

Attitudes and factors influencing adoption of green dentistry among dental practitioners in Hubli-Dharwad – A cross sectional survey

Dr. Abhinav Bhargava

Post Graduate, Department of Public Health Dentistry, SDM College of Dental Sciences and Hospital, Sattur, Dharwad, Karnataka, India

Dr. Bhavika Anand, B.D.S

Former House Surgeon, SDM College of Dental Sciences and Hospital, Sattur, Dharwad, Karnataka, India

Abstract

Introduction: Dentists generate wastes in their practices that challenge global environment and human health. 'Green Dentistry' will improve human wellbeing through minimization of waste, decrease in pollution and conservation of energy and water.

Objective: To know about dental practitioner's attitudes and the factors that are influential in the adoption of green dentistry.

Methodology: 100 registered private dental practitioners in Hubli-Dharwad were approached and data was collected and analysed using pretested questionnaire containing attitudes and persuasive factors influencing adoption of green dentistry

Results: Results revealed that 64 % practitioners knew the term 'green dentistry' of which 53% were males and 47 % females. Majority (84.4%) of dental practitioners showed positive attitude however 49.4 % thought it was difficult to change their current practice to green practice. Amongst the persuasive factors of 'relative advantage' 'compatibility' 'simplicity' 'trialability' and 'observability', 80.9% practitioners found 'trialability' characteristic most influential in adopting green dentistry.

Conclusion: Majority of dental surgeons had positive attitude towards green dentistry irrespective of age, qualification and years in profession, 'trialability' was found to be most influential for adoption. Green dentistry awareness among dentists needs to be increased which is required to conserve the environment for a better future with more initiatives to evolve from current practice to green practice

I. Introduction

Today environmental pollution is one of the most serious issues people are facing around the globe. Environmental pollution is leading to global warming which is disturbing the balance of nature and wrecking havoc all around the globe. Global warming is the increase of earth's average surface temperature due to effect of greenhouse gases, such as carbon dioxide emissions from burning fossil fuels or from deforestation which trap heat. At the present time, global warming is one of the most serious issues facing people around the globe^{1,2} One of the most significant negative effects of climate change is its potentially devastating impact on human health². A change in the global climate results in a rise of air pollutant levels, an increase in disease transmission through contaminated food and water, and a higher level of extreme weather hazards. A warmer world will lead to changes in disease vectors. Temperature extremes and smog might hit people with heart and respiratory diseases including asthma etc. it is expected that between 2030 and 2050, 250000 additional deaths per year might occur from malnutrition, malaria, diarrhea and heat stress³

The term 'green' is defined as 'actions that reduce the impact on the environmental, such as eco purchasing or recycling'⁴. Green innovations are therefore being considered across all spheres of life⁵ and the healthcare sector is no exception; this is especially due the fact that it produces large quantities of waste and also consumes a lot of energy, water, and other resources.⁶

Dentistry is also an important component of health care sector. And it produces a large amount of waste in the form of amalgam, lead biomedical and general office waste⁷. Hence it is very necessary to become eco-friendly in every facet of our lives, including dental practice. Practitioners can thereby switch over to green dentistry which is an innovative way of dental practice that is environment friendly and at the same time conserves money and time by reducing waste, conserving energy and decreasing pollution with the use of latest techniques and procedures. Green dentistry was introduced in the west and is still in its initial stages in a developing country like India. It becomes imperative to know the existing status of green dentistry, what the practitioners feel and expect from this noble concept. Need of the hour is to evaluate the present and evolve for a

better future. Thereby the aim of the study was to know about dental practitioner's attitudes and the factors that can be persuasive in the adopting green dentistry, involved in private practice in the twin city of Hubli Dharwad.

II. Methodology

Theoretical framework:

Based on Rogers' diffusion of innovation theory (1995), the term 'Innovation' was defined as 'an idea, practice, or object that is perceived as new by an individual or other unit of adoption'. This study is going to label 'green dentistry' as an innovation because it is a new practice for Indian dentists.

The attitude formation in the first stage has been found to be highly based on individuals' perceptions of the characteristics of the innovation. The innovation characteristics that influence an individual's decision to adopt or reject innovation are relative advantages, compatibility, complexity, trialability and observability.⁸

Questionnaire design:

The questionnaire has been adopted from a previously done study on dentists in Thailand⁹ the author's consent was taken and the same questionnaire was employed, however, the questionnaire was again tested on 30 practitioners to check the reliability in the Indian context, obtaining a cronbach alpha value of 0.72 the results of which were not included in the final study. The survey included questions on attitudes of green dentistry and regarding the green innovation characteristics that influence dentists to adopt green practice which were assessed on a three point likert scale. The questionnaire consisted of sections; demographic information followed by questions regarding attitudes about green dentistry practices. Last section included the persuasive effects of innovation characteristics on the adoption of green innovation; five constructs were developed based on the literature review¹⁰. The five constructs were measured relating to relative advantage, compatibility, simplicity (the inverse of complexity), trialability and observability which were assessed using the same three point likert scale.

Data collection

All the registered dental practitioners (140) in Hubli-Dharwad were approached among whom 30 were included in the pilot study (were not included in the main study). Remaining practitioners were given the questionnaire by the investigator by approaching them individually in their respective clinics. The questionnaire was asked to be filled in the presence of the investigator to avoid any misrepresentation of factors from the participant's side. Data was collected from the practitioners with a response rate of 90.90%

Data analysis

The data was coded and analysed by SPSS. Version 2.0. A descriptive statistical method was used, including means, frequencies, etc. The data was tested for normality of distribution before analysis, and the results show that the data deviates from a normal distribution. As a result, non-parametric statistics, such as the Chi-square test, was done to check whether any correlation existed between demographic factors and the attitudes and adoption characteristics

III. Results

Among 100 practitioners age ranging from 31-60 years, 53 % were males and 47 % were females, 61% were qualified graduates and 39 % were post graduates, 61% of the practitioners were between the age group of 30-40 years, and 54 % had an experience of 11 -20 years in clinical practice. (Table 1)

Attitudes among the practitioners (Table 2)

64% of respondents indicated that they had heard the term 'green dentistry' however no statistical significance was found with respect to age gender experience qualification. 58.9 % of the participants agreed that green practice can play a role in environment conservation while 84.4 % agreed that green practice has many long term benefits. 49.8% of the participants thought that it was difficult to change their current practice where 45.6% said that going green will increase their financial burden. 49.4 % of the participants suggested that they had difficulty in finding compatible products. 79.9% agreed that digital radiographs were more eco friendly and only 29.9 % of the practitioners thought of recycling waste was an extra burden on them. A proportion of 73.5% of the practitioners viewed energy management beneficial and 64.4% believed that water conservation is necessary for a green practice

Innovation characteristics (Table 3)

71.325 % of practitioners found innovation characteristics influential and 23.05% found them slightly influential.

Relative Advantage

It includes two components: first component being an increase in patient satisfaction which, 52.4% of dentists found influential whereas 38.1% found it slightly influential; followed by second component being providing lower operating and maintenance costs, which was found to be influential for 77.8% and slightly influential being 19.1% of the sample population.

Compatibility

Compatibility included previous standards and the availability of dental products supporting greendentistry. The majority of respondents felt that it would be influential (79%) and while only 19.5% dentists felt it is slightly influential if greendentistry could be compatible with previous standards. . However, 53.3% study subjects reported that they would be influenced and 30.0% would be slightly influenced with availability of several dental materials, products, and types of equipment that currently support such a green practice.

Simplicity

Simplicity was one of the two most influential characteristic in persuading respondents to adopt a green practice. A large proportion of 79.9 % found green practice influential and 17.8 % slightly influential if it required minimal resources and no additional cost of basic infrastructure.

Trialability

This was the most **influential characteristic** where 80.9% of the respondents mentioned that they would be influenced to adopt a green dentistry approach if they could try the adoption on a smaller scale or test some products before deciding to fully adopt it.

Observability

Increasing number of patients who select service providers based on their green credentials could persuade respondents to adopt a green practice; 74% of respondents felt it was an influential characteristic, while 21.6% of respondents believed that it was only slightly influential.

IV. Discussion

Although green dentistry has developed in several countries like the United States for several years,¹¹ green dentistry is still a newly evolving practice.¹² In the present study 64 % of the practitioners had heard of the term 'green dentistry' before, whereas only 16.5 % of practitioners were aware in Thailand⁹. Moreover, the percentage of respondents who had heard of green dentistry showed consistency with their age group, gender, experience and qualification. A previous study however mentioned that concerns about the environment were a low priority for young people (Department for Environment, Food and Rural Affairs, 2007).¹³ In present study it could be different because of assimilation of knowledge thru continuing dental education programmes. In the present study 58.9 % of the practitioners agreed that green practice can play a role in environment conservation whereas only 33 % practitioners were interested in taking a first step towards an ecological profession in as revealed in a study done in Romania¹⁴. A study in Thailand reported that 91.1 % practitioners believed that green practice has many long term benefits⁹ which was slightly more than the present study in which 84.4% agreed on the same, more awareness regarding benefits of green practice has to be created to overcome this gap. 49.8 % of the dentists said that it was difficult for them to change their current practice to green practice, the reason might be established practitioners' unwillingness to change and a relatively new practitioners would be more interested in establishing their practice on a basic infrastructural level. Also, 45.6% practitioners believed that green practice would increase financial burden on them and in turn they would probably cover their expenses through patients. 49.4 % of the practitioners feel that green dentistry products are difficult to find. However, companies are now providing green solutions for dental practice ranging from biodegradable materials to recycling techniques, this misconception of non availability might be prevalent in study population due to lack of up gradation of knowledge. 79.9 % of the practitioners are supportive of the fact of that digital radiographs are more environment friendly, which is a good indication. In a review given by Farahani et al¹¹ by using digital systems he saved 12600 papers annually and also eliminated the need for x-ray films lead foil and fixing and developing solutions. The practitioners might also find digital radiography convenient because of the decrease in operating times and better efficiency in image diagnosis. 29.9% of the practitioners thought that recycling waste management was a financial burden. Recycling in the long run would be more cost effective and can help by saving money energy and natural resources.¹⁵

In a country like India water and electricity are deficient in many parts, dentistry involves both water and electricity so conservation of both is paramount. The present study revealed that 73.5% and 64.4% of the practitioners respectively thought energy and water management are essential for green practice as compared to

practitioners in Thailand where a studied revealed that 89 % and 91% dentists believe that water and electricity consumption is essential.

80.9% dentists would prefer to sustain green innovations if they are simple, comfortable and can function effectively on a small scale. Also, these innovations should not incur any additional costs and resources over the basic requirements, as agreed upon by 79.9% respondents, which may be due to their current attitude towards green dentistry that it will increase a practice's financial burden, and also from the fact that eco-friendly products for dental practices are difficult to find. Patient satisfaction was not influential (52.4 %) for practitioners which may be because of their preconceived notion that patients don't care much about green practice. However they would consider adopting green dentistry if in the future patients choose practices based on green practice (74%).

Recommendations

A guideline for green dentistry should include several methods for the easy implementation and incorporation of the same divided into different levels. For example, it could include both a beginner's level, that does not require additional cost, and a higher level, which could refer to international green standards adopted sequentially on satisfactory adoption of a beginner level. Future campaign strategies should address these issues by convincing dentists and making them realise that they have a crucial role to play in addressing climate change issues by imbibing certain changes in their practice which would help them in a long run. Further studies and research in the future can help in identifying the lacunae and areas where more attention has to be paid regarding the development of this environment friendly practice

Limitations

Green Dentistry is a new approach to dentistry in developing nations and is slowly and gradually paving its way to success. With the dearth of literature and resources on the current topic performed using Indian population, comparative analysis of results with other countries regarding the same becomes difficult. The sample size used in the present study is confined to the local dentists of one city. Studies involving multicentre design including a larger population of dentists' will help to gain insight into this inchoate field. Also, the interpretation of each statement is related to individual perceptions and are influenced by training and experience. Since opinions are subject to personal likes and dislikes, this study cannot be generalized to the dentists of the entire country.

V. Conclusion

Green dentistry is a relatively new development in India. Majority of dental surgeons have shown a positive attitude towards green dentistry irrespective of age, qualification and years in profession and trial ability emerged as the most influential factor adopting influence of green dentistry. However, awareness among dentists needs to be increased which is required to conserve the environment for a better future and more initiatives are required to evolve from current practice to green practice. This innovation urges a involvement of dentists at a mass level and everyone must realise their responsibilities towards the current environmental issues. This study is just the start of an extensive investigation and acceptance into green dentistry in India in a hope that more extensive research would be conducted.

References

- [1]. World Health Organisation, 2011. Healthy hospitals healthy planet healthy People: addressing climate change in health care settings. World Health Organisation (WHO) and Health Care without Harm (HCWH), http://www.who.int/globalchange/publications/climatefootprint_report.pdf
- [2]. Garla, B.K., 2012. Green dentistry; ecofriendly dentistry: beneficial for patients, beneficial for the environment. *Annals and Essences of Dentistry*4(2), pp.72-74.
- [3]. <http://www.who.int/mediacentre/factsheets>
- [4]. Wolfe, K.L. and Shanklin, C.W., 2001. Environmental practices and management concerns of conference center administrators. *Journal of Hospitality and Tourism Research* 25(2), pp.209-216.
- [5]. Iqbal, H., 2012. Consumer attitude and behavior toward green hospitals in Thailand. *The IMRE Journal* 6(2), pp.15-36.
- [6]. Levin, s., 2006. Learning to live in a global commons: Socioeconomic challenges for a sustainable environment. *Ecological Research Special feature*, pp.328-333.
- [7]. Muhamedagic B, Muhamedagic L, Dental office Waste – Public Health and Ecological Risk. *Materia SocioMedica*.2009;21(1): 35-38.
- [8]. Rogers, E.M. (1995). *Diffusion of innovations*. 4th edition, New York, NY: Free Press.
- [9]. Agrasuta Voramon The Adoption Of Green Dentistry among Dentists in Thailand <http://www.researchgate.net/publication/281629128>
- [10]. Smerecnik, K.R. and Andersen, P.A., 2011. The diffusion of environmental sustainability innovations in North American hotels and ski resorts. *Journal of Sustainable Tourism* 19(2), pp.171-196
- [11]. Farahani, A. and Suchak, M., 2007. Eco-friendly Dentistry: The Environmentally Responsible Dental Practice. University of Waterloo. http://c.yimcdn.com/sites/www.ecodentistry.org/resource/resmgr/docs/ecofriendly_dentistry_jcda
- [12].

- [13]. Rastogi V, Sharma R , Yadav L , Satpute P, Sharma V . Green Dentistry , AMetamorphosis Towards an Eco Friendly Dentistry : A Short Communication .Journal of Clinical and Diagnostic Research : JCDS.2014;8(7); ZMO1-ZMO2
- [14]. Department for Environment, Food and Rural Affairs, 2007. Survey of publicattitudes and behaviours toward the environment 2007, <http://www.defra.gov.uk/evidence/statistics/environment/pubatt/download/pas2007report.pdf/>
- [15]. Popa et al Attitudes and behaviours in Dental Practice Regarding Human andEnvironment Protection Procedia Environmental Science ,Engineering andMangaement , 2 , 2015 , 2 107-112
- [16]. Reducing and Reusing Basics <http://www.epa.gov/recycle /reducing-and - reusing-basics>

	Yes	No	Total
Respondents	64	36	100
<i>Gender</i>			
Male	34 (64.15%)	19 (35.84%)	53
Female	30 (63.82%)	17 (36.18%)	47
<i>Age</i>			
Below 30	10 (62.5%)	6 (37.5%)	16
30-40	39 (63.93%)	22 (36.06%)	61
40-50	12 (63.15%)	07 (36.85%)	19
Above 50	3 (60.00%)	02 (40%)	5
<i>Experience</i>			
1-10	24 (63.15%)	14 (36.85%)	38
11-20	35 (64.81%)	19 (35.19%)	54
Above 20	05 (62.5%)	03 (37.5%)	08
<i>Qualification</i>			
Graduates	39 (63.93%)	22 (36.07%)	61
Post Graduates	25 (64.10%)	14 (35.90%)	39

Table 1 : Demographic data

Attitudes	Agree	Not sure	Don't agree
Green practice can play a role in environment conservation	58.9%	35.8%	5.5 %
Green practice has many long term benefits	84.4 %	12.5%	3.1 %
Difficulty in changing from current practice to green practice	49.8 %	30.7%	19.5 %
Green practice will increase financial burden	45.6 %	41.5 %	12.9 %
Difficulty in finding products compatible with green dentistry	49.4%	40 %	10.6 %
Digital radiographs are more green practice friendly thanconventional techniques	79.9%	13.1%	7 %
Recycling waste management is an extra burden on the dentist	29.9%	48.5 %	21.6 %
Energy management is beneficial in green dental practice	73.5 %	16.3 %	10.2%
Water conservation is necessary in green dental practice	64.4 %	27.5 %	8.1 %

Table 2: Attitudes of Practitioners towards green dentistry

Innovation characteristics	Influential	Slightly influential	Non influential
Relative advantage			
Increased patient satisfaction	52.4%	38.1 %	9.5%
Providing lower operating and maintenance costs	77.8 %	19.1 %	3.1%
Compatibility			
Green dentistry can be compatible with previous standard and new features	79 %	19.5 %	1.5 %
Several dental materials equipments that support green practice	53.3 %	30 %	16.7%
Simplicity	73.3%	20.7%	6 %

Simple and easy to practice			
Requires minimal resources and no additional cost of basic infrastructure	79.9%	17.8%	2.3%
Trialability Before switching over to green practice I would test the adoption on small scale and products compatible with green practice	80.9%	17.6%	1.5%
Observability Increase in awareness among people regarding environment, patients in future might select providers based on their green practice	74%	21.6 %	4.4%

Table 3: Innovation characteristics influencing adoption of green dentistry

*Dr.Abhinav Bhargava. "Attitudes And Factors Influencing Adoption Of Green Dentistry Among Dentalpractitioners In Hubli-Dharwad – A Cross Sectional Survey." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 16.7 (2017): 64-69.