

**PRACTICES OF STERILIZATION TECHNIQUES AT DENTAL CLINICS OF KARACHI, PAKISTAN**Atiquddin Mallick¹, Sheikh Abdul Khaliq^{2,*}, Muhammad Nasir³, Rehan Qureshi⁴¹Department of Prosthodontic, Karachi Medical & Dental College, Karachi, Pakistan²Department of Pharmaceutics, Faculty of Pharmacy, Federal Urdu University, Karachi, Pakistan³Department of Periodontics, Karachi Medical & Dental College, Karachi, Pakistan⁴Department of Conservative, Karachi Medical & Dental College, Karachi, Pakistan***Corresponding author e-mail:** sheikh1974@gmail.com**ABSTRACT**

The main objective of the study was to determine of practices of sterilization techniques at private dental clinics of Karachi, Pakistan. 150 dental clinics of the town were selected, owned and run by qualified dentists. The purpose of the study was explained to the owners /practitioners verbal consent was taken. Author designed the questionnaire by close ended questions in order to get information for sterilization method and infection control. The survey was completed in two weeks while five house officers of Karachi Medical & Dental College participated to in filling of questionnaire. The sample size of the study was 150 with 95% confidence interval. Sample selection criteria: (Inclusion) Dentists, Dental hygienists and Dental assistants who are responsible or oversee the sterilization procedure from dental clinics of District Central Karachi. Exclusion: Reception staff, dental technicians. The result shows that 121 (81%) out of 150 clinics used autoclave as the method of sterilization and 15(10%) of the clinics used dry heat as the method of sterilization. While 14(9.3%) still employ the boiling and chemical as method of sterilization. The result shows that the 65.3% were the owner of the clinic and 34.7 % were dentist among the respondents. It is worth noting that 115(76.7) were female and 35(23.3%) male were among respondent. Among the dentist who answered the questioner 79.3% were BDS and 20.7% were postgraduates. From the results of the study it is quite evident that the Infection control measures taken in dental clinics were quite satisfactory. It is worth noting that almost 81% of the clinics used autoclaving method of sterilization. Internationally, the method used for sterilization is autoclaving for the sterilization of instruments in the private dental clinics. Some of the dental clinics used, chemical and dry heat sterilizer for the sterilizations of instruments. However, PMDC (Pakistan Medical & Dental Council) or any other government organization did not set any legal bindings for the quality and standards of dental practice in Pakistan.

Key words: Sterilization, Dental practitioners, Dentists.**INTRODUCTION**

After the rise of 21st century, healthcare professionals and patients are more concerned about transmission of pathogenic microorganisms. Sterilization by different techniques is an important component in clinical practices to ensure protection of the patient, and the health care professional from various infection diseases. Application of inappropriate sterilization techniques may not only poses the individuals at greater risk of infection but also raises

the cost burden due to management of infectivity. In the similar way, it is imperative for all dental staff to update themselves continuously for control of infection and prevention of transmission of infections. The reasons why infection controlling procedures are extremely necessary must be understood by dental practitioners. Dentistry predominantly involves exposure not only by the dentist to patient or dental staff to patients but also from the dental laboratory to dental health care workers (DHCWs) and patients. The most important

part of infection control is the decontamination of contaminated instruments, which is the main source of cross infection in the dental clinics. In United States there is a recommendation that all the instruments used intra orally should be sterilized by oxide gas sterilizers.^[1]

Dental procedures can transmit disease like Hepatitis B and Herpes simplex virus. Nowadays work related infection hazards are common in developing countries like Pakistan. Dental procedures involve contact with human blood, tissues or secretions. However, there is no current documentation of patient-to-patient, blood or saliva-borne disease transmission from procedures performed in dental clinic.^[2] In some reports, serious and sometimes fatal consequences have been observed in the transmission of hepatitis B. The unnecessary risk of infection to personnel can be minimized by following standard precaution, whether aware or unaware about the status of infection in patients. Determination of health history of the patients is not valid tool for those patients where symptoms of infection are not appeared. The consideration must be given to individuals, infected and contagious without any symptom of infection. Herpes simplex virus has been reported to be transmitted to patients from the fingers of dental health-care workers (DHCW).^[3] Therefore dental practitioners cannot assure status of absence of infection in their patients. That is the main rationale for the implementation of precautions as well as standards. These standards and precautions include; measures to prevent transmission of pathogenic microorganisms, pathogens transmitted via blood and other microorganisms which are not very contagious.^[4]

There is a need to follow standard precautionary measures in case of anticipated exposure of body substances excluding tears and sweat. Indeed these precautions are not exclusively for dental clinics and oral health care settings but must be applied in every health care set up. Hygiene of hand, gown, gloves, mask, and eye wears must be used as standard precautions in addition to handling of sharp objectives safely. The probability is very high that dental health care practitioner (DHCP) will be exposed to highly pathogenic microorganisms including blood borne infections unless standards are implemented. The knowledge of mechanism of disease transmission and practices of infection control measures can prevent the disease transmission in dental practitioners.^[4]

Sterilization is process that ensure to eliminate the living microorganisms e.g. bacteria, viruses, fungi

and spores from the surface of instrument or any other item. However, sterilization does not remove infectious proteins like prions, which is a major cause of encephalopathy (Mad Cow Disease). Sterilization can be achieved by various means, which includes heat (dry & moist/steam heat), chemical (ethylene oxide, formaldehyde, alcohol), radiation (ultraviolet, cathode) or filtration (mechanical method).^[5]

Among these, application of moist heat sterilization which is also called steam sterilization is very wide because of its penetration power in semi critical, wrapped and unwrapped items; however heat sensitive as well as moisture sensitive items should not be sterilized by this method. In case of moist heat sterilization method, steam must be in contacted with the item need to be sterilized for certain period of time at specific temperature and pressure.^[6] The steam sterilizers can be categorized in to two types: 1- Non vacume (Gravity Displacement) and 2- Autoclaves which is Vacume assisted. Gravity displacement autoclave or class "N" has a heating element fully or partially sunken in a collection of water, along with a hole that transfers water from a pool to the chamber. As water is heated, begins to evaporate, form steam. When chamber occupys by steam the most of air in the compartment is pressed to base, and escapes via the hole. The hole is coupled with heat responsive diaphragm that turns off when sufficiently heated. Once the diaphragm turned off, pressure develops within the autoclave chamber.^[7] The drawback of this autoclave is that they are mainly intended for sterilization of unwrapped solid instruments. Negative pressure, or vacuum assisted autoclaves, also known as class "S". It has detached steam generator and a vacuum pump. Once the autoclave compartment is closed, vacuum pump eliminates air from the compartment and steam is forcefully entered in the compartment. Negative pressure autoclaves are capable to achieve maximum sterility assurance level. Negative displacement autoclaves in general have enforced filtered air drying method which lets the autoclave items to be comprehensively dries earlier than contacting any ambient air.^[5, 7, 8, 9, 10] The drawback of this system is high initial cost and sometimes small size.

Cleaning of autoclaves is critical in almost all sterilization methods. The remaining parts of any tissues or any external biological substances may protect microorganisms from killing by any chemical or physical methods. Therefore, physical scrubbing is most appropriate method of cleaning to remove large number of micro organisms. Water and detergents should be used for this purpose in order to get optimum results. As hot water coagulates the debris,

cool water cleans easily organic substances. Pulsed air and ultrasounds are other options to remove biological debris.^[11, 12, 13, 14]

Validation and monitoring of sterilization procedures: There are several definitions of validation but, in simple terms, the word means demonstrating that a process will consistently produce the results that it is intended to. Thus, with respect to sterile instruments, validation would be necessary for each of the individual aspects including sterilization process itself and the sterility testing procedure. Of these, it is the sterilization process that is likely to be subject to the most detailed and complex validation procedures, and these will be used to exemplify the factors to be considered. A typical validation procedure for a steam sterilization process is likely to incorporate most, or all, of the following features:^[19]

- The calibration and testing of all the physical instruments used to monitor the process, e.g. thermocouples, pressure gauges and timers.
- Production of evidence that the steam is of the desired quality (e.g. that the chamber temperature is that expected for pure steam at the measured pressure).
- The conduct of leak tests and steam penetration tests using both an empty chamber and a chamber filled with the instrument to be sterilized in the intended load conformation.
- The use of biological indicators either alone or in combination with bioburden organisms to demonstrate that the sterilization cycle is capable of producing an acceptable level of sterility assurance under worst case conditions.
- The production of data to demonstrate repeatability of the above (typically for three runs).
- Comprehensive documentation of all of these aspects.

MATERIAL AND METHODS

The data for descriptive cross sectional study has been collected by convenient sampling technique to cover one town (North Nazimabad). 150 dental practices of the town were selected, owned or run by qualified dentists. Purpose of the study and consent was taken verbally from dental practitioners and owners of the clinics. Author designed the questionnaire with closed ended questions and objectivity of questionnaire was to gather information about sterilization methods as well as infection control measures. The survey was conducted through five dental house officers of Karachi Medical &

Dental College. Duration of survey was two weeks (July 2, 2011 to July 18, 2011). The pilot study on questionnaire was done on ten dental house officers and dental practitioners; a reliability of 100% was achieved.

The study was targeted to Dental clinics, Dentists, Dental hygienists and Dental assistants. Considering 6.6% usage of boiling water,^[6] on 4% bound on error, 95% confidence interval, the required maximum sample size for all methods was at least 150. Among respondents 31(20.1%) were dentist, 103(68.7%) dental assistant, 13(8.7%) dental hygienist and 3(2%) were others.

Sample selection criteria:

Inclusion criteria

Dentists, Dental hygienists and Dental assistants who are responsible or over see the sterilization procedure for dental clinics of District Central Karachi.

Exclusion criteria

Reception staff and dental technicians.

Statistical Test/ Data Analysis

The statistical evaluation integrated in the study and SPSS software used for data analysis.

RESULTS

Among 150 respondents, 121 (80.66%) employ moist heat sterilization by autoclave, 15 (10%) practice dry heat sterilization. Interestingly, 14 (9.33%) respondents still use boiling and chemical as a mean of sterilization. (Figure.1)

The demographics of the study represents that 65.3% were the owner of the clinic and 34.7 % were dentist among the respondents. It is worth noting that gender wise 115(76.66%) were female and 35(23.33%) were male. Among the dentist who answered the questioner 79.3% were BDS and 20.7% were postgraduates. (Table.1)

DISCUSSION

The data produced by Pakistan Medical & Dental Council (PM&DC) mentioned that, there would be around 3721 qualified dentists will be available only in Sindh province by June 2011. Most of these dentists will be practicing in Karachi. As there is no study about the type of sterilization performed in the dental clinics of Karachi i.e. why probably this is the first study of its kind. Though sample size is not big

enough but still our purpose is served by this study. There is a study done in Lahore but it's a comparison of infection control between qualified and unqualified dental clinics.^[6]

The result showed that almost 81% of the dental clinics used moist heat/autoclaving for the sterilization. Though this result is not consistent with the result of some international researches but still autoclaving is considered as one of the best methods for sterilization of dental instruments in the dental clinics.^[15] The use of autoclaving in the dental clinics was due to the best results. This result is somewhat in accordance with the result of a research done in the dental practices in the municipality of Sao Paulo, which says that the autoclave was used by 69.38% of participants.^[16] The method of choice for all instruments is the autoclave, using one of the following time temperature combinations: Temperature of 134-138°C and minimum holding time is 3 minutes and minimum temperature is 126-129°C and minimum hold time is 10 minutes.

Another interesting finding of the study was that the female practitioners were 76.66% and male practitioner 23.33%. It is evident from our study that majority of the students are female and males are getting less number of admissions in dental colleges on merit basis.

In the present study, we can see that the dentists with 1-5 years and above 5 years are experiences are above 80 present. Though there is no significant difference in the percentage of male and female dentists.^[17] Although most of the clinics are employing autoclave as sterilizing instrument, however, they do not have any validation records of

their autoclaves, as a result of this, there is still potential danger for transmission of infections despite autoclaving. They do not check periodically the working capability of autoclave, whether they are giving results which are expected.

Therefore, it is suggested that, any kind of legal standard procedure and protocol should be made by ministry of health at provincial or federal level in order to get the validation and calibration data of sterilizers in dental clinics because non-validated and non-calibrated autoclaves may have higher potential of transmittance of bacterial, viral and fungal infections that may be life threatening. A regulatory authority should be made in the pattern of the American dental association who regulates the procedures of sterilization in the dental clinics.^[18] In Pakistan, the regulatory body should ensure that the proper sterilization is maintained in the dental clinics.

CONCLUSION

It is quite evident that the Infection control measures taken in dental clinics are quite satisfactory, however validation and calibration data needs to be highlighted. It is worth noting that almost 81% of the clinics used autoclaving method of sterilization. The method use internationally is autoclaving for the sterilization of instruments in the private dental clinics. Some of the dental clinics used, chemical and dry heat sterilizer for the sterilizations of instruments. However, there is no legal binding or legislation regarding the standards and quality of sterilization practices at dental clinics, it is only the conscious and training that they are practicing infection control in there clinics.

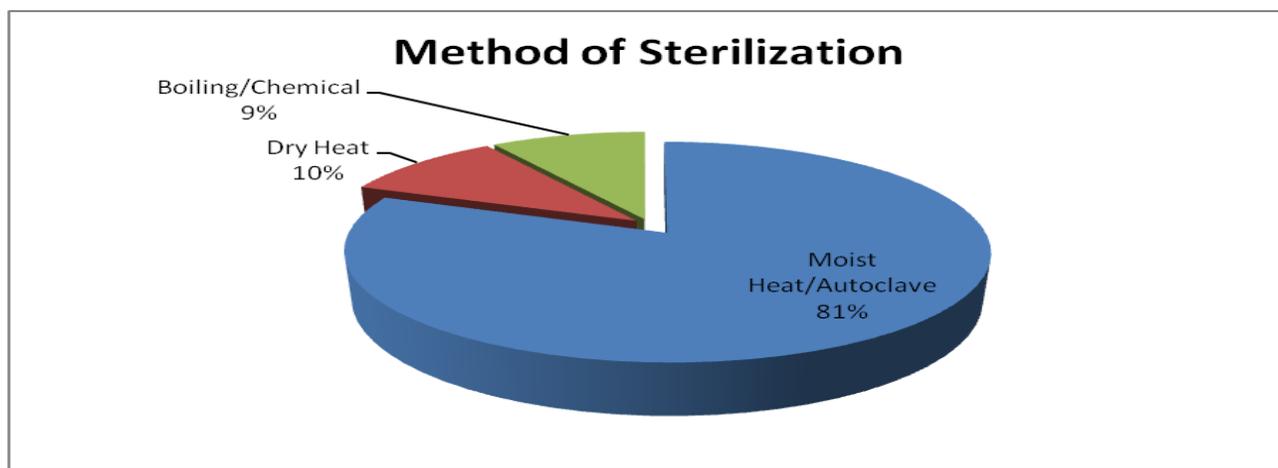


Figure. 1. Results of the study

Table.1 Results of the study

Demographic Category	No. of Respondents
Clinic Owners	65.30%
Dentists	34.70%
Female	76.66%
Male	23.33%
BDS (Bachelor of Dental Surgery) Degree Holders	79.30%
BDS+Postgraduate Certificate/Degree Holders	20.70%

REFERENCES

1. Kohan WG, Collins AS, Cleveland JK, Harte JA, Eklund KJ, Malvitz DM. Guidelines for infection control in dental health-care settings– 2003. MMWR Recomm Rep 2003;52:1-61
2. N. Mahboobi, F. Agha-Hosseini, N. Mahboobi, S. Safari, D. Lavanchy and S-M. (2010). Alavian Article first published online: (pages 307–316) 25 FEB 2010
3. Ramandeep Singh Gambhir, Gurminder Singh, Sumit Sharma, Rajdeep Brar and Heena Kakar. The Open Occupational Health & Safety Journal, 2011, 3, 57-64.
4. Kohn WG, Harte JA, Malvitz DM, Collins AS, Cleveland JL, Eklund KJ. J Am Dent Assoc 2003;135(1):33-47.
5. J AHarte. J Calif Dent Assoc 2004;32(11):919-30.
6. Bokhari SAH, Sufia S, Khan AA. Pak J Med Sci 2009;25(1):126-130.
7. Kohn WG, Harte JA, Malvitz DM, Collins AS, Clevel and JL. Eklund KJ. J Am Dent Assoc 2004; 135, (1): 33-47.
8. AlNegrish A, Al Momani, Al Sharafat. Int Dent J Oct 2008;58(5):231-6.
9. J Falak I, R Taha, Q Rasha, A Hani and F J Daameh. Testing of several methods of sterilization in dental practice 1995; 1(1):80-86.
10. Raju G.K. and Cooney C L. Media and air sterilization: In Biotechnology, ed. Stephanopoulos G 1993; 3: 157-84.
11. C L Whitworth, M V Martin, M Gallagher and H V Worthington. BDJ.2004;197, 635 – 40.
12. Roscoe DL, Gibson GC, Noble MA and Mathias RG. J Canadian Dent Assoc 1991; 57: 863-70.
13. Bagieh NH and Shalhoub SY. Tropical Dent J 1992; 15:11-13.
14. Deskins-Knebel D and Rosen S. Focus Ohio Dental J 1993; 67:8-12.
15. Venkatasubramanian R; Jayanthi, Das UM, Bhatnagar S, J Indian Soc Pedod Prev Dent. 2010 Jan-Mar;28(1):2-5
16. Matsuda JK, Grinbaum RS, Davidowicz H. Braz J Infect Dis. 2011 Jan-Feb;15(1):45-51.
17. Nahid Y. Ashri, Norah Al Ajaji, Mayyadah Al Mozainy, Rasha Al Sourani. Saudi Dental Journal, Volume 21, No. 1, January - April 2009 .
18. CDC. Draft. Recommended infection control practices for dentistry, "http://www.cdc.gov/OralHealth/infection_control/pdf/infection_control.pdf." Accessed June 17, 2003
19. Stephen P. Denyar, Norman A. Hodges. Hugo and Russell's Pharmaceutical Microbiology, 7th Ed. Ch-20, Sterilization procedures and sterility assurance, Validation and in-process monitoring of sterilization procedures. Blackwell Science Ltd a Blackwell Publishing company, 2004. 2003024264 ISBN 0–632–06467–6