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Short Communication

Knowledge, attitude, and perspective of dental students related to green dentistry: A Cross-Sectional Study.

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Abstract

Background: In an era marked by heightened environmental consciousness, Green Dentistry emerges as a pivotal approach, intertwining oral health with ecological responsibility. This study aims to explore the awareness, attitudes, and practices of green dentistry among dental students in Karachi, Pakistan.

Methodology: A cross-sectional study was conducted among undergraduate and postgraduate dental students in Karachi using a structured questionnaire adapted from previous research. Data collection occurred through various online platforms, and statistical analysis was performed using SPSS version 23.0.

Results: This study reveals varying levels of awareness among participants, with undergraduates (48.46%) generally exhibiting higher familiarity with Green Dentistry compared to postgraduates (27.04%). Factors influencing adoption include cost considerations and knowledge gaps. While promising trends in eco-friendly practices are noted, particularly in waste management, barriers such as time constraints persist.

Conclusion: The study highlights a positive shift towards sustainable dentistry among emerging professionals in Karachi. Collaboration between institutions and policymakers is crucial for fostering eco-friendly practices. Future efforts should focus on targeted educational interventions and continuous evaluation to promote sustainable dental practices effectively. Integrating Green Dentistry principles into dental education and practice is essential for shaping a more environmentally conscious dental landscape in Karachi and beyond.

Keywords

Green Dentistry, Dental Students, Awareness, Attitudes, Sustainable Practices.

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Introduction

In an era marked by heightened environmental consciousness and the urgency to adopt sustainable practices, the field of dentistry is not exempt from the call for eco-friendly initiatives[1]. Imagine a world where your routine dental check-up not only enhances your oral health but also contributes to the well-being of the planet. This is the essence of Green Dentistry, a concept that marries oral healthcare with ecological responsibility and has gained significant traction worldwide[2,3].

The relationship between Green Dentistry and conventional dental practices goes beyond mere overlap—it represents a fundamental shift towards sustainable healthcare delivery[2]. Both approaches share a common objective of maintaining oral health and ensuring patient well-being, but they diverge in methodologies. Green Dentistry advocates for environmentally friendly materials, resource-efficient procedures, and waste reduction strategies, all of which contribute to broader environmental sustainability goals[4].

The advantages of Green Dentistry are manifold, encompassing ecological benefits alongside potential improvements in patient care and the dental experience[5]. Reduced exposure to harmful chemicals, minimized water and energy usage, and the utilization of biocompatible materials are among the defining features of this eco-conscious approach. Beyond environmental considerations, Green Dentistry aligns with the broader trend towards patient-centered care by prioritizing individual well-being and health outcomes[6].

The global adoption of Green Dentistry practices is gaining momentum, with various regions showcasing notable progress. In Europe, countries like Sweden and Denmark have pioneered green dental clinics, demonstrating the feasibility of sustainable dental practices[7]. Similarly, in North America and Asia, dental associations and practitioners are increasingly embracing eco-friendly materials, efficient water management, and responsible waste disposal[8].

However, amidst the bustling urban landscape of Karachi, Pakistan, where healthcare dynamics intersect with escalating environmental challenges, the integration of Green Dentistry practices presents both obstacles and opportunities[9]. Against the backdrop of a burgeoning population and mounting environmental concerns, Karachi's dental community plays a crucial role in shaping the city's healthcare and environmental trajectory[10].

The rationale behind conducting a comprehensive study on the knowledge, awareness, and perspectives of dental students in Karachi regarding Green Dentistry stems from the dearth of empirical evidence. As future leaders in oral healthcare provision, dental students hold the key to driving the transition towards sustainable dental practices. By exploring their perceptions, identifying knowledge gaps, and addressing potential barriers, this study aims to offer actionable insights to educational institutions, policymakers, and dental practitioners. Through an examination of current awareness levels, challenges, and opportunities, the study endeavors to pave the way for the integration of Green Dentistry principles into dental education, clinical practice, and policymaking in Karachi.

Methodology

Study Design & Setting

This cross-sectional study was conducted among undergraduate and postgraduate dental students in Karachi, Pakistan, aiming to evaluate their knowledge, attitudes, and practices regarding Green Dentistry. The study was conducted over a two-week period from August 1, 2023, to August 15, 2023, utilizing a structured questionnaire.

Participants

The participants included undergraduate and postgraduate dental students from both private and government dental universities in Karachi. The inclusion criteria required participants to be students enrolled in dental colleges in Karachi, while those who did not provide consent or submit incomplete survey forms were excluded from the study.

Variables
The variables examined in the study included demographic characteristics such as educational level, university type (private or government), age, and gender. Additionally, the questionnaire assessed participants' knowledge, awareness, and practices related to Green Dentistry.

Data Sources/ Measurement
Data were collected using a structured questionnaire adapted from Verma et al[11]. The questionnaire was distributed online via email, Facebook Messenger, and WhatsApp to reach dental students from both private and government dental universities in Karachi. The questionnaire comprised two parts: the first part gathered demographic information, while the second part assessed participants' knowledge, awareness, and practices related to Green Dentistry.

Bias
To minimize bias, all participants remained anonymous, and informed consent was obtained before they completed the questionnaire. Additionally, efforts were made to ensure representation from both private and government dental universities to mitigate selection bias.

Quantitative Variables
Quantitative variables such as age were analyzed descriptively, while categorical variables such as educational level, university type, and participants' responses to Green Dentistry-related questions were analyzed using Chi-Square tests.

Statistical Methods
Data were collected and managed using Google Forms, and responses were stored in an Excel spreadsheet for further analysis. Descriptive statistics were used to summarize demographic data and participants' responses, while Chi-Square tests were employed to assess associations, with a significance level set at $p < 0.05$. Statistical analysis was performed using SPSS version 23.0.

Results

Participants
A total of 196 participants were enrolled in the study, predominantly female (84.18%), with 60.71% affiliated with public dental institutions and 39.29% associated with private dental colleges. Regarding educational status, 59.69% were undergraduates, and 40.31% were in the graduate and postgraduate stages of their dental education.

Descriptive Data
The analysis of knowledge and practice related to Eco-Friendly dentistry revealed that 48.46% of undergraduates reported familiarity with green dentistry, showing a statistically significant difference compared to graduate and postgraduate students ($p=0.024$). Additionally, 38.77% of undergraduates expressed the belief that photochemical waste should be eliminated, compared to their advanced counterparts ($p=0.044$).

Outcome Data
Notably, a significant proportion of both undergraduate and graduate/postgraduate students utilize non-reusable drapes in their practice. Furthermore, participants across both groups reported employing VOC-free paint on their internal walls and adhering to environmentally conscious practices regarding electric appliances.

Main Results
There were disparities in knowledge and practice between undergraduate and graduate/postgraduate dental students regarding Eco-Friendly dentistry. While nearly half of undergraduates were aware of green dentistry, awareness among graduate and postgraduate students was comparatively lower. Similarly, undergraduates exhibited a greater inclination towards advocating for the elimination of photochemical waste. However, both groups demonstrate a consistent adoption of eco-friendly practices in their dental settings, particularly in the use of non-reusable drapes and adherence to environmentally conscious practices regarding paint and electric appliances.

Table 1: Knowledge, attitude & practice related to green dentistry among dental students.

Questions		Undergraduate (n=117)		Graduate & Postgraduate (n=79)		p-value
		n	%	n	%	
Knowledge						
Q1. Are you aware of the term green dentistry?	Heard Before	95	81.20	53	67.09	0.024*
	I heard for the first time	22	18.80	26	32.91	
Q2. Factors that are influencing the adoption of green dentistry?	Cost	93	79.49	63	79.75	0.812
	Not enough knowledge to proceed	21	17.95	15	18.99	
	Not enough time	3	2.56	1	1.27	
Q3. Is there a need to promote reusable metal air/ water syringes suction devices and biodegradable cups?	Yes	91	77.78	63	79.75	0.742
	No	26	22.22	16	20.25	
Q4. What is the preferred type of flooring?	Vinyl	49	41.88	31	39.24	0.749
	PVC	20	17.09	18	22.78	
	Linoleum/cork	17	14.53	9	11.39	
	None	31	26.50	21	26.58	
Q5. Should we go to digital to eliminate the photochemical waste?	Yes	76	64.96	64	81.01	0.044*
	No	5	4.27	1	1.27	
	Maybe	36	30.77	14	17.72	
Q6. Do you use a computer-based record system for paper waste management?	Yes	34	29.06	27	34.18	0.734
	No	62	52.99	38	48.10	
	Sometimes	21	17.95	14	17.72	
Q7. Do you use tree oil/ thyme/ natural disinfecting agents as a surface disinfectant in the clinic?	Yes	24	20.51	17	21.52	0.981
	No	82	70.09	55	69.62	
	Sometimes	11	9.40	7	8.86	
Q8. Do you prefer cloth instruments wrapped over paper and plastic autoclave bags for steam sterilization?	Yes	47	40.17	33	41.77	0.823
	No	70	59.83	46	58.23	
Q9. Should Eco-Friendly be universally recommended?	Yes	93	79.49	64	81.01	0.812
	No	5	4.27	2	2.53	
	Maybe	19	16.24	13	16.46	
Q10. Do dental office disinfection control and	Yes	79	67.52	60	75.95	0.116
	No	38	32.48	17	21.52	

sterilization processes can be a major source of waste generation and population?						
Attitude & Practice						
Q1. Do you recycle the fixer and developer solution?	Yes	15	12.82	12	15.19	0.871
	No	87	74.36	58	73.42	
	Sometimes	15	12.82	9	11.39	
Q2. Where do you dispose of mercury?	In Liquid	75	64.10	54	68.35	0.538
	In Garbage	42	35.90	25	31.65	
Q3. What type of lab Coats and patient drapes are being used in your practice?	Reusable	27	23.08	14	17.72	0.066
	Non-Reusable	61	52.14	33	41.77	
	Both	29	24.79	32	40.51	
Q4. What do you use for energy management?	Normal Lights/Bulbs	49	41.88	30	37.97	0.831
	LED light bulbs	60	51.28	44	55.70	
	CFL	8	6.84	5	6.33	
Q5. What type of dental vacuum pump do you use?	Dry Dental Vacuum Pump	80	68.38	57	72.15	0.572
	Wet Dental Vacuum	37	31.62	22	27.85	
Q6. What do you use as an alternative to amalgam filling?	Composite	93	79.49	69	87.34	0.154
	Glass Ionomer Cement	24	20.51	10	12.66	
Q7. Do you use sterilization instruments like trays, film holding devices rather than disposable products?	Yes	89	76.07	63	79.75	0.359
	No	18	15.38	7	8.86	
	Sometimes	10	8.55	9	11.39	
Q8. Do you reduce water wastage during hand washing?	Yes	77	65.81	55	69.62	0.661
	No	17	14.53	8	10.13	
	Sometimes	23	19.66	16	20.25	
Q9. Do you unplug all electric appliances after use?	Yes	89	76.07	62	78.48	0.743
	No	11	9.40	5	6.33	
	Sometimes	17	14.53	12	15.19	
Q10. Which type of green design of dental unit you are Practicing?	Use of Paints on internal walls free of VOC	36	30.77	23	29.11	0.963
	Indoor Greenery	18	15.38	62	78.48	
	None	13	11.11	41	51.90	

*p<0.05 is considered statistically significant.

Discussion

The findings of this study unveil a spectrum of awareness levels among participants, indicating varying degrees of familiarity with Green Dentistry concepts. Notably, while a majority of undergraduates demonstrated awareness of Green Dentistry, a lower percentage of graduate and postgraduate students exhibited similar familiarity, suggesting a potential gap in higher-level dental education regarding environmental sustainability integration. This observation aligns with prior research, indicating a collective urge among dental professionals towards embracing eco-conscious practices. The ratios observed in our study correspond with cross-sectional research conducted in Navi Mumbai, where a significant proportion of dentists expressed a desire to propagate environmental sustainability within the dental community[11].

Interestingly, the study identified consistent factors influencing the adoption of Green Dentistry across both undergraduate and graduate/postgraduate levels, with cost emerging as a significant barrier. This underscores the need for cost-effective eco-friendly alternatives in dental practices to facilitate widespread adoption. Moreover, a substantial proportion of participants cited lack of knowledge and time constraints as hindrances, highlighting the necessity for educational interventions and time-efficient solutions to facilitate the transition towards sustainable dental practices[2,12].

Examining the actual practices of participants reveals both promising and concerning trends. According to a prior research study held in King Edward College Lahore, in which (69.52%) of BDS students and (30.48%) of MDS students participated shows that ample numbers of dentists are still hesitant to practice modern dentistry due to reasons such as financial expenditure and unfamiliarity with the phases of environmentally friendly dental practices[13]. Notably, a significant proportion of dentists were observed to adopt natural and organic materials for disinfection, aligning with Green Dentistry principles. However, there remains a need for greater emphasis on recycling and reusing practices to fully embrace the ethos of bio-compatibility[14].

The study also discerns a generational shift in attitudes towards eco-friendly dentistry, with recent graduates demonstrating a heightened inclination towards sustainable practices compared to experienced professionals. This highlights the importance of continuous awareness and educational initiatives to drive widespread adoption. Efforts should focus on promoting reusable alternatives and integrating Green Dentistry principles into dental curricula at all educational levels[15-17]. Collaboration among educational institutions, policymakers, and dental practitioners is pivotal to establish a robust framework for sustainable dentistry in Karachi[18].

While this study provides valuable insights, it is essential to acknowledge its limitations, including its cross-sectional design and reliance on self-reported data. Future research could adopt longitudinal approaches and objective measures to validate participants' practices. Additionally, expanding the scope to include practicing dentists and assessing the long-term impact of educational interventions would offer a more comprehensive understanding of Green Dentistry adoption. Furthermore, intercity comparisons and interventions implementation could enhance the generalizability and applicability of findings beyond Karachi.

Conclusion

Our study sheds light on the varied awareness levels among dental professionals in Karachi regarding Green Dentistry, reflecting both encouraging positive shifts and persistent challenges. While a majority of participants exhibit some degree of familiarity with eco-friendly practices, notable barriers such as cost considerations remain significant hurdles to widespread adoption. These findings underscore the urgent need for targeted educational initiatives aimed at addressing knowledge gaps and promoting the benefits of sustainable dental practices. Furthermore, the study highlights the pivotal role of collaborative efforts between

educational institutions, policymakers, and dental practitioners in establishing a robust framework for embracing eco-friendly dentistry. Moving forward, continuous endeavors and further research will be crucial in assessing the sustained impact of these initiatives and fostering a culture of environmental responsibility within the dental community in Pakistan.

Conflicts of Interest

The Author(s) declare no conflicts of interest.

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References

1. Fallah Shayan N, Mohabbati-Kalejahi N, Alavi S, Zahed MA. Sustainable development goals (SDGs) as a framework for corporate social responsibility (CSR). Sustainability. 2022;14(3):1222. Doi: 10.3390/su14031222
2. Rastogi V, Sharma R, Yadav L, Satpute P, Sharma V. Green dentistry, a metamorphosis towards an eco-friendly dentistry: a short communication. J Clin Diagn Res. 2014;8(7):Zm01-Zm02. Doi: 10.7860/JCDR/2014/8084.4556
3. Damle S. Eco-friendly green dentistry: The future of dentistry?. Contemporary clinical dentistry. 2016;7(4):423-435. Doi: 10.4103/0976-237X.194096.
4. Dentistry Di. Basic Concepts of green dentistry. J. multidiscip. Care. 2020;6(3):40-43.
5. Damle SG. Eco-friendly green dentistry: The future of dentistry? Contemp Clin Dent. 2016;7(4):423-425. DOI: 10.4103/0976-237X.194096
6. Avinash B, Avinash B, Shivalinga B, Jyothikiran S, Padmini M. Going green with eco-friendly dentistry. The journal of contemporary dental practice. 2013;14(4):766-769. Doi: 10.5005/jp-journals-10024-1400.
7. Al-Thunian FF, Al-Bounni RS, Ingle NA, Assery MK. Evaluation of Green Dental Practice Implementation among Dental Practitioners Worldwide-A Systematic Review. J Dent Oral Health. 2020;7:1-7.
8. Mulimani P. Green dentistry: the art and science of sustainable practice. Br Dent J. 2017;222(12):954-961. Doi: 10.1038/sj.bdj.2017.546
9. Pakistan Go. Pakistan's Implementation of the 2030 Agenda for Sustainable Development: Voluntary National Review. SDG Section, Ministry of Planning, Development and Reforms. 2019.
10. Riaz K, Ahmad M, Gul S, Malik M, Ur Rehman ME. Climate change and its implications on health and the healthcare system: A perspective from Pakistan. Ann Med Surg (Lond). 2022;81:104507. Doi: 10.1016/j.amsu.2022.104507
11. Verma S, Jain AN, Thakur RU, Maran SA, Kale AN, Sagar KR, Mishra SA. Knowledge, attitude and practice of green dentistry among dental professionals of Bhopal city: A cross-sectional survey. J Clin Diagn Res. 2020;14(4): 9-13. Doi: 10.7860/JCDR/2020/43406.13637
12. Glick M, da Silva OM, Seeberger GK, Xu T, Pucca G, Williams DM, Kess S, Eiselé JL, Séverin T. FDI Vision 2020: shaping the future of oral health. International dental journal. 2012;62(6):278-291. Doi: 10.1111/idj.12009
13. Zulfiqar R, Naser MS, Ijaz HS, Saloom WN, Suleman S, Hussain SS, Akinbode AO. A Cross-Sectional Study of Green Behaviors: Current Usage and Perceived Barriers among Worldwide Dental Care Practitioners. Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2023; 54(10):1265-1272.
14. BEŞİROĞLU S, TAĞTEKİN D, BEŞİROĞLU Ş. Sustainability In Dentistry. Eur. J. Res. Dent. 2021;5(2):91-98. Doi: 10.29228/erd.12
15. Thakar S, Kinariwala N, Pandya D, Parekh NH, Patel NK, Patel A. Awareness and Constraints towards the Implementation of Green Dentistry amongst Dental Students and Private Practitioners of West India. J Pharm Bioallied Sci. 2023;15(Suppl 2):S1287-S1290. Doi: 10.4103/jpbs.jpbs_116_23
16. Martin N, Sheppard M, Gorasia G, Arora P, Cooper M, Mulligan S. Drivers, opportunities and best practice for sustainability in dentistry: A scoping review.J Dent. 2021;112:103737. Doi: 10.1016/j.jdent.2021.103737
17. Zia N, Doss JG, John J, Panezai J. Sustainability in Dentistry: Assessing knowledge, attitude, and practices of dental practitioners about green dentistry. PJMS. 2024;40(1Part-I):233-241. Doi:10.12669/pjms.40.1.7606.
18. Duane B, Stancliffe R, Miller F, Sherman J, Pasdeki-Clewer E. Sustainability in dentistry: a multifaceted approach needed. J. Dent. Res. 2020;99(9):998-1003. Doi:10.1177/0022034520919391.