

Survey Study on Awareness and Consciousness Level of Sustainability in Dentistry

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ABSTRACT : The United Nations' 17 Sustainable Development Goals (SDGs) are vital for equitable global benefits and a healthier future. This study examines the awareness levels of individuals with and without clinical dentistry training using LimeSurvey Community Edition and SPSS (Version 28.0.1.). The survey, conducted between July 15, 2021, and January 1, 2022, had 1734 participants, excluding third-grade students due to differing clinical instruction. Dental students, dentists, specialty/PhD students, specialists, academicians, and health personnel were included. The dental questionnaire comprised 26 questions, with statistically significant differences ($p < 0.05$) in 11 responses. Those with clinical dental education showed significant ($p < 0.05$) positive responses to sustainability-related questions, but no significant difference ($p \geq 0.05$) in general sustainability statements. The study emphasizes the need to define fundamental steps to address the current lack of interest in Sustainability in Dentistry and suggests integrating sustainability topics into the dental curriculum. Encouraging such practices can have a global impact, aligning with the SDGs. Educating dentistry professionals on sustainability will contribute to achieving these goals and benefitting present and future generations.

KEYWORDS : Dentistry, Ecology, Sustainable Development, Survey

I. INTRODUCTION

Since the 1960s, many different disciplines have focused on sustainability and each discipline has worked with the concept of sustainability in its context. The widely accepted definition of the concept of sustainability was introduced in the Brundtland Report titled "Our Common Future" published in 1987 by the World Commission on Environment and Development within the United Nations. The definition of sustainability in this report is: Sustainable development is an advancement that meets the needs of the present without compromising the ability of future generations to meet their own needs [1]. Sustainability started as a means of emphasizing the damage caused by some economic activities to the environment and then deformities such as global warming and climate change have had a major impact, a debate has been launched about the importance of environmental action [2,4]. Following that, with the addition of social elements, it became a more complex and multidimensional field. There are economic, social, and environmental benefits to becoming sustainable. The current model of health care delivery in the modern world is not sustainable due to increasing financial costs, increasing demands, and environmental problems. As suggested under the title of "Good Health and Well-Being", which is the 3rd objective among the 17 objectives of The UN 2030 Agenda for Sustainable Development, for sustainable health services; it works within economic, environmental, and social resources and aims to protect and treat the health of future generations [5-7]. Since oral and dental health is a crucial part of human life; dental professionals should incorporate sustainable development goals into their daily lives, raise awareness of their environment and encourage the transition to a green economy at all stages of life [8]. Sustainability in dentistry aims to manage the materials used during dental treatment in a way that will not harm the environment and any living being, including the patient, to use and improve resources well, and adopt an environmentally friendly behavior [9-12]. Every professional in the field of dentistry should have sufficient knowledge about Sustainability in Dentistry and regulate their procedures while keeping sustainability principles into account.

II. MATERIALS AND METHODS

The study was carried out after obtaining required clearance from the Institutional Faculty of Health Sciences Non-Invasive Clinical Studies Ethics Committee of Marmara University (protocol approval no. 2021/71).

Necessary approvals and permissions were obtained from the deanship of the relevant universities and the Istanbul Chamber of Dentists. A questionnaire was checked for content and construct validity. The questionnaire included questions about knowledge and awareness of sustainability in dentistry and the willingness of participants to embrace sustainability in dentistry. The duration of the study was 5 months and 15 days from July 15, 2021, to January 1, 2022. A total of 1734 people participated in this research in the 2021-2022 academic year, and the data were coded and analyzed with the LimeSurvey Community Edition (Version 5.1.14.). Data were transferred to SPSS (Version 28.0.1.) for statistical analysis. The chi-square test was applied to find the relationship between different responses from different universities for statistical analysis. A p-value of 0.05 was considered statistically significant. While evaluating the statistical data of the questionnaire, those who marked the options strongly disagree, disagree, neither agree nor disagree were negative, those who marked agree, strongly agree were accepted as positive. Data collection was done with the help of a structured questionnaire that consisted of six parts. The first part of the questionnaire consists of questions about the demographic profile of the participants. The second and third part consists of questions about the meaning of the term sustainability. In the fourth, fifth, and sixth parts, questions were asked about sustainability awareness and practices in the social, environmental, economic, and dental categories, respectively. The first, second, and third parts contain the multiple choice question type, whereas the other parts include a matrix/rating scale question type.

III. RESULTS

A survey was conducted with the participation of 1734 participants, 1132 (73.94%) of whom are dentistry students and 155 (10.12%) dentists, 68 (4.44%) specialty/Ph.D. students, 53 (3.46%) specialist dentists, 105 (6.86%) academicians, 8 assistant health personnel and 10 other professional groups (0.65%) as you can see in **Figure 1**. There are 989 women and 553 males in the population. 304 (19.39%) of the participants were under the age of 20, 831 (53 %) were between the ages of 20 and 25, 122 (7.78%) were between the ages of 25 and 30, 65 (4.15%) were between the ages of 30-35, and 219 (13.97%) were beyond the age of 35 as you can see in **Figure 2**. 1734 participants took part in the survey, 717 completed it, and 1017 did not. 1st part 1542 people, 2nd part and 3rd part 1117 people, 4th part 886 people, 5th part 777 was completed by 749 people, part 6 was completed by 749 people and part 7 was completed by 725 people. There are 1132 dentistry students, 12 are preparatory, 420 are in 1st grade, 191 are in 2nd grade, 298 are in 3rd grade, 143 are in 4th grade, and 76 are in 5th grade. 298 third-grade students (17.1% participants) were excluded from the study group because clinical education varied by institution. The total study group is 542 people. 251(46.3%) people have not received clinical training, whereas 291(53.7%) have.

Figure 1. Occupation of the participants.

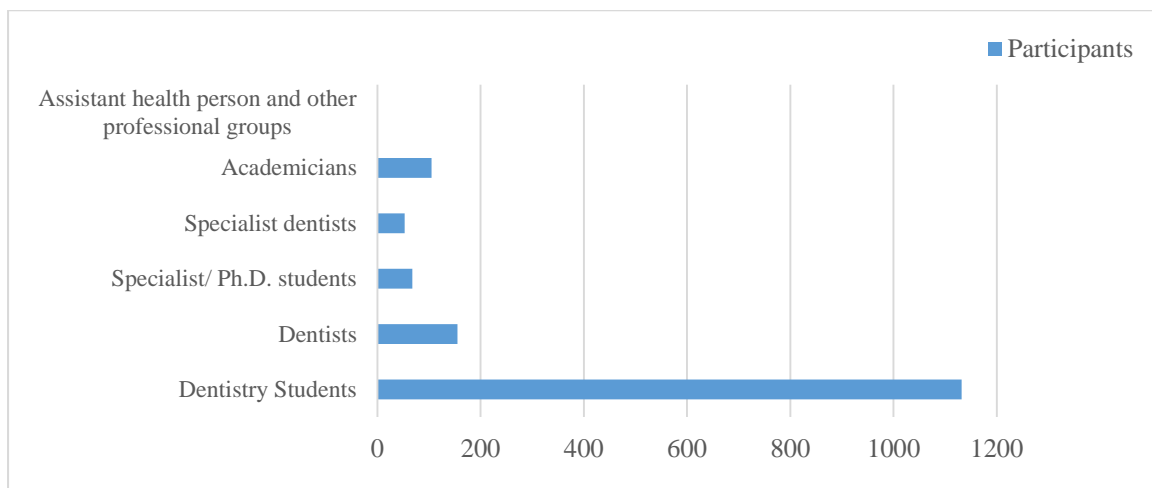
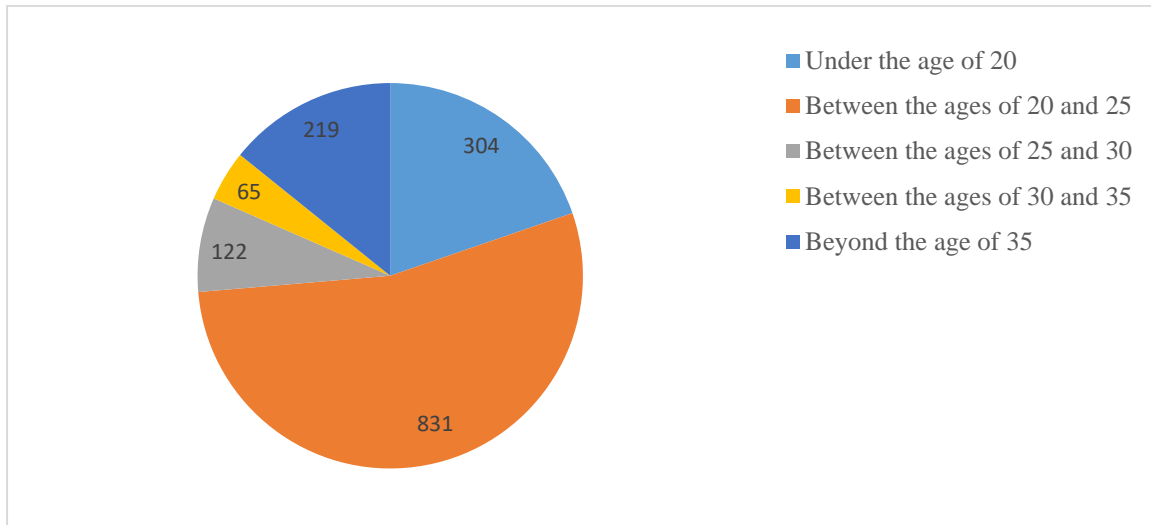
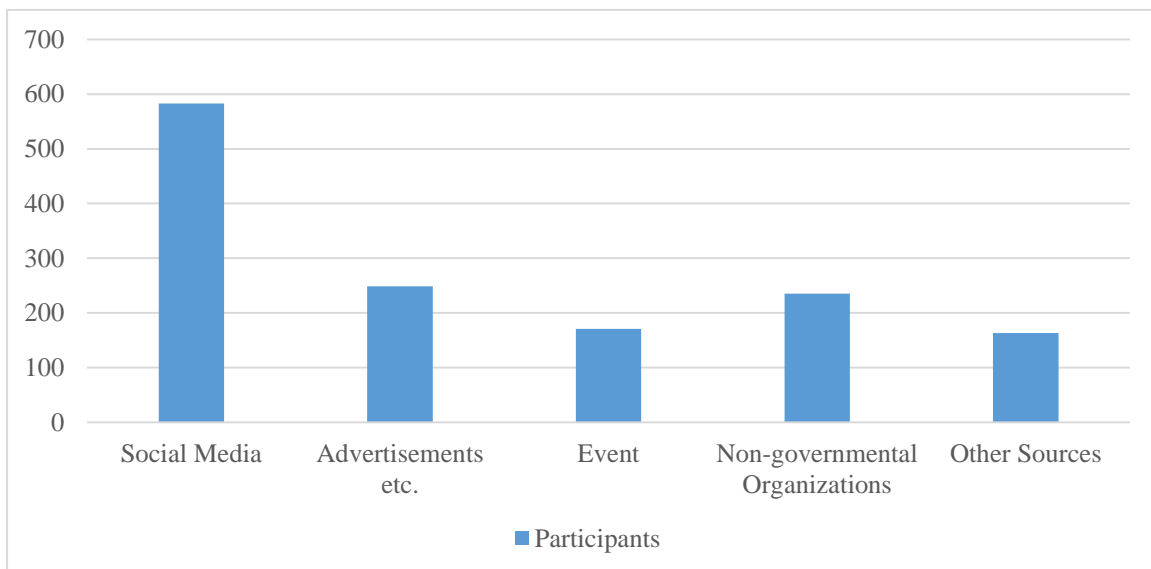


Figure 2. Age of the participants.



When asked whether they had heard of the concept of sustainability before, 950 people stated that they had heard it, and 166 people had not. There are many answers to the question of where they heard it; these are; social media 583 people, advertisements, brochures, etc. 249 people, 171 people who heard about an event they attended, 235 people heard from non-governmental organizations, 163 people who heard from other sources as you can see in **Figure 3**.

Figure 3. Many answers to the question of where they heard of the concept of sustainability before.



The question of what is sustainability; 782 people (38.3%) answered correctly, thinking that it is to meet the needs of today without compromising the ability of future generations to meet their needs. These 782 people are; 82 dentists, 562 dentistry students and 39 specialists/Ph.D. students. In this part, the level of awareness in the environmental dimension of sustainability was also examined. The number of people who make practices to reduce waste, for example, categorizing garbage into recycling bins and not wasting paper, is 692 (88.04%). It is 526 people (66.92%) who prefer to ride a bike, walk or use public transport instead of traveling by motor vehicle whenever possible (except for pandemic conditions). While the number of people who know the carbon footprint is 597 (75.95%), the number of people who know what carbon emissions are 481 (61.20%). What is more, the level of awareness in the economic dimension of sustainability was also examined. 506 people

(67.65%) try to evaluate non-needed products from second-hand sites or by contacting those in need. Otherwise, the level of awareness in the dental dimension of sustainability was also examined. There were 26 questions in the dentistry part of the questionnaire. The responses to 11 questions differed significantly ($p < 0.05$). Participants who had clinical training in dentistry provided statistically significant ($p < 0.05$) positive responses to questions about Sustainability in Dentistry. When the responses to the general sustainability statements were compared, there was no significant difference ($p \geq 0.05$). There are 300 (41.38%) who know that the global warming potential of nitrous oxide used for sedation is greater than carbon dioxide. Those who believe that electronic patient registration, consent form, and notifications via e-mail and/or message are beneficial in terms of sustainability are 649 (89.52%). 602 people (83.03%) think that digital radiography should be used to reduce the chemical waste generation in the dentistry clinic. Those who think that there should be recycling bins for paper/glass/plastic waste in the dentistry clinic are 685 (94.48%). Those who know that amalgam waste should be disposed of in the medical waste are 431 people (59.45%). While 518 people (71.45%) support the statement that when making an appointment with the dentist, it should be arranged so that family members can come together at once, 468 (64.55%) think that when the dentist gives an appointment, the number of appointments should be reduced by increasing the number of procedures as much as possible. Other questions and their results are available in the **Table 1**.

Table 1. Knowledge regarding awareness and consciousness level of sustainability in dentistry among study participants.,

Q1.Sustainability is a concept that should be given importance in many sectors, including the health sector.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	12			239		0,621
Have clinical training	10			231		
Q2.I am interested in sustainability in dentistry.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	138			113		0,000
Have clinical training	101			190		
Q3.I pay attention to the use of water and environmentally friendly products while doing my care (Bathing, shaving, tooth brushing, etc.). I try to motivate my patients in this regard.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	48			203		0,711
Have clinical training	58			231		
Q4.I inform my patients that not using water during tooth brushing and not rinsing their mouth with water after brushing is necessary both to increase the effect of toothpaste and to prevent water waste.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	90			161		0,670
Have clinical training	108			181		
Q5.I am conscious of antibiotic resistance and think that no unnecessary medication should be prescribed.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	23			228		0,043
Have clinical training	13			276		

Q6. There should be recycling bins for paper/glass/plastic waste in the dentistry clinic.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	14			237		0,609
Have clinical training	14			293		
Q7. Amalgam wastes should be collected in a jar containing water and stored as medical waste.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	108			143		0,000
Have clinical training	170			119		
Q8. Lamps used for illumination at the end of the day in the dentistry clinic should be turned off as soon as the patient's treatments are over.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	24			226		0,001
Have clinical training	8			281		
Q9. Sensor systems should be used in the dentistry clinic to prevent water-electricity waste.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	36			213		0,233
Have clinical training	31			258		
Q10. Making the clinic sustainable reduces costs in the long run.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	21			229		0,124
Have clinical training	13			276		
Q11. When making an appointment with the dentist, it should be arranged so that family members can come together at once.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	77			173		0,052
Have clinical training	66			274		
Q12. I am aware that regular stock control is required for the materials we use and it is important to develop solutions for products with close expiration dates.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	27			142		0,001
Have clinical training	9			210		
Q13. Auxiliary health personnel; should be informed and trained about preventing waste of electricity, water, and separating recyclable materials.						
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	p-value
Have not clinical training	24			226		0,005
Have clinical training	10			279		

IV. DISCUSSION

The study investigated the awareness level of dental professionals and dental students about sustainability. In the environmental dimension, the number of people who have the knowledge that sustainable development requires us to switch to renewable resources is 731 (93.00%). While 60% of the participants knew that the sun and wind are renewable energy sources (60.36% of the sun and 60.42% of the wind), biomass, hydroelectricity, and hydrogen (respectively 27.06%, 39.47%, 22.33%). They are not aware that energy sources are renewable energy sources. Although it is thought that it is necessary to switch to renewable energy at such a high rate, the level of knowledge about renewable energy sources is not sufficient when the results are obtained in light of the data related to the question in the first part. In another study, the sentence that solar panels can help save energy was directed. Undergraduates (147) 87.5%, post graduates (133) 90.47% positive respond positively to the attitude towards sustainable development [13]. While the type of light bulb they use at home/room/office should be fluorescent or energy-saving light, there were 217 (12.52%) who knew that fluorescent bulbs should be used. Those who think that using LED lights instead of fluorescent lights will increase energy efficiency are 582(74.90%). 582 people responded positively because they agreed with this question, of which 402 were dental students, 112 were dentists, and 25 were Ph.D./specialty students, and 43 were from other occupational groups. In another study, when asked what they use for energy management majority of the postgraduates (75.0%) used LED Light bulbs/CFL as these utilise low voltage and are found to be durable whereas, in a study conducted by Kallakuri P et al., it was seen that only 45% practitioners were in favour of using the LED lights bulbs [14, 15]. Both investigations discovered similar rates.

When we examine the answers in the social part of the questionnaire, if our university will organize any project or seminar that will raise awareness about sustainability, the number of people who will participate in it is quite high with 586 (65.55%). It can be extrapolated from the results that professionals in the field of dentistry want to get information in this field as it is not included in the curriculum. The level of awareness in the environmental dimension of sustainability was also investigated in this section. 553 (70.36%) are trying to get help from technology as much as possible to minimize paper usage. In other study, when asked whether they use computer-based record systems for paper waste management, while the yes responses were 51.6% in studentship, there was a decrease towards post-graduation [14]. Similarly, in the present study paper waste management was carried out by 44.5% of participants with a computer-based record system. Another study done in Lucknow by Rahman H et al. stated in this regard that one must reduce the consumption of paper and initiate the use of electronic and digital methods which will also reduce deforestation and will retard global warming [16].

The number of people who said that they make sure that organic wastes (food wastes, etc.) and recyclable wastes are not thrown into the same place as the recyclable wastes are 495 (62.98%). In the previous study, when asked whether they segregate the waste before disposal, 131 (70.5%) answered them as yes [17]. Compared to the previous study, there was a decrease in the level of consciousness. When it comes to the number of people who think they have a grasp of waste management procedures, there is a decrease of 360 (45.80%). In the other study, respondents were asked, "How aware are you about the amount of waste generated by a typical dental practice?" and the positive response rate of 35% is very low [18]. A solution can be produced by considering it and adding the necessary training to the curriculum. The level of awareness in the dental dimension of sustainability was also examined. The number of people interested in sustainability in dentistry is 410 (56.55%). In dentistry, 618 (85.24%) know that they need to integrate sustainable development goals into daily practice and encourage the transition to a green economy in every stage of life in pursuit of healthier lives and well-being for all. In the previous study, 86% agree that their studies are helping them learn how they can positively impact the world around them. 57% agree that their studies are helping them learn how to make changes to their lifestyle to help the environment [19]. 590 (81.38%) are aware of the advantages of current technologies such as intraoral scanner systems in terms of reducing the use of materials and the number of sessions and contribution to sustainability. In a previous study, methods used in dental offices to reduce waste/conserve energy/ reduce pollution, digital radiography; dental practitioners %64.10, interns %94.74, postgraduate students %90.74 [20].

While removing the old amalgam restoration, 118 (16.28%) had sufficient knowledge of aspiration with a saliva ejector. The number of people who thought that when removing the old amalgam restoration, removal with a saliva ejector and surgical aspirator is sufficient was 219 (30.21%). There is a study that asked the question "Does a mercury-free practice still require an amalgam separator" before. In this study, two groups were asked questions. 71% of 3rd-grade students said yes, 23% said no, 6% said do not know, 67% of 5th-grade students said yes, 18% said no, and 15% said do not know [18]. When the previous study and those who marked the

correct answer in this study are compared, it is observed that there is a lack of information about the amalgam separator in this study. 611 (84.28%) gave a negative response to the statement that there is no need for rubber cover isolation and surgical aspirator when removing the old amalgam restoration, and they showed that they are at a sufficient level of awareness on this issue. While 349 (48.14%) people thought positively about the statement "I know the alternatives to reduce the gray area and increase the green area in a clinic", 372 (51.31%) think negatively. Interestingly, respondents are generally unaware of the meaning of the gray area. The number of people who are aware of the fact that most of the carbon emissions in dental practice are caused by transportation is 272 (37.52%). 306 (42.21%) respondents think that the vast majority of carbon emissions in dental practice originate from the materials used. The number of people who think that participating in this survey increases their awareness and awareness about sustainability is 603 (84.22%). In another case, when asked how would they rate their current place of study against the following actions, two-thirds say their place of study is very good at providing opportunities for students linked to sustainability, and at addressing its negative impacts [20].

V. CONCLUSION

Although there was no significant difference between students in different grades, dentists, and other dentists regarding sustainable development, it was determined that the knowledge and practices of the participants about sustainability in dentistry were not sufficient. This study will make the participants reflect on their daily practices and attitudes, and will help them make the necessary changes in their lifestyles to sustain their future. It is also desired that academics and practitioners participate in an informed discussion and training on how to help dental students learn more about sustainability, thereby committing to utilizing innovations that will make the practice even more sustainable later in their professional careers. It demonstrates that much remains to be done to promote understanding and awareness of sustainability in the dental curriculum.

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