

Assessment of Sterilization and Waste Management in Pediatric Dental Practice in India- A Cross Sectional Study

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Abstract:- Aim: To assess the sterilization and waste management practice among the Paediatric dentists with private clinics. Methodology: Survey was conducted among the Paediatric dentists with private clinics in India to be part of the assessment. The study tool was a questionnaire consisting of 20 questions that was sent through WhatsApp, E-mails and approached personally and assessment was made on the foundation of answers subjected to a set of questionnaires. Results: Most of the dentists used Autoclave for sterilization and on the other hand, developer and fixer solution were not recycled by most of them hence failing both the patients and environment by not adapting proper guidelines for sterilization and waste management in day-to-day life. However, most of the practioners were aware of its significance and was willing to get a change. Conclusion: To maintain innocuous practice of sterilization and disinfection the discovered results deliver a need to protect the environment in its maximum by bringing in the smallest changes from our dental clinic which could impact in a huge way.

Keywords:- BMW- Biomedical Waste.

I. INTRODUCTION

- Biomedical waste (BMW) is any waste produced during the diagnosis, treatment or immunization of human or animal research activities pertaining there to in the production or testing of biological or in health camps. The basic principle of good BMW practice is based on the concept of 3Rs, namely, reduce, recycle, and reuse. The best BMW management methods aim at avoiding generation of waste or recovering as much as waste as possible, rather than disposing¹.
- Dentistry is a profession dedicated to promoting and enhancing oral health and wellbeing. On the other side, dental practices generate large number of wastes like cotton, plastic, latex, glass and other materials much of which may be contaminated with body fluids². Understanding this, we should begin to take measures to minimize the production of these wastes and their potential environmental effects and if recycling is not an option, disposal as hazardous waste should be done which is mandatory.

- Waste management is one of the key ecological challenges of the modern world³. Waste is a direct consequence of human activity and the quantity of generated waste is often an indicator of the economic strength and development of a community⁴. Unfortunately, some of the materials that are currently in use present potential challenges to the environment.
- Environmental best practice in dentistry is an ever-emerging discipline in which each member of the dental needs to play their part. Eco-friendly dentistry refers to the delivery of oral health care and dental treatments using technologies, procedures and materials that promote environmental health⁵. Dental waste from dental clinics has become a hazard to environment and public safety. As producers of hazard, it is the duty of the dentists to be aware of the correct management of waste within their practice and take up voluntary measures to reduce the harm. As health practitioners, we should be considerate promoting not only human health and well-being but also protect the environment in detail so such a proactive approach will let our profession to succeed in an era of increased environmental awareness.
- Dental wastes are regulated under medical waste control regulations in most countries. A large proportion of the dentists are not practicing right method of health care waste disposal due to lack of awareness and we observe that most of the dental waste is dumped at uncontrolled disposal sites and that is public health and ecological risk. Even though the quantity of hazardous wastes in dental solid wastes is a small proportion, there is still cross infection risk and potential danger for environment associated with mismanaged wastes. For this reason, knowledge of waste composition and development of proper management alternatives are necessary³
- Due to lack of accurate information about the quantity of waste produced, who produces what type of waste in what quantities, how it is further treated and disposed. So, it is very important to establish a medical and dental waste management system that would protect the environment and promote eco-friendly dentistry.

AIM

- Aim of the study is to assess sterilization and waste management in pediatric dental practice in India.

II. MATERIALS AND METHODS

- The study was a cross sectional questionnaire and the study population included the pediatric dentists of India with private practice and who were solely consulting to clinics were excluded.
- The questionnaire was designed to assess sterilization and waste management in and from the dental clinics. The questions were framed in three sets; knowledge based, attitude based and those regarding the behavior of dentist in relation to dental health care waste management. The questions were structured using google forms and the questions were sent through email and WhatsApp.

III. RESULT

- Questionnaire were sent to approximately 400 pediatric dentists out of which 101 individuals had responded With regard to the question about the frequency of disposal of untreated BMW from the clinic, 50.9% dentists disposed weekly. 70.7% collected amalgam and 85.4% amalgam contained cotton and gloves were collected in an air tight container and disposed as BMW and 12.2% disposed along with the regular waste. Developer and fixer solution used for x-ray films, in which 37% diluted and poured down the sewer and 13% poured directly to the sewer. 73.2% collected and disposed x-ray film lead foils as BMW and 19.5% disposed with regular waste. 74.4% collected and disposed x-ray film as BMW and 17.9% disposed as regular waste. 54.5% broke the syringe needle and disposed as a separate BMW and 43.6% destroyed with needle burner. 70.9% dentists don't seem to have a problem in managing BMW but the most common barrier faced by them was lack of availability of biomedical waste management services. 100% dentists used Autoclave for sterilization. 56.4% sterilize their endodontic instruments using autoclave while 30.9% used glass bead steriliser. 90.7% disinfected/cleaned the hand-piece and turbines after each use and 37% sterilized them in autoclave. 75.9% sterilized the used burs in autoclave. 40% of the clinicians disinfected the dental chair set up after every patient.
- 76.4% agreed that their clinical assistants were trained in sterilization and biomedical waste disposal and they used protective measures like gloves, masks, gown and eye wear while handling the waste.
- 40% of them updated their knowledge regarding the management of biomedical waste disposal and sterilization from time to time through scientific articles While 49.1% perceived the need for information in waste management and sterilization through CDE programs.

QUESTIONNAIRE

(You are requested to answer all the questions)

Gender: M/ F

Age of the dental setup: (< 5years), (5-10years), (10-15years), (> 15years)

Place of practice:

North (Jammu & Kashmir, Himachal Pradesh, Punjab, Uttarkhand, Haryana, Uttar Pradesh, Delhi)

South (Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Telangana, Goa)

Central (Madhya Pradesh, Chhattisgarh, Orissa, Jharkhand)

East (West Bengal, Bihar, Sikkim, Meghalaya, Manipur, Assam, Tripura, Arunachal Pradesh, Nagaland, Mizoram)

Rural/Semi urban/urban

(Kindly go through the alternative given below the questions and tick (✓) whichever is applicable to you. You can tick on more than one option if applicable)

1) How is the disposal of health care waste in your clinic done?

- a) Dumping directly into garbage bins
- b) Handing it over to biomedical waste management agencies.
- c) Handing over to the garbage collector
- d) Disposed in a secure landfill
- e) incinerated/ burnt with in house set up)

2) What is the frequency of disposal of untreated biomedical waste from your clinic?

- a) Once in a day
- b) Once in two days
- c) Weekly

3) How is the disposal of silver amalgam done in your clinic?

- a) Disposed along with the regular waste
- b) Stored in an air tight container with water and given it to the recycling agent
- c) Collected in an air tight container and disposed as biomedical waste via a service provider
- d) Disposed in to the sewage line

4) How is the disposal of amalgam contaminated cotton and gloves done?

- a) Disposed along with the regular waste
- b) Collected and disposed as a biomedical waste via a service provider
- c) Incinerated/ burnt with in house set up
- d) Disposed in a secure landfill

5) How is the disposal of the developer and fixer solution used for x-ray films done?

- a) Poured down the sewer
- b) Diluted and poured down the sewer
- c) Return it to the supplier for recycling
- d) Other

6) How is the disposal of the x-ray film lead foil done?

- a) Disposed with regular waste
- b) Collected and disposed as separate biomedical waste
- c) Collected and sold to certified buyers
- d) Buried in the soil
- e) Disposed in a secured landfill
- f) Incinerated/ burnt with in house set up

7) How do you dispose exposed x-ray film?

- a) Disposed with regular waste
- b) Collected and disposed as separate biomedical waste

- c) Collected and sold to certified buyers
 d) Buried in the soil
 e) Disposed in a secured landfill
 f) Incinerated/ burnt with in house set up

- 8) How is the disposal of the sharp waste like needle?
 a) Disposed with regular waste as it is
 b) Break the needle and disposed as a separate biomedical waste
 c) Destroy the needle with needle burner
 d) Dispose in a puncture proof plastic bag and given to recycle
 9) Do you find safe management of health care waste from your clinic a problem?
 a) Yes b) No

- 10) If yes, what is the most common barrier faced?
 a) lack of availability of biomedical waste management services
 b) expensive
 c) Lack of time and personal
 d) Lack of knowledge

- 11) Which method of sterilization is used in your clinic?
 a) Autoclave
 b) Hot air oven
 c) Disinfectant solution
 d) Boiling water

- 12) How is the sterilization of endodontic instruments like endodontic files done?
 a) Glass bead sterilization
 b) Glutaraldehyde disinfectant
 c) Using spirit
 d) Autoclave
 e) Others

- 13) Are the endodontic files sterilized between the treatment of two teeth of the same patient?
 a) Yes
 b) No

- 14) Is the hand-piece and turbines cleaned/disinfected after each use?
 a) Yes
 b) No

- 15) How do you sterilize hand piece?
 a) Glutaraldehyde disinfectant
 b) Using spirit
 c) Autoclave
 d) Others

- 16) How do you sterilize the used burs?
 a) hot air oven
 b) Glass bead sterilization
 c) Ultrasonic cleaner d) Autoclave

- 17) Frequency of disinfecting the dental chair setup?
 a) After every patient
 b) Once daily

- c) Twice daily
 d) Once in 2 days
 e) Once in a week

- 18) Are your clinical assistants trained in sterilization and biomedical waste disposal and do they use protective measures like gloves, masks, gown and eyewear while handling biomedical waste/ sterilization process?
 a) Yes
 b) No

- 19) How do you update your knowledge regarding the management of bio medical waste disposal and sterilization from time to time?
 a) Through scientific articles
 b) Attending lectures
 c) Social media
 d) Promotion by companies/ service providers

- 20) Do you perceive the need for information in waste management and sterilization?
 (If yes, in which mode would you prefer?)
 a) Newspaper articles
 b) Scientific articles
 c) CDE programs
 d) Podcast/ YouTube

IV. DISCUSSION

- Infectious, chemical, and hazardous contents in dental health care waste makes its management very complex. Poor dental waste management exposes the workers of health care facility, waste handlers and community as a whole to infection, toxic effect and injury. Lack of information continues to lead dental professionals to contribute to environmental dehydration⁶.
- The present study was a small effort to assess the attitude of pediatric dentists who possess dental clinic all over India towards dental waste management. The study is based on a questionnaire provided to the clinicians having their own clinic. The aggregate appropriate response. However, each question was indeed very specific.

Due to neurotoxic and nephrotoxic effects of mercury, this area of study should be given utmost attention. It has shown that, prenatal exposure of methyl Hg from the consumption of Hg- contaminated fish can produce complications like neurobehavioral abnormalities in children. If we note, Dental clinics are responsible for the major amount of mercury waste which is generated in the form of amalgam particles and accidental mercury spills. A spill is considered small if there are less than 10 grams of mercury present and large if it is more than 10 grams. To avoid these, small spills can be cleaned safely using commercially available mercury clean up kits which chiefly contains a pair of nitrile gloves, scoop and scraper, absorbent activator bottle, safety shield, mercury caution label and instructions⁶.

- Over the period, it has been observed that the mercury released from the dental clinic is directly poured down the

sludge which is illegal and could not be recovered and recycled. By installation of efficient in-house amalgam separator devices that collect amalgam particles, this harm can be prevented. On the other side, Chair side amalgam filtration systems which retain amalgam waste at the chair are effective in removing substantial amounts of Hg from dental unit waste water. Another advantage of a chair side location is that maintenance of the separator is more convenient and there is no need to visit a utility room to check on the status of the separator⁷.

- Unused X ray films should not be placed in the regular bins as they contain unreacted silver that can be toxic to the environment. 56.1% acknowledged of throwing X ray films in regular bins. So to avoid environmental hazards, Safe disposal can generally be accomplished by simply contacting the supplier of the product and returning the waste for recycling. Exposed radiographic films are harmless and can be considered as general waste⁶.
- In our study, 100% of the clinicians use autoclave as a method for sterilization in the clinic and 56.4% use autoclave as the method of choice for sterilization of endodontic files also 52.7% sterilize between the treatment of 2 teeth of the same patient. 90.7% disinfect handpiece and turbines after every use and 37% use spirit to sterilize hand piece. 75.9% use autoclave to sterilize used burs. 40% of the clinicians disinfect the dental chair set up after every use. 76.4% of the clinical assistants are trained in sterilizations and biomedical waste management and they use protective measures like gloves, masks, gown and eye wear while handling BMW. Sterilization and disinfection process with the aid of variegated techniques is an imperative constituent in dental clinics to guard the patient as well as the dental care professionals from innumerable communicable infections. Sterilization has been designated as a determined process safeguarding a comprehensive eradication of all the living microorganisms, majorly the infectious groups of bacteria, viruses, and fungi. This comprises of complete eradication of the spores from any dental instrument or equipment¹⁰.
- 54.5% of the clinicians break the needle and dispose as separate BMW. Segregation of different categories of waste plays an important role in the entire process of waste management. Hazardous and non-hazardous waste should be segregated in order to reduce the rate of infections. Separate containers should be used to help distinguish between medical and general waste. All containers for biomedical waste must display the biohazard symbol and the words Biohazard in a color contrasting the container as per color coding system¹¹.
- 40% of the clinicians update the knowledge regarding the management of biomedical waste disposal and sterilization from time to time through scientific articles and 49.1% would like to perceive the need for information in waste management and sterilization. This shows that there is a need to inform all personnel involved in the handling regarding the potential hazards and inculcate responsibility of proper disposal of waste management.

V. CONCLUSION

The novel Coronavirus pandemic defines a new risk for all the dental practitioners, dental staff and the patients and brought a new unprecedented challenge to the world of dentistry. Being aware of it, Dentistry can lessen the combined environmental impact and the dentists should take the initiative to practise safe. To maintain innocuous practice of sterilization and disinfection the discovered results deliver a need to protect the environment in its maximum by bringing in the smallest changes from our dental clinic which could impact in a huge way and help the world a cleaner and healthier place.

REFERENCES

- [1]. Datta P, Mohi GK, Chander J. Biomedical waste management in India: Critical appraisal. *J Lab Physicians*. 2018 Jan-Mar;10(1):6-14.
- [2]. Sudhakar V, Chandrashekar J. Dental health care waste disposal among private dental practices in Bangalore City, India. *Int Dent J*, 2008; 58(1):51-4.
- [3]. Muhamedagic B, Muhamedagic L, Masic I. Dental office waste - public health and ecological risk. *Mater Sociomed*. 2009;21(1):35-8.
- [4]. Kucar Dragicević S, Butuci J, Kufrin J. Waste management in the Republic of Croatia-current status. *Arh Hig Rada Toksikol*, 2006; 57(3): 263-6.
- [5]. Anderson K. Creating an environmentally friendly dental practice. *CDS Rev*. 1999 Mar:12-8
- [6]. Bindra S, Mehrotra N, Chaudhry K, Nagpal K .A Study on Management of Dental Health Care Waste: Hyderabad Experience. *IOSR J Dent and Med Sci*. 2015; 14 (9): 98-102
- [7]. Stone ME, Cohen ME, Berry DL, James C. Ragain Jr. Design and evaluation of a filter-based chairside amalgam separation system. *Science of the Total Environment* 2008; 396: 28-33.
- [8]. 2003 ADA Council on Scientific Affairs Managing silver and lead waste in dental offices. *J Am Dent Assoc* 2003; 134:1095-96.
- [9]. Charania ZK, Ingle NA. Awareness awareness and Practices of Dental Care Waste Management Among Dental Practitioners In Chennai City. *Journal of Contemporary Dentistry* 2011;1(1):1-7.
- [10]. Assessment of Sterilization at Dental Clinics in India – A Cross-Sectional Study. Pala A , Sorathiya N , Noorani N , Shah J. *ISSN 2395-7387* September-October 2016: 3(3)