

Original Research

Sustainable oral hygiene products and practices: Perspectives, expectations, and barriers of portuguese residents



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ABSTRACT

Objectives: In recent decades, there has been a growing awareness of the impact of daily practices on the environment and a greater concern of companies to develop sustainable products; consequently, a wide variety of sustainable oral hygiene products is available. The study aims to analyze the consumer's perspective regarding the use of sustainable products for oral health self-care, namely practices, opinions, and difficulties felt regarding the use of these products.

Methods: A cross-sectional study was carried out on individuals 18 years old or older living in Portugal. Data were obtained through an online questionnaire, which collected information on the use of sustainable oral hygiene products, practices, perceptions, and difficulties experienced in adopting a sustainable lifestyle. Descriptive statistics were performed for the variables.

Results: The sample consisted of 185 participants. The majority (64.3%) considered it "very important" to invest in developing sustainable oral hygiene products. However, only 37.3% reported having already used these products. Of these, most were satisfied or very satisfied with the sustainable products used. Personal lack of interest (93.0%), difficulty in accessing products in commercial establishments (69.2%), and the high price of products (61.1%) were the main difficulties experienced in using these products.

Conclusions: Participants were aware of more sustainable oral hygiene products, but there is still a low frequency of use. It would be important to study the efficacy and safety of these products to promote the use of more environmentally friendly oral hygiene products. (Rev Port Estomatol Med Dent Cir Maxilofac. 2023;64(4):139-146)

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Produtos e práticas de higiene oral sustentáveis: Perspetivas, expectativas e barreiras de residentes em Portugal

R E S U M O

Palavras-chave:

Comportamento do consumidor
Saúde oral
Percepção
Desenvolvimento sustentável

Objetivos: Há uma crescente sensibilização para o impacto das práticas quotidianas sobre o ambiente e uma maior preocupação das empresas no desenvolvimento de produtos sustentáveis, surgindo no mercado uma variedade de produtos para utilização na higiene oral. Este estudo pretendeu analisar a perspetiva do consumidor relativamente aos produtos sustentáveis de autocuidados de saúde oral, nomeadamente as práticas, percepção e barreiras sentidas no que se refere à utilização destes produtos.

Métodos: Estudo transversal, dirigido a indivíduos maiores de 18 anos, residentes em Portugal. Os dados foram obtidos através de um questionário *on-line*, que recolheu informação sobre a utilização de produtos de higiene oral sustentáveis, práticas, percepções e dificuldades sentidas na adoção de um estilo de vida sustentável. Foi realizada a estatística descritiva das variáveis.

Resultados: A amostra foi constituída por 185 participantes. A maioria (64,3%) considerou “muito importante” existir um investimento no desenvolvimento de produtos de higiene oral sustentáveis. No entanto, apenas 37,3% referiram já ter utilizado este tipo de produtos, mostrando-se satisfeito ou muito satisfeito com os produtos utilizados. As principais dificuldades sentidas para utilização destes produtos foram o desinteresse pessoal (93,0%), a dificuldade no acesso aos produtos (69,2%) e o preço elevado (61,1%).

Conclusões: Os participantes mostraram-se sensibilizados para a utilização de produtos de higiene oral sustentáveis, no entanto ainda há uma baixa frequência da sua utilização. Seria importante o estudo da eficácia e segurança deste tipo de produtos, de modo a promover a utilização de produtos de higiene oral mais amigos do ambiente. (Rev Port Estomatol Med Dent Cir Maxilofac. 2023;64(4):139-146)

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Introduction

One of the most significant challenges of the 21st century is the global warming caused by climate change.^{1,2} With this concern in mind, in 2015, the United Nations proposed an agenda for sustainable development by 2030 to increase environmental, social, and economic efforts for an improvement in the population's quality of life.³ In 2017, the World Health Organization European Region members adopted sustainable development measures in the area of health.⁴

Since oral health is a part of human life and health, incorporating sustainable development goals is essential in making changes for sustainable dentistry.^{5,6} Oral health professionals should be aware of their role in promoting sustainability in clinical practice, office management, counseling, and patient health promotion.^{7,8} They can be a vehicle for changing behavior and promoting good oral health with ecological and sustainable practices.^{9,10} Effectively, oral disease prevention allows for a decrease in their economic and environmental impact, reducing traveling by patients and the number of clinical appointments and minimizing the amount of waste produced and recycled.^{1,5,10} However, this is hindered by the need for more information and motivation and the wrong perception that sustainable alternatives represent an additional cost.^{8,11-13}

Oral hygiene products are mostly made of plastic, contributing to one of the world's major problems today: plastic pollution. Fortunately, alternative ecological products are emerging to promote sustainable oral health care. The World Dental Federation (FDI) launched a new project, “Sustainability in Dentistry,” with commercial and high-education partners, intended to achieve sustainable purchasing and supply procedures.¹⁴ Through this and other initiatives, a wide variety of sustainable oral hygiene products have arisen on the market and can be found in commercial companies, online stores, and “zero-waste” associations.^{12,15} Examples of this type of product are toothbrushes with bamboo or sugar-cane handles; dental floss with recyclable packaging and made from biodegradable materials, such as bamboo, starch, charcoal, or beeswax; and toothpaste with packaging made from biodegradable, recycled, and recyclable materials, such as glass, paper, or cardboard, also facilitating the product separation and recycling process.

A study in Ireland highlighted characteristics of a manual toothbrush that were considered important influencers of the consumer's choice, namely the sustainable disposal of products and packaging and the texture of the bristles.¹⁶ Another study carried out in the United Kingdom found that participants reported positive attitudes toward more sustainable dentistry and that they were willing to compromise their time,

the convenience and durability of their dental treatment, as well as paying more, to reduce the impact of dental treatments on the environment.¹⁷ The results of these studies demonstrate the growing concern for sustainability by the populations, including a greater concern related to oral health self-care and treatment.

To promote the use of more sustainable products, it is important to know the factors consumers consider when buying oral hygiene products, as well as their perceptions and opinions regarding using more eco-friendly products. Thus, intending to contribute to the knowledge of sustainability related to oral health, this study aims to know the consumer's perspective, expectations, and barriers regarding the use of sustainable oral hygiene procedures and products.

Material and Methods

The Faculty of Dentistry of the University of Lisbon's Ethics Committee approved this cross-sectional study.

Data was collected through an online questionnaire self-completed by the participants. The questionnaire was available through a link that was disseminated to the general population via social media (Facebook and Instagram) between March and April 2022.

The target population consisted of individuals 18 years old or older residing in Portugal. All individuals who voluntarily agreed to participate and responded to the questionnaire were included.

The anonymous questionnaire was developed specifically for the study based on a literature review.^{3,12-14} Before its application, it was reviewed by a panel of three experts and subsequently subjected to a pre-test. The objectives and procedures of the study were presented on the first page. The first question confirmed the agreement to participate in the study (informed consent), and only those who consented had access to the questionnaire. The inclusion criteria were also confirmed at the beginning of the questionnaire. The questionnaire collected information about demographic characterization, the use of general oral hygiene products, the use of sustainable oral hygiene products (practices, perceptions, opinions, and experienced barriers), and sustainable lifestyle practices.

Descriptive analysis was performed, calculating all variables' absolute and relative frequencies.

Results

The sample included 185 individuals. Most of the participants were female (77.8%), with ages between 18-24 years old (55.1%), and secondary education (59.5%) (Table 1).

The most frequently used toothbrushes for oral hygiene were conventional manual plastic brushes (63.2%), followed by electric toothbrushes (20.0%). When asked about the main concern regarding the purchase of toothbrushes, the quality of the brush (41.8%) and the softness of the bristles (32.6%) were most frequently mentioned, while only 8.2% mentioned environmental sustainability as a priority for the selection of these

products. Regarding dental floss or interdental brush, 67.6% of the participants mentioned using them. When buying these products, there was a significant concern with the quality (54.4%) and the price (36.8%). Similarly, quality (67.2%) and price (25.6%) were mentioned as the primary concerns when buying toothpaste, with only 3.9% stating environmental concerns (Table 2).

About 64% of the participants considered that it is essential to invest in the development of sustainable oral hygiene products. The vast majority (85.2%) indicated they had never received advice from oral health professionals for using these products. Although 64.9% reported knowing sustainable oral hygiene products, only 37.3% mentioned using them. The sustainable oral hygiene products most frequently known by the participants were toothbrushes (98.3%) and toothpaste (75.8%) (Table 2).

Considering the individuals who already used sustainable oral hygiene products, 79.7% stated they had already used a sustainable toothbrush, namely, one with bamboo handles (85%), biodegradable plastic handles (43.6%), or sugar-cane handles (10.9%). Regarding sustainable dental floss, 17.4% of the participants reported already using it. Sustainable toothpaste was reported by 60.9% of the participants, namely, one with packaging with biodegradable plastic (76.2%) and paper (35.7%).

Table 3 presents the participants' perceptions of the effectiveness of sustainable oral hygiene products. Most participants who had used these products said that the sustainable toothbrushes and dental floss were "effective" or "very effective" and would recommend these products to others. Most participants felt "satisfied" or "very satisfied" using sustainable dental products.

The most frequently referred barriers to implementing sustainable oral hygiene were personal disinterest (93.0%), the difficulty in accessing products (69.2%), the high price of products (61.1%), and the difficulty in accessing information about

Table 1. Sample characterization.

Variable	Categories	n	%
Sex	Female	144	77.8
	Male	41	22.2
Age (years)	18-24	102	55.1
	25-34	30	16.2
	35-44	21	11.4
	45-54	16	8.6
	55-64	12	6.5
	+ 65	4	2.2
Education level	Less than basic education (less than 9 years)	4	2.2
	Complete basic education (9 years)	7	3.8
	Complete secondary education (12 years)	110	59.5
	Complete higher education	64	34.6
Occupation	Student	84	45.4
	Student / employed	17	9.2
	Employed	72	38.9
	Retired	3	1.6
	Unemployed	8	4.3
	Other	1	0.6

Table 2. Use of oral hygiene products and sustainable oral hygiene products.

Variable	Categories	% (n)
Type of toothbrush used	Conventional plastic manual toothbrush	63.2 (117)
	Electric toothbrush	20.0 (37)
	Plastic manual toothbrush with refillable heads	14.1 (26)
	Manual toothbrush made of biodegradable materials	2.7 (5)
Biggest concern when buying toothbrushes	Quality	41.8 (77)
	Bristle softness	32.6 (60)
	Price	16.3 (30)
	Environmental sustainability (ecological product)	8.2 (15)
	Other	1.1 (2)
Use of floss/interdental brush	Yes	67.6 (125)
	No	32.4 (60)
Biggest concern when buying dental floss/ interdental brush	Quality	54.4 (68)
	Price	36.8 (46)
	Environmental sustainability (ecological product)	7.2 (9)
	Other	1.6 (2)
Biggest concern when buying toothpaste	Quality	67.2 (121)
	Price	25.6 (46)
	Environmental sustainability (ecological product)	3.9 (7)
	Fluoride concentration	1.1 (2)
	Other	1.7 (3)
Importance of the investment for sustainable oral hygiene products	Very important	64.3 (119)
	Important	31.4 (58)
	More or less important	3.2 (6)
	Little important	1.1 (2)
Oral health professionals' counseling for the use of sustainable products	Yes	11.5 (21)
	No	85.2 (156)
	I never had an oral health appointment	3.3 (6)
Knowledge about sustainable oral hygiene products	Yes	64.9 (120)
	No	22.7 (42)
	Don't know	12.4 (23)
Knowledge about type of sustainable oral hygiene products	Toothbrush	98.3 (118)
	Toothpaste	75.8 (95)
	Dental floss	43.3 (52)
	Interdental brush	34.2 (41)
	Elixir	10.3 (12)
Already used a sustainable oral hygiene product	Yes	37.3 (69)
	No	45.9 (85)
	Don't know	16.8 (31)

Table 3. Opinions on the use of sustainable oral hygiene products.

Variable	Categories	% (n)
Opinion on the effectiveness of sustainable toothbrushes	Very effective, would recommend to others	30.9 (17)
	Effective, would recommend to others	52.7 (29)
	Not effective, would not recommend to others	9.1 (5)
	I don't know/I have no opinion	7.3 (4)
Opinion on the effectiveness of sustainable dental floss	Very effective, would recommend to others	41.7 (5)
	Effective, would recommend to others	41.7 (5)
	Not effective, would not recommend to others	8.3 (1)
	I don't know/I have no opinion	8.3 (1)
Satisfaction with sustainable toothbrushes	Satisfied or very satisfied	74.6 (42)
	More or less satisfied	14.5 (8)
	Not satisfied or little satisfied	10.9 (6)
Satisfaction with sustainable dental floss	Satisfied or very satisfied	83.4 (10)
	More or less satisfied	8.3 (1)
	Not satisfied or little satisfied	8.3 (1)
Satisfaction with sustainable toothpaste	Satisfied or very satisfied	83.3 (35)
	More or less satisfied	11.9 (5)
	Not satisfied or little satisfied	4.8 (2)

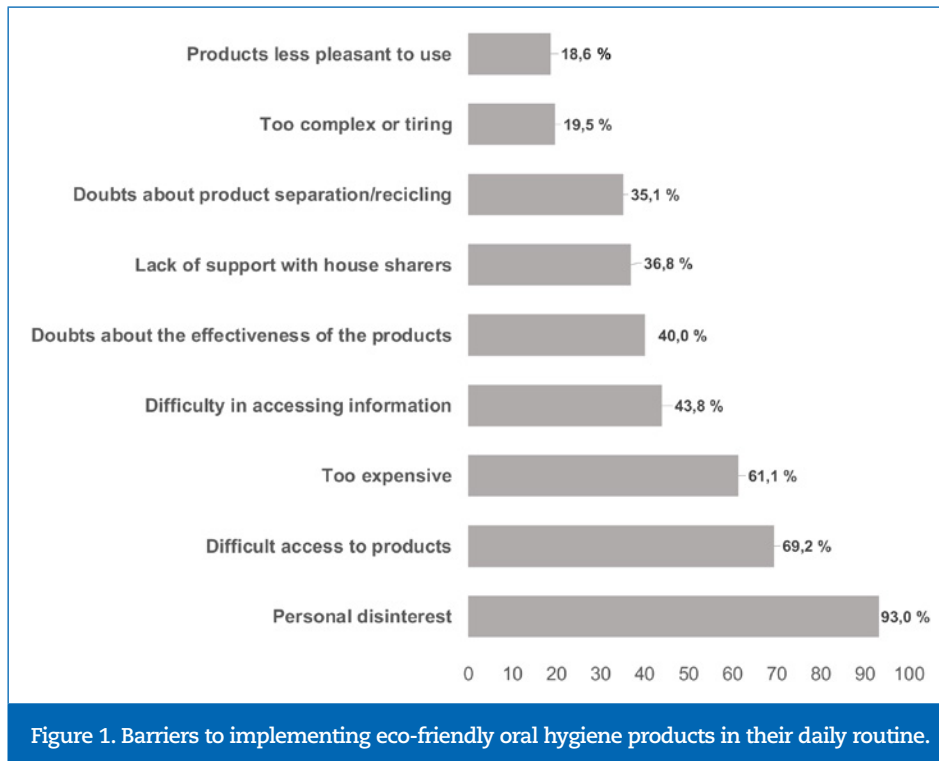


Table 4. Practices and perception about sustainability.

		% (n)
Turning off the tap while brushing teeth	Yes	94.6 (175)
	No	5.4 (10)
Search for eco-friendly oral hygiene products	Yes	34.6 (64)
	No	65.4 (121)
Recycling oral hygiene products	Yes	55.1(102)
	No	44.9 (83)
Most sustainable products are very expensive and that's why I can't use them	Agree	36.8 (68)
	Neither agree nor disagree	41.6 (77)
	Do not agree	21.6 (40)
I feel I can do more, but I have little information	Agree	62.7 (116)
	Neither agree nor disagree	25.4 (47)
	Do not agree	11.9 (22)
Sustainable products do not have the same quality as others	Agree	10.8 (20)
	Neither agree nor disagree	48.1 (89)
	Do not agree	41.1 (76)
Perspective of their actions on the environment	I am informed and aware	47.0 (87)
	I do not have enough knowledge about the subject	20.5 (38)
	I do not have enough knowledge, but I would like to get more	31.4 (58)
	I do not have an opinion / I do not identify	1.1 (2)

this topic (43.8%) (Figure 1). Regarding sustainable practices implemented in their daily routine, about 94.6% of the participants indicated they had the habit of turning off the tap while brushing their teeth, 55.1% reported recycling used oral hygiene products, and 34.6% said they were looking for more “environmentally friendly” oral hygiene products (Table 4). About 47% perceived that their individual actions have environmental consequences, and 20.5% answered that they did

not know enough about the subject. About 31% of the participants revealed wanting to learn more about the topic (Table 4).

Discussion

The 2030 Agenda established 17 sustainable development goals (SDGs) and 164 targets to be achieved by the year 2030,

including goals and targets for good health and well-being (SDG 3) and for responsible consumption and production (SDG 12). The health-related objectives intend to promote the adoption of sustainable practices in all areas of health and ensure people's well-being and quality of life. Regarding responsible consumption and production, the objectives intend to reduce the use of natural resources, waste production, and air and water pollution.⁴ Preventing oral health diseases and counseling the patients for correct oral self-care with more sustainable products can be included in the clinical routine practices of oral health professionals, contributing to achieving these SDGs.

Globally, there is a growing concern about using environmentally friendly products, and companies are increasing the development of this type of product. However, there are still several challenges, namely, increasing the awareness for adopting more sustainable practices and promoting the production of more ecological products. Sustainable products require renewable and recyclable materials and waste treatment that can make them more expensive; consequently, not all consumers can or want to pay for them.¹⁸

In recent years, the availability of ecological and sustainable oral healthcare products has increased. Using this type of product can lead to more sustainable oral hygiene practices, which, when included in the daily routine, can positively impact the environment. To promote the use of this type of product, consumers must be informed and involved, reinforcing that each individual's sustainable behaviors are essential. Indeed, a lack of knowledge and environmental awareness can reduce the effectiveness of more environmentally friendly actions.¹⁹

The results of the present study demonstrated that the participants are aware of the theme of sustainability, with the majority considering the development of sustainable products important. However, only a third of the individuals reported having tried this type of product, and a minority considered sustainability aspects when choosing oral hygiene products. Thus, there is an interest and knowledge about these products, but not an actual implementation of their use in a constant and sustained way. A study in Ireland found that consumers considered the sustainable disposal of products and packaging and the texture of the bristles to be the most important characteristics when choosing toothbrushes, stating they would consider paying around 6 euros extra to buy a more sustainable product.¹⁶

Other studies carried out on specific populations of oral health professionals have shown they were aware of the commitment to environmental sustainability but felt that transforming this awareness into action was a great challenge. Some barriers identified included limited knowledge, the availability of sustainable products,^{8,20} and meeting the requirements of current performance standards, costs, and infection control guidelines.²⁰ Effectively, to support changes and increase the use of sustainable products, patient counseling by oral health professionals may be crucial in promoting awareness of environmental problems. The involvement and training of oral health professionals are essential, so introducing this theme should be considered in the pre-graduate curriculum of oral health courses.²¹ Educational institutions, in-

cluding higher education institutions, must play an active role in promoting knowledge and skills related to sustainability, encouraging future professionals and citizens to be better prepared for the challenges of climate change, and contributing to a "quality education" (SDG 2).

On the other hand, for health professionals to have more confidence in advising sustainable products, they must have knowledge and confidence in the quality of the products, their safety, and their effectiveness in preventing oral pathologies. So, it is necessary to promote quality research for better information on products' effectiveness and carbon footprint. Some recent studies have compared some oral hygiene materials for sustainability,²²⁻²⁴ but more is needed to promote confidence among healthcare professionals and consumers. Additionally, companies must provide more detailed information on the type and origin of sustainable materials and how they are manufactured to facilitate the product's recommendation by oral health professionals. Some authors advocate an approach similar to food products and their labeling, suggesting that the packaging of oral hygiene products should follow an appropriate standardized methodology and that an overall assessment of their environmental impact should be included on the packaging of these products to guide an informed decision by consumers and oral health professionals.²⁵

Most participants who had already used sustainable oral hygiene products were satisfied, considering them effective and recommending their use. However, they indicated difficulties such as lack of interest, product availability, price, and doubts about efficacy and safety, which may condition their use. So, there is a high level of intention to purchase sustainable products and satisfaction with their effect. However, these are not directly reflected in the routine practice of their use and consumption. Despite the barriers, the sustained use of these products is only more effective in individuals who are more attentive and aware of adopting sustainable practices.⁽²⁶⁾ As sustainable products tend to be more expensive than conventional products, consumers directly compare the ecology of sustainable products with cost-effectiveness. Consumers already predisposed to using ecological products are usually more receptive to paying more for these products.^{19,26} However, a study in Brazil about the consumption of sustainable products—not directly related to oral health—identified information and knowledge, environmental attitude, social context, and environmental awareness as factors that strongly influenced the consumption of sustainable products. This study also showed that quality and price were less influential in consumer decision-making.²⁷

Some factors that lead Portuguese consumers to adopt sustainable behaviors are social influence, feelings, and cognition. Social influence is crucial in ensuring both the adoption of sustainable practices and the intention of sustainable purchases. It means that individuals are more receptive to adopting behaviors practiced in their community or that seem more socially accepted. In addition, personal norms and values also constitute a determining and decisive factor in the adoption/change of behaviors.²⁸ Consumers who already adopt other sustainable practices in their daily lives will be more predisposed to buying sustainable products, as a growing awareness

and inclination toward sustainable consumption influences their purchasing decisions.^{28,29}

Another important aspect is that sustainable products must meet consumer expectations, so their marketing must be consistent and reliable to avoid the consumers' disbelief. It is also crucial for companies to guarantee the quality of their products, which is fundamental to increasing satisfaction and confidence in sustainable products.¹⁸ In the present study, quality was the most frequently highlighted aspect of choosing oral hygiene products.

Oral health care is a fundamental requirement for good oral and general health, significantly impacting quality of life, self-esteem, and social relationships. Combining proper oral hygiene with sustainable practices promotes a healthy lifestyle in a healthy environment. It is impossible to ignore the impact that consumption and our practices have on future generations, so this alliance of oral health prevention to ecological behaviors and practices is crucial to this collective and integrated thinking. Oral health professionals must be informed about this subject and be able to make simple recommendations to reduce the human ecological footprint, such as encouraging the closing of the water tap when brushing teeth, recycling used hygiene products, or using more environmentally friendly products that are adequate to the patient's condition.

This study aims to contribute to the knowledge of the use of sustainable oral hygiene products and habits, offering an exploratory insight into the perceptions and expectations of consumers living in Portugal. This cross-sectional study included a non-probabilistic sample, with data collected by an online questionnaire. This methodology has some advantages but also several caveats. The latter ones are related to the sample and include the possibility of self-selection, non-response, unknown participation rates, and under-coverage of the target population, determined, among others, by access to the internet.³⁰ Despite these limitations, the present study aimed to contribute to the theme of sustainability related to oral health, which still needs further investigation. The extrapolation of the results is not possible, considering the limitations already mentioned. Future studies using representative samples would be important.

Conclusions

The participants considered it essential to acquire sustainable habits related to oral hygiene, but only a minority had used sustainable oral hygiene products. The main concerns when buying oral hygiene products were their quality or cost, and sustainability was not a frequent concern. Most individuals who already used sustainable oral hygiene products were satisfied and would recommend them. The main barriers to using sustainable oral hygiene products were the personal lack of interest, the availability of the products, and their cost.

Conflict of interest

The authors have no conflicts of interest to declare.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed their work center protocols on access to patient data and for its publication.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

Cleuzilena Barros: Conceptualization, Methodology, Validation, Resources, Formal analysis, Investigation, Data curation, Writing – original draft. **Cristina Bettencourt Neves:** Conceptualization, Methodology, Validation, Supervision, Writing – review & editing. **Sónia Mendes:** Conceptualization, Methodology, Validation, Formal analysis, Supervision, Writing – original draft, Writing – review & editing.

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