

COMPLIANCE OF INFECTION CONTROL PROTOCOL AMONG DENTISTS IN TRIVANDRUM CITY, KERALA, INDIA

Simy Mathew, Alexander M Luke

College of Dentistry, Ajman University, United Arab Emirates

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Corresponding author: Simy Mathew

e-mail: s.mathew@ajman.ac.ae

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ABSTRACT:

Aim: Dentists are at a risk of transmitting infectious diseases in a dental setting, which may be transferred from the patient to dentist, dentist to patient or from patient to patient. There is risk of transmission of infectious agents via cross contamination through dental procedures. To assess the compliance to infection control protocol and assess the knowledge of infectious diseases among dentists in Trivandrum city. A descriptive cross sectional study was carried out among the dentists in Trivandrum city.

Materials and Methods: One hundred and seventy four dentists (males 56.7%), who were members of the Indian Dental Association, Trivandrum Branch (80% of total dentists), were given self-administered questionnaires. Analysis was done using SPSS version 14.

Results: None of the respondents had 100% compliance to all infection control procedure. The mean score of compliance was 84.7/115 (86.3 - females and 83.5 - males, Range: 58-107). Mean score of knowledge of infectious diseases was 23.7/30 (23.6 - males and 23.8 - females) 93% compliance with standard protocol was the maximum reported (2 dentists). Experience of more than 30 yrs and presence of a dental assistant was significantly associated with higher compliance to infection control protocol.

Conclusion: Being a dental college faculty, working in the private sector and awareness of standard protocol were significantly associated with Knowledge of infectious diseases. Compliance was positively correlated to knowledge. It is imperative from the study that dentists require more training and continuing dental education in infection control.

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سيمى ماثيو

البريد الإلكتروني: s.mathew@ajman.ac.ae

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الامتثال، أطباء الأسنان، بروتوكول التحكم في العدوى، الأمراض المعدية

الملخص العربي:

الامتثال لبروتوكول التحكم في العدوى بين أطباء الأسنان في تريفاندرم، كيرالا، الهند

سيمى ماثيو، أليكسندر لوك

كلية طب الأسنان، جامعة عجمان، الإمارات العربية المتحدة

الهدف: أطباء الأسنان أكثر عرضة لخطر انتقال الأمراض المعدية أثناء علاجهم للمرضى، والتي يمكن نقلها من المريض إلى طبيب الأسنان، أو من طبيب الأسنان للمريض أو من مريض لآخر. هناك خطر انتقال العوامل المعدية عن طريق التلوث من خلال الإجراءات العلاجية. لتقييم الامتثال لبروتوكولات مكافحة العدوى وتقييم معرفة الأمراض المعدية بين أطباء الأسنان في مدينة تريفاندرم الهندية.

المواد والطرق: أجريت هذه الدراسة المقطعية الوصفية لعينة من بين أطباء الأسنان في المدينة وذلك بمشاركة 174 من أطباء الأسنان، الذين كانوا أعضاء في (80% من إجمالي أطباء الأسنان المسجلون بنقابة أطباء الأسنان الهندية، فرع تريفاندرم). قدمت الاستبيانات ذاتياً، وقد تم تحليل الردود باستخدام SPSS النسخة 14.

النتائج: لا أحد من أفراد العينة أظهر الامتثال التام بجميع إجراءات مكافحة العدوى. وكان معدل متوسط الامتثال 84.7 / 115 (86.3 - إناث و 83.5 - الذكور، المدى: 58-107). وكانت درجة من معرفة الأمراض المعدية 23.7 / 30 (23.6 - الذكور والإناث 23.8).

الخلاصة: ارتبط الامتثال بخبرة أطباء الأسنان (أكثر من 30 عاماً) وبوجود مساعد طب الأسنان بشكل كبير في حين ارتبط الوعي بالبروتوكول القياسي والمعرفة بالأمراض المعدية بشكل كبير بكون المشارك عضو هيئة التدريس بأحدى كليات طب الأسنان، أو بالعمل في القطاع الخاص. وأخيراً ارتبط الامتثال بشكل إيجابي بالمعرفة. توصي الدراسة بأن أطباء الأسنان بحاجة للمزيد من التدريب والتعليم المستمر الأسنان في مكافحة العدوى.

INTRODUCTION

Infection control is an important part in the practice of health professionals.¹ Dentists are at a risk of transmitting infectious diseases in a dental setting, which may be transferred from the patient to dentist, dentist to patient or from patient to patient.² There is risk of transmission of infectious agents via cross contamination through dental procedures. Transmission of microorganisms can occur in the dental settings through contact with blood or other body fluids, contaminated objects, an infected person or inhalation of airborne microorganisms.³

Percutaneous injuries in the dental office are one of the main risk factors for the transmission of diseases like Hepatitis B (HBV), Hepatitis C (HCV) and Human Immunodeficiency virus (HIV).^{4,5} A study among dental professionals in Washington revealed that the injuries were mainly related with cleaning of instruments, recapping needles and administering of local anesthesia.⁶ A review of literature by John A. Molinari⁷ has concluded that dentists are at higher risk of certain infectious diseases in comparison with the general population; and that the modified infection control protocol recommended by CDC in 2003 would reduce the risk of transmission of infectious diseases in the dental scenario. Cross infection can be described as the transmission of infectious agents between the patients and the staff in a clinical environment.²

The infection control scenario in India has not been one to show a consistent level of compliance. The various literature suggests that dental personnel and the dental students are not aware of a laid down protocol for infection control.⁸ Although there have been clear protocol from the Western countries,² the Indian dental fraternity is far behind in terms of compliance to these policies.⁸ Literature suggests that training for dental personnel in infection control has to be undertaken as mandatory in order to attain effective compliance to infection control procedures.⁹ The need for infection control in health care is a globally accepted fact. With the advent of the number of infectious diseases, the need for infection control in the dental setting has become very necessary.

In light of the limited studies in India on general dental practitioners, and lack of studies in Kerala, this study aims to fill in this critical gap in research by aiming to

study the infection control procedures followed by dentists in Kerala; their compliance to internationally accepted standard guidelines and to understand their knowledge and perceptions with regard to infectious disease transmission in dentistry and infection control procedures. The objectives of this research were :

- To assess level of compliance with infection control protocol among dentists in Trivandrum city and factors associated with it.
- To evaluate the knowledge of dentists with respect to infection control and factors associated with it.
- To assess knowledge among dentists of risks of transmission of diseases like HIV, Hepatitis, Herpes etc.

MATERIALS AND METHODS

Ethical approval was obtained from Research Ethics Committee of Sree Chithra Tirunal Institute of Medical Sciences and Technology, Trivandrum, Kerala. This was a cross sectional descriptive survey, which documented the practices, knowledge and compliance of dentists, in accordance with the guidelines prescribed by the Center for Disease Control, Atlanta in the Morbidity and Mortality Weekly Report, May 28, 1993/42, and updated further in the Morbidity and Mortality weekly Report, December 19, 2003 / 52(RR17);1-61. The cross sectional study was done among the dentists in Trivandrum city. The sampling frame included all those dentists (BDS or MDS) who were working in Trivandrum city. Only those registered with the Indian Dental Association, Trivandrum branch were included in the study. Dental graduates either with or without post graduate training who are registered with the IDA, Trivandrum branch and are willing to participate were the study objects. This included private practitioners, employees of dental clinics and hospitals and dental college faculty. Dentists were deemed to be compliant with infection control protocol if they carried out all of the procedures listed in Table 1.

The responses were 'never', rarely', 'sometimes', 'often' and 'routinely' were scored as '1', '2', '3', '4' and '5' respectively. Dichotomous responses like 'Yes' and 'No' were scored as '1' and '0' respectively. Knowledge was also scored similarly. Scores were

categorized as compliant for responses '4' and '5', while the rest were considered as non compliant; for the ease of analysis.

The data were entered into Epi Data Version 3.1 and exported to SPSS. The data were then cleaned, coded and analyzed using SPSS for windows version 18.

Table 1: Infection Control protocol to complied to.

<ul style="list-style-type: none"> • Immunized against Hepatitis B, • Wore gloves, • Washed hands before gloving. • Wore gloves routinely • Changed gloves between patients, • Wore mouth masks routinely • Changed masks between patients • Wore apron routinely, • Changed apron routinely, • Wore protective eyewear routinely, • Recapped used needles, • Used single handed technique to recap needles, • Disposed used sharps in special containers, 	<ul style="list-style-type: none"> • Have a separate area for sterilization procedures, • Performed surface disinfection between patients • Disinfected impressions before sending them to the laboratory • Disinfected soiled instruments before sterilizing • Sterilizing surgical instruments endodontic instruments, air rotor/micro motor, • Use of anti retraction valves • Changing water daily, • Use of drinking water in the dental chair • Removing rings, watches and bangles before beginning treatment • Use of pre procedural mouthwash • Use of rubber dams, • Changing of prophylaxis cups and brushes, tips for high speed evacuators, saliva ejectors, air/water syringes between patients.
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Dentists were deemed non-compliant if they did not adhere to any of the above procedures.

RESULTS

Participant characteristics

Out of the 174 dentists selected, 171(98.3%) responded. The participants consisted of 97(56.7%) males and 74(43.3%) females. The age of the sample dentists ranged from 23 to 66 years (Mean 33.51 yrs, Standard deviation = 8.22). The mean age for males was 34.35 yrs and 32.41 yrs for females. There were 91 dentists (53.2%) without postgraduate training and 80 dentists (46.8%) who had completed postgraduate training. 55% of the total sample had undergone undergraduate training in private institutions, while only 45% studied in government institutions. The number of patients attended to in a day ranged from 2 to 100 patients (Mean = 11.57, Standard deviation = 12.38). The number of years of practice ranged from 1 to 43 years (Mean = 7.74, Standard Deviation = 7.27). The dentists in the sample worked over a range of 2 to 10

hours per day (Mean = 6.43, Standard Deviation = 1.91). The number of dental assistants for each dentist ranged from nil to 11 (Mean = 1.49, Standard deviation = 1.6). The demographic characteristics of the sample are presented in Table 2.

Compliance to Infection Control Protocol

The percentage of the participants who complied with the infection control protocol is described in Table 3.

Personal Protective Equipment

The use of gloves and mouth masks were reported more frequently than protective eyewear and apron/coat 70.2 % (120 dentists) reported to use disposable gloves, 14 % (24 dentists) used sterile surgical gloves and 15.8%(27 dentists) used both disposable and sterile surgical gloves depending on the case. Thirty-nine dentists (22.8%) reported to use soap for washing

Table 2: Demographic characteristics.

Variable	No (%) of participants
Age	
23 to 35 years	67.3%
36 to 45 years	25.7%
45 and above	7.0%
Sex	
Male	56.7%
Female	43.3%
Qualification	
General Dentist	53.2%
Specialist	46.8%
Occupation	
Private practice	32.2%
Government Dental College Faculty	31.6%
Private Dental College Faculty	19.3%
Private Hospital	14%
Public Hospital	2.9%
Type of college in which general dentistry was completed	
Private	55%
Government	45%
Type of college in which specialization was completed	
Private	26.3%
Government	73.8%
Field of Specialization	
General Dentistry	39.8%
Endodontics	15.2%
Prosthodontics	9.9%
Orthodontics	8.2%
Oral Surgery	8.2%
Pedodontics	7.0%
Periodontics	4.7%
Oral Pathology	2.3%
Oral Medicine and Radiology	3.5%
Community/Public Health Dentistry	1.2%
No. of hours working per day	
1 to 3 hours	7.0%
4 to 6 hours	45.6%
More than 7 hours	47.4%
Average no. of patients per day	
1 to 10	69.6%
11 to 20	23.4%
More than 20	7.0%
No. of years in practice	
1 to 10 years	49.1%
11 to 20 years	24.0
21 to 30 years	15.8
More than 30 years	11.1
No. of dental assistants	
Nil	26.9
1 to 5	70.2
More than 5	2.9

Table 3: Infection Control Protocol

Infection Control Procedure	No of participants who followed the procedure (%)
Vaccination against Hepatitis B	90.1%*
No	9.9%
One dose	2.9%
Two doses	10.5%
Three doses	76.6%
(* includes those having taken vaccination regardless of completion)	
PERSONAL PROTECTIVE EQUIPMENT	
Gloves	
Routinely washing hands before gloving	71.9%
Wearing Routinely	98.8%
Changing between patients routinely	94.2%
Mouth masks	
Wearing Routinely	98.2%
Changing between patients routinely	29.2%
Apron/Coat	
Wearing routinely	60.8%
Changing regularly	19.9%
Using protective eyewear routinely	25.7%
NEEDLE SAFETY	
Needle recap	93.6%
Single handed recap technique	67.3%
Special container for disposal of sharps	31%
STERILISATION AND DISINFECTION	
Separate area for sterilization	87.1%
Surface Disinfection routinely	64.9%
Disinfection of impressions	42.1%
Disinfection of soiled instruments	100%
Surgical Instruments	
Autoclaving	87.1%
Endodontic Instruments	
Glass bead sterilizer	47.4%
Autoclaving	28.1%
Airrotor/Micromotor	
Sterilize between patients	54.4%
Autoclaving	31.6%
WATER QUALITY	
Use of Antiretraction valves	15.8%
Changing water daily	58.5%
Use of drinking water	28.1%
SPECIAL CONSIDERATIONS	
Remove rings/watches/bangles	68.4%
Use of pre procedural mouthwash	25.1%
Use of rubber dams	2.3%
Change for each patient	
Prophylaxis cups and brushes	84.8%
Tips for high speed evacuators	88.9%
Saliva ejectors	90.6%
Air/Water syringes	40.9%

of hands before donning gloves, 111 dentists (64.1%) used disinfecting solution and 20 dentists (11.7%) used both soap and disinfecting solution. Two dentists reported that they never changed gloves between patients. Four dentists reported that they used the same pair of gloves for patients attended to in a session and that the gloves were changed only at the end of each session (2 pairs of gloves a day). Twelve dentists reported that they do not use apron/coat while treating patients. Thirty dentists never used protective eyewear during dental procedures.

Sterilization and Disinfection

One hundred and forty nine dentists (87.1%) reported the presence of a separate area for sterilization procedures. One hundred and fifty seven dentists (91.8%) regularly asked the patients about their medical history before commencement of treatment, while 14 dentists (8.2%) did so only if they doubted the medical status of the patient.

Surface disinfection was done routinely by 64.9% (111 dentists). Only one dentist reported of not following surface disinfection procedures. Alcohol was the most frequently used surface disinfectant (60.8%), followed by ammonium compounds (15.2%), phenolics (10.5%), sodium hypochlorite (7.6%) and iodophors (5.8%).

Autoclaving of surgical instruments was reported by 87.1%, while 17% used boiling water and 3% used other methods. For the sterilization of endodontic files, glass bead sterilizer was used by 47.4% and autoclave by 28.1%. Alcohol was most commonly used to sterilize the rotary instruments between patients (52%) while autoclaving was followed by 31.6%. Only 54.4% of dentists sterilized the rotary instruments between patients.

Needle Safety

One hundred and sixty nine dentists (98.8%) used single use disposable syringes. Ten dentists (5.8%) did not recap the needle after administering local anesthesia. One hundred dentists (58.5%) reported having experienced needle injury in their

practice. Of these, 55% have experienced needle injury once, 20% twice, 7% thrice and 12% more than thrice in the past year. Six percent reported to have experienced needle injury in previous years of practice.

Water Safety

Eighty-eight dentists (51.5%) reported that they were aware of anti retraction valves but only 27 dentists (15.8%) used them in their practice. Only 48 dentists (28.1%) reported the use of potable water in the dental unit, while 15.2% used the corporation water and 56.7% used water stored in tanks.

Special Considerations

Eleven dentists (6.4%) never removed their watches/rings/bangles before commencing treatment procedure. Before dental treatment, 9.4% never used pre procedural mouthwash. 52.6% never used rubber dams in their practice.

Knowledge of Standard Infection Control Protocol

Only 29.2 % (50 dentists) reported having knowledge of any standard infection control protocol. 2.3% reported to know of the CDC protocol, 9.4% knew of the OSHA protocol, 7% were aware of both the CDC and OSHA protocol and 9.4% knew of other protocol.

Table 4 and 5 show the knowledge of standard infection control protocol. The mean score of compliance in the sample was 84.7 (Range 58 to 107). Mean score of compliance among males and females was 83.5 and 86.2 respectively. The mean score of compliance among general dentists and specialists was 86.4 and 82.9. Since scoring was done to assess the level of compliance and a wide range was obtained, tests for normality were done. This gave a 'p' value of 0.514 (Shapiro- Wilk), which is statistically insignificant. Therefore, it was concluded that the distributions were not different from the normal distribution and parametric tests assuming normality were performed to test association of variables with compliance. No dentist in the sample was completely compliant with all the procedures of infection control as per the CDC guidelines. The maximum score of compliance obtained was 107 out of 115 (2 dentists, 93% compliance).

Table 4: Bivariate Analysis: Demographic factors and compliance with Infection control protocol

Variable	Total (n=171)	Compliance (mean score)	t test p value
Sex			
Male	97	83.5	0.05
Female	74	86.3	
Qualification			
General Dentistry	91	86.3	0.018
Specialty Dentistry	80	82.8	
Type of college in which General Dentistry was completed			
Private	94	86.2	0.027
Government	77	82.9	
Type of college in which specialization was completed			
Private	21	87.3	0.024
Government	59	81.3	
Type of practice			
General practice	68	87.8	0.001
Specialty practice	103	82.7	
Employment sector			
Private sector	112	86	0.017
Government sector	59	82.3	
College faculty versus private practice			
Dental college faculty	84	87.5	0.000
Private practice	87	82.0	

Table 5: Bivariate Analysis: Demographic Factors and Compliance with Infection Control Protocol

Variable	Total (n=171)	Compliance (mean score)	ANOVA p value
No. of patients			
Less than 10	119	83.9	0.176(not significant)
11 to 25	43	86.2	
More than 25	9	88.8	
No. of hours working per day			
Less than 5 hrs	33	81.4	0.05
5 to 8 hrs	121	85.2	
More than 8 hrs	17	87.8	
Years of experience			
1 to 10 yrs	125	83	0.002
11 to 20 yrs	37	89.4	
21 to 30 yrs	5	89.2	
More than 30 yrs	4	89	
Number of dental assistants			
No assistants	46	78.8	0.000
1 to 5 assistants	120	86.7	
More than 5 assistants	5	91.4	
Age groups			
Up to 35 yrs	114	83.6	0.074(not significant)
36 to 45 yrs	44	86.8	
More than 45 yrs	12	88.5	
Patient load(no. of patients per hour)			
1 patient	62	83.5	0.432(not significant)
2 to 3 patients	87	85.6	
More than 3 patients	22	84.6	

Correlation was performed between the variables 'compliance' and 'knowledge'. They were found to be positively correlated (Spearman Rho Rank correlation coefficient = 0.20, $p = 0.009$). Therefore, it can be concluded that compliance improved if knowledge was increased.

Multivariate analysis (logistic regression)

The knowledge score was dichotomized using 75th percentile to be taken as the dependent variable. Multivariate analysis was done using logistic regression. Variables having 'p' value of less than 0.2 were considered for multivariate analysis. The variables included in the logistic regressions were: awareness of standard infection control protocol, employment sector, type of practice and being a dental college faculty versus private practice.

DISCUSSION

In the sample surveyed, none of the dentists complied 100% with all the procedures described in the standard protocol. This may be due to the lack of knowledge among dentists of the standard protocol that is to be followed. Only 50 dentists (29.2%) were aware of the standard infection control protocol. This was much lesser than that reported in Valcea, Romania.¹⁰

Almost all the dentists in used gloves and mouth masks routinely (99% and 98% respectively). This is much higher than that reported in Pakistan¹¹ and similar to studies performed in Canada¹² and Italy.¹³ Changing of gloves between patients (94%) was practiced more often in this study than in Haryana.¹⁴ Changing of mouth masks for each patient was routinely practiced by only 30% of dentists. This was much lower than the Canadian¹² and Jordanian¹⁵ studies. More than half of the dentists used apron on regular practice, which was in tandem with the Jordanian study.¹⁵ Routine use of eyewear was reported by 26%, which was higher than that in Sudan¹⁶ and Haryana.¹⁴

More than 90% of dentists recapped needles after use. Of these, more than 65% used single-handed recap technique. Although this was less than that reported in the US Air Force dental clinics, it was higher than that reported in Haryana.¹⁴ Only 31 percent

of dentists used special puncture resistant containers for the disposal of sharps. This was higher than that used in Pakistan.¹¹ Almost all dentists used disposable syringes for administering local anesthesia. This was in par with studies from Malaysia¹⁷ and Haryana.¹⁴

Needle injury was reported by almost 60 percent of the dentists in the past one year, but there was no information regarding post exposure prophylaxis. This was less than that reported in the Romanian study¹⁰ but more than that reported in Durban¹⁸ and South Africa.¹⁹ Three doses of Hepatitis B vaccination was completed by more than 75 percent which was higher than in dentists in Haryana,¹⁴ Pakistan¹¹ and Thailand,²⁰ but much lesser than Canadian¹² and Scottish²¹ dentists were.

Autoclaves were used in more than 85 percent of the practices for the sterilization of dental instruments, which was in tandem with studies from United Kingdom²² and Scotland.²¹ The use of autoclaves among dentists in Trivandrum was considerably higher than that among dentists in Haryana.¹⁴ Almost 60 percent of the dentists reported to sterilize dental impressions before sending to the laboratory, which was similar to that reported in Durban¹⁸ and higher than that reported by dentists in Italy.¹³ Use of rubber dams was reported to be only in 2.3 percent, which was much lesser than that reported in Canada,¹² Western Cape²³ and Durban.¹⁸

Compliance to infection control protocol was higher in the private sector. This was in accordance to literature.²⁰ Dental college faculties were more compliant with infection control protocol. This may be because of the constant exposure of dental college faculty to theory of dental practice and infection control in contrast to those in private practice. Conversely, there was poor compliance among dental school students of the final years of study.²³⁻²⁵

In this study, it was noted that the general practitioners were more compliant with infection control protocol in comparison to specialists. This suggests that postgraduate education does not add to the compliance levels. The data collected shows that the average number of patients for specialists is higher than that for general dentists. Although, the patient load was not significant in this study for compliance, it could be a factor that influenced lower levels of

compliance among specialists. None of the previous studies documented the presence and number of dental assistants. The presence of dental assistants in dental clinics was significantly associated with compliance levels. Dental assistants perform the infection control procedures when they are present. This brings about more regularity in the performance of infection control. Compliance levels were dependent on knowledge levels and as knowledge was higher in the private sector, compliance was higher in private sector. Literature from Chennai opposes this finding, as the knowledge in the private sector dental clinic was inadequate in the sample.²⁶ The lack of compliance in the government sector could be due to the heavy load of patients in government hospitals and dental colleges. In addition, literature suggests that expenditure on infection control creates a gap in compliance to infection control procedures.⁸ As the government sector depends on funding from the government, there could be a lack of infection control materials, which could be the reason for lower compliance levels.

The publication of a protocol for infection control among oral health care workers by the Dental Council of India has emphasized on the priority of compliance to practices to prevent and control contamination and cross infection.²⁷ Yet the role of the national, state and local agencies to ensure the adherence has to be reexamined and reinforced. Therefore, from this study, it is evident that not all infection control procedures are complied with in the dental practice in Trivandrum city.

CONCLUSION

In conclusion, the findings of this study highlight the need for strict adherence to infection control protocol in dentists. Evidence has suggested that infection control procedures can reduce the risk of disease transmission by compliance to standard infection control protocol.

This study shows that there is regularity of compliance to certain procedures like use of personal protective equipment etc., but a gap lays in the use of single use disposable items. The need to incorporate infection control as a mandatory part of dental curriculum has been stressed in this study.

There is need to increase the knowledge among dental professionals on the risks and routes of disease transmission in the dental office. In addition, very few

dentists were aware of the standard protocol to be adhered to in dental practice for infection control. There needs to be standards set by the local, state and national dental associations with regard to standard procedures to be followed.

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