavity. Dental impressions are possible sources of cross contamination and should always be handled in a way that avoids exposure to dental professionals, patients, and the environment, according to Centre for disease control and prevention guidelines.[6] In the dental clinical setting, it has been demonstrated that the use of alcohol-based disinfectants in conjunction with proper hygienic hand disinfection considerably reduces transitory microflora and limits the transmission of harmful bacteria. Clinical practice should regularly implement the clear and unambiguous international recommendations for the prevention of healthcare associated infections. However, a number of studies have found that dentists and dental students have inadequate understanding which leads to less-than-ideal hand hygiene compliance.[7]

METHODS

Study area

Study was done among dental students and practicing dentists in Karnataka State, India.

Study period

The study period was for 2 months from April 2026 to May 2026.

Study design and participants

This was a cross-sectional study, it was conducted among dental students and practicing dentist in Karnataka, India. Convenience sampling technique was used as part of this study. A minimum sample size of 100 was estimated. Total of 113 dental students and dental practitioners participated in this study.

Inclusion criteria

Dental practitioners and dental students who consented and duly filled up the google form were selected as participants in this study.

Exclusion criteria

Dental practitioners and dental students who did not give consent and who did not duly fill the google form were excluded from this study.

Data collection

The questionnaire was validated, pretested questionnaire regarding the infection control among dentists and dental students. Google forms were circulated and duly filled forms were selected.

Data analysis

Data was analyzed using SPSS v26 software. Data was expressed in mean, percentage. Data was expressed in tables and figures.

RESULTS

The study on the knowledge, attitudes and practices related

to infection control among university dental students and practicing dentists in India revealed the following results; There was a total of the 113 participants in this study. The participants were in the age groups as described below, 62 (54.9%) were between 25 and 30 years, while 29 (30-35%) were between 30 and 35 years old, 8 (7.1%) were in the age group 35 to 40 years, 9 (8%) were 40 and above, 4(3.5%) were in-between 21 and 25 years and 1(0.9%) were between 15 and 20 years.

Table 1: Sociodemographic profile.

Characteristics		Frequency (n)	Percentage (%)
Age group (years)	15-20	1	0.9
	21-25	4	3.5
	26-30	62	54.9
	31-35	29	25.7
	36-40	8	7.1
	Above 40	9	8
Gender	Female	42	37.2
	Male	71	62.8
Residence	Rural	26	23
	Urban	87	77
Year of study	Year 1	0	0
	Year 2	1	0.9
	Year 3	4	3.5
	Year 4	8	7.1
	Internship	33	29.2
	Practicing dentist	67	59.3

Table 2: Knowledge questions.

Characteristics		Frequency (n)	Percentage (%)
Do you wash your hands before and after patient examination?	Yes	113	100
	No	0	0
With what do you wash your hands?	Plain soap	21	18.6
	Detergents	0	0
	Antiseptic solution	92	81.4
Do you prefer oral mouth rinse before commencement of any treatment procedure?	Yes	105	92.9
	No	8	7.1
Do you think isolation is important in infection control?	Yes	113	100
	No	0	0
With which of the following vaccines have you been vaccinated?	Hepatitis B	1	0.9
	Tetanus	0	0
	Tuberculosis	2	1.8
	None	0	0
	More than 1	25	22.1
	All	85	75.2
Which of the following do you use to sterilize instruments in dental clinic?	Autoclave	113	100
	Boiling	58	51.3
	Washing	46	40.7
Minimum time required for sterilization in autoclave? (minutes)	5	111	98.2
	10	2	1.8
	15	0	0
Temperature for sterilization in autoclave?	100	0	0
	120	112	99.1
	150	1	0.9
Which of the following has the highest rate of transmission via saliva?	Hepatitis B	2	1.8
	AIDS	0	0
	Tuberculosis	111	98.2
	Do not know	0	0

Continued.

Characteristics		Frequency (n)	Percentage (%)
What immediate action should be taken in case of direct blood contact with an HIV patient?	Anti-HIV immunoglobulins	3	2.7
	Anti-HIV drugs	106	93.8
	Blood tests to be carried out	3	2.7
	Do not know	1	0.9

Table 3: Knowledge questions continued.

Characteristics		Frequency (n)	Percentage (%)
Odds of HIV transmission after a single contaminated needlestick injury?	0.1-0.4%	109	96.5
	1-4%	1	0.9
	10-40%	0	0
	70-90%	3	2.7
As a clinician, what protective measures do you take to prevent yourself from injury?	Face mask and gloves	1	0.9
	Eyewear	0	0
	Protective clothing	0	0
	All of the above	112	99.1
After use of gloves for a patient, what do you do with them?	Dispose of them	113	100
	Reuse them after wash	0	0
	Reuse them after sterilization	0	0
Ineffective sterilization during clinical practice can transmit infection from one patient to another?	Yes	112	99.1
	No	1	0.9
	Do not know	0	0
Apart from instrument sterilization, disinfection of dental chair, clinic, dental office is required?	Yes	106	93.8
	No	7	6.2
In your opinion, can artificial intelligence help in transforming dental education and practice	Yes	106	93.8
	No	7	6.2

Table 4: Association between various parameters and knowledge questions.

Questions		No (%)	Yes (%)	Total	Chi square	P value
Do you prefer oral mouth rinse before commencement of any treatment procedure?	Female	3 (7.1)	39 (92.9)	42 (100)	0.0001	0.984
	Male	5 (7)	66 (93)	71(100)		
Year of study with do you prefer oral mouth rinse before commencement of any treatment procedure?	Practicing dentist	6 (9)	61 (91)	67 (100)	0.880	0.348
	Student	2 (4.3)	44 (95.7)	46 (100)		
Are you from an urban or rural area with do you prefer oral mouth rinse before commencement of any treatment procedure?	Rural	3 (11.5)	23 (88.5)	26 (100)	1.021	0.312
	Urban	5 (5.7)	82 (94.3)	87 (100)		
With which of the following vaccines have you been vaccinated? with year of study	All	45 (52.9)	40 (47.1)	85 (100)	11.343	0.010*
	Hepatitis B	1 (100)	0 (0)	1 (100)		
	More than 1	21 (84)	4 (16)	25 (100)		
	Tuberculosis	0 (0)	2 (100)	2 (113)		

Continued.

Questions		No (%)	Yes (%)	Total	Chi square	P value
Which of the following do you use to sterilize instruments in dental clinic? with year of study	Autoclave	32 (59.3)	22 (40.7)	54 (100)		
	Autoclave, boiling	2 (15.4)	11 (84.6)	13 (100)		
	Autoclave, boiling, washing	33 (73.3)	12 (26.7)	45 (100)		
	Autoclave, washing	0 (0)	1 (100)	1 (100)		
Minimum time required for sterilization in autoclave? with year of study (minutes)	10	2 (100)	0 (0)	2 (100)	1.398	0.237
	15	65 (58.6)	46 (41.4)	111 (113)		
Temperature for sterilization in autoclave? with year of study (degree C)	120	66 (58.9)	46 (41.1)	112 (100)	0.693	0.405
	150	1 (100)	0 (0)	1 (100)		

* p value less than 0.05 is statistically significant.

Table 5: Association table between year of study and questions regarding infection control.

Questions		No (%)	Yes (%)	Total	Chi square	P value
Which of the following has the highest rate of transmission via saliva? association with year of study	Hepatitis B	1 (50)	1 (50)	2 (100)	0.73	0.787
	Tuberculosis	66 (59.5)	45 (40.5)	111 (100)		
What immediate action should be taken in case of direct blood contact with an HIV patient? with year of study	Anti-HIV drugs	61 (57.5)	45 (42.5)	106 (100)	2.948	0.400
	Anti-HIV immunoglobulins	3 (100)	0 (0)	3 (100)		
	Blood tests to be carried out	2 (66.7)	1 (33.3)	3 (100)		
	Do not know	1 (100)	0 (0)	1 (100)		
Odds of HIV transmission after a single contaminated needlestick injury? with year of study	0.1-0.4%	64 (58.7)	45 (41.3)	109 (100)	3.531	0.171
	1-4%	0 (0)	1 (100)	1 (100)		
	70-90%	3 (100)	0 (0)	3 (100)		
Ineffective sterilization during clinical practice can transmit infection from one patient to another? with year of study	No	1(100)	0(0)	1(100)	0.693	0.405
	Yes	66 (58.9)	46 (41.1)	112 (100)		
Apart from instrument sterilization, disinfection of dental chair, clinic, dental office is required? with year of study	No	1 (100)	0 (0)	1 (100)	0.693	0.405
	Yes	66 (58.9)	46 (41.1)	112 (100)		
In your opinion, can artificial intelligence help in transforming dental education and practice with year of study	No	3 (42.9)	4 (57.1)	7 (100)	0.835	0.361
	Yes	64 (60.4)	42 (39.6)	106 (100)		

Based on gender the majority 71 (62.8%) were males and 42 (37.2%) were females. Regarding practicing status or year of dental studies, 67 (59.3%) were practicing dentists, 33 (29.2%) were interns, 8(7.1%) were from year 4, 4 (3.5%) were from year 3. 1 (0.9%) were from year 2. The majority 87 (77%) were from urban areas, and 23% were from rural areas (Table 1).

Regarding the knowledge attitude and practices of infection prevention these are the results. All 113 participants said that they washed their hand before and after patient examination. 92 (81.4%) respondents said that they washed their hands with antiseptic solution while 21 (18.6%) said that they washed their hands with plain soap. The majority 105 (92.9%) said that they preferred oral mouth wash before commencement of any treatment procedure, while 8 (7.1%) said that they did not do so. All the respondents 113 (100%) thought that isolation is important in infection control. The dentists were asked if they were vaccinated and 86 (76.2%) said that they were

vaccinated with all the vaccines which included, hepatitis B, Tetanus, BCG vaccine for tuberculosis, while 25 (22.1%) said that they were vaccinated with more than one vaccine. 2 (1.8%) said that they were vaccinated with only TB vaccine, and 1 (0.09%) person said that he was vaccinated with hepatitis vaccine only. When enquired as to which methods they employed to sterilize instruments in dental clinic, all 113 (100%) respondents said they used autoclave, while 58 (51.3%) said boiling and 46 (40.7%) said they used washing. Minimum time required for sterilization in autoclave was 15 minutes according to the vast majority 11 (98.2%) and 2 (1.9%) said 10 minutes. 112 n(99.1%) participants said that the temperature for sterilization in autoclave was 120 degrees centigrade, while 1 (0.9%) thought that it was 150 degrees centigrade.

The 111 (98.2%) respondents believed that tuberculosis was the disease that had the highest rate of transmission via saliva and 2 (1.8%) thought it was hepatitis B. The dental students and practitioners were asked what immediate action they would take in case of direct blood contact with an HIV patient, 106 (93.8%) said that they would take anti-HIV drugs, while 3 (2.7%) thought that they would take anti-HIV immunoglobins, 3 (2.7%) said that they would do blood tests, while 1 (0.9%) did not know what to do in this circumstance (Table 2).

109 (96.5%) believed that the odds of HIV transmission after a single contaminated needlestick injury was 0.1% to 0.4%, while 3 (2.7%) thought it was 70% to 90%. 1 (0.9%) believed it was 1% to 4%. As a clinician what protective measures would be taken by the dentists to prevent injury to themselves, this question got an overwhelming support from 112 (99.1%) dentist s who said they would use all protective equipment like facemasks and gloves, eyewear, protective clothing etc. While 1(0.9%) said that the person would only use a facemask and gloves. 113 (100%) dentists said that they would dispose of the gloves after using it on a patient.

The majority of dentists, 112 (99.1%) believed that ineffective sterilization during clinical practice can transmit infection from one patient to another.112 (99.1%) dentists believed that apart from instrument sterilization, disinfection of dental chair, clinic, dental office is required. 106 (93.8%) of dental students and practicing dentists thought that artificial intelligence can help in transforming dental education and dental practice (Table 3).

Table 4 depicts the association between knowledge questions and parameters including gender, year of study and other factors. Sterilization methods related questions were statistically significant. Similarly, vaccination and year of study was statistically significant. P value <0.05 is statistically significant. Table 5 denotes the association between the level of study and the knowledge regarding infection control questions.

DISCUSSION

A study done by Kondeva et al, showed that students performed better than dentists in practice when it came to hand asepsis. This suggests that consistent adherence to hygiene procedures. In clinical settings may eventually decline due to time constraints, ingrained habits, and a lack of regular monitoring, even though it also probably reflects the influence of undergraduate infection control instruction. Therefore, the less-than-ideal outcomes highlight the need for dental staff to become more knowledgeable and dedicated to hand disinfection prior to manipulations.[6,7] In a study conducted by Lin et al, in China, a quantitative questionnaire based, single center investigation to assess the knowledge, practices, and attitudes of infection prevention and control among university dental students. A survey was done, current dental students (response rate was 82%) KAP regarding infection prevention and control was assessed. The total scores of knowledges, attitude, and practice were 2.92±1.07, 3.54±0.54, and 4.03±0.84 respectively. There were 15 questions in the questionnaire.[1]

In a cross-sectional study done by Abozaid et al, a total of 104 dental students who participated in clinical practical sessions at an Egyptian nonprofit dentistry school were included in the study. An online survey was used to gather data. According to this study, 88.5% of the dental students had a practice score for safe dental measures that was satisfactory. Safe dental practices were seen favorably by 93.2% of the pupils. The students most frequent and consistent safe dental practice was hand hygiene (82.7%), while taking a patient's temperature was the least frequent practice (28.8%). A statistically significant correlation was found between checking the patient's temperature (p=0.046) and hand hygiene (p=0.023).[2]

In a study done by Dinca et al, in Romania among dental students, found out that hand hygiene was indeed a crucial part of standard precautions and is fundamental to infection prevention. The majority of survey respondents said that they regularly used masks and gloves during their clinical practice. However, a concerning finding was that 7.9% of students said they never wore masks and less than half of respondents used safety goggles, despite confirming the availability of PPE in their clinical practice. This correlation was found throughout the main PPE items assessed.[8]

In a study done in Peru by Robies et al, of the 503 participants 85.69% had insufficient knowledge, 14.31% had sufficient knowledge and 10.74 % had negative attitudes and 89.26% had positive attitudes about disinfection as a control measure to stop the spread of COVID -19. [9,10]

Limitations

This study was done among dental students and dental practitioners, a bigger sample size and multi centric data collection would have improved the generalizability of the study.

CONCLUSION

Dentists and dental students should be taught on the recent advances in infection control procedures, techniques and technologies. Ineffective sterilization was identified as a problem in this sector. Enforcing hand washing techniques and increasing awareness is the key to improve practice outcomes.

Recommendations

Further studies should be conducted regarding the topic infection control awareness among dental students and dental practitioners. More number of institutions should be part of the study. This will improve the generalizability of the study.

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