REVIEW ARTICLE

Eco-Friendly Dentistry: A Green Business with Teeth

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ABSTRACT

Dentistry is the quintessential curative profession. Today's scenario necessitates understanding the grave demand of being eco-friendly in every facade of our lives which duly involves the dental practice. Dentistry as a profession has contributed a heavy load of metallic waste on the environment and has over exploited the water and the electricity for various dental procedures, which specifically emphasize the thrust to move towards "green dentistry". Eco-friendly dentistry is an intellectual way of dental practice which is environment friendly and at the same time conserves the money and time by reducing waste, decreasing pollution, and conserving energy with the use of latest techniques and procedures. Eco-friendly dentistry consequently safeguards the biodiversity and the human race from the hazards of rapid urbanization in developing countries. We need to emphasize the practice of eco-friendly, green dentistry in a developing country like India, which needs to conserve resources and curb environment pollution.

KEYWORDS: Green Dentistry, Pollution, Dental Waste, Recycle, Reuse

INTRODUCTION

Since decades, the influence of human practices on the environment has been a major concern globally. As stated by the statistics given by WHO, SouthEast Asia Regional Office; production of hazardous and non-hazardous waste by a total of 11 SouthEast Asian countries come to a total of about 1000 tons per day and approximately 35000 tons of health care waste per year.[1] Dentistry as a profession has an exuberant endeavour in the health care waste. Though the individual dentist yields dental waste on a small scale, the overall accrued wastage may have a prodigious result on the environment. Ergo, it is the call of the clock for the dentists to become environmentally sensible and direct themselves to an eco-friendly dental practice. Eco-friendly dentistry is relatively a virgin concept in dental practice. It is a part of a bigger picture of the ecologically-sustainable healthcare system.

The ECO-DENTISTRY ASSOCIATION defines Green Dentistry as: "green dentistry is a high-tech approach that reduces the environmental impact of dental practices and encompasses a service model for dentistry that supports and maintains wellness.[2] It is an emerging concept which is worthwhile to the environment and has taken the dental profession faraway from the stage of preventing pollution to a juncture of encouraging sustainability. It majorly focuses on waste reduction, energy conservation, and pollution prevention.

The two dominant boulevard to materialize an advance in the field of environmental friendly dentistry are the following: (a) development and application of tailor-made policies in this regard. (b) authority and possesorship taken by the dentists themselves.[3]

This article provides an insight on green dentistry and commend discursive methods to lay the foundation of a dental practice with is environment friendly.

PURPOSE

The prime intent behind this review article is to investigate the various environmental problems caused by the dental community and to equip the dentists with various environmental substitutes of the materials in use and to impart them with tier of "green" guidance which would invoke them to become leading stewards of the environment.

According to EDA, the prime worth of switching to the eco friendly dentistry is as follows:

- It is high-tech
- Reduces waste and pollution
- Saves time, energy, and money
- Promotes wellness

"CARDINAL POINTS IN GREEN DENTISTRY"

According to the ballpark figure provided by Environment Protection Agency (EPA), annual turnover of mercury containing waste amounts to be approximately 3.7 tons which forms the deadweight on

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the local waste-water treatment plan, or is incinerated with the other trash. Majority of the dental waste is contributed by an estimate of 65% - 75% dental clinics that uses conventional X-ray systems which requires the disposal of 4.8 million lead foils and about 28 million litres of X-ray fixers yearly; ultimately burdening the biodiversity.[4] Dentistry can limit its burden on the environment by employing the "Four R's of Going Green," namely, **"Re-think, Reduce, Reuse, and Recycle".**

Re-Think: "GO GREEN", Environmentalism, etc. is a state of mind, and reincarnating the demeanor towards dentistry is the key to transformation. Rethinking is the first of the four R's and is of utmost importance. It includes re-thinking the dental procedures, construction, and administration of a dental clinic, in accordance to the dogma of eco-friendly dentistry as a paradigm. Disposable items like gloves, masks, cotton, glasses, etc. for instance. As of now, there is no ideal alternative for downsizing the waste generated by these used disposable items. It indicates endless number of rubber and plastic items will end up overflowing the landfills. However, that doesn't mean it isn't worth "re-thinking." Perhaps, one can place a bulk order to cut back on the pollution caused by transportation. In addition to it; manufacturing the plastic impression trays utilizes a huge percentage of energy and then sequentially wrecks havoc in the landfills; which creates an issue for the next generations.[5] Therefore, trays made out of corn (single use) or stainless steel trays can be used as an alternative instead.

It is the act of rethinking that matters: stopping to take notice of the obvious things in our practice that we do every day, and asking oneself if there is a different method to do the things so that it proves to be more efficacious and reduces the burden on the Earth. Executing little, affordable transitions will still have a remarkable effect on the environment on a long run.

Reduce: The first and most efficient element of the waste hierarchy is minimizing the waste created and the obvious approach to have an abundance of a resource is to use less of it. Under mentioned are a few key measures to reduce the onus on the environment:

1. Conserving water: Some ways in which dental office can participate in saving water includes the following:

- Supervene the guidelines provided by Centre for Disease Control for hand sanitization and whenever relevant; prefer sterilium in lieu of cleaning hands with soap and water.[6,7]
- When hand-washing is required, turn off the water while lathering.
- As already known, less than 1% of water on earth is considered fit for human utilization and in line with the data provided by Eco–Dentistry Association; leaving the tap open while brushing, accounts for wastage of 90 glasses of water per day per person; roughly giving the statistics of approximately wasting 118 billion glasses of clean water every day in this country alone; when utilization of this water can be done for other prospects. Therefore it is the need of the hour to commit oneself to "SAVE 90 A DAY" campaign by Eco-Dentistry Association to help spread out awareness to patients to turn off taps while brushing.[7]
- Make use of wet dental vacuum pump instead of dry one.[8]
- Only run full loads when using sterilization equipment or the practice laundry machines. Install all the sink faucets with low flow aerators.
- Check for and repair the leaky faucets throughout the dental clinic.[9]

2. Downsizing the utilization of disposable utilities in dentistry goes a long way in safeguarding the environment.[8,9,10]
3. Reduction in the dental office must follow the motto of going "paperless", which involves the office employing computers and digital technology whenever possible to create, use, and store office records.
4. Cast out the use of plastic bags by using paper ones when appropriate.[9]

Reuse: To "re-use" is to use an item again after it is already used once. This maneuver boosts the extended use of an item; thus debaring the item from contributing to the waste in the landfills. Assigning a refreshing intent for an item prolongs its life and lessen the excess baggage on the landfills. By making use of the items again, it takes off the affliction on the natural resources by reducing the need for extractions, along with curtailing the amount of energy needed for the production of new products.

Few ways to implement "re-using" in the dental office are:

- Reusable operating room cotton towels in place of disposable plastic or paper patient drapes, [5]
- As a back-up to disposable suction tips, prefer reusable stainless steel high- and low-volume, surgical/endodontic suction tips, [5]
- Instead of the disposable plastic syringe, utilize a reusable glass irrigation syringe, [5]
- Biodegradable disposable cups instead of regular paper cups, [5]
- Chlorine-free, high postconsumer recycled paper products in place of traditional paper products, [5] and
- Whenever suitable; re-use papers. Used papers can be shredded and utilized again as packaging materials. [5]

Recycle: the process of converting the waste materials into reusable objects is recycling. It reduces the exhaustion of potentially commodious materials, fresh raw materials, energy consumption, air pollution and water pollution (from landfills). Thereby reducing the demand for "stereotyped" waste disposal system and lowering the emission of greenhouse gases. Recycling triangle has three chasing arrows wherein, the first arrow denotes the collection of the items to be recycled; the

second arrow represents "re-manufacturing" i.e. creating a brand new out of recycled items; the third arrow denotes offering for sale items created from recycled materials.[5]

In the scenario of eco-friendly dentistry, by rethinking the choices we make, cutting back on the consumption and utilizing again whatever we can, there will be less for us to recycle. But if it comes down to discarding an item into the trash or recycling it, choose the latter whenever possible. Owing to the statistics given by U.S. Environmental Protection Agency, more than 75 percent of what we throw away could be recycled, and the material we currently recycle diverts 68 million tons of material from our landfills and incinerators.

Various measures of recycling that can be taken in a dental office are as follows:

1. Collect and store all contact and noncontact scrap amalgam and send it to an approved recycler for reprocessing the mercury.
2. Establish an amalgam separator which keeps the mercury-containing material out of the water system.
3. Recycle fixer and developer solutions and the lead foils from x-ray films if one still uses conventional x-ray processing system.
4. Use recycled materials such as toilet tissue, paper towels, and office furniture, whenever feasible.
5. Instead of disposable batteries, make use of rechargeable batteries for flashlights and digital camera and broken instruments can be transformed for other motives and thus helps in recycling efforts.[5]
6. A programme named Environdent introduced by Hu-Friedy 12 years back helps the practitioner to recycle their old hand instruments and to further help the planet; they provide the practitioners with free instruments in exchange.[9]
7. Individually recycle the paper and plastic fractions of autoclaved bags by utilizing the community's existing recycling programme. [5]

EFFECT OF GREEN DENTISTRY ON BIODIVERSITY

Gulf oil disaster, scorching heat in Russia, 1998 being the warmest year on record globally, the significant meltdown of the polar icecaps, uncalled floods, are just a few to name that has taken place in the last few years. What is this to do with the dentistry as a profession ?? It is easy to say, "they don't have anything in common with the dental profession," turn the other way and head back to the job that you do. But stop for a moment and analyze carefully- somewhere we all know that our planet's bounty is limited and that we as humans better do something about environmental degradation as quickly as possible, before our own survival is imperilled. Most of the dentists are unaware that the waste generated by our practice contributes oodles to the Earth's landfills. We must come to the senses that the wastage that leaves our practices doesn't go away. While we cannot do much about the wastage and the pollution generated by other working sectors but we can do our bit for sure and take steps and embrace technology to make a green difference. Every high tech permutation in dentistry has environmental perks of its own. One such example is CAD/CAM system which provides the advantage of single visit restorations which points out to a significant decrease in the number of patient visits eventually lowering the carbon dioxide emissions. Moreover, the system strikes out the need for disposable impression materials, and the consignment and transportation that is required to send the restorations back and forth to the lab.[11] Another small step is painting the dental clinics with the paint that doesn't incorporate any volatile organic compounds (VOC) henceforth decreasing the amount of toxins in the air. It is a basic sense that in order to save the resources that are limited, for a longer period, we must use them judiciously. An illustration in this regard is, to interdict the deforestation and to retard the global warming; we must reduce the consumption of paper and initiate the use of electronic and digital methods.[11] Also the fact that the supply of fresh water not being endless, the resource must be respected and preserved. Moreover, dental offices are one of the largest users of inorganic mercury, and hence dental clinics forms the largest source of polluting water with mercury. The mercury in water, which gets converted into methylmercury is readily absorbed by the marine life eventually shortening their lives and increasing the content of mercury as we go up the food chain, thus creating a havoc in the balance of aquatic life. Henceforth, as a dentist, it is upto us to play our part carefully in conserving the water and preventing the dentist induced water pollution by using substitutes of mercury containing amalgam, using amalgam separators, etc.[7] In all, protect the nature, and she will protect us.

IMPLEMENTATION

Many of the going green suggestions are great, but the implementation part may seem daunting and complicated. Few convenient methods that can be considered are:

At a private level: Energy can be conserved by the implementation of simple practices in the daily lives, making green dentistry natural. Few noteworthy measures are as follows:

1. Green office:

a) Using concrete as an alternative to bricks, which improves the thermal efficacy by reducing the heating and cooling load.
b) Make use of double walled glass in the windows as it reduces the direct gain of heat while maximizing the sunlight entering the office.
c) Use eco-friendly nontoxic paints instead of traditional paints that contains VOCs that contributes to the carbon footprints.
d) An eco-friendly choice of flooring the dental office is linoleum.

2. Conserve energy in the clinics by usage of compact fluorescent light bulbs.[10]

3. Use a Programmable thermostat that runs on altered temperatures at different times of the day. Energy can be conserved even while the office is closed by adjusting the temperature of the thermostat according to the outside temperature.[5]

4. Preserve upto 1/3rd of energy cost by using an ENERGY STAR® rated appliance in dental offices.[5]

5. Use a dry dental vacuum pump system instead of a wet one which uses approximately 360 gallons of water every day in a typical practice.

At a community level: From a disease- based model the health sector has metamorphosized to a wellness- based model which focuses on prevention, early detection, and less invasive treatments. Green future of dentistry envisions the wellness based model of health sector.[11]

Following are the wellness-based modalities that are considered to be a part of green dentistry:

- Laser diagnostic tools that permits you to detect caries earlier than with the naked eye.
- To help dental patients relax naturally, use aroma therapy.
- To increase the oxygenation, use live, green plants in the clinics.
- To remove particulates from the air, HEPA UV germicidal, in-operatory air purifiers can be used.[11]

BARRIERS IN IMPLEMENTATION OF GREEN DENTISTRY

Despite the many benefits offered by the eco-friendly approach, dentistry as a whole has been slow to catch on to the trend. It is still a work in progress and it meets certain barriers in its implementation. Few of the shortcomings in this regard are as follows:

1. The first and foremost barrier in the implementation of eco-friendly dentistry is the "UNAWARENESS" of the concept among the concerned professionals. Green dentistry being a 'new', budding notion, is still doing rounds just on the internet, and a very few have worked on the concept.
2. The consideration of building a "Green Office" is one of the prerequisites in green dentistry. But those already with a conventional dental clinic would give a difficult time in getting convinced to re-build their offices according to the guidelines of green dentistry because it would be a costly affair and high costs may also be a deterrent for some dentists. Moreover, it is a time consuming pursuit to switch from conventional practice to green practice.
3. Over-exploitation of the natural resources

RECOMMENDATIONS

1. As eco-friendly dentistry is a fresh and emerging concept in the field, the existing dentist population are unaware of the notion. Therefore, special workshops, seminars, and conferences must be conducted in this regard.
2. The future of green dentistry rests in the hands of the younger dental students, thereupon the Dental Council of India must include the concept of green dentistry in the existing curriculum to bring out this transformation in the field of dentistry.
3. Special monitoring cells must be assigned to evaluate the implementation of the concept by the dentists on a personal level, and we must take stringent actions for those not abiding the concept.
4. Create special NGOs and/or provide a government subsidy for the pre-existing conventional dental clinics to transform them into green dental offices.
5. Establish an organization regarding Green dentistry such that through their elementary, no-cost "Green Rewards" programme, it can support the sustainability or green initiatives of the members. They can help members save money on services that nearly every business buys- credit card processing, telephone, travel, tech support, office supplies, etc. and they may give back a piece of cost as "Green Rewards" for subsidy such as smart thermostats, LED light bulbs, or sustainable projects. In the long run, the members tell the world about it, and hence the word spreads itself.
6. Promoting research works on the concept and providing grants in this field will further help the cause.

CONCLUSION

Decrease the combined environmental impact of dentistry by inculcating the Four R's of going green (recycle, reduce, reuse, and rethink) that can be easily applied to the dental office. However, the impact of these practices on the planet cannot be quantified; endeavours must be made towards an eco-friendly approach. We, being a part of the system responsible for spreading smiles, it's time for us stop overlooking sustainability and make our dental practice eco-friendly. Become a part of dentistry's clean, green and profitable future. Start wherever you are and do something for a safer and greener future. The planet, your patients, and your practice will thank you.

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