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Assessment of awareness, attitude and practices regarding eco-friendly dentistry among dental professionals in Pune city of Maharashtra

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Abstract

Introduction: Given the current devastating state of our ecosystem and statistics regarding the depleting nature of our natural resources, adoption of green dentistry in clinics is a necessity.

Aim: This study was done with the intent of assessing awareness of dental practitioners about Eco-dentistry and strategies currently employed.

Materials and Methods: A structured, self-administered, close ended questionnaire was designed for data collection and shared with dentists residing in Pune city via a Google form link. It consisted of 24 questions that assessed awareness, attitude and practices with regards to green dentistry. Reliability and validity was calculated. Statistical analysis was done using descriptive statistics.

Results: The study involved 252 participants, of which, 82.14% were general practitioners and 17.85% were specialised practitioners respectively. Collectively, 90.47 % respondents were aware of the ideology behind Eco-dentistry. 61.90% participants believe that there is a requirement for formally educating dental professionals regarding the same. 67.46% participants implement efficient energy saving strategies in their clinics.

Conclusion: The study concluded that awareness about Eco-dentistry was fairly good in the study participants whereas attitude and implementation was satisfactory.

Keywords: Awareness, attitude, eco-friendly dentistry, green dentistry, dental professionals, sustainability

1. Introduction

Derogatory activity of our society and corporates with regards to the environment has resulted in gradual decline of the ecosystem foundations on which our survival depends. Global warming, extinction of various flora, fauna and marine species, as well as fresh water shortage are just few of the many global catastrophes that are being carelessly aroused [1]. The dental industry has been found to be a minor but consistent contributing factor to this scenario. Dental clinics produce an overwhelming bulk of domestic, toxic, chemical and pharmaceutical waste [2]. It is estimated that a typical dental setup utilises 57000 gallons of water annually, with the average vacuum system using 360 gallons of water per day [3]. Conventional X-ray systems call for disposal of 4.8 million lead foils and about 28 million litres of X-ray fixers yearly [4]. Disposable form of suction tips, personal protective equipment, patient drapes, plastic syringes sum upto copious amounts of non-biodegradable waste. 680 million plastic chair barriers and 1.7 billion instrument sterilisation pouches are dumped into landfills yearly [5]. Dental offices utilize PBT (persistent bio-accumulative toxins) such as mercury, lead, PVC, DEHP, VOCs (volatile organic compounds), PBDEs (Poly brominated diphenyl ethers) and HBCDs (hexabromocyclododecans), and other harmful elements, which with exposure can adversely affect the health of team members, patients, and the environment [6]. Dentists are responsible for 3-70% of total mercury load entering wastewater treatment [5].

FDI World Dental Federation considers sustainability to be an indispensable principle of dentistry, which “must be practiced ethically, with high levels of quality and safety, in the pursuit of optimal oral health.

Sustainability integrates a broader commitment of the oral health professionals to social and environmental responsibility. The right of future generations to a world with adequate natural resources must be respected” [7].

Inculcation of an environmentalist mind set is of utmost importance in these times of environmental crisis. Environmentalism is a social movement that targets political processes for implementation of systems for preservation of natural resources and ecosystems [8]. Propagating this ideology, a pioneering movement was initiated by the 5th European Dental Students Association (EDSA) Congress in Belgrade, Serbia in March 2003, called The Green Dental Movement, when the Greek delegacy proposed the initiative for adoption by the assembly [9]. Since then, various alliances have been formed that provide access to eco-friendly dental resources and environment conscious dental health professionals. Eco-Dentistry Association (EDA) is one such exemplary organisation. It was cofounded by Dr. Fred Pockrass and his wife Ina Pockrass, launched internationally in June 2009 [10, 6].

EDA has defined Green dentistry as a high-tech approach that encompasses an eco-friendly service model for dentistry that supports and maintains wellness [10]. It promotes the key ideology of “going green” that is Re-think, Reduce, Reuse, Recycle (4R’s) [4]. Conceptually, it entails practices aimed at reducing wastage, usage of green products and conservation of water as well as electricity [4]. It is advantageous to the practitioner and the patient as it reduces supply costs by utilising dental innovations and increases productivity by efficient time use, thereby aiding in provision of quality treatment and a reduction in treatment costs [11].

Widespread implementation of Green dentistry would have a profound beneficial impact on the environment. Thus, awareness of this model of dental practice becomes crucial. This study was done with the intent of assessing awareness of dental practitioners about Eco- dentistry and strategies currently employed.

Materials and Methods

A cross-sectional questionnaire study was conducted among dental professionals in Pune city of Maharashtra. This study was aimed to assess the awareness, attitude and practices regarding green dentistry among dental professionals. Inclusion criteria: Participants had to have been either general or specialised dental practitioners. The calculated sample size was 317 using G* Power software version 3.1.9.2 (Heinrich Heine University, Düsseldorf). The final considered sample size was 252. Convenient sampling techniques were used in the study. A questionnaire was pretested among 20 subjects to check for reliability and validity. These subjects were not included in the final study. This structured, self-administered and close ended questionnaire was designed for data collection. It comprised of demographic data such as age, gender, qualification and designation along with 24 questions that assessed awareness, attitude and practices with regards to green dentistry. The questionnaire was formulated on Google forms (Google LLC, Mountain view, California, United States) and the link was shared via Google form link. A brief introduction was given about the study to the participants. Data collected was entered in an excel spreadsheet (Microsoft Excel 2016). Statistical analysis was done using descriptive statistics using Statistical Package for Social Science (SPSS) 23.0 version software (IBM, Chicago, Illinois, United States).

Results

Table 1 depicts demographic data of the respondents. The male participants were 51.58 % and female were 48.01 %. Majority of the respondents were general practitioners (82.14 %).

Table 2 depicts knowledge, attitude and practice pertaining assessment of the study participants. 90.47% respondents were aware of the notion behind eco-friendly dentistry. 75.39% clinicians were aware that dental setups are a major cause of mercury waste entering waste water treatment facilities while it was also noted that 71.8% of these clinicians were not aware that a massive number of instrument sterilization pouches from dental setups reach landfills on an annual basis. 79.69% dental practitioners maintained digital patient records although 66.26% participants were not aware of biodegradable electronic supplies. 52.77% clinicians were aware of usage of amalgam separator as a green amalgam management practice. 69.84% respondents were well aware of sustainable dental hygiene products and 93.25% respondents recommend them as well. 72.2% clinician’s responses inferred a good attitude with regards to ethical consideration in practicing sustainable dentistry. Additionally, there is a strong collective agreement that there should be a provision for educating clinicians regarding green practices. 71.82% participants while washing their hands, habitually turn off the tap. 67.46% participants implement efficient energy saving strategies in their clinic.

Discussion

The present study sought to assess awareness, attitude and practices regarding Eco-friendly dentistry among dental practitioners of Pune city. It demonstrates the following key findings: 1) Participants are familiar with green dentistry conceptually. 2) Participants (63%) consider green dentistry to be financially beneficial in terms of potential increase in new patient visits. 3) Participants (72%) associate ethics with not only caution regarding welfare of the patient but also the environment. 4) Majority participants follow water and energy saving practices.

In this study, 90.47% participants exhibited awareness about the ideology behind Eco-dentistry, which is significantly higher than a study by Chandrashekhar *et al.* (2020) [12], where 64.4% respondents were aware. Additionally, in a study by V. Prathima *et al.* (2017) [14], only 40.6% participants were aware of the same. In recent years, the use of social media as a platform for business advertising and promotion has seen a growth rate. Dentists are now exposed to newer and more efficient marketing strategies. Greener dental practices have attracted the attention of “woke” clientele which gives conventional dental practitioners enough incentive to update themselves with this ongoing trend in the dental industry.

24% participants were familiar with Eco-dentistry Association (EDA) in the current study whereas an even lower percentage of respondents i.e. 23% were aware of EDA in the above mentioned study by V. Prathima *et al.* Our study revealed that 80% respondents maintained digital records which was found to be higher than a study by Chopra and Raju (2017) [15] where 62% respondents maintained digital records. 75% participants in the current study believed that making a shift to green dentistry would attract more patients to their clinic which was found to be slightly lower than a study by Parakh *et al.* (2020) [16] where 87% respondents shared the same belief.

We believe that the pandemic scenario may have some significant weightage in the reason for which we received an overwhelming number of positive responses. The Covid-19 pandemic has shed a light on the intimate and delicate links between humankind and our environment [17]. It is a possibility that experiencing mayhem due to an air-borne virus has opened people's eyes to the aggravated environmental crisis. This may have motivated them to take initiatives in whatever capacity they deem doable, to save the environment.

The same unsustainable choices that are killing our planet are killing people [17]. World Health organisation (WHO), on the date of 11th October 2021, called out to all countries to

commit to decisive action on limiting global warming to 1.5°C at the United Nations Climate Change Conference [17]. Their recommendations include: 1) Complete shift of current financing into development of clean energy. 2) High income countries should make larger cuts in greenhouse emissions 3) Governments should build climate resilient, low carbon, sustainable health systems [17].

One inherent weakness of this study is its restricted geographic relevance. Convenient sampling techniques were utilised for this study. Another important limitation is that a relatively small number of specialised practitioners were willing to participate in the study.

Table 1: Demographic details of study participants (N=252)

Sr. No.	Demographic details	Response	Number (N)	Percentage (%)	Total
1	Gender	Male	130	51.58	252
		Female	122	48.01	
2	Qualification	BDS	207	82.14	252
		MDS	45	17.85	

Table 2: Knowledge related questions' responses of study participants (n=252)

Sr. No.	Demographic details	Response	Number (N)	Percentage (%)	Total
1	Are you familiar with the notion behind eco-friendly dentistry?	Yes	228	90.47	252
		No	24	9.52	
2	Did you know that dentists contribute to 70% of total mercury load entering waste water treatment facilities?	Yes	190	75.39	252
		No	62	24.60	
3	Did you know that nearly 1.7 billion instrument sterilization pouches are dumped into landfills yearly?	Yes	71	28.17	252
		No	181	71.82	
4	Are you aware that worn out dental instruments can be recycled?	Yes	176	69.84	252
		No	76	30.15	
5	Are you aware of biodegradable electronic supplies?	Yes	85	33.73	252
		No	167	66.26	
6	Are you aware of the programs endorsed by eco-dentistry association (EDA)?	Yes	59	23.41	252
		No	193	76.58	
7	Which of the following is an eco-friendly amalgam management practice?	Disregard of alternatives to amalgam filling	46	18.25	252
		Keeping unused amalgam in poorly-sealed containers	12	4.76	
		Use of amalgam separator	133	52.77	
		All of the above	50	19.84	
		None of the above	11	4.36	
8	Which of the following is a sustainable dental hygiene product?	Bamboo toothbrush	176	69.84	252
		Nylon dental floss	4	1.58	
		Copper tongue cleaner	9	3.57	
		All of the above	58	23.01	
		None of the above	5	1.98	
9	Which of the following is an eco-friendly type of flooring?	Bamboo	199	78.96	252
		Vinyl	4	1.58	
		Marble	12	4.76	
		All of the above	24	9.52	
		None of the above	13	5.15	
10	Which of the following is a green infection control practice?	Use of non-biodegradable disinfectants	17	6.74	252
		Use of HDPE plastic disinfectant pump spray bottles	4	1.58	
		Use of washable cloth lab coats rather than disposable ones	167	66.26	
		All of the above	55	21.82	
		None of the above	9	3.57	
11	Which of the following is an innovation employed in green dentistry?	Digital imaging system	11	4.36	252
		Digital patient charting, scheduling, billing and records	4	1.58	
		CAD/CAM system	21	8.33	
		Steam sterilisers	0	0	
		All of the above	209	82.93	
12	Which of the following methods would be effective in reducing the dental industry's carbon footprint?	Reducing appointment frequency based on patient risk	10	3.96	252

	Implementing telemedicine and teleconferencing for patients	11	4.36
	Combining visits for family members	12	4.76
	Encouraging cycle to work schemes or car-pooling for staff	9	3.57
	All of the above	194	76.98
	None of the above	13	5.15

Table 3: Attitude related questions’ responses of study participants (N=252)

1	With the overwhelming evidence of global climate changes, do you consider it an ethical duty to practice sustainable dentistry?	Strongly agree	182	72.22	252
		Agree	46	18.25	
		Neutral	24	9.52	
		Disagree	0	0	
		Strongly disagree	0	0	
2	In your opinion, would eco-friendly practices lead to more patients visiting your clinic?	Strongly agree	32	12.69	252
		Agree	160	63.49	
		Neutral	51	20.23	
		Disagree	9	3.57	
		Strongly disagree	0	0	
3	In your opinion, would eco-friendly practices reduce your work efficiency?	Strongly agree	31	12.30	252
		Agree	28	11.11	
		Neutral	155	61.50	
		Disagree	38	15.07	
		Strongly disagree	0	0	
4	Do you think there is a need for formally educating clinicians regarding green practices?	Strongly agree	156	61.90	252
		Agree	80	31.74	
		Neutral	16	6.34	
		Disagree	0	0	
		Strongly disagree	0	0	
5	Do you think that shifting to green practice would be more economical to dentists, require minimal resources and no additional cost of basic infrastructure?	Strongly agree	29	11.50	252
		Agree	50	19.84	
		Neutral	149	59.12	
		Disagree	24	9.52	
		Strongly disagree	0	0	

Table 4: Practice related questions’ responses of study participants (N=252)

1	While washing hands, do you turn off the water while lathering?	Always	181	71.82	252
		Often	50	19.84	
		Sometimes	13	5.15	
		Rarely	8	3.17	
		None of the above	0	0	
2	What are the energy management practices followed in your clinic?	Use of LED light bulbs	28	11.11	252
		Use of renewable sources of energy (wind & solar)	17	6.74	
		All of the above	170	67.46	
		None of the above	12	4.76	
		None of the above	0	0	
3	What are the paper waste management practices followed in your clinic?	Recycle dental office waste	31	12.30	252
		Use of recycled paper products	8	3.17	
		Donate old magazines and dental books to libraries or community centres	35	13.88	
		All of the above	59	23.41	
		None of the above	119	47.22	
4	Which of the following eco-friendly items do you use instead of disposable ones?	Cloth drape, head cap and arm rest covers	40	15.87	252
		Reusable glass/metal cups and metal suction tips	10	3.96	
		Reusable metal air/water syringe	19	7.53	
		All of the above	143	56.74	
		None of the above	40	15.87	
5	Do you use any eco-friendly dental hygiene products and would you advise your patients to use the same?	Yes	235	93.25	252
		No	17	6.74	
6	What is your preferred method of maintaining patient records?	Digital records	201	79.76	252
		On paper records	51	20.23	
7	What type of personal protection equipment do you use?	Disposable	156	61.90	252
		Reusable	96	38.09	

Conclusion

Our findings deemed that awareness about Eco-dentistry was fairly good in the study participants whereas attitude and implementation was satisfactory. If this study is any evidence

that “going green” has become a trend in the post-pandemic era, eco-friendly dentistry is definitely an alternative to conventional dentistry worth exploring.

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