

Methods of Sterilization and Monitoring of Sterilization Across Selected Dental Practices in Karachi, Pakistan

Hina Ahmed

ABSTRACT

Objective: To assess methods of sterilization in dental practices in Karachi and secondly to investigate methods of monitoring sterilization in dental practices in Karachi, Pakistan.

Study Design: Cross-sectional, descriptive study.

Place and Duration of Study: Dental colleges, hospitals and private clinics of Karachi, Pakistan, from January to March 2013.

Methodology: A total of 251 questionnaires were obtained. Descriptive statistics were computed and differences between groups were assessed through chi-square test using Statistical Package for the Social Sciences (SPSS) version 16.0. P-value < 0.05 was taken as statistically significant.

Results: Autoclave, used by 155 (61.8%) dentists was the most common method of sterilization followed by more than one method, 65 (25.9%); dry heat, 24 (9.6%); and cold sterilization, 7 (2.8%). Majority of dentists, 126 (50.1%), never monitored sterilization and those who did monitored mostly monthly. Statistically significant difference was found amongst the three groups of dentists monitoring sterilization ($p=0.09$) and methods of sterilization ($p < 0.01$).

Conclusion: Statistically significant difference was found in infection control practices of specialists, postgraduate trainees and general dentists regarding method of monitoring sterilization with majority of dentists never monitoring sterilization.

Key Words: Cross infection control. Sterilization. Disinfection.

INTRODUCTION

Infection is a major problem for healthcare systems in many countries. In spite of advances in infection control and emphasis placed on standardized infection control procedures in recent years, there is still infection control problem in healthcare centers including dental clinics and hospitals.¹⁻²

Individuals seeking dental care may be healthy or suffering from various infectious diseases or may be carriers of infectious diseases that cannot be easily identified.

Dental health personnel are at high risk of exposure to cross-infection with blood-borne pathogens, such as Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV), *Mycobacterium tuberculosis*, *Streptococci*, and other viruses and bacteria that colonize the oral cavity and the upper respiratory tract.³ Concerns over possible transmission of blood-borne viruses were highlighted in the 1980s following the emergence of HIV and Creutzfeldt-Jacob Disease, which emerged during the mid 1990s.⁴

Centre for Disease Control (CDC) published guidelines for infection control in dental healthcare settings.⁵ These

guidelines include standard precautions which aim to ensure a safe working environment and prevent the potential transmission of occupational and nosocomial infections among dental healthcare professionals and their patients.

Although several recommendations and guidelines are issued by medical and dental societies as well as governmental organizations, studies demonstrate that infection is not well-controlled in the dental settings and hospitals in many countries.⁶⁻¹⁰

Even at places where infection control protocols are followed and sterilization is done, monitoring of sterilization is not done. Monitoring of sterilization is very important; otherwise, standard of sterilization becomes questionable.

In terms of methods of sterilization and monitoring of sterilization, the dental profession may reflect that it is perhaps timely to become more proactive in highlighting and implementing guidelines of sterilization and monitoring sterilization.

Therefore, the purpose of the present study was to systematically summarize and report the methods of sterilization and methods of monitoring sterilization followed in different dental settings in Karachi, Pakistan.

METHODOLOGY

This cross-sectional study was carried out over a period of 3 months from January to March 2013, in dental colleges, hospitals and private clinics of Karachi,

Department of Operative Dentistry, Ziauddin College of Dentistry/ Ziauddin University, Karachi.

Correspondence: Dr. Hina Ahmed, 103/III, 34th Street, Off Khayaban-e-Saheer, Phase V Extension, DHA, Karachi-75500. E-mail: hanaahmed5@hotmail.com

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Pakistan. A precoded questionnaire was used to collect data from dentists working in different work places. The actual sample size was calculated at 50% prevalence as it was a Knowledge, Attitude, Perception (KAP) survey. Total sample size was 450 after adding 20% wastage. The questionnaire was sent and the response rate was 50%, therefore, the actual sample size on which analysis was done was 251. The total sample consisted of 251 completed questionnaires. The dentists filled the questionnaire and were categorized into three groups, specialists, postgraduate trainees and general dentists, according to their qualifications. Study included dentists working in dental colleges, hospitals and private clinics. Undergraduate dental students and dentists not having Pakistan Medical and Dental Council (PMDC), Pakistan, registration were excluded from the study. Data was collected by the primary investigator and the team.

Data collection was done using Statistical Package for the Social Sciences (SPSS) version 16.0. Descriptive statistics were computed and differences between groups were assessed through chi-square test. P-value ≤ 0.05 was taken as statistically significant.

RESULTS

A total of 251 dental surgeons completed the questionnaire and the distribution of dental surgeons was; 186 (74%) were general dentists, 44 (18%) were postgraduate trainees and 21 (8%) were specialists.

As far as the method of sterilization was concerned, it was observed that Autoclave, which was used by 155 (61.8%) dentists, was the most common method of sterilizing instruments followed by more than one method, 65 (25.9%); dry heat, 24 (9.6%); and cold sterilization, 7 (2.8%).

Statistically significant difference ($p = 0.009$) was found amongst the three groups of dentists in monitoring sterilization. A majority of the dentists, 126 (50.1%) never monitored sterilization, with mostly postgraduate trainees, 26 (59.1%) not monitoring sterilization followed by general dental practitioners, 96 (51.6%) and specialists, 4 (19%). Less than 50% of dentists who monitored sterilization mostly used mechanical method, 53 (21.1%) followed by chemical, 49 (19.5%) and biological means, 7 (2.8%) as shown in Table I.

There was statistically significant difference ($p < 0.001$) amongst the three groups of dentists in case of surface disinfection between patients. Majority of dentists doing surface disinfection were specialists, 19 (90.5%) followed by postgraduate trainees, 25 (56.8%) and general dental practitioners, 86 (46.2%) as shown in Table II.

As far as timing of monitoring sterilization was concerned, majority of them did not monitor sterilization, 126 (50.2%) followed by weekly, 66 (26.3%) and monthly, 54 (21.5%) intervals mostly by specialists.

Table I: Method of monitoring sterilization categorical data is presented as frequencies and percentages.

Method of monitoring sterilization	Specialist n=21	PGT n=44	GDP n=186	p-value
Mechanical	4 (19%)	6 (13.6%)	43 (23.1%)	0.009
Chemical indicator strips	10 (47.6%)	9 (20.5%)	30 (16.1%)	
Biological monitoring strips	0 (0%)	0 (0%)	7 (3.8%)	
More than one method	3 (14.3%)	3 (6.8%)	10 (5.4%)	
No method	4 (19%)	26 (59.1%)	96 (51.6%)	

Table II: Infection control protocol.

Infection control protocol	Specialist n=21	PGT n=44	GDP n=186	p-value
Surface disinfection between patients	19 (90.5%)	25 (56.8%)	86 (46.2%)	< 0.001
Financial burden	8 (38.1%)	14 (31.8%)	52 (28.1%)	0.598

Dentists in general did not consider following infection control protocols a financial burden as shown in Table II.

DISCUSSION

The majority of procedures performed in dental practice involve devices that are classified as critical or semi-critical, since they frequently breach the patients mucosae or gingivae. There have been a number of reported transmissions of hepatitis B in dentistry, although it has been difficult to prove or disprove direct links associated with failure of decontamination of dental instruments. Nevertheless, there is clear potential for cross-infection to occur if certain basic principles are not adhered to.¹¹

There are a number of areas of concern arising from this survey. A fundamental principle of any sterilization method is that it should be carried out using a validated process. This is because it is not practicable to test instruments emerging from the sterilizer for sterility prior to use. It is necessary to establish that the sterilization process, when correctly implemented, will consistently and reliably produce the required outcome; this is demonstrated during the validation process.¹²

This study provides an insight into the methods of sterilization and methods of monitoring sterilization in dental community in Pakistan. The most practical and safe method of operating is to clean and steam sterilize all re-usable instruments. Many dental instruments are categorized as critical devices and as such should be sterile at the point of use.¹²

Improvements in dental infection control practices have been steadily made since the start of the HIV epidemic.¹³

The results of previous studies indicate inappropriate KAP regarding proper measures of infection control among dentists.^{14,15}

In spite of advances in infection control in recent years, there is still infection control problem in healthcare

centers including dentistry clinics and hospitals in many parts of the world.¹⁻²

According to the results of this study, autoclave (61.8%) was the most common method of sterilizing instruments followed by, more than one method, (25.9%), dry heat (9.6%) and cold sterilization (2.8%). These findings are in accordance with other studies as well,^{8,12,16,17} where mostly (82%) dental practitioners reported using an autoclave. The remainder of respondents used either a hot air oven (10%) or used a central sterile service department or other facility (8%). However, although steam sterilization is used so widely in general dental practice, there is evidence that the equipment is not being tested, monitored or maintained correctly.¹²

According to some studies, dry heat was the most common method of sterilization followed by autoclave.¹⁸⁻²⁰

An important factor related to sterilization is monitoring of sterilization. All surgeries surveyed had a steam sterilizer, but the documentation, testing and operation of these machines were frequently unsatisfactory, increasing the risks of an adverse event occurring.

The lack of periodic and daily testing being undertaken on the sterilizers is a fundamental lapse in the quality control of the steam sterilization process and has identified both training requirements and the need for formal recording of tests that are undertaken.

There are four methods of monitoring sterilization; physical, chemical, biologic and documentation. In most cases, it was difficult to determine from the documentation available, whether, daily, weekly, quarterly or annual testing was undertaken in accordance with recognized standards.

According to this study, majority of dentists (50.1%) never monitored sterilization, which is in accordance to other studies.^{16,17} Less than 50% of dentists who monitored sterilization mostly used mechanical method (21.1%) followed by chemical (19.5%) and biological means (2.8%).

With respect to reason for not following cross-infection control guidelines, majority of dentists stated lack of formal training in infection control and negligence in following guideline as the primary causes. Dental education can play a significant role in the training of dentists by helping them to adopt adequate knowledge and attitudes related to infection control procedures. Limited literature is available on this subject for comparison but the result is understandable since Pakistan is a developing country.

Cross-infection control is becoming a global problem. Worldwide, 300 - 400 million people are chronic hepatitis B carriers. It is important to make note of this problem especially among dentists as it is postulated that dentists and dental staff are a frequent cause of transmitting infections to themselves as well as to other patients.²¹

Studies in Pakistan also show dental procedures to be the most common cause of hepatitis C transmission.²²

There have been no large-scale studies that have involved visits to dental practices to view the operation of steam sterilizers, review at first hand, the documentation accompanying these machines and interview the staff operating them.

On the basis of the results obtained from the study, the author would like to give the following recommendations:

Formal programs in infection control and safety at work must be developed which should be attended by dental staff and dentists. Methods of sterilization and methods of monitoring sterilization should be regularly checked by competent authorities. There is a need of national survey on cross-infection control in dental practices in Pakistan.

CONCLUSION

Infection control practices of the three groups of dentists were different. Moreover, the infection control practices of dentists working in different workplaces was also different. There is a dire need for improvement in disinfection and sterilization in dental practices, especially including: monitoring and documentation of sterilization process and proper use of disinfectants according to manufacturer's instructions. The level of infection control in dental practice in Pakistan is of concern and although some areas are encouraging, there is a clear need to ensure that standards are maintained and monitored.

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