

Green dentistry: a systematic review of ecological dental practices

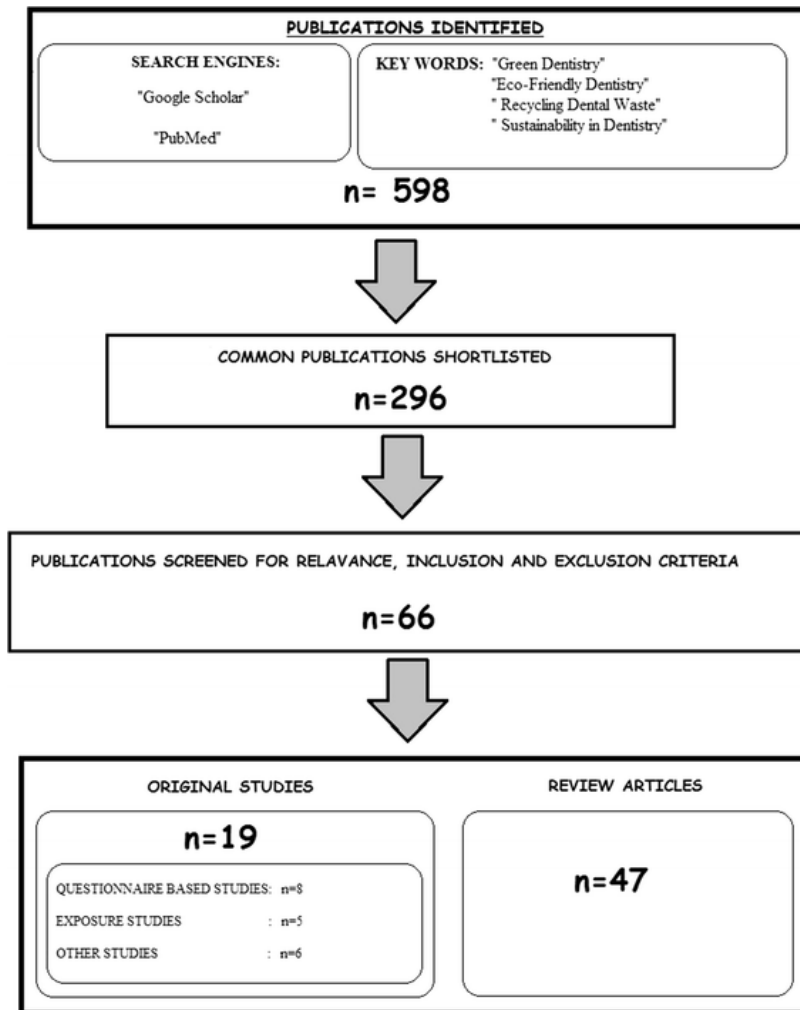
Summary by Maral Aghourian

Introduction:

- Importance of being conscious of carbon footprint to reduce global burden
- Dentistry contributes to climate change and pollution due to:
 - o Obligatory use of large amounts of water, electricity and plastics
- Each year Dental Office Waste and Pollution:
 - o 4.8 million lead foils
 - o 28 million liters of toxic X-ray fixer
 - o 3.7 tons of mercury waste
 - o 1.7 billion sterilization pouches
 - o >680 million chair barriers, light handle covers and patient drapes
 - o ~57,000 gallons of water each year for an average dental practice
- Some studies indicate the changing attitudes and acceptance of “eco-friendly” or “green dentistry”
- Green dentistry is a high-tech approach that reduces environmental impact of dental practices and encompasses a service model that supports and maintains wellness
- Eco-Dentistry Association (EDA) offers knowledge, membership, standards and best practices to dentists willing to adopt and practice eco-friendly dentistry
- Green dentistry based on the model of four R’s—Reduce, Reuse, Recycle and Rethink
 - o Efficient use of time, resources, reduces supply costs, eventually preventing pollution
 - o Key concepts are conservation of resources like water and energy.
- Limited research available on knowledge and practices of dental students and dental practitioners about “eco-friendly dentistry.”
- This paper reviews studies and highlights what is recommended for eco-friendly dentistry

Data extraction and results:

- 47 review articles
- 19 original studies:
 - o 8 questionnaire-based: scrutinizing level of knowledge about the concept and practices of green dentistry and their implementation of eco-friendly strategies.
 - o Five exposure studies: assessing the ill effects of amalgam exposure to dental patients, practitioners and dental students.
 - o 6 studies: centered on the environmental impacts of disposable vs. reusable and recyclable materials



Discussion:

- Reduction in environmental footprint by adoption of simple, practical and reasonable alternatives
- Some “green” recommendations provided, allowing for “eco-friendly” dentistry
- High level of knowledge but low level of implementation about eco-friendly strategies for:
 - o amalgam, radiology, paper waste, infection control, conservation of energy and water
- Interest in eco-friendly alternatives but concept of “green dentistry” not well understood
- Positive attitudes toward adopting measures of “green dentistry”
- Dental practitioner, staff and students at a high risk of ill effects of mercury during appropriate and safe disposal of amalgam waste
- Staff aware of concept of sustainability and focus on waste management protocol
- Strict infection control guidelines → increase use of disposable plastic equipment
- Possible lack of clear guidance for sustainable dentistry
- Majority of dental office waste is semi-house hold waste and can be recycled

- Over half of the dental clinics in study did not have any programs implemented for reducing or recycling waste
- Amalgam scrap from preclinic can be used to recycle mercury and silver
- Stainless steel orthodontic brackets can be reused after appropriate reconditioning treatments
- 40% less environmental impact with reusable burs
 - o provided ultrasonic cleaner and autoclave were loaded optimally
- 4 principles of “green dentistry,” i.e., Reduce, Reuse, Recycle and Rethink
 - o simple yet effective recommendations to reduce the environmental impact of dentistry

5 Recommendations:

5.1 Reduce

- Reduce use of resources → reduce the amount of waste generated
- Reduce consumption → prevent depletion of natural resources
- 5.1.1 Reducing electricity consumption
 - o Use of LED lights
 - o Switching off the lights and computers when not in use instead of standby
- 5.1.2 Reducing water consumption
 - o Use efficient disinfection and sterilization
 - o Regularly monitoring and servicing to prevent leaks
 - o Faucet is left running while brushing = up to 90 glasses of water is wasted
- 5.1.3 Reduce paper waste
 - o Use computer-based/electronic records systems

5.2 Reuse

- Finding new purpose for an item
- Use reusable and sterilizable instruments reduces amount of plastic waste
 - o Petroleum-derived plastic ends up in landfills and cannot be biodegraded
- Use biodegradable disposable instruments
 - o limited use such as in cases with universal precautions
- Use of sterilizable stainless steel instruments is the best option
 - o Metal can be recycled into a new purpose after dentistry
 - o Least wasteful and least polluting option

5.3 Recycle

- Recycling is an integral part of waste disposal
 - o Limits use resources and reduces amount of disposed waste
- Aluminum, glass, plastic, paper and metals like steel are easily recycled.
- high silver content in fixer easily recycled
 - o of silver recovery unit and transporting collected silver to Certified Waste Carrier
 - o After the separation of silver, solutions should be packaged and labeled to be carried away by the hazardous waste disposal services.
- Undeveloped X-ray films contain a high level of silver
 - o Considered hazardous waste that can contaminate soil and groundwater

- Lead in film packet is a leachable toxin
 - o Lead foil should be recycled for its scrap metal content instead of being dumped
 - o Digital radiography:
 - Eliminates lead waste
 - Reduces amount of plastic casings
 - Helpful in record keeping
- Mercury released into the environment with inappropriate amalgam waste disposal
- Amalgam-free dentistry advised when possible or “best management practices” in the handling and disposal
- Variety of amalgam wastes in dentistry:
 - o Elemental mercury vapors released during trituration
 - o Dental amalgam scrap (amalgam that has not come in contact with patient)
 - o Amalgam waste (particles that have come in contact with secretions of patients)
 - Can be trapped in chair-side traps, vacuum filters, etc.
 - Appropriate separators must be used
 - “GRIT”; G—grey bag it; R—recycle it; I—install an amalgam separator; T—teach it
- Studies done to identify protocols to reuse some stainless-steel equipment
- Hu-Friedy program: recycle old hand instruments and receive a free instrument

5.4 Rethink

- Rethink every decision and every step in the dental practice
 - o a. *Rethink sterilization:*
 - Avoid dangerous and toxic chemicals to reduce water pollution
 - Steam sterilization instead of cold and chemical sterilization
 - Reusable instruments and equipment
 - Use eco-friendly disinfectants
 - Use metal tray or reusable cloth
 - o b. *Rethink radiology*
 - Use digital radiography → reduce waste lead foils, fixers
 - o c. *Rethink waste management*
 - Pay attention to waste segregation, recycling and waste disposal
 - o d. *Rethink office operations*
 - Digitization saves substantial amounts of paper
 - o e. *Rethink energy*
 - Renewable energy sources
 - o f. *Rethink building*
 - A green building: concrete instead of brick, eco-friendly nontoxic paint, etc

6 Conclusion

- Green dentistry:
 - o multi-disciplinary approach
 - o 4 R’s: Reduce, Reuse, Recycle and Rethink
 - o To be sustainable, dental practice can adopt several simple changes in their clinic
 - o Though it may require money and effort, dentists are together doing their best to practice green dentistry

Reference:

Khanna, S.S., & Dhaimade, P.A. (2018, April 28). Green dentistry: A systematic review of ecological dental practices. Retrieved from <https://link.springer.com/article/10.1007%2Fs10668-018-0156-5#citeas>