

Nature Friendly Dentistry

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ABSTRACT

Background: Green dentistry is a nature-friendly practice that is revolutionizing the dental field and its effect on the environment. It predominantly focuses on the incorporation of effective waste management and pollution prevention strategy by adopting the 4R method (Reduce, Reuse, Recycle, Rethink). Along with this, it also encompasses our crucial need to save resources and use hi-tech products. It is a burgeoning field which will aid in reducing the detrimental effects of global warming. The main aim of this article is to raise awareness among dental professionals and provide a series of green ideas that can be incorporated in our quotidian dental practices. Green dentistry is imperative, and doing our bit for the environment is the need of the hour.

Keywords: eco-friendly, environment, global warming, pollution, green.

INTRODUCTION

Global warming has become one of the most pressing issues in our modern society. Even dentists play a small role in contributing to this. Though individual dentist generates only a small amount of environmentally 'unfriendly waste', the accumulated waste produced by profession may have a consequential environmental impact¹. Hence, modifications need to be made promptly. Fortunately, with green dentistry into the picture, we have our chance to do our part in saving the environment. The aim of eco-friendly dentistry is to reduce the detrimental impact on the environment and promote environmental awareness and sustainability to patients². As dentists, we need to become more aware of the situation and embrace practices that help reduce waste and pollution, save energy, water and money and focus on reinforcement of a wellness lifestyle³. Dentistry is accountable in contributing to pollution by use of X-rays, generation of biomedical, hazardous and chemical waste, placement and removal of silver amalgam, etc². The dental industry plays a critical

role in adding to the waste disposed of in the landfills, which leads to the release of methane gas which is one of the strong greenhouse gases⁴. Thus, a lot of researchers have been committed to the environmental aspects of these dental wastes and its consequences on the environment⁵. It is necessary to alter our ways to decrease such effects on the environment. By doing this, using elementary, practical alternatives as well as common sense, we can be a part of dentistry's clean and foreseeable green future⁶. The green colour is used as it has healing powers, can help in enhancing vision, stability and endurance⁷. The aim of this review article is to spread awareness, provide a series of green recommendations that can be incorporated to aid in making dentistry environmental friendly.

Waste Management

Dentistry can limit its burden on the environment by employing the concept of the 4 R's. Health professionals are on the leading edge of helping to

Received: July. 17, 2020; Accepted: Aug. 26, 2020

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heal our planet by introducing the 4 R's- Rethink, Reduce, Re-use, Recycle⁸. They provide an ecologically sound and environmentally friendly approach to minimizing and managing waste. It is a strategy executed by dental professionals to make the transition to a more sustainable environment, an effortless one. The dental industry can be metamorphosed into a sustainable one just by implementing these four simple measures⁴.

REDUCE

With the aim of decreasing the burden on the earth's resources, one must minimize their consumption. The easiest way to have more resources is to utilize less of it. (9) This, in turn would also lessen the amount of waste created.

In order to achieve this in the dental office, the following measures can be implemented-

Disposing of the waste in biohazard waste accounts for 33% garbage (FIG 1). Hence, by purchasing products with minimal packaging, waste products can be reduced¹⁰. We can put an end to the use of chemicals by making use of steam sterilization. Purchase often used items in bulk, which in succession will reduce packaging waste⁴. The number of papers used in the dental office can be minimized by printing on both sides of the paper¹¹.

We are eliminating the use of plastic bags by using paper when possible^{12,13}.

The ideal way would be to go 'Paperless' (FIG 2). Use of computers and digital technology for patient charting, billing and radiography can be a great alternative¹⁴.

REUSE

This step helps us to prolong the use of items. Extending the lifecycle of an item by reusing it eliminates the need to transport it away¹⁵. By reusing these items, not only do we avert them from contributing to the waste in the landfills, but we also retrench the amount of energy needed to produce new products.

Few ways to execute using 'in the dental office are-

Switching to stainless steel impression trays (FIG. 3), diagnostic instruments (FIG. 4), providing glass

or ceramic rinse cups, switching to cloth patient barriers, utilizing a reusable glass (FIG. 5) irrigation syringe (Instead of a disposable plastic syringe), Using reusable operating room cotton towels in place of disposable plastic or paper patient drapes¹⁶.

RECYCLE

Recycling is the conversion of waste materials into reusable objects. Using recycled materials to make new products reduces the need for virgin materials. This avoids greenhouse gas emissions that would result from extracting or mining of the virgin materials. It also reduces the burden on waste management system¹⁷. It is an effective way to minimize overall contamination of the environment.¹⁸

The recycling triangle has three chasing arrows wherein each arrow has its own significant denotation. The first arrow represents a collection of materials to be recycled, and the second indicates 'Remanufacturing' or developing something new out of the recycled materials and the third arrow denotes 'Resale,' i.e. offering for sale items created from recycled materials.¹⁹

A few ways of putting recycling into practice are-

1. Installing an amalgam separator (FIG. 6)

Silver amalgam is one of the most widely used restorative material in dentistry. One of its major components is mercury, which poses a great threat to the environment²⁰. Dentists play a major role in the contamination of water systems by heavy metals²¹. Hence, installing an amalgam separator would impede this. Additionally, recycling waste amalgam also means that more of this need not be extracted, reducing the environmental burden.

2. If using traditional X-rays, recycle fixer and developer solutions and recycle lead foil from the x-rays¹¹ leads to pollution, digital X-rays can be used. (FIG. 7)

3. Buy rechargeable batteries for digital cameras¹².

4. Recycle old hand instruments

For over 12 years, Hu-friendly has offered a program called Envirodent which allows

practitioners to recycle old hand instruments and receive free instruments for helping the planet.¹³

5. Discretely recycle the paper and plastic portions of autoclaved bags by employing the community's existing recycling program¹⁶.



Fig 1: Waste disposal.



Fig 2: Paper waste.



Fig 3: Impression trays.

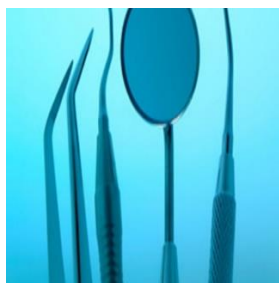


Fig 4: Instruments.



Fig 5: Disposable glasses.



Fig 6: Amalgamators.

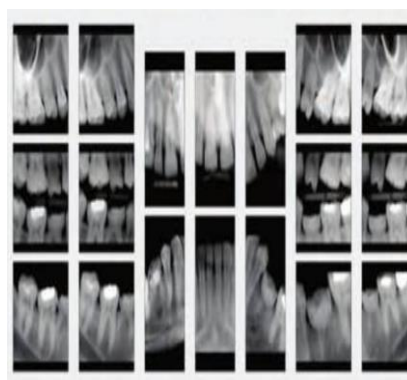


Fig 7: OPG's

RETHINK

Rethinking might be seen as the key to bringing about imperative changes and is of utmost importance. Thinking about the various operations and protocols in dentistry with an environmentally friendly approach and discussing them with the dental team can lead to new schemes for reduction, reusing and recycling. Implementing these schemes may have a remarkable effect, can lessen the burden on our environment and save the planet⁹.

Save resources

The time has come for every enterprise to save resources and dental offices have a significant role

in the environment. Green dentistry adopts renewable access to embolden dentists to achieve modern approaches to bid and saving the resources that are being depleted by the enterprises. Going green in dental offices reviews the number of patients, utilization of the supplies and all the energy used to make it environmental²¹.

SAVE ENERGY:

Go Green: Having a green construction which is eco-friendly and reserve productive by its architecture, development, and preservation has become the need of the hour. It may be expensive but is beneficial all over. A US-based Leadership in Energy and Environmental Design (LEED) is a powerful all overrating system, also favoured in India, this can be used to consume resources and save energy⁹.

Economical use of energy: Use of modern innovations and taking small steps like using motion sensors, switching off lights and utilization of compact fluorescent lights (CFL) in the dental offices can be an economical use of energy⁶.

Maintenance:

i. Having a regular check on the air conditioning units, furnaces, autoclaves, evacuation systems and updating them are few valuable ways that can be helpful in increasing the efficacy.

ii. Regular check on the refrigerators in the clinic for their supply of temperature to safeguard it is potent.

iii. Materials such as paper cups, booklets, and general waste can be recycled. This benefits in decreasing waste as well as cost.

Technology: The storage of data with respect to the cases of patients in computers will reduce the usage of papers and will bid to keep the data definite⁶. Some other equipment's that can be used are:

i. Computer-aided design and computer-aided manufacturing Systems:

Use of Computer-aided design and computer-aided manufacturing (CAD/CAMS) in clinics is helpful for the quality single appointment restorations. It is accessible globally and reduces the travel of experts

and decreases greenhouse gases formed by the machines⁴.

ii. Digital X-rays:

Conventional x-ray techniques harm nature in multiple ways. It produces paper, plastic and lead waste while disposing of empty film packets and developer and fixer waste which is disposed of in the drains. It exposes the patient to 75 to 90% more radiation than digital x-rays (FIG.7). On the other hand, Digital x-rays produce minimum exposure and reduce waste and supplies.

Other Methods to save energy:

Use of stainless suction tips instead of plastic, Practice switching off the lights while leaving the room, Minimal use of disposable plastics and paper and making use of biodegradable or chlorine-free cups or products, Practice an eco-friendly sterilization practice, Recycle fixer and developer solutions if using conventional techniques while taking x-rays, Do not use paints that include volatile organic compounds, High-energy consuming office lights to be changed into compact fluorescent lights (CFL), Furniture for the clinics can be made from recycled wood, To clean and sterilize making minimal use of harmful surface disinfectants²².

SAVE WATER:

One of the important components in green dentistry is to save water in the dentist's office in every way possible. Following methods can be used to save water in the dental office.

Conventional vacuum systems: A Dental vacuum system is an important segment of the clinic in machinery. These machines disastrously use a huge amount of water that is approximately 57000 gallons of water per year by a single clinic. In this era of global warming, it is not the best idea to use the most important resource extravagantly. A similar outcome can be produced by a High-tech dry vacuum system with no use of water at all²⁴.

Amalgam separator: One of the most frequently used dental restoration in clinics is silver amalgam as it is a sturdy, economical and robust material. But it consists of mercury, silver and other metals that can harm the environment. Mercury has its lethal effects on nature and humans as well. Presently it is

stated that total mercury load that enters drainage facilities is about 70% by dental offices. This can be prevented by setting up an amalgam separator in the dental office to make it ecofriendly. These machines prevent the entry of mercury in dental wastewater by segregating the minute particles from the wastewater. These machines are economical and globally accessible²³. One of the most advised machines is the number of ISO 11143-certified amalgam separator for the minimal mercury particles in wastewater which is about 95%⁴.

Pollution Prevention

The dental industry is responsible for contributing to pollution in several ways. They are as follows:

1. Dental amalgam wastes
2. Use of toxic chemicals in chemical sterilization
3. Healthcare waste

They include expired drugs, sharps, specimen tubes, slides, syringes, blood-soaked materials and human tissue which can cause a possible challenge to the environment²⁵.

4. X-rays

Conventional radiography generates waste in the form of chemical fixers and lead foil. The fixer comprises of silver which must be managed as hazardous waste or might be toxic. Also, the lead foil present in each film packet may be perilous to our environment²⁶.

5. According to the WHO, 80-85% of non-hazardous waste and 15-20% of hazardous waste is generated by hospitals.²⁷

Pollution prevention is a strategy for minimizing the amount of waste generated and released into the environment. Steps to be carried out by a dentist to prevent pollution are:

Use of steam sterilization as an alternative to chemical sterilization when possible²⁸.

Use digital radiography as it not only helps to prevent pollution but also has a lot of other advantages like reduced exposure to radiation,

increased speed of image viewing, enhancement of diagnostic image, etc²⁹.

Mercury pollution prevention

- Using substitutes like Glass ionomer cement (GIC), Composite.
- Installation of an amalgam separator in every clinic³⁰.
- Recycle waste amalgam
- Capture scrap amalgam and store in an appropriate sealed container
- During the removal of amalgam restorations, make use of High-volume evacuation (HVE) and water sprays as they decrease the level of mercury dust and vapor³¹.

Hi-tech Dentistry

The growing technology and its advancements have a great effect on dentistry. High tech dentistry plays a vital role in dental offices in saving resources and minimal waste production. Procedures can be done faster, effortlessly, and in less time by the dentists, hence it is important to throw light on and acknowledge the newer technologies for a better standard of living³².

Some innovations that can be adopted are:

Use of oil-free compressors, Computer-aided design and computer-aided manufacturing (CAD/CAMS) (FIG. 8), Digital imaging Digital communications scheduling appointments and details, Digital storage of patient records and cases and use of steam sterilizers rather than chemicals (FIG. 9).



Fig 8: CAD CAM.



Fig 9: Steam sterilization.

CONCLUSION

In this era of global warming, green dentistry not only reduces cost supply but also reduces the environmental impact. It adopts the innovations and helps in increasing the productivity by proficient use of time, minimizing the wastage and pollution by the dental fraternity. Eventually, it is also benefitted by the patients by giving the efficient treatment and making it economical.

We are a part of the system that is responsible for fostering the well-being of the environment. So, let us implement eco-friendly dentistry and protect mother nature from all the biohazards for a better tomorrow.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

REFERENCES

1. Lakshman P. Green Dentistry- Pollution Free, Ecofriendly dentistry. IDRR 2010;5(2):36-38.
2. Green dentistry; Ecofriendly dentistry: Beneficial for patients, beneficial for the environment;
3. Bharat Kumar Garla. What exactly is Green dentistry?; available from url :<http://www.ecodentistry.org/>
4. Bhagyalakshmi Avinash; BS Avinash, BM Shivalinga et al.
Going Green with Eco-friendly dentistry; Bhagyalakshmi Avinash; BS Avinash, BM Shivalinga et al. Available from: http://www.ada.org/sections/professionalResources/pdfs/5402_150_ways.pdf.

5. Green Dentistry: The Future; Mensudar Rathakrishnan, Amudha Priyadarhini

6. Green Dentistry, A Metamorphosis towards an Eco-Friendly Dentistry; a Short Communication.

7. Color meaning. Retrieved from <http://www.bourncreative.com/meaning-of-the-color-green> Accessed. (October 2013)

8. Pockrass F, Pockrass L the four "Rs" of Eco-friendly dentistry American dental practice, Canadian Dentistry Association 2008;22(8):18-21.

9. Amandeep Chopra, Nidhi Gupta, Nanak Chand Rao, Shelja Vashisth

Eco-dentistry: The environment-friendly dentistry;

10. Best management practices for hazardous dental waste disposal (website of the nova Scotia Dental Association) December 2006.

11. Adams E. Eco-friendly dentistry. Not a matter of choice. Canadian Dental Association 2007;73(7):581-584.

12. American dental association council on dental practice. go green: It's the right thing to do. Available from: <http://dentalcare.com/media/en-US/education/ce383/ce383.pdf>

13. Hu-friendly. Envirodent. Available from: <http://www.hu-friendly.com/programs/envirodent.aspx>

14. ADA. 150 ways to go green. Available from: http://www.ada.org/sections/professionalResources/pdfs/5402_150_ways.pdf.

15. Cunningham WP, Cunningham MA. Environmental science: a global concern. 8th ed. New York: Mc Graw-Hill 2008.

16. Chopra A, Gupta N, Chand Rao N, Vashisth S. Eco-friendly dentistry: The environment friendly dentistry.

17. Nikita Mohelay, Shravani G Deolia, Dollu Jagyasi, Rashmi Lakhwani, Sourav Sen, Jyoti Chapekar. Eco-friendly Dentistry: A Green Business with teeth. International Journal of Oral Health and Medical Research | ISSN 2395-7387 | JULY-AUGUST 2016 | VOL 3 | ISSUE 2.

18. Baron T. Mercury in our environment. J Calif Dent Assoc 2004;32(7):564-573.
19. Earth911.com, Recycling, Available from: <http://earth911.com/recycling/>.
20. G Chin, J Chong, A Kluczevska, A Lau, S Gorjy, M Tennant. The environmental effects of dental amalgam. Australian Dental Journal. 2008;45(4): 246-96.
21. Anderson K. Creating an environmentally friendly dental practice. CDS Rev. 1999;(1):12-8.
22. Go Green dentistry; Passi S
23. Canadian Dental Association. CDA position on dental amalgam, February 2005.
24. American dental association council on dental practice. go green: It's the right thing to do. Available from: <http://dentalcare.com/media/en-US/education/ce383/ce383.pdf>
25. Rao SKM, Ranyal RK, Bhatia SS, Sharma VR. Biomedical waste management: an infrastructural survey of hospitals, Med J Armed forces India 2004;60(4):379-382.
26. Patenik CJ. Managing regulated waste in dental environments. J Contemp Dent Pract 2003;4(1):76.
27. Baghele OM, Phadke S, Deshpande AA, Deshpande JP, Baghele MO. A simplified model for biomedical waste management in dental practice: a pilot project at Thane, India. Eur J Gen Dent 2013;2:235-40.
28. CDC. Guideline for disinfection and sterilization in healthcare facilities, 2008. Available from: http://www.cdc.gov/hicpac/pdf/guidelines/Disinfection_Nov_2008.pdf
29. Berkhout E, Sanderink G, Stelt. Digital intra-oral radiography in dentistry. Diagnostic efficacy and dose considerations. Oral Radiol 2003;19:1-13.
30. ADA. Best management practices for amalgam waste, Oct. 2007. Available from: http://www.ada.org/sections/publicResources/pdfs/topics_amalgamwaste.pdf.
31. Akshat Sachdeva, Aditi Sharma, Sumit Bhateja and Geetika Arora. Green Dentistry: A Review. Journal of Dentistry and Oral Biology. 2018 | Volume 3 | Issue 6 | Article 1144.
32. High Tech Dentistry. ECO Dent Association. 2016.
33. Rathakrishnan M, Priyadarhini A. Green dentistry: The future. J Int Clin Dent Res Organ. 2017;9(2):59-61.