

Original Research Article

Assessment of sterilization technique practices at dental clinics of Vadodara, Gujarat, India

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Abstract: To evaluate the knowledge of sterilization methods used in private dental practitioners in Vadodara, Gujarat. It was a cross-sectional survey study design which was conducted to assess Private Dental Practitioner's knowledge and awareness towards sterilization in Vadodara city, Gujarat. Prior appointment and the schedule for the study were obtained from the Private Dental Practitioners. The objective questionnaire proformas was distributed on first appointment and it was collected after 3-4-days. The questionnaire proformas contains 12 self prepared questions which had been validated through statistical analysis. The questionnaire is self-prepared. Validation Formula: Validated Questionnaire Results is 82.5% for this study. Self-prepared questionnaire is validated using chi-square test. The collected data will be entered in SPSS 18.0 with the level of significance is 0.05 (5%). Content Validity: All content of questioners with respect to multiple options are checked by the experts and its 100% reliable. Statistically significance difference in knowledge regarding sterilization has been seen in qualification of private dental practitioners with better knowledge in MDS that is 49.1% as compared to BDS that is 17.4%. While 27.8% Male and 19.6% Female have good Knowledge and 63.3% Male and 76.1% Female have Moderate Knowledge Regarding the sterilization Practice. No statistically significance difference has been observed in year of practice and age of private dental practitioners. The Knowledge assessment regarding sterilization was better in MDS private dental practitioners.

Keywords: Sterilization, Dental private practitioners, Knowledge

INTRODUCTION

In today's dental practice to sustain or increase productivity while ensuring patient safety is a serious challenge. At times, these may seem like incompatible goal. Advances in dental processing equipment, however, have empowered practices to develop safer processes which is efficient and ultimately, saving money.

In today's 21st century, healthcare professionals and patients are more concerned about transmission of pathogenic microorganisms. To ensure protection of the patient as well as health care professional from various infection diseases, sterilization using different techniques is an important component in clinical practices. Application of inappropriate sterilization techniques may not only poses the individuals at greater risk of infection but also raises the economic burden of an individual 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 supervisory procedures for infection are extremely necessary must be understood by dental practitioners[1].

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[2].

A cleaning and sterilization process that meets ADA and CDC guidelines is vital to an effective infection control program[1]. Streamlining of this process needs an understanding of proper methods, materials, and devices. Many methods of instrument reprocessing are available. Use of a complete system that incorporates and fulfils all elements that are critical

maximizes efficiency and minimizes risks. In a dental office, closed cassette systems provide a more efficient and safer way to process, sterilize and organize instruments. These eliminate manual steps during instrument reprocessing like hand scrubbing and time-consuming sorting of instruments, thereby improving safety and increasing efficiency[3].

Dental techniques can transmit disease like Hepatitis B and Herpes simplex virus. These involve contact with human blood, tissues or secretions. However, there is no existing documentation of patient-to-patient, blood or saliva-born disease transmission from procedures performed in dental clinic[4] in some reports, serious and sometimes fatal consequences have been observed where transmission of hepatitis B occurred. 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 DHCW[5].

Therefore dental practitioners cannot assure status of absence of infection in their patients. That is the main rationale for the implementation of precautions with 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[6].

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)[7].

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 for removal of 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 and cool water easily cleans organic substances. Pulsed air and ultrasounds are other options to remove biological debris[8-11].

There are no studies have been found for knowledge assessment of sterilization methods amongst dental practitioner in Vadodara city (searched in

EBSCO and PUBMED dated till 23/08/2015). So the study is designed for checking the knowledge regarding the sterilization and its practice in dentistry amongst dental practitioner of Vadodara city.

MATERIAL AND METHODS

It is a cross-sectional survey study design which was conducted to among Private Dental Practitioners to assess knowledge and awareness towards sterilization in Vadodara city, Gujarat.

Sample selection criteria:

Inclusion criteria

- Private dental practitioner who are willing to participate in the study.

Exclusion criteria

- Dental practitioner who could not be contacted for three times.
- Dental practitioner who did not fill the questionnaire.

The questionnaire was self-prepared. Self-prepared questionnaire was validated using chi-square test. The collected data was entered in SPSS 18.0 with the level of significance was 0.05 (5%). The pilot study on questionnaire was done on ten Private Dental Practitioners for content validation and all content of questioners with respect to multiple options are checked by the experts and its 100% reliable. Validated Questionnaire Results is 82.5% for this study.

Prior appointment and the schedule for the study were obtained from the Private Dental Practitioners. The objective questionnaire proformas were distributed on first appointment among the Private Dental Practitioners in Vadodara city. The questionnaire proformas contains 12 self prepared questions which have been validated through statistical analysis which is mentioned below. PDP had been asked to fill the proformas and the filled questionnaire proformas were collected in the second appointment by the investigator. The data has been entered in the excel sheet.

Statistical Test/ Data Analysis

The statistical evaluation integrated in the study by Chi Square test with Fisher Exact test using SPSS 18.0 at 5% level of significance and SPSS software used for data analysis.

RESULTS

All Dental surgeons who are IDA members of Vadodara city, Gujarat were invited to participate in the research study. The 197 PDP participated in the study. The questionnaire proformas were tabulated with the analysis of the sterilization process used.

Figure 1 showing the gender distribution of PDPS. Among 197 PDPS 151(76.6 %) Male PDPS While

46(23%) Female PDPS were participated in the present study.

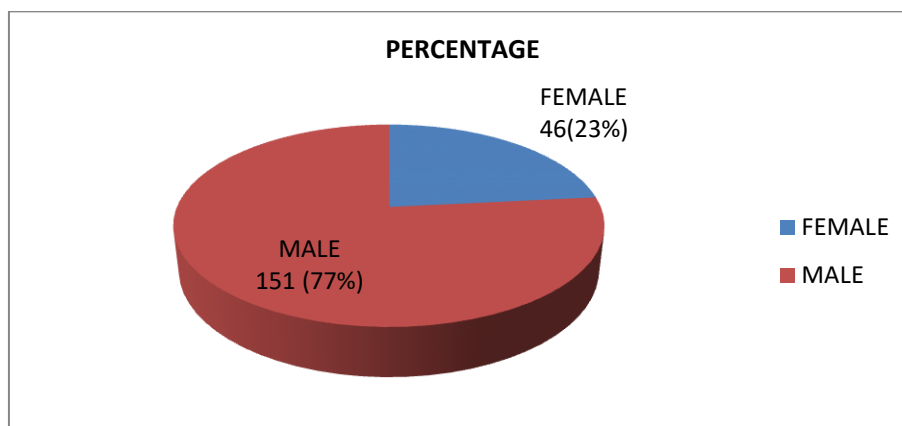


Fig-1: Gender Distribution of Private Dental Practitioners

Figure 2 showing the Qualification distribution of PDP. Out of 197 PDPS, 144(73%) are having Bachelor in dental surgery degree and 53(27%) are

having Master in dental surgery degree as per qualification distribution of PDPS.

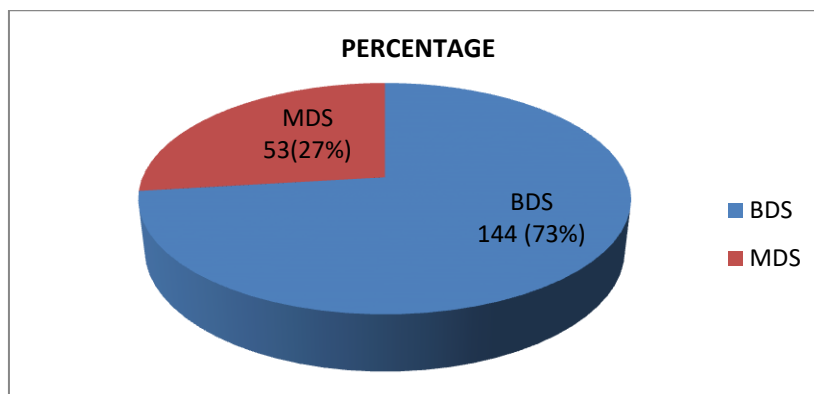


Fig-2: Qualification Distribution of Private Dental Practitioners

Figure 3 showing the year of practice distribution of PDP. Among 197 PDP, 75(38%) PDP are practicing less than five years while 38(19%) are

those PDP who are practicing more than ten years in Vadodara city. 84(43%) PDP are those who are practicing in between five to ten years.

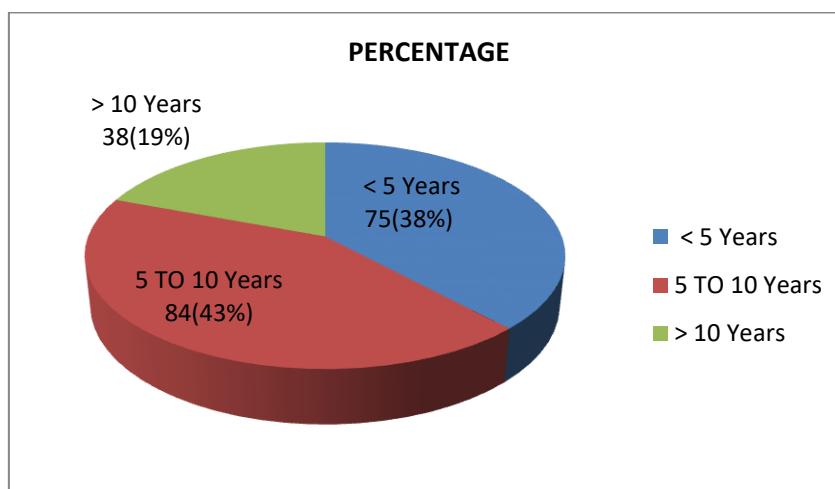


Fig-3: Year of Practice Distribution of Private Dental Practitioners

Table 1 is showing the questionnaire responses by PDP. It is a cross-sectional survey study design which was conducted to assess Private Dental

Practitioners (PDP) knowledge and awareness towards sterilization.

Table-1: Questionnaire Responses by PDP

Question Number	A		B		C		D	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
1	25	12.7	31	15.7	28	14.2	113	57.4
2	5	2.5	47	23.9	16	8.1	129	65.5
3	21	10.7	10	5.1	129	65.5	36	18.3
4			3	1.5			193	98.0
5			154	78.2	34	17.3	9	4.6
6	4	2.0	158	80.2	15	7.6	12	6.1
7	28	14.2	74	37.6	22	11.2	59	29.9
8	81	41.1	57	28.9	30	15.2	22	11.2
9	32	16.2	120	60.9	6	3.0	38	19.3
10	14	7.1	5	2.5	121	61.4	57	28.9
11	55	27.9	48	24.4	35	17.8	45	22.8
12	5	2.5	13	6.6	1	.5	177	89.8

The GDP have been asked the question regarding Cleaning, sterilizing and storing instruments are done where the patient care is provided in the operatory room, then 57.4% PDPS were believed to have separate room for Cleaning, sterilizing and storing instruments where the patient care is provided in the operatory. While 15.7% PDPS were believed to helps in time saving, 14.2% PDP consider it against the infection control and rest 12.7% PDPS were believed to its ideal to have in operatory itself.

When question has been asked regarding using a standardized protocol including the use of cassettes, then 65.5% PDP had knowledge regarding storage of instruments in cassettes which was helpful in sterilization methods. In addition 23.9% PDP believed to be easy to handling instruments in cassettes, 8.1% PDP answered in relation to damage of instruments and rest 2.5% PDP believed its time saving.

The GDP have been asked the question regarding which Sterilization procedure to be follow, then 65.5% PDP had clear concept of physical and chemical sterilization which destroy all forms of microbial life with highly resistant bacteria. 18.3% PDP believed Physical and chemical sterilization leads to destroy all forms of microbial life without highly resistant bacteria spores. While 10.7% PDP believed that it helps to remove microorganism from surgical instruments and rest 5.15% PDP were said it destroy non-pathogenic organisms.

When question has been asked regarding the most widely used, effective, economical and reliable method of sterilization used in the health care setting, then 98% PDP use autoclave and considered to be most widely used, effective, economical and reliable method

of sterilization used in the health care setting. Rest 1.5 % PDPS are ethylene oxide.

The GDP have been asked the question regarding temperature of most pre vacuum autoclaves, then 78.2% PDP had knowledge regarding pre vacuum autoclave temperature that is 120⁰ C to 130⁰ C. 17.3% PDP had different temperature range that is 132⁰ C to 135⁰ C. While only 4.6% PDP agreed with the 100⁰ C to 120⁰ C.

When question has been asked regarding the essential parameters of steam sterilization, then time, temperature and pressure are the essential parameter of steam sterilization is known fact by the 80.2% PDP while 7.6% PDP believed that they are biological and chemical indicator. Although 6.1% PDP gave positive response in relation to saturated steam and 2% PDP in relation to wrapped packages in terms of essential parameter of sterilization.

The GDP have been asked the question regarding the classifications of chemical indicators recognized by the FDA, and then only 37.6% PDP were able to give the correct answer regarding the use of chemical indicators recognized by the FDA.

When question has been asked regarding biological monitors are also known as, then 41.1% PDP were aware with spore tests as one of the common biological monitor in sterilization process, 28.9% PDP relied on Probiotic tests as biological monitor. 15.2% PDP aware about the biomechanical tests while 11.2% PDP use biological monitor as chemical indicator.

The GDP have been asked the question regarding the proprietary chemical used in unsaturated chemical vapour sterilization contains, and then 60.9% PDP believed that the proprietary chemical use in

unsaturated chemical vapour sterilization contains formaldehyde while 19.3% PDP had knowledge regarding Vaporized Hydrogen Peroxide use as proprietary chemical in unsaturated chemical vapour sterilization. However, 16.2% PDP believed it is alcohol while only 3.0% believed inert ingredients use as proprietary chemical unsaturated chemical vapour in sterilization.

When question has been asked regarding the most frequently used liquid chemical sterilant is, then Glutaraldehyde most frequently used as chemical sterilant by 61.4% PDP and Formaldehyde by 28.9% PDP. While Alcohol is used by 7.1% PDP and least is par acetic acid used only by 2.5% PDP as chemical sterilant.

The GDP have been asked the question regarding the established sterilization parameters may not be adequate rendering the sterilization process ineffective, then 27.9% PDP assumed that the established sterilization parameters may not be adequate rendering the sterilization process ineffective is temperature while 24.4% believed that bio burden dependant. On the other part knowledge regarding vacuum and pH amongst PDP is 22.8% and 17.8% respectively.

When question has been asked regarding reasons of failure for sterilization, then 89.8% PDP were aware of failure of sterilization process due to mechanical malfunction of the sterilizer, operator error, and improper location of sterilization While 6.6% PDP believed that only operator error can lead to failure of sterilization. However, 2.5% PDP believed that sterilization depends on mechanical malfunction of the sterilization and only 0.5% agreed for improper location for failure of sterilization.

DISCUSSION

The control of microbial contamination in indoor environments is great problem, especially in health services. Such contamination seems to be strongly related to the sanitary conditions of the service, the number of people who attended it and the pattern of procedures carried out. In dental health services the situation is still more critical[12-13].

Dental practices are often invasive and they always cause bleeding and production of contaminated aerosols by instruments as turbines, micro-engines, and air-water syringes[14]. Moreover such contaminated aerosols carry microorganisms that normally follow the parenteral way of transmission. During invasive procedures high levels of microbial contamination of air for a long time (more than an hour) increase infective risk both for dental personnel and patient[15]. Therefore, adequate safety measures must be carried out to prevent biological risk in dental services[16,17].

In dentistry, there is a major effort to re-evaluate methods of maintaining sterilization in the dental environment. The upsurge of new diseases such as AIDS and the recrudescence of diseases such as tuberculosis, hepatitis B, C, and D have made it essential that strict sterilization be maintained[18].

In this study, all participations were selected who are Indian Dental Association member. IDA is the standardized body of dentistry in India where almost all dentists are registered as member. In addition to, there are also state level and district level IDA branch. From where we can easily take the record of private dental practitioners who are doing practice in particular area whom we want to target for our study.

57.4% PDP are believed to have separate room for Cleaning, sterilizing and storing instruments where the patient care is provided in the operatory in the present study which is scientifically supported by Cuny V[3] In which they mentioned that most dental offices have a designated area for instrument reprocessing that is separate from the dental treatment room. This is ideal, since cleaning, sterilizing and storing instruments in the same room where the delivery of patient care is provided increases the risk of cross-contamination.

Closed cassette systems provide a more efficient and safer way to process, sterilize and organize instruments in a dental office. These eliminate manual steps during instrument reprocessing such as hand scrubbing and time-consuming sorting of instruments, thereby improving safety and increasing efficiency[3]. In the present study 65.5% PDP have knowledge regarding cassette used in terms of sterilization methods.

65.5% PDP had clear concept of physical and chemical sterilization which destroy all forms of microbial life with highly resistant bacteria which is clearly stated in by Ananthanarayan[19]. In which they considered physical and chemical sterilization methods is the most efficacious methods against the highly resistant bacteria.

The result showed that almost 98% PDP use autoclave and considered to be most widely used, effective, economical and reliable method of sterilization while 78.2% follow proper range of temperature for pre vacuum autoclave 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[20]. 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[21]. The commonly 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. In case of moist heat sterilization method, steam must be in contact with the item need to be sterilized for certain period of time at specific temperature and pressure[22]. 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[8,23].

Parameters such as time, pressure and temperature vary according to the type of sterilizer, materials being sterilized and individual models within sterilizer brands. It is never appropriate and advisable to use a household device, such as a toaster oven, for sterilization of dental instruments, devices, or equipment[3]. In present study time, temperature and pressure are the critical parameter of steam sterilization is known fact by the 80.2% PDP

Only 37.6% PDP were able to give the correct answer regarding the use of chemical indicators recognized by the FDA. Chemical indicators indicate the presence of certain conditions during the sterilization cycle, like the presence of heat and steam. There are five classifications of indicators recognized by the FDA, and it is important to note that it is now recommended that all packs or cassettes include internal and external indicators[3].

The use of biological monitors (spore tests) is the most reliable method to validate that the sterilizer is functioning and that the sterilization of instruments is effective. It is recommended that biological monitoring is to be conducted at least weekly and with every load that includes an implantable device[3]. In the present study 41.1% PDP were aware with spore tests as one of the common biological monitor in sterilization process, 28.9% PDP relied on Probiotic tests as biological monitor.

60.9% PDP believed that the proprietary chemical use in unsaturated chemical vapour sterilization contains formaldehyde while 19.3% PDP had knowledge regarding Vaporized Hydrogen Peroxide use as proprietary chemical in unsaturated chemical vapour sterilization. Ananthanarayan[19] stated that formaldehyde is the proprietary unsaturated chemical in vapour sterilization.

As regards chemical steriliant procedures, the 40.4% uses glutaraldehyde that is effective only if they are correctly used[19]. In this present study we found Glutaraldehyde most frequently used as chemical

steriliant by 61.4% PDP and Formaldehyde by 28.9% PDP.

27.9% PDP assumed that the established sterilization parameters may not be adequate rendering the sterilization process ineffective is temperature while 24.4% believed that bio burden dependant. Sterilizers are medical devices, requiring clearance by the Food and Drug Administration before manufacturers may offer them for sale. The FDA requires rigorous testing to ensure an adequate margin of safety in each cycle type described in the instructions[3].

89.8% PDP were aware of failure of sterilization process due to mechanical malfunction of the sterilizer, operator error, and improper location of sterilization. Operator error in loading the sterilizer could result in failure to sterilize all the packs in spite of the proper time, temperature and/or pressure. The heat and/or steam must be able to circulate throughout the chamber and between the packs or cassettes for successful sterilization[3].

CONCLUSION

From the present study, it can be concluded that the knowledge on sterilization method are agreeable however the dental professionals do not possess adequate attitude. Even though most of the practitioners follow proper sterilization methods, improvement in the practice of handling disinfectant solutions and methods of sterilization are required. The different types of sterilization are employed for the particular instruments and equipments and the knowledge on this is mandatory for all the dental practitioners.

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