

Awareness of Eco-Friendly Dentistry among Dental Faculty and Students of King Khalid University, Saudi Arabia

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ABSTRACT

Introduction: Eco-friendly or green dentistry can be a reality by effectively designing dental clinics and using more eco-friendly materials in the clinical practice.

Aim: To determine the awareness of eco-friendly dentistry among dental faculty and students in preparation for future implementation.

Materials and Methods: Assessment of knowledge regarding eco-friendly dentistry was done using an 18 item self-administered questionnaire among 160 participants. After baseline data collection, the intervention was done by educating participants with a power point presentation. The post-intervention data was then collected for analysis. Statistical analysis was done using Wilcoxon's signed rank test and one-way ANOVA.

Results: The educational intervention increased the knowledge about eco-friendly dentistry confirming the importance of continuing education. There was a statistically significant gain in knowledge among the participants after the presentation. The gain was highest for department of Preventive Dental Sciences (PDS) followed by Substitute Dental Sciences (SDS), No specialty, Maxillofacial Dental Sciences (MDS), and Restorative Dental Sciences (RDS) respectively. ($F=5.5091$, $p<0.05$).

Conclusion: Lack of knowledge of green dentistry amongst the dental fraternity is highly prevailing. The same can be substantiated with effective training in the respective fields if channelized through the curriculum in an educational set-up.

Keywords: Dental professionals, Green dentistry, Questionnaire

INTRODUCTION

Dental health care is devoted to endorsing and enhancing oral health and well-being and to achieve such goals, dentists use a diversity of materials and instruments. Unfortunately, particular materials that are currently used include heavy metals as well as biomedical waste, which offer impending challenges to the environmental balance [1]. Dentistry has a substantial contribution to the pollution generated by the waste material, source of energy used, use of paper and use of toxic material in dental practice. This emphasizes that although dentistry deals with promotion and maintenance of health, at the same time contributes to pollution. To counter the ill-effects as stated, more recently, the term "Eco-Dentistry or Green Dentistry" has been pioneered which has taken dentistry beyond the point of preventing pollution to a place of promoting sustainability [2,3].

The word green and eco-friendly signifies the use of an alternative source of energy, non-toxic material, renewability, efficient use of energy and fewer carbon footprints. Concentration on the factors thereby will promote dentistry as a non-contributory profession to environmental pollution. However, the application of same is possible only if a directive education in the field is stated and implemented at a primary level. Eco-friendly or green dentistry can be a reality by effectively designing dental clinics and using more eco-friendly materials in the clinical practice. Although, the basis of same is dependent on educating the budding dentists in their respective fields [4].

Today, the dental education system throughout the globe lacks incorporation of such a subject. Dental health care workers also have an important task of analysing and carrying out their bit of responsibilities for the eco-friendly environment [4]. This concept should be made accessible to all dental health care professionals

and students. However, the aspect and its extent whether known to the professionals, remains a query to be analysed. If unknown, the implementation of same and its effects thereby would be another question to clarify.

Thus, this study was done to determine the awareness of eco-friendly dentistry among dental faculty and students in preparation for future implementation.

MATERIALS AND METHODS

A cross-sectional survey was conducted to determine the awareness of eco-friendly dentistry among 160 participants of King Khalid University, Saudi Arabia, consisting of 100 doctors, 50 students, and 10 dental auxiliaries. The sample size was determined based on the results of a previous study using proportion sampling technique [5]. Informed consent was obtained from all participants. Ethical clearance was obtained for Institutional Review Board. An 18 item closed-ended questionnaire (in English language) was designed and was checked for content and construct validity. The questionnaire was assessed for face and content validity. It was pilot tested on 20 participants and was evaluated for the uniformity of interpretation. Reliability for internal consistency of the questionnaire was checked with Cronbach's alpha (0.80 - 1.00) during the pilot study. The survey consisted of two parts, the Pre-Education Survey, and the Post-Education Survey. The 2nd set of survey was post-presentation in which the participants had to answer the same round of questions after going through a presentation on eco-friendly dentistry, which included practice of dentistry with minimal wastage, maximum recycle and more energy efficient resources. Statistical analysis was done using Wilcoxon's matched paired test and one-way ANOVA. Data was analysed using Statistical Package for Social Sciences (SPSS) Inc. version 20 Chicago, USA (IBM Statistics Inc., Chicago, USA).

RESULTS

The survey was conducted among 160 participants of which 78.75% were males. The response rate was 100%. [Table/Fig-1] shows the distribution of male and female respondents by specialty and position. Comparison of knowledge before and after lectures in each question was analysed using Wilcoxon signed rank test. There was statistically significant increase found in the number of correct responses to all questions after the lecture [Table/Fig-2]. Comparison of gain in knowledge with respect to specialties after the lecture was determined using one-way ANOVA, and it was observed that there was a statistically significant increase in the knowledge regarding eco-friendly dentistry after the lecture. The gain was highest for Department of Preventive Dental Sciences (PDS) followed by Substitute Dental Sciences (SDS), No specialty, Maxillofacial Dental Sciences (MDS), and Restorative Dental Sciences (RDS) respectively [Table/Fig-3]. Comparison of gain in knowledge with respect to positions after lecture using one-way ANOVA shows that there was a statistically significant gain in knowledge among the participants. The gain was highest for General practitioners followed by Assistant Professor, Demonstrator and Lecturer, Associate Professor and Professor, student and auxiliary respectively [Table/Fig-4].

Factors	Male	%	Female	%	Total
Specialty					
None	77	61.11	31	91.18	108
RDS	13	10.32	0	0.00	13
MDS	13	10.32	0	0.00	13
SDS	12	9.52	1	2.94	13
PDS	11	8.73	2	5.88	13
Position					
Student	29	23.02	21	61.76	50
Demonstrator and Lecturer	6	4.76	0	0.00	6
General Practitioner	48	38.10	0	0.00	48
Assistant Professor	31	24.60	2	5.88	33
Associate Professor and Professor	12	9.52	1	2.94	13
Auxiliary	0	0.00	10	29.41	10
Total	126	100.00	34	100.00	160

[Table/Fig-1]: Distribution of male and female respondents by specialty and position.

Preventive Dental Sciences (PDS)
 Substitute Dental Sciences (SDS)
 Maxillofacial Dental Sciences (MDS)
 Restorative Dental Sciences (RDS)

DISCUSSION

The response rate of the participants in this study was found to be good due to a direct contact with the respondents. The present study revealed several lacunae in the knowledge regarding eco-friendly dental practices among the study population which is in contrast to the findings of Al Shatrat et al., who found a high level of awareness among private practitioners in Jordan about eco-friendly dental practices for amalgam management, radiographs, waste paper management, infection control, energy and water conservation [5].

Continuing dental education is an important part of any dental health professional's life. There was statistically significant difference seen in the change in knowledge of the respondents after the presentation thereby emphasizing the effect of continuing dental education for dental health professionals. Continuing dental education programs can improve professional practice and health care outcomes for the patients [6].

Eco-friendly/green dental practices are the need of the hour to

Question	Before lecture	%	After lecture	%	Z-value	p-value
Q1. Since how many years you are practicing dentistry?	160	100.00	160	100.00	--	--
Q2. Green dentistry (eco-friendly dentistry) is referred to:	117	73.13	158	98.75	5.5786	0.00001*
Q3. The average number of papers in a typical chart is:	78	48.75	143	89.38	6.1235	0.00001*
Q4. The average number of autoclave bags used per day:	72	45.00	142	88.75	6.8859	0.00001*
Q5. The average number of patient bibs used per day:	6	3.75	65	40.63	6.3618	0.00001*
Q6. Washer used at sterilization section:	10	6.25	104	65.00	7.8514	0.00001*
Q7. The type of light bulb:	60	37.50	155	96.88	8.3749	0.00001*
Q8. The type of computer screen:	40	25.00	137	85.63	8.2972	0.00001*
Q9. The dental vacuum pump:	39	24.38	155	96.88	9.3474	0.00001*
Q10. Waste management of your office and document papers:	15	9.38	153	95.63	10.1185	0.00001*
Q11. Biohazard material management in office:	133	83.13	155	96.88	3.5069	0.0005*
Q12. Surface disinfectants used in the office:	61	38.13	146	91.25	7.7377	0.00001*
Q13. Type of flooring in clinical area:	33	20.63	151	94.38	9.2708	0.00001*
Q14. Paint of internal walls of clinic:	58	36.25	135	84.38	7.1697	0.00001*
Q15. Waste management of autoclave bags:	25	15.63	126	78.75	8.3207	0.00001*
Q16. Disposal of excess mercury:	49	30.63	135	84.38	7.7859	0.00001*
Q17. College's management for waste water:	15	9.38	119	74.38	8.6069	0.00001*
Q18. Filing and x-ray system:	26	16.25	105	65.63	7.2723	0.00001*

[Table/Fig-2]: Comparison of knowledge (only correct) in before and after lectures in each question by Wilcoxon matched paired test.

*p<0.05 - Wilcoxon matched paired test

reduce their effects on the environment. Implementation of new strategies to try and reduce the waste generated by the dental profession in a feasible and sustainable way is the rationale behind green dentistry. There are many rational, practical and easy substitutes which have the potential to reduce the environmental hazard of a dental office if it was to follow the 'green' commendations. It is the moral responsibility of dental professionals to take the lead in society and implement 'green' initiatives to lessen their impact on the environment [4,7,8].

The major barrier to the implementation of an eco-friendly dental practice is the economic consideration. A financial return from changes implemented may not be achieved for years. The initial cost and expenses are limiting factors of implementing an eco-friendly dental practice [5,9,10]. However, this should not deter us from adopting eco-friendly practices as every person holds the responsibility of working towards a safer and cleaner environment for the future generations.

Dental professionals share global responsibility for elimination or reduction of toxic wastes that could harm human health and

Specialty	Before lecture knowledge (%)		Gain in knowledge (%)	
	Mean	SD	Mean	SD
None	34.35	12.79	49.87	17.50
RDS	35.90	12.39	35.16	17.34
MDS	40.66	11.27	49.45	14.87
SDS	40.29	11.44	56.78	12.06
PDS	33.70	14.74	64.47	14.63
F-value	1.2858		5.5091	
p-value	0.2780		0.0004*	
Pairwise comparisons by Tukey's post-hoc				
None vs. RDS	p=0.9938		p=0.0230*	
None vs. MDS	p=0.4393		p=0.9999	
None vs. SDS	p=0.5018		p=0.6229	
None vs. PDS	p=0.9998		p=0.0245*	
RDS vs. MDS	p=0.8751		p=0.1879	
RDS vs. SDS	p=0.9038		p=0.0087*	
RDS vs. PDS	p=0.9922		p=0.0001*	
MDS vs. SDS	p=0.9999		p=0.7977	
MDS vs. PDS	p=0.6304		p=0.1481	
SDS vs. PDS	p=0.6773		p=0.7670	

[Table/Fig-3]: Comparison of gain in knowledge with respect to specialties after lecture using one-way ANOVA.

*p<0.05 – one-way ANOVA

Preventive Dental Sciences (PDS), Substitute Dental Sciences (SDS), Maxillofacial Dental Sciences (MDS), Restorative Dental Sciences (RDS)

Positions	Before lecture (%)		Gain in knowledge (%)	
	Mean	SD	Mean	SD
Student	29.33	11.84	45.24	16.13
Demonstrator and Lecturer	34.92	11.53	51.59	20.30
General Practitioner	37.60	12.12	58.53	13.86
Assistant Professor	38.53	12.73	52.38	15.34
Associate Professor and Professor	36.63	13.10	49.08	24.08
Auxiliary	43.81	10.95	31.43	17.99
F-value	4.2272		6.1742	
p-value	0.0013*		0.00001*	
Pairwise comparisons by Tukey's post-hoc				
Student vs. Demonstrator and Lecturer	p=0.8957		p=0.9471	
Student vs. General Practitioner	p=0.0100*		p=0.0008*	
Student vs. Assistant Professor	p=0.0097*		p=0.3738	
Student vs. Associate Professor and Professor	p=0.3849		p=0.9748	
Student vs. Auxiliary	p=0.0077		p=0.1438	
Demonstrator and Lecturer vs. General Practitioner	p=0.9959		p=0.9244	
Demonstrator and Lecturer vs. Assistant Professor	p=0.9853		p=0.9999	
Demonstrator & Lecturer vs. Associate Professor & Professor	p=0.9997		p=0.9996	
Demonstrator and Lecturer vs. Auxiliary	p=0.7174		p=0.1612	
General Practitioner vs. Assistant Professor	p=0.9994		p=0.5570	
General Practitioner vs. Associate Professor and Professor	p=0.9999		p=0.4356	
General Practitioner vs. Auxiliary	p=0.6838		p=0.00001*	
Assistant Professor vs. Associate Professor and Professor	p=0.9970		p=0.9900	
Assistant Professor vs. Auxiliary	p=0.8354		p=0.0052*	
Associate Professor and Professor vs. Auxiliary	p=0.7246		p=0.1059	

[Table/Fig-4]: Comparison of gain in knowledge with respect to positions after lecture using one-way ANOVA.

*p<0.05 – one-way ANOVA

the environment. Amalgam restoration materials, plastic covers, radiographic chemicals, lead foils and disinfectant solutions are waste materials from dental settings that eventually end-up in landfills and water supplies. Using eco-friendly strategies in dental offices can improve public health through minimizing waste and hence reducing pollution [4,9-12].

Dental health professionals can be on the forefront of change and help in saving our planet from the catastrophic effects of environmental changes adopting and advocating the four 'R's— Rethink, Reduce, Reuse, Recycle. It is common place to perceive recycling as the first step but the reduction in waste production and rethinking and reusing our things are much more effective. The key to reducing our waste is to extend the life of things we use. Moreover, by implementing these four easy steps, dentistry and dental hygienists can transform the dental health profession into a greener and cleaner one [4,9,13].

There are innumerable ways to introduce eco-friendly dental practices: 1) Introduce digital X-rays that will help in reduction of radiation and use of chemicals; 2) Low energy bulbs and motion sensors can be introduced to reduce electricity usage; 3) Reduce water wastage; 4) Using amalgam separators on chairs and sinks can reduce amalgam pollution; 5) Reduce paper usage and recycle wherever possible. Investing in energy efficient equipment can significantly help [10-13].

LIMITATION, CLINICAL IMPLICATION AND FUTURE PROSPECTS

The sample size for the present study was determined based on a previous study which may have led to bias. The study examined the role of dentists but the role of dental hygienists and dental assistants in the implementation of eco-friendly dental strategies may also be important and the dental auxiliaries may have been inappropriately represented in the present study. The lack of literature on a similar topic limits our discussion to the viewpoint of the authors. Hence, further researches are recommended in this area among the dental fraternity all over the world. It is imperative that the dental fraternity contributes to the preservation of the environment through green practices. The practice of green dentistry has to be incorporated in the dental curriculum to make a difference.

CONCLUSION

Lack of knowledge of green dentistry amongst the dental fraternity is highly prevailing. The same can be substantiated with effective training in the respective field, if channelized through the curriculum. The said proposal forms the need of an hour and can be designated as an essential para-dental platform that needs further exploration for evident dental literature. The present study shows the importance of eco-friendly dentistry among the dental profession. It should be highly emphasized in the dentistry program throughout the dental schools.

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