

Knowledge, Attitudes, and Practice Regarding Infection Control Measures among Dental Students in Western India

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Abstract

Background: A questionnaire study was conducted among 133 undergraduate students (45 third year, 42 final year and 46 interns) and 51 postgraduate students from Government Dental College and Hospital, Aurangabad, Western India. The objectives of this study were to explore the awareness and beliefs regarding infection and infection control in dental clinics (Aim 1), to evaluate the knowledge regarding hand hygiene (Aim2) and to evaluate the knowledge and awareness regarding gloves as means of personal protection equipment (Aim 3).

Method: The students responded to a self-administered anonymous survey consisting of 44 questions related to hand hygiene, gloves and infection control in dental hospital.

Result: Majority of students (96%) of students were aware that saliva and blood can be the modes of transmission of infection. Significant proportion of students (66.64% third year, 62.70% final year, 58.70% interns and 46% post graduates) were unaware about WHO and CDC guidelines for infection control. High percentage of students (93.33% third year, 95.24% final year, 86.96% interns and 82.35% post graduates) did not

know the difference between latex, nitrile and vinyl gloves. The cost of the gloves was most frequently named reason (44.44% third year, 50% final year, 52.17% interns and 58.82% post graduates) followed by the “protection” (33.35% third year, 30.96% final year, 13.04% interns and 11.78% post graduates) for gloves preference. Comfort, fit, texture and feel of the gloves were least preferred quality. Only 28.89% third year, 14.29% final year, 17.39% interns and 17.65% post graduates washed their gloves in between patients.

Conclusion: The results of this study should alert the educators of dental profession to educate their students regarding guidelines and practical application of infection control measures.

Keywords: Dental students, Gloves, Hand hygiene, Infection control.

Introduction

Dental professionals work in an environment that is bathed in saliva, blood and oral fluids. They work with high speed and sharp instruments with constant exposure to aerosols of oral and respiratory fluids of their patients. The transmission of infectious agents between the patient and health care worker is known as cross infection. The

infectious diseases can be transmitted through direct contact with blood, oral fluids or other secretions. Indirect transmission can take place via contact with contaminated instruments, surgical equipment or environmental surfaces, or contact with aerosols of oral and respiratory fluids of infected patients.^[1,2] The cross infection can take place from patient to dentist, from dentist to patient and from one patient to another.

Centre for Disease Control and Prevention of the United States of America (CDC) published infection control recommendations for dentistry first in 1986 and again in 1993.^[3,4] In 2003, the CDC updated their guidelines for infection control in dental settings. These guidelines include standard precautions which intend to make sure a safe working atmosphere along with preventing potential transmission of professional and nosocomial infections among dentists, dental health-care professionals and their patients.^[5] Universal precautions consider that all patients have to be accepted as an infectious patient and apply these precautions to all patients. Current CDC-HICPAC (Centre for Disease Control and Prevention-Healthcare Infection Control Practices Advisory Committee) proposed guidelines the most cost-effective, simple, and feasible way to prevent transmission of pathogens, consists in a two-tier approach. First, the standard precautions, which are applied to every patient in a healthcare setting. Second, the extra barrier or isolation precautions are necessary during the care of patients suspected or known for colonization, or an infection with highly transmissible or epidemiologically important pathogens. These practices are designed to contain airborne, droplet, and direct or indirect contact transmission.^[6] These precautions are based on the principle that all blood, body fluids, secretions, excretions except sweat, non-intact skin, and mucous membranes may contain transmissible infectious agents. The Health

Care Professionals should wash hands when soiled, and disinfect hands, irrespective of whether gloves were worn. Gloves should be worn if there is contact with blood, body fluids, secretions, excretions, mucous membranes, non-intact skin, or when potentially contaminated objects are manipulated. Gloves must be changed between patients and before touching clean sites on the same patient. Hand hygiene should be applied immediately after gloves are removed, before and between patient contacts. A mask and eye protection as well as a gown should be worn to protect mucous membranes, skin, and clothing during procedures that are likely to result in splashing of blood, body fluids, secretions, or excretions. Masks are worn within 1 meter (3 feet) of the patient.^[3]

Centre for Disease Control has defined hand hygiene as cleaning your hands by using either hand washing (washing hands with soap and water), antiseptic hand wash, antiseptic hand rub (i.e. alcohol-based hand sanitizer including foam or gel), or surgical hand antisepsis. Current CDC guidelines recommend use of alcohol based hand sanitizer immediately before touching a patient, before handling invasive medical devices, after contact with blood, body fluids or contaminated surfaces and immediately after removal of gloves.^[7]

Dental professionals wear gloves to protect themselves from cross infection while being in contact with oral fluids, saliva and blood during dental procedures. There are varieties of gloves available in the market made of different materials. Research studies have found that the vinyl gloves performance of was significantly inferior to that of latex and nitrile gloves in terms of barrier protection, durability, and resistance to tear.^[8-12] Nitrile gloves have been found to be comparable to latex gloves in barrier protection, puncture resistance and durability.^[13] However, nitrile gloves have less elasticity resulting in reduced dexterity for fine motor skills as compared to

latex gloves. ^[14] This reduced elasticity may cause more fatigue in providers' hands when they use these gloves for long periods of time. ^[15,16] It is recommended that the hands should be washed in between patient care and gloves do not replace hand –washing. After washing hands, it is important to thoroughly dry the hands, as wet hands promote rapid multiplication of microbes under the gloves. ^[17] There are no published guidelines for type of gloves to be used during dental procedures. Most of the dental professionals choose the gloves depending upon the availability, cost, comfort and their preference. ^[18] Research have shown that the different types of gloves have different levels of performance, protection and effectiveness. ^[19-23]

India is the second most populated country in the world with nearly a fifth of the world's population. According to the 2019 revision of the World Population Prospects population stood at 1,369,330,900. ^[24] The socio-cultural ethos in India and its varying standards of healthcare pose unique challenges to the application of universal ethical principles to biomedical and health research. Indian Council of Medical Research (ICMR) brought out the 'Policy Statement on Ethical Considerations Involved in Research on Human Subjects' in 1980. These guidelines were revised in 2000 as the 'Ethical Guidelines for Biomedical Research on Human Subjects'. In view of the new developments in the field of science and technology, another revision was carried out as Ethical Guidelines for Biomedical Research on Human Participants in 2006. The last decade has seen emerging ethical issues necessitating further revision of the earlier guidelines and preparation of the current National Ethical Guidelines for Biomedical and Health Research Involving Human Participants, 2017. The new guidelines have many new sections added up and many changes incorporated in the existing sections. There are now a total of 12 sections including Responsible

Conduct of Research, Informed Consent Process, Vulnerability, Public Health Research, Social and Behavioural Sciences Research for Health, Biological materials, Biobanking and Datasets and Research during Humanitarian Emergencies and Disasters. ^[25] There are over 290 dental institutes in India training 6228 post graduate and 26, 949 undergraduates. ^[26] The dental institutes have the responsibility to educate and train the future dentists regarding infection control methods. Though knowledge regarding infection control, hand hygiene and cross infection is given to the dental students, very few practice it.

Considering this the study was conducted among the undergraduate and post graduate students in Aurangabad city, Western India, with the following aims and objectives:

- 1) To evaluate the awareness and beliefs regarding infection and infection control in dental clinics.
- 2) To evaluate the knowledge regarding hand hygiene
- 3) To evaluate the knowledge and awareness regarding gloves as means of personal protection equipment.

Material and method

Recruitment of Participant and Ethical Approval:

Before the onset of the study approval was obtained from Government Dental College review board (ECR/Inst/684/2014/RR-17). The study was conducted in full accordance with current National Ethical Guidelines for Biomedical and Health Research Involving Human Participants, 2017. The participation in the study was voluntary and written consent was obtained from them. All subjects participated after written and verbal informed consent, in accordance with local ethics committee standards and the revised Helsinki declaration(2013). ^[18]

Study Sample: This study was a cross sectional study, conducted in the Government Dental College and Hospital, Aurangabad, Western India. The duration of the

study was from June to July 2019. The participants of the study were undergraduate (third year, final year and interns) and postgraduate students. The first and second year students were excluded from the study as they had not yet begun their clinical training.

Selection criteria: The inclusion criteria were: 1) The undergraduate (third year, final year and interns) and postgraduate students studying in the institute. 2) Voluntary students willing to give informed consent.

The exclusion criteria were: 1) The undergraduate (first and second year) students studying in the institute. 2) Involuntary students.

Sample Size: 133 undergraduate students (45 third year, 42 final year and 46 interns) and 51 postgraduate students participated in the study. Total 184 students participated in the study.

Questionnaire: A validated questionnaire of 44 questions related to hand hygiene, gloves and infection control in dental hospital was prepared. The questionnaire was structured, close ended and designed in English language. There were four sections of the questionnaire. The first section covered the demographic profile including details regarding age, sex, and education. Section two had 8 questions regarding awareness and beliefs regarding infection and infection control in dental clinics. Section three had 14 questions regarding knowledge regarding hand hygiene. Section four had 22 questions about awareness and knowledge about gloves.

Reliability and Validity of Study: The reliability and validity of the survey was tested prior to its administration. The validity of the content was analyzed and assessed by researchers familiar with research methodology. After necessary corrections the questionnaire was tested on students of the institute to evaluate the comprehensibility and accessibility. Forty volunteers participated in the preliminary survey. They

were able to comprehend the questionnaire of the survey without any difficulty. The questionnaire was tested on the same group after a period of one month to test the reliability and consistency of answers. This pilot test obtained 95% reliability. Cronbach's alpha internal consistency coefficient assessed the validity of the questionnaire. The sectional variability was compared using Chi-square test. Mean of knowledge and awareness was compared using Analysis of variance (ANOVA). The statistical analysis of data was done using SPSS Statistics Version 25.

Results

Total 184 students (80 male and 104 female) participated in the study. 133 were undergraduate students (45 third year, 42 final year and 46 interns) and 51 were postgraduate students (Table 1).

Table 1: Distribution of study sample according to gender and academic year

Gender	n (%)			
	Third Year	Final year	Interns	Post Graduates
Male	22 (48.89%)	23 (54.76%)	25 (54.35%)	10 (19.61%)
Female	23 (51.11%)	19 (45.24%)	21 (45.65%)	41 (80.39%)
Total	45 (100%)	42 (100%)	46 (100%)	51 (100%)

The first objective of this study was to assess the awareness and beliefs regarding infection and infection control in dental clinics among the undergraduate and the post graduate students. Table 2 shows that most of the students had basic knowledge about infection and modes of transmission of the infection. Around 95-98% of students were aware that saliva and blood can be the mode of transmission of infection. 96% undergraduate and all the post graduates believed that infections like AIDS, Hepatitis and herpes can be transmitted to the dentist during dental treatment.

Table 2: Awareness and beliefs regarding infection and infection control in dental clinics

S.No.	Question	Answer	Academic Year			
			Third Year n(%)	Final year n(%)	Interns n(%)	Post Graduates n(%)
1	Do you understand the significance and meaning of infection?	Yes	40(88.89)	40(95.24)	41(89.13)	51(100)
		No	5(11.11)	2(4.76)	5(10.87)	0(0)
2	Are you aware about the protocol for infection control?	Yes	30(66.67)	31(73.80)	35(76.09)	42(82.35)
		No	15(33.33)	11(26.20)	11(23.91)	9(7.65)
3	Do you believe that harmful germs can be transmitted between patients by unclean hand of dentist?	Yes	30(66.67)	32(76.19)	36(78.26)	44(86.27)
		No	3(6.66)	2(4.76)	0	0
		I don't know	12(26.67)	8(19.05)	10(21.74)	7(13.73)
4	Do you believe that harmful germs can be transmitted from the patients to the dentist?	Yes	40(88.89)	41(97.62)	43(93.48)	50(8.04)
		No	0	0	0	0
		I don't know	5(11.11)	1(2.38)	3(6.52)	1(1.96)
5	Do you believe that saliva can be a mode of transmission for infection?	Yes	42(93.33)	40(95.24)	44(95.65)	49(96.08)
		No	0	0	0	0
		I don't know	3(6.67)	2(4.76)	2(4.35)	3(3.92)
6	Do you believe that blood can be a mode of transmission for infection?	Yes	43(95.56)	41(97.62)	45(97.83)	50(98.04)
		No	0	0	0	0
		I don't know	3(4.44)	1(2.38)	1(2.17)	1(1.96)
7	Do you believe that harmful germs can be transmitted from the patients to the dentist?	Yes	40(88.89)	40(95.24)	44(95.66)	51(100)
		No	2(4.44)	1(2.38)	1(2.17)	0
		I don't know	3(6.67)	1(2.38)	1(2.17)	0
8	Do you believe that infections like AIDS, Hepatitis and herpes can be transmitted to the dentist during dental treatment?	Yes	43(95.56)	41(97.62)	46(100)	51(100)
		No	1(2.22)	0	0	0
		I don't know	1(2.22)	12.38)	0	0

the difference between these . Similar percentages of respondents in each group were not aware the effectiveness of either hand rubbing or hand scrubbing. 62.22% third year, 61.90% final year ,60.87% interns and 57.90% post graduate believed that appropriate duration for hand rubbing was more than 5 minutes. 62.22% third year students did not know that finger rings and nail polish can act as potential reservoir for germs. More than 50% students used soap and water for maintenance of hand hygiene. Though majority (73.25%) of students washes their hand before touching the patient ,only 22.67% washed their hands after touching the patient surroundings These responses showed that only a small percentage of respondents in each group knew correctly the hand hygiene protocol and majority of them did not follow it.

Table 3: Knowledge and awareness regarding hand hygiene

S.No.	Question	Answer	Academic Year			
			Third Year n(%)	Final year n(%)	Interns n(%)	Post Graduates n(%)
1	Do you feel that hand hygiene is important?	Yes	44(97.78)	42(100)	46(100)	51(100)
		No	1(2.22)	0	0	0
2	Are you aware about the CDC guideline for hand hygiene?	Yes	15(33.33)	18(42.86)	20(43.49)	26(50.98)
		No	30(66.64)	24(57.14)	26(56.51)	25(49.02)
3	Are you aware about the WHO guideline for hand hygiene?	Yes	11(24.44)	14(33.33)	19(41.30)	28(54.90)
		No	34(75.56)	28(66.67)	27(58.70)	23(45.10)
4	Are you familiar with the terms: Hand washing	Yes	42(93.33)	42(100)	46(100)	51(100)
		No	2(6.67)	0	0	0
	Hand scrubbing	Yes	28(62.22)	26(61.90)	30(65.22)	35(68.63)
		No	17(37.78)	16(38.10)	16(34.78)	16(31.37)
	Hand rubbing	Yes	27(60)	28(66.67)	34(73.91)	40(78.43)
		No	18(40)	14(33.33)	12(26.09)	11(21.57)
5	Are you aware about the difference between the above mentioned terms?	Yes	9(20)	11(26.19)	13(28.26)	21(41.18)
		No	36(80)	31(73.81)	33(71.74)	30(58.82)
6	Do you believe that hand	Yes	8(17.78)	9(21.43)	9(19.57)	16(31.37)
		No	2(4.44)	3(7.14)	3(6.52)	5(9.81)

The second objective of the study was to assess the knowledge and awareness regarding hand hygiene among the undergraduate and the post graduate students (Table 3). Majority of the students felt that hand hygiene is important. Most of the students were unaware about the CDC and WHO guideline for hand hygiene (66.64% third year, 62.70% final year, 58.70% interns and 46% post graduates). Around 95% of undergraduate and the post graduate students were aware about the meaning of hand washing. 60% of them were aware about the term hand scrubbing and hand rubbing. Majority (73%) of undergraduate and 58.82% of post graduate were not aware of

	scrubbing is more effective than hand washing?	I don't know	35(77.78)	30(71.43)	34(73.91)	30(58.82)
7	Do you believe that hand rubbing is more effective than hand scrubbing?	Yes	9(20)	5(11.90)	11(23.91)	17(33.33)
		No	3(6.67)	5(11.90)	4(8.7)	6(11.77)
		I don't know	33(73.33)	32(76.20)	31(67.39)	28(54.90)
8	Do you believe that hand scrubbing is more effective than hand rubbing?	Yes	8(17.78)	8(19.05)	11(23.91)	15(29.41)
		No	5(11.11)	4(9.52)	5(10.87)	6(11.77)
		I don't know	32(71.11)	30(71.43)	30(62.22)	30(58.82)
9	According to you what is the appropriate duration for hand rubbing?	1-2 minutes	6(13.34)	6(14.29)	8(17.39)	10(16.61)
		3-5 minutes	11(24.44)	10(23.81)	10(21.74)	13(15.49)
		more than 5 minutes	28(62.22)	26(61.90)	28(60.87)	28(57.90)
10	According to you what is the appropriate duration for hand washing?	1-2 minutes	6(13.33)	10(23.81)	8(17.39)	10(19.61)
		3-5 minutes	9(20)	8(19.05)	10(21.74)	16(31.37)
		more than 5 minutes	30(66.67)	24(57.14)	28(60.87)	25(49.02)
11	Do you think that finger rings and nail polish can act as potential reservoir for germs?	Yes	11(24.44)	24(57.14)	26(56.52)	29(56.86)
		No	6(13.34)	8(19.05)	10(17.39)	12(23.53)
		I don't know	28(62.22)	10(23.08)	12(26.09)	10(19.61)
12	Do you think that it is necessary to remove finger rings and nail polish prior to hand preparation?	Yes	12(26.67)	20(47.62)	23(50)	31(60.78)
		No	7(15.55)	7(16.67)	10(21.74)	9(17.65)
		I don't know	26(57.78)	15(35.71)	13(28.26)	11(21.57)
13	Which of the following do you use for hand hygiene?	Soap and water	25(55.56)	22(52.38)	20(43.48)	26(50.98)
		antiseptic hand rub	5(11.11)	6(14.29)	9(19.56)	6(11.77)
		both	10(22.22)	14(33.33)	17(36.96)	19(37.25)
		none	0	0	0	0
14	Do you wash hand - before touching a patient?	Yes	34(75.55)	39(92.86)	40(86.96)	48(94.12)
		No	11(24.44)	3(7.14)	6(13.04)	5(5.88)
	Before aseptic procedures?	Yes	39(86.67)	38(90.48)	42(91.30)	50(98.04)
		No	6(13.33)	4(9.52)	4(8.70)	1(1.96)
	After risk of exposure to saliva and blood?	Yes	40(88.89)	42(100)	46(100)	51(100)
		No	5(11.11)	0	0	0

After touching a patient?	Yes	26(57.78)	35(83.33)	39(84.78)	45(88.24)
	No	19(42.22)	7(16.67)	7(15.22)	6(11.76)
After touching the patient surroundings?	Yes	5(11.11)	10(23.80)	12(26.09)	11(21.57)
	No	40(88.89)	32(76.10)	34(73.91)	40(78.43)

The next question probed the awareness and knowledge about gloves (Table 4). High percentage of students was aware that gloves are necessary during patient treatment. Most of them knew the difference between the examination gloves and surgical gloves (74.33%). High percentage of students (93.33% third year, 95.24% final year, 86.96% interns and 82.35% post graduates) did not know the difference between latex, nitrile and vinyl gloves. Only 8-10% of students changed their gloves after each use. Majority of students (88.89% third year, 73.81% final year, 69.57% interns and 88.24% post graduates) changed their gloves only after the gloves were visibly torn. The students were asked for reason for preference of a certain type of glove. The cost of the gloves was most frequently named reason (44.44% third year, 50% final year, 52.17% interns and 58.82% post graduates) followed by the “protection” (33.35% third year, 30.96% final year, 13.04% interns and 11.78% post graduates). Comfort, fit, texture and feel of the gloves were least preferred quality. Only 28.89% third year, 14.29% final year, 17.39% interns and 17.65% post graduates washed their gloves in between patients. Soap bar was most preferred (84.44% third year, 85.72% final year, 86.96% interns and 86.27% post graduates) and antiseptic least preferred mean of disinfecting agent for the gloves (6.67% third year, 4.76% final year, 2.17% interns and 5.88% post graduates). Significantly higher percentages of under graduate and postgraduate students were not aware about double gloving, indicator gloves, coloured gloves, scented gloves, flavoured gloves and textured gloves. Majority of the students preferred smooth gloves with texture present on the entire gloves. This indicates that the respondents were not having knowledge regarding the textured gloves.

Table 4: Awareness and knowledge about gloves

S.No.	Question	Answer	Academic Year			
			Third Year n(%)	Final year n(%)	Interns n(%)	Post Graduates n(%)
1	Do you think gloves are necessary during patient treatment?	Yes	43(95.56)	42(100)	46(100)	51(100)
		No	2(4.44)	0	0	0
2	Do you know the difference between the examination gloves and surgical gloves?	Yes	25(55.56)	28(66.67)	30(62.22)	42(82.35)
		No	20(44.44)	14(33.33)	16(37.78)	9(17.65)
3	Do you know the difference between latex, nitrile and vinyl gloves?	Yes	3(6.67)	2(4.76)	6(13.04)	9(17.65)
		No	42(93.33)	40(95.24)	40(86.96)	42(82.35)
4	Which glove you would prefer while treating patient for dental problem? Latex	Yes	22(48.89)	21(50)	24(52.17)	34(66.67)
	Nitrile	Yes	18(40)	15(35.71)	19(41.30)	12(23.53)
	Vinyl	Yes	5(11.11)	6(14.29)	3(6.52)	5(9.8)
5	Do you change gloves after each use?	Yes	5(11.11)	2(4.76)	4(8.70)	5(9.80)
		No	40(88.89)	40(95.24)	42(91.30)	46(90.20)
6	You change gloves after- Each Patient	Yes	0	5(11.11)	2(4.44)	2(4.44)
	Don't Change	Yes	5(11.11)	6(26.19)	12(30.43)	4(11.76)
	Change only after torn	Yes	40(88.89)	31(73.81)	32(69.57)	45(88.24)
7	You prefer gloves according to its: Fit	Yes	2(4.44)	3(7.14)	4(8.7)	5(9.8)
	Comfort	Yes	2(4.44)	2(4.76)	4(8.7)	2(3.92)
	Protection	Yes	15(33.35)	13(30.96)	6(13.04)	6(11.78)
	Cost	Yes	20(44.44)	21(50)	24(52.17)	30(58.82)
	Texture	Yes	2(4.44)	1(2.38)	3(6.52)	2(3.92)
	Feel	Yes	4(8.89)	2(4.76)	5(10.87)	6(11.76)
8	Do you wash gloves in	Yes	32(77.11)	36(85.71)	38(82.61)	42(82.35)
		No	13(28.89)	6(14.29)	8(17.39)	9(17.65)

	between patients? Yes/no					
9	You wash gloves with- Soap Bar	Yes	38(84.44)	36(85.72)	40(86.96)	44(86.27)
	Antiseptic Solution	Yes	3(6.67)	2(4.76)	1(2.17)	3(5.88)
	Sanitizer	Yes	4(8.89)	4(9.52)	5(10.87)	4(7.84)
10	Are you aware about double gloving?	Yes	3(6.67)	2(4.76)	6(13.04)	6(11.76)
		No	42(93.33)	40(95.24)	40(86.96)	45(88.24)
11	Are you aware about the indicator gloves?	Yes	0	1(2.38)	10(21.74)	15(29.41)
		No	45(100)	41(97.62)	36(78.26)	36(70.59)
12	Are you aware about the coloured gloves?	Yes	2(4.44)	4(9.52)	12(26.09)	30(58.82)
		No	43(95.56)	38(90.48)	34(73.91)	21(41.18)
13	Are you aware about scented gloves?	Yes	0	1(2.38)	11(23.91)	16(31.37)
		No	45(100)	41(97.62)	35(76.09)	35(68.63)
14	Are you aware about flavoured gloves?	Yes	0	1(2.38)	11(23.91)	16(31.37)
		No	45(100)	41(97.62)	35(76.09)	35(68.63)
15	Are you aware about the textured gloves?	Yes	2(4.44)	3(7.14)	14(30.43)	25(39.22)
		No	43(95.56)	39(92.86)	32(69.57)	31(60.78)
16	Which texture would you prefer in gloves? Smooth	Yes	43(95.56)	36(85.71)	25(54.35)	29(56.86)
	Micro Roughened	Yes	2(4.44)	5(11.90)	13(28.26)	20(39.22)
	Aggressively Textured	Yes	0	1(2.39)	8(17.39)	2(3.92)
17	Which area on the gloves would you prefer the texture? Palm	Yes	4(9.52)	10(22.22)	10(21.74)	10(19.6)
	Finger	Yes	8(19.05)	14(31.11)	8(17.39)	21(41.18)
	Full Gloves	Yes	30(71.43)	21(46.67)	28(60.87)	20(39.22)
18	Do you prefer powdered gloves?	Yes	30(71.43)	28(62.22)	30(62.22)	36(70.59)
		No	4(9.52)	14(31.11)	10(21.74)	5(9.80)
		I don't know	8(19.05)	10(22.22)	6(13.04)	10(19.61)
19	Do you believe that there is no difference in protection provided by	Yes	18(42.86)	28(62.22)	30(62.22)	25(49.12)
		No	2(4.76)	14(31.11)	6(13.04)	16(31.37)
		I don't know	22(52.38)	10(22.22)	10(21.74)	10(19.61)

	different gloves?						
20	Do you think that washing hands replace the need to wear glove?	Yes	2(4.76)	29(64.44)	34(73.91)	45(88.24)	
		No	30(71.43)	7(15.56)	5(10.87)	4(7.84)	
		I don't know	10(23.81)	9(20)	7(15.22)	2(3.92)	
21	Do you believe that glove provide 100% protection?	Yes	30(71.43)	29(64.44)	34(73.91)	45(88.24)	
		No	2(4.76)	7(15.56)	5(10.87)	4(7.84)	
		I don't know	10(23.81)	9(20)	7(15.22)	2(3.92)	
22	According to you gloves provide adequate protection for-0-30 minutes	Yes	7(16.67)	5(11.11)	10(21.74)	20(39.22)	
		30min-1 Hour	Yes	7(16.67)	10(22.22)	5(10.89)	10(19.61)
		More Than 1 Hour	Yes	10(23.80)	11(24.44)	12(26.09)	6(11.76)
		Till Visible Tear	Yes	12(28.57)	14(31.12)	15(32.61)	13(25.49)
		I Don't Know	Yes	6(14.29)	5(11.11)	4(8.67)	2(3.92)

The knowledge regarding the duration for which the gloves provide protection against the transmission of disease was also evaluated. A significant percentage of the students believed that the gloves provided complete protection (71.43% third year, 64.44% final year, 73.91% interns and 88.24% post graduates). A substantial percentage of students (28.57% third year, 31.12% final year, 32.61% interns and 25.49% post graduates) believed that gloves protect them as long as there is no visible tear.

Discussion

Dental health professionals are at high risk of infection and cross-contamination by blood-borne pathogens, as they are dealing with saliva and blood. The dental students are at high risk of cross infection and contamination if they don't have sufficient knowledge, training and education. [27,28] The aim of this study was to evaluate awareness and beliefs regarding infection control, hand hygiene and gloves as tools of personal protection among the undergraduate and post graduate students dental student in Aurangabad city of Western India.

The data convincingly showed that the absolute majority (98%) of the students had the basic knowledge regarding infection and modes of its transmission which is higher than previous reported studies among Indian students. [29] Although 96.8% students felt the importance of hand hygiene majority of them were unaware about the WHO and CDC guidelines for hand hygiene. A significant percentage of the students did not know the difference between hand scrubbing and hand washing. 66.67 percentage of third year under graduate students believed that more than five minutes was the appropriate duration of hand washing as compared to 49.02 percent post graduate students. It is taught and regularly advised to remove the figure rings and nail polish prior to the hand preparation to prevent the transmission of infection from one patient to another or to the providing health-care professional. Only 50% of the under graduate and postgraduate students practiced it. Soap was found to be the preferred means of maintaining hand hygiene (56%) followed by both soap and antiseptic hand rub (35%). these results are better as compared to previous studies where only 9-14% students use antiseptic hand rub. Around 75.34% students were aware about the fact that the hands are considered to be the most infectious part of the body with infectious agents being trapped under finger nails, only 11-21% students washed their hands after touching the patient. This percentage was far below the previous studies conducted on Indian dental students. [30, 31, 32]

The study convincingly showed that the absolute majority of students (96.4 percent of the third year and 100 percent of the all the remaining students) clearly believed that gloves are necessary during patient treatment. The knowledge and preference regarding different types of gloves was more among the senior students (94.3%). This could be due to the performance of

complicated and skilled dental treatments. This result was similar to studies previously conducted. [18, 33, 34]

The students did not change their gloves after each use. Majority of them (88.65%) changed them only after a visible tear. This study also found that cost of the gloves (54.32%) was the major factor determining the preference for selection of gloves. These results are different from previous studies where comfort and protection of the gloves were major factors determining the preference for selection of gloves. [18, 29, 33] These findings might be related to the fact that dental students attending the Government Institute Aurangabad, came from poor socioeconomic background. The level of knowledge regarding the types of the gloves was not sufficient. The students were not having knowledge about double gloves, indicator gloves, scented gloves, coloured gloves and flavoured gloves.

The studies of literature regarding the gloves consistently supports the evidence that glove type, length of time, and type of procedure impact the quality of barrier protection offered by the gloves. [35,36] Again, it is noteworthy that substantial percentages of under graduate students (74.36 percent), and post graduate students (88.24 percent) believed that gloves would provide them hundred percent protection. Concerning the amount of time their gloves would protect them 29.15percent believed it to be till the visible tear in the gloves. These answers should raise serious concerns about the students understanding of infection control, especially of how to protect themselves and their patients from the transmission of communicable infectious diseases.

To summarize, the results of this study indicate that thought the students have theoretical knowledge of infection and infection control there is a lack of understanding of the basics of infection control, hand hygiene and the knowledge about gloves in large

percentages of undergraduate and post graduate dental students who responded to this survey.

Conclusion

Improved educational efforts should be made to improve students' awareness, skills, knowledge and its practical application in order to allow them to engage in optimal professional behaviour.

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