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# An analytical study on awareness of knowledge, implementation and barriers of eco-friendly dental office strategies with respect to dentists in a city of Western Maharashtra.

[1]Dr.Ashwini.Nerkar.Rajbhoj, Dept of Oral Medicine and Maxillofacial Radiology, Assistant Professor, DY Patil Dental School, Pune

[2]Dr.Tejas.Mukund.Kulkarni, Dept of Oral Medicine and Radiology, Associate Professor, SMBT Institute of dental science and research,Nandi hills,Dhamangaon,Igatpuri,Nashik

[3]Dr.Anuja Moharir, Dept of Periodontics, Assistant Professor, DY Patil Dental School, Pune

[4]Dr.Rohan Pulgaonkar, Dept of Orthodontics, Assistant Professor, DY Patil Dental School, Pune

[5]Dr.Abhishek Kumbhalwar, Dept of Public Health Dentistry, Assistant Professor, DY Patil Dental School, Pune

[6]Dr. Sneha Suwarnkar, Dept of Pedodontics, Tutor, DY Patil Dental School, Pune

**Corresponding Author:** Dr.Ashwini.Nerkar.Rajbhoj, Dept of Oral Medicine and Maxillofacial Radiology, Assistant Professor, DY Patil Dental School, Pune

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**Abstract**

**Background:** Global warming is one of the serious issues that people face around the globe (WHO 2011).Eco-friendly dentistry is a newly evolving practice of dentistry, which encompasses a simultaneous devotion to sustainability, prevention, precaution, and a minimally invasive patient-centric as well as global-centric treatment. Hence, as a dentist, it is our responsibility to extend our contribution towards environmental protection, by creating awareness and knowledge of eco-friendly approach in clinical practice. Also by knowing and solving rootproblems/barriers, which prevents implementation of such strategies can help us, in encouraging & promoting such practices at a larger scale.

**Aim:** The survey aims to assess Awareness, knowledge, implementation and barriers of Eco-friendly dental office strategies among dental practitioners in a city of Western Maharashtra.

**Material and Methods**: A cross-sectional survey was conducted using a self-administered close-ended questionnaire comprising of 25 questions among 240 dental practitioners to evaluate the awareness of eco-

friendly dentistry and procedures involved in implementing them and also about the barriers for implementation of such strategies.

**Results:** The overall attitude, knowledge among all the dental practioner's of pune regarding eco-friendly dentistry is satisfactory ,but the implementation of the same is not upto the mark.Contributing to this, are barriers such as cost and unawareness about any government bodies help, which adds up to the prevention of implementation.

**Conclusions**: The current study suggests that the implementation of eco-friendly dentistry practices among the dental practitioners in pune is not adequate.

**Keywords**:Eco-FriendlyDentistry,Dental Practiotioner's,Pune

**Introduction**

Eco-friendly dentistry is an approach to dentistry that implements sustainable practices by keeping resource consumption in line with nature's economy, by safeguarding the external environment by virtue of eliminating or reducing outgoing wastes and by promoting the well-being of all those in the clinical environment by conscious reduction of the chemicals in the breathable air.[1] In June 2009, the Eco-Friendly Dentistry Association (EDA) was launched internationally.[1] In India, The Ministry of Environment and Forests (MoEFs) has promulgated Hazardous Wastes (Management and Handling) Rules, 1989 and amended the same in 2000 and 2003 for proper management and handling of hazardous wastes in the country.[2]

Eco-Friendly Dentistry is a newly evolving practice of dentistry, which encompasses a simultaneous devotion to sustainability, prevention, precaution, and a minimally invasive patient-centric as well as global-centric treatment philosophy. The responsibility of a dentist is not just towards the patient but towards preservation of environment also.[1] Eco-Friendly Dentistry, through green design and operations, protects the immediate health of patients and team members, the health of the surrounding community, and the health of the global community.[2] The implementation of eco-friendly practices in the dental office involves an extensive list of protocols, procedures, materials, state-of-the-art equipment and methods, but does not have to be a daunting endeavour and can be accomplished with small, incremental steps and natural resources[3].

Dentists throughout the world are doing their best to reduce the environmental impact of dental practice. Certainly, collective efforts are necessary to ensure that dentists, at least, will not be responsible for destroying it. This concept should be made accessible to all dental health-care professionals [4] .However, this concept and its awareness among professionals remain a query to be analyzed.

Thus, the purpose of this study is to analyze the awareness of Knowledge, Implementation and barriers of Eco-Friendly Dental Office Strategies amongst dentists in a city of Western Maharashtra.

**Material & Methods**

A cross-sectional research survey was conducted in DY .Patil dental school, Lohegaon, Pune. The study was approved by the institutional review board, and the ethical clearance was obtained prior to the commencement of the study. Voluntary informed consent was obtained from dental practitioners after explaining the purpose of the study and the assurance of maintenance of anonymity. The survey was conducted amongst the dental practioners working in Pune,Western Maharashtra, India. The list of dental clinics was obtained from the office of the Indian Dental Association, Pune.

**Inclusion criteria**: included dentists who were practitioners from in various fields of dentistry with diverse years of experience.

**Exclusion criteria:** were the practitioners who were not willing to participate in the study, incompletely filled questionnaires

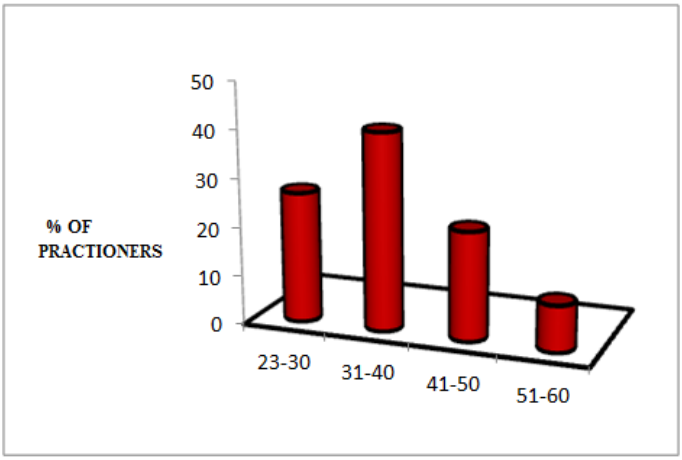
Systematic random sampling was used for sample size determination. A sample size of **240** was considered adequate. The study was conducted in **July 2020**, and a designated research assistant distributed the questionnaires designed by the researcher to the dental clinicians. A self designed questionnaire was pilot tested among 50 volunteer dentists to check the reliability and internal consistency of the questionnaire. Data was collected using the pretested structured closed ended questionnaire. The first part of the questionnaire consisted of the demographic details and the second part was of awareness on eco-friendly dentistry, its associations and implemented strategies in their practice and any barriers for the implementation of such strategies. SPSS package version 7.0 was used for statistical analysis of the questionnaire data. Chi-square test was used to understand the proportions. Significance level was fixed as 5% ($\alpha = 0.05$).

**Results**

Among the total participants 72.91% were male and 27.08% were females.Amongst all the 240 dental practioners,66.66% were undergraduates,16.66% were postgraduates.12.5%,2.08%,0.83%,5.41%,2.91%,1.25%,2.5%,2.5% and 3.33% were from conservative, oral medicine,oralpathology,prosthodontics,periodontics,public health dentistry, pedodontics, oral maxillofacial surgeons and orthodontics specialty branch respectively. 33.33% ,39.58% ,18.75% and 8.33% of dental Practioner were having 1-9,10-19,20-29 and 30-39 years of practice.

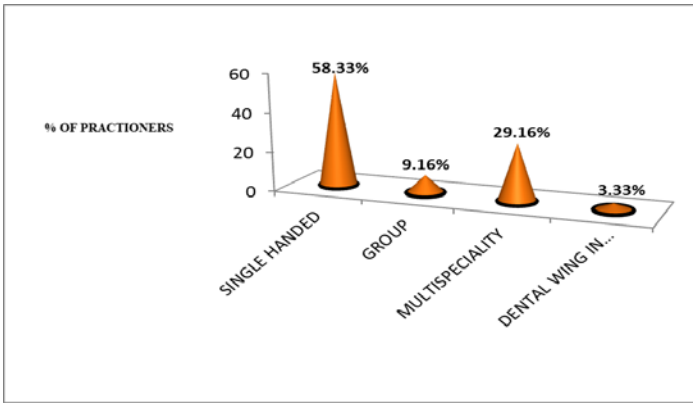
Graph 1 shows distribution of age groups of total dental practioners. 40.83% ,the highest age range of practioner's belong to 31-40 age group.

Graph 1: Age Groups




Graph 2 shows distribution of type of practice of total dental practioners. Highest type of practice belonged to single handed parctioners group of about 58.33%.

Graph 2: Type of Practice




Graph 3 shows place of practice of all the dental practioners.Highest place of practice was seen in Warje area of pune 76 (31.66%).

Graph : 3 Place of Practice

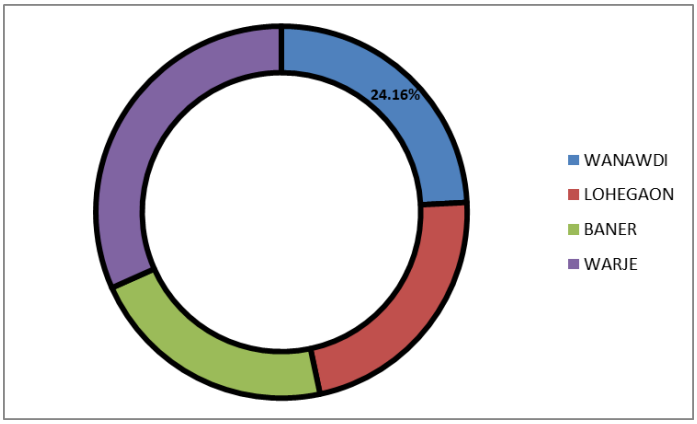



Table 1 Questions and responses for attitude, knowledge and barriers regarding eco-friendly dental practice

| Sr.No. | Variable | No. of Practioners | | Percentage (%) | | P value |
|---|---|---|---|---|---|---|
| | | YES | NO | YES | NO | |
| 1 | Are u aware of eco-friendly dentistry? | 88 | 152 | 36.66 | 63.33 | **0.002** |
| 2 | Aware of harm done to environment by dental practice | 176 | 64 | 73.33 | 26.66 | **0.003** |
| 3 | Eco-friendly method followed in clinic ? | 52 | 188 | 21.66 | 78.33 | **0.002** |
| 4 | Use alternatives to amalgam ?lling such as composite,ceramic,gold and porcelain | 199 | 41 | 82.91 | 17.08 | **0.001*** |
| 5 | Dispose amalgam in means other than regular trash or down drain | 180 | 60 | 75 | 25 | 0.03 |
| 6 | Use digital radiograph | 175 | 65 | 72.91 | 27.08 | 0.065 |
| 7 | Use waste management programme to dispose of leadfoil | 85 | 155 | 35.41 | 64.58 | **0.002** |
| 8 | Use computer-based records system | 138 | 102 | 57.5 | 42.5 | 0.03 |
| 9 | Implement patient electronic messaging service instead of written prescriptions on paper | 165 | 75 | 68.75 | 31.25 | 0.05 |
| 10 | Use steam sterilization with cloth instrument wraps vs.paper and plastic autoclave bags | 165 | 75 | 68.75 | 31.25 | 0.06 |

Table 1: Shows questions and responses of attitude,knowledge and barriers regarding eco-friendly dental practice. Results regarding questions about awareness of eco-friendly dentistry,any harm done contribution to the environment,implementation of eco-friendly methods in clinics and use of alternative restoration instead of amalgam in order to avoid use and disposal of mercury showed statiscally significant difference,with a p value of 0.002,0.003,0.002 and 0.001 respectively.

Responses regarding disposal of amalgam,use of digital radiograph,use of computer for records,use of electronic messaging system instead of hand written prescriptions and avoidance of plastic autoclave bags showed difference, but it was stastically insignificant.Where as, disposal of lead foils of xray showed statistically significant difference with a p value of 0.002.

Table 2 : Questions and responses for attitude, knowledge and barriers regarding eco-friendly dental practice

| Sr.No. | Variable | No. of Practioners | | Percentage (%) | | P value |
|---|---|---|---|---|---|---|
| 11 | Use reusable glass/metalcups instead of paper,plastic or Styrofoam | 178 | 62 | 74.16 | 25.83 | 0.03 |
| 12 | Use compact ?uorescent light bulb | 68 | 172 | 28.33 | 71.66 | 0.04 |
| 13 | Turn off and unplug all the electrical appliances at the end of the day, including computers,printers and copiers | 186 | 54 | 77.5 | 22.5 | 0.02 |
| 14 | Use water faucet sensor | 62 | 178 | 25.83 | 74.16 | **0.003** |
| 15 | Use dual-?ush toilet | 45 | 195 | 18.75 | 81.25 | **0.002** |
| 16 | Aware of EFD association (EDA) | 51 | 189 | 21.25 | 78.75 | **0.001*** |
| 17 | Due to cost factor efd implementation is not so common | 190 | 50 | 79.16 | 20.83 | **0.005** |
| 18 | Due to unawareness of any help from government regarding implementation of Efd efd practice is not so common | 210 | 30 | 87.5 | 12.5 | **0.001*** |

Table 2 shows Use of reusable glass,compact fluorescent bulbs,turning off all the swtiches before leaving the clinic,showed statically insiginificant difference.But,use of water faucet and use of dual-flush toilet showed statistically significant difference with a p value of 0.003 and 0.002 respectively.

Responses regarding awareness of EFD associations and about barriers to the implementation of eco-friendly dental practice such as cost factor and awareness about any of government policies of EFD practice showed statiscally significant difference with a p value of 0.001,0.005 and 0.001 respectively.

Table 2 Questions and responses for attitude, knowledge and barriers regarding eco-friendly dental practice

**Discussion**

In India, green dentistry is still in progressing state, while in several countries, it has been developed long ago [5]. In the present study,175(72.91%) were males and 65(27.08%) were female participant, which was similar to study Chandrasekhar Pallavi et al., in 2020,[4] where there is a higher proportion of males (68.9%) and less number of female dentists (39%).

The bachelor's degree is the minimal educational requirement to practice dentistry in India and is reflected in the level of education of the majority of respondents in this survey.As per distribution of speciality branch among all 240 dentist,majority were from conservative followed by prosthodontics and periodontics and than oral medicine,oral surgeon and oral pathologist.This results were similar to the findings found in V.Prathima.et al, [3](2017), majority of participants were from conservative,prosthodontics and periodontics.

The age of the dentist who participated in this study ranged from (23-60) years with the majority between the ages of 31-40. These finding are similar to the study by Sawair et al.,[6] (2010) in which the majority of Jordanian dentists were 30-39 years old. The majority of the respondents have practiced between (10-19) years which correlate with the majority of respondent's age in this survey.

The highest type of practice which was found in this study was single handed private practice 140(58.33%),which was similar to the findings found in V.Prathima.et al,[3](2017) in which single handed private practicioner were 446(55.8%).The highest place of practice was seen in warje area of pune 76(31.66%).

In this study, the awareness about term Eco-friendly dentistry was only among 36.6% of dentist participant and almost 63.33% were not aware.This findings are in accordance to the findings of study conducted by Agrasuta and Nelson et al.,[7] 2013 where 83.5% of respondents never heard the term “green dentistry,” only 16.5% had idea of what it is.

This study results revealed (82.91%) preferred alternative restorative material than amalgam restorations which is similar to the study conducted by Chopra and Raju et al.[8], in 2017,where 98% of practitioners are implementing alternative to amalgam restoration practices. This is not in accordance with the study of Sawair et al.,[6] (2010) who found that about 76% of Jordanian general dental practitioners use amalgam.Results revealed that almost 180 (75%) of dentist dispose amalgam in means other than regular trash ,which might be because of the awareness of health hazards caused due to mercury toxicity. This result might also be due to the high use of alternative restoration materials; and therefore, represent a low need for amalgam waste management.This results were in accordance to the results found in Sabha M. Al Shatrat et al.,[9] (2013) study which also showed low implementation of the amalgam management strategies.

The present study results illustrated that 72.91% dentists used digital radiography which is in accordance to the study conducted by Sen et al.,[10] in 2017 where 40.3% are using digital radiography. In the present study ,results showed only 35.41% of dentist use proper waste management programme,which was in accordance to the results of study Sabha M. Al Shatrat et al.,[9] (2013),which showed only 30% followed proper waste disposal and recycling methods for radiographic waste.

The present study results revealed that almost majority of 57.5% of dentist use computer-based records system.The reason might me increased awareness among dentist and general public regarding paper waste managaement.Also ,almost 68.75% ,which is majority of dentist implement

patient electronic messaging service instead of written prescriptions on paper. High access to the internet by most of western maharshtra citizens can explain this results.This results were not in accordance to the finding found in Sabha M. Al Shatrat et al.,[9] (2013) study,which reveal low use of patient electronic messaging services (18%).

Results of this study revealed, that almost 165% of dentist prefer using steam sterilization with cloth instrument wraps than paper and plastic autoclave bags.This results goes in accordance to the findings found related to paper waste management question among pune dentist.Results of this study also revealed, high use of glass /metal cups 74.16% ,which was not in accordance to the findings of the study carried by Sabha M. Al Shatrat et al.,[9] (2013). Great care that is needed to properly clean and sterilize all reusable items,need for extra equipment such as a dishwasher with a special sanitizer cycle for reusable cups can be avoided by using using disposable items.This kind of awareness is needed to be encouraged among pune dentist.

About only 28.33% practitioners preferred LED light bulbs when compared to incandescent lights which was in accordance to Kallakuri et al.,[11] (2019) where only 45% practitioners used LED lights bulbs.Contrarily ,study conducted by Chopra and Raju et al.,[8] in (2017),dentists employed the use of LED light bulbs almost (91%). Lack of knowledge, about LED lights that are highly energy-efficient, tough and durable, and they work in low voltages also when compared to incandescent lights,might be the reason behind this problem.

On the other hand, water faucet sensors save water usage, prevents water overflow with automatic turn off, hands-free and easy to operate, help to stop the spread of germs and bacteria. In the present study, the usage of water faucet sensors was found only to be around 25.83% which was in accordance to the findings of study conducted by Kallakuri et al.,[11] in 2019 where only 11.7% used the water faucet sensors , which shows that there is a need for implementation of water conservation in clinics.

At the end of the study,few questions were asked regarding any kind of barriers for implementation of eco-friendly dentistry practice.Majority 79.16% of dentist practicing in pune were in the favour of cost factor ,as one of the major barrier and 87.5% stated that unawareness of any help from government for implementation of EFD practice.

**Conclusion**

The current study suggests that awareness of green dentistry is high in dental practitioners, but they lack in implementing the same. Furthermore, proper education through CDE programs, workshops, and seminars can bring a change and create a positive attitude among dentists to change from conventional dentistry to eco-friendly dentistry.

**Take home message :** This survey would prove to be helpful, as it has provided a mirror to the actual awareness ,knowledge,implementing startegies and barriers of implementation, among dental practioner's of Pune regarding eco-friendly dentistry.Understanding the obstacles and analysis of awareness and knowledge, will help in implementing dental practice with environmental conservation and also increase in encouragement of the practioner's to follow the newly evolving and global-centric treatment philosophy.

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