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Prevalence and determinants of traditional and alternative nicotine product use among dental students – a questionnaire study

Rozpowszechnienie i determinanty użytkowania tradycyjnych i alternatywnych produktów nikotynowych wśród studentów stomatologii – badanie ankietowe

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ABSTRACT

Nicotine use still remains a significant challenge to global public health. The adverse effects of smoking are extensively documented, however novel nicotine product such as electronic cigarettes, heated tobacco and nicotine pouches still requires further research. This questionnaire study examines the prevalence and determinants of traditional and alternative nicotine product use among dental students, along with their knowledge of smoking-related oral health risks. A total of 92 participated in the study. Regular nicotine use was reported by 24.7% of respondents, with e-cigarettes being the most common product (12.9%). Occasional use was higher at 46.4%, driven mainly by social interactions (25.8%) and stress (25.8%). The study found a notable association between students' nicotine use and the habits of their social circles, highlighting the influence of environmental factors. Knowledge of smoking's impact on oral health was high (96.7%), though fewer students were aware of the risks associated with alternative products such as e-cigarettes (87.0%). These findings suggest that targeted education within the dental curriculum plays an important role and potentially influence nicotine use behaviors. The study emphasizes the need for earlier integration of comprehensive tobacco education, particularly novel nicotine products.

Keywords: cigarette smoking, alternative nicotine products, electronic cigarettes.

STRESZCZENIE

Użytkowanie produktów nikotynowch nadal pozostaje poważnym wyzwaniem w zakresie zdrowia publicznego. Niekorzystne skutki palenia tytoniu zostały szczegółowo udokumentowane, jednakże nowe produkty nikotynowe, takie jak papierosy elektroniczne, podrzewacze tytoniu i saszetki nikotynowe, nadal wymagają przeprowadzenia dalszych badań naukowych. W przeprowadzonym badaniu ankietowym zbadano rozpowszechnienie i czynniki determinujące użytkowanie tradycyjnych i alternatywnych produktów nikotynowych wśród studentów stomatologii, a także ich wiedzę na temat zagrożeń dla zdrowia jamy ustnej związanych z paleniem tytoniu. W badaniu wzięło udział łącznie 92 osoby. Regularne używanie nikotyny deklarowało 24,7% ankietowanych, przy czym najpopularniejszy produkt stanowiły e-papierosy (12,9%). Sporadyczne używanie było wyższe i wyniosło 46,4%, a jego główne przyczyny to interakcje społeczne (25,8%) oraz stres (25,8%). Badanie wykazało zauważalny związek między użytkowaniem produktów nikotynowych przez studentów a nawykami ich kręgów społecznych, podkreślając wpływ czynników środowiskowych. Wiedza na temat wpływu palenia na zdrowie jamy ustnej była wysoka (96,7%), chociaż mniej studentów było świadomych zagrożeń związanych z produktami alternatywnymi, takimi jak e-papierosy (87,0%). Odkrycia te sugerują, że ukierunkowana edukacja w ramach programu nauczania stomatologicznego odgrywa ważną rolę i potencjalnie wpływa na zachowania związane z używaniem nikotyny. W badaniu podkreślono potrzebę wprowadzenia kompleksowej edukacji, zwłaszcza w zakresie nowych wyrobów nikotynowych.

Słowa kluczowe: palenie tytoniu, alternatywne produkty nikotynowe, elektroniczne papierosy.

Introduction

Nicotine addiction remains a formidable challenge to global public health, with tobacco products, especially cigarettes, recognized as a leading cause of preventable death and disease worldwide [1, 2]. The main problem is nicotine, a highly addictive compound found in tobacco, compelling continued use despite well-documented health risks [3].

The adverse effects of smoking are extensively documented, including increased risks of cardiovascular disease, stroke, respiratory disorders and various cancers [4–6]. Moreover, smoking induces significant alterations in the oral cavity, leading to higher susceptibility to periodontal diseases, tooth loss, oral cancers and compromised wound healing post-dental procedures [7–10]. The addictive nature of nicotine exacerbates cessation efforts, often necessitating multiple attempts and comprehensive support [11].

In response to the harmful effects of traditional smoking, alternative nicotine delivery systems have beed developed [12]. These products offer nicotine without the combustion and harmful by-products of conventional cigarettes. Notable alternatives include electronic cigarettes (e-cigarettes), heated tobacco devices (HTD) and nicotine pouches, each with distinct delivery mechanisms [13].

Electronic cigarettes or electronic nicotine delivery systems (ENDS), function by heating a liquid solution containing nicotine, flavorings, and additives to produce an inhalable aerosol [9,10,12,14–19]. These devices are available in various forms such as cigalikes, vape pens and advanced mods, adjusted to diverse user preferences [14–16, 18].

Heated tobacco devices represent a novel approach to nicotine administration, utilizing a heating mechanism rather than combustion to generate smoke [20, 21]. They utilize specially designed tobacco sticks, heated to produce a nicotine-laden aerosol [21, 22].

Termed "heat-not-burn" technology, its aim is to mitigate exposure to harmful compounds associated with traditional smoking while providing a sensory experience similar to conventional smoking [21].

Nicotine pouches have emerged as a smokeless alternative to conventional tobacco products [23]. These small pouches, filled predominantly with nicotine, flavorings and plant fibers, are placed in the buccal cavity, facilitating nicotine absorption through the oral mucosa. This discrete mode of consumption appeals to individuals seeking alternatives to smoking or vaping [24].

The impact of nicotine uses and addiction extends to the population of dental students [25–28]. The aim of this study was to analyze nicotine product use among dental students through a questionnaire-based approach including various aspects of students' nicotine consumption behaviors, exploring contexts of use, potential triggers and the influence of social environments. Through these inquiries, the study seeks to provide comprehensive insights into nicotine usage dynamics among students and the multifaceted factors that impact their behaviors.

Materials and Methods

Study Design

The study was conducted at the Faculty of Dentistry at the Medical University of Gdańsk. The respondents completed questionnaires regarding tobacco use anonymously. The survey included three screening questions regarding gender, year of study, and age range of the responders, followed by thirteen closed-ended questions regarding the use of nicotine products. The initial five questions referred to the frequency, regularity, duration, circumstances and the kind of used nicotine products. The sixth question concerned the subjective symptoms in the oral cavity (such as the feeling of dryness, burning or taste disorders). The following four questions inquired about the respondent's immediate environment – family and friends, and their habits related to the use of tobacco products. The last three questions concerned the respondent's awareness of the impact of tobacco product use on oral health and the possibilities of addiction treatment.

Participants

The study involved a total of 92 students (N = 92; 100%), with a higher proportion of female participants (N = 71; 77%) compared to males (N = 21; 23%), reflecting the typical gender distribution in the dental program. The study group was predominantly composed of fifth-year students (N = 60; 65%), followed by third-year students (N = 17; 19%), second-year students (N = 9; 10%), fourth-year students (N = 4; 4%), and first-year students (N = 2; 2%). The majority of participants were in the 21–23 age group (N = 38; 42%), with the next largest age group being in age 24–26 (N = 36; 39%). This was followed by those aged 26 and above (N = 15; 16%), while the least represented group was aged 18–20 (N = 3; 3%). Group characteristics is presented in **Table 1.**

Table 1. Group characteristics
Tabela 1. *Charakterystyka grupy*

Gender	Female	71	77%
	Male	21	23%
Year of Study	First	2	2%
	Second	9	10%
	Third	17	19%
	Fourth	4	4%
	Fifth	60	65%
Age Group	18–20	3	3%
	21–23	38	42%
	24–26	36	39%
	26+	15	16

Data collection
Data analysis was based on responses from both multiple-choice and single-choice questions. Some questions assessed the nicotine dependence of the participants, while others explored the attitudes of their family and friends toward nicotine products.

Ethical Considerations
The study was reviewed and approved by the Bioethics Committee of the Medical University of Gdańsk – NKBBN/708/2022

Results
Nicotine Use Prevalence and Patterns
24.7% of participants reported using nicotine products regularly. E-cigarettes were the most commonly used product (12.9%), followed by cigarettes (6.5%), tobacco heaters (3.2%), and nicotine pouches (2.1%). More students reported occasional nicotine use (46.4%). E-cigarettes remained the most frequently used (27.8%), with cigarettes (8.3%) and tobacco heaters (7.2%) also showing significant usage.

Circumstances of Nicotine Use
Social interactions and stress were the two primary triggers for nicotine use, each presented by 25.8% of responses and 10.3% of students reported using nicotine while studying or during leisure time. Therefore, 27.8% of respondents indicated that nicotine use did not apply to them.

Duration and Frequency of Nicotine Use
Among nicotine users, 14.6% have been using nicotine products for 1–2 years, 14.6% for 3–4 years, and another 14.6% for more than six years. Most users (71.0%) indicated that they use nicotine products sparingly or not at all. However, 12.9% reported consuming more than 10 units of nicotine products daily, reflecting a subgroup of heavy users. Therefore, 46.9% of students reported that nicotine use did not apply to them.

Oral Discomfort and Health Impact
While 39.1% of respondents did not report any discomfort in the oral cavity, 8.7% mentioned experiencing dryness. Taste alterations were reported by only 1.1% of participants, and no respondents reported a burning sensation.

Social Influence on Nicotine Use
There was a high prevalence of nicotine use among friends, with 43.6% of respondents indicating that their friends regularly used e-cigarettes, followed by tobacco heaters (18.3%) and cigarettes (13.5%). Occasional use was even higher, with 39.4% reporting that their friends occasionally used e-cigarettes. Among respondents, 26.5% reported that their family members regularly smoked cigarettes, and 11.2% mentioned that their family used tobacco heaters. Occasional nicotine use within families was less common but still notable, with 16.2% reporting occasional cigarette use.

Knowledge of Nicotine's Impact on Oral Health
Nearly all respondents (96.7%) were aware of the detrimental effects of smoking on oral health, though slightly fewer (87.0%) understood the impact of alternatives like e-cigarettes and tobacco heaters. Knowledge of pharmacological nicotine cessation therapies was also on a high level (83.7%).

The obtained results and the questionnaire are presented in **Table 2**.

Table 2. The obtained results and the questionnaire
Tabela 2. *Uzyskane wyniki i kwestionariusz*

Question No.	Question Content	Possible Answers	Results from Survey N (%)
1. Do you regularly use nicotine products?		Yes, cigarettes	6 (6.5%)
		Yes, e-cigarettes	12 (12.9%)
		Yes, tobacco heaters	3 (3.2%)
		Yes, nicotine pouches	2 (2.1%)
		No	70 (75.3%)
2. Do you occasionally use nicotine products?		Yes, cigarettes	8 (8.3%)
		Yes, e-cigarettes	27 (27.8%)
		Yes, tobacco heaters	7 (7.2%)
		Yes, nicotine pouches	3 (3.1%)
		No	52 (53.6%)
3. Under what circumstances do you use nicotine?		During social interactions	40 (25.8%)
		Whilst stressed	40 (25.8%)
		While learning	16 (10.3%)
		During leisure time	16 (10.3%)
		Does not apply	43 (27.8%)
4. Since when have you used nicotine?		1-2 years	14 (14.6%)
		3-4 years	14 (14.6%)
		5-6 years	9 (9.3%)
		>6 years	14 (14.6%)
		Does not apply	45 (46.9%)
5. How often do you use nicotine products?		1-2 per day	5 (5.4%)
		3-5 per day	6 (6.4%)
		5-10 per day	4 (4.3%)
		>10 per day	12 (12.9%)
		Does not apply	66 (71.0%)
6. Did you notice any discomfort in the oral cavity?		Yes, dryness in the oral cavity	8 (8.7%)
		Yes, burning in the oral cavity	0 (0.0%)
		Yes, taste alterations	1 (1.1%)
		No	36 (39.1%)
		Does not apply	47 (51.1%)
7. Do your friends regularly use nicotine products?		Yes, cigarettes	17 (13.5%)
		Yes, e-cigarettes	55 (43.6%)
		Yes, tobacco heaters	23 (18.3%)
		Yes, nicotine pouches	10 (7.9%)
		No	21 (16.7%)
8. Do your friends occasionally use nicotine products?		Yes, cigarettes	26 (19.7%)
		Yes, e-cigarettes	52 (39.4%)
		Yes, tobacco heaters	24 (18.2%)
		Yes, nicotine pouches	12 (9.1%)
		No	21 (13.6%)
9. Does your family regularly use nicotine products?		Yes, cigarettes	26 (26.5%)
		Yes, e-cigarettes	8 (8.2%)
		Yes, tobacco heaters	11 (11.2%)
		Yes, nicotine pouches	0 (0.0%)
		No	53 (54.1%)

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10. Does your family occasionally use nicotine products?	Yes, cigarettes	16 (16.2%)
	Yes, e-cigarettes	12 (12.1%)
	Yes, tobacco heaters	4 (4.0%)
	Yes, nicotine pouches	1 (1.0%)
	No	66 (66.7%)
11. Do you know the impact of smoking on oral health?	Yes	89 (96.7%)
	No	3 (3.3%)
12. Do you know the impact of alternatives to smoking on oral health?	Yes	80 (87.0%)
	No	12 (13.0%)
13. Do you know the pharmaceuticals used in the treatment of nicotine addiction?	Yes	77 (83.7%)
	No	15 (16,3%)

Discussion

The results of this study highlight several key trends in nicotine use among dental students. While a significant number of students are regular nicotine users, a larger group uses nicotine occasionally, most often driven by stress and social settings. These findings are consistent with other studies indicating that students, particularly in high-pressure environments like dental school, may resort to nicotine as a coping mechanism.

In comparison to studies conducted on global dental student populations, notable differences emerge. The tobacco smoking prevalence in dental students (6% in our study) is significantly lower than the global average of 22.3% [25]. This suggests that dental education and awareness of health risks may reduce smoking rates among students. The nicotine use rate in dental students (23.9% in our study) aligns closely with the general European population [25]. However, a higher number of dental students seem to favor e-cigarettes and nicotine pouches over traditional smoking, similar to trends observed in the younger European demographic. This indicates that despite higher awareness among dental students, social factors and stress continue to drive the use of alternative nicotine products [25]. However, the overall nicotine use, including alternatives, remains concer, indicating that while traditional smoking rates are lower, newer nicotine products are gaining more popularity. In our research, 23.9% of students use nicotine products, with only 6% smoking traditional cigarettes, a lower rate than in studies such as Alhajj et al., where countries like Yemen (28.3%) and Turkey (25.6%) report higher smoking rates [26]. Conversely, countries like Kuwait and Nigeria report much lower smoking rates, with Nigeria being the lowest at 4.2%. Therefore, our study's smoking prevalence aligns more closely with countries like Canada (3%), the USA (4%), and Brazil (6%) [30]. Comparative analysis with similar studies reveals both alignment and divergence in nicotine use patterns among dental students. For instance, the prevalence of nicotine use in our study (24.7%) is consistent with findings from Turkey (25%) by Gürlek et al. and Brazil (30%) by Marta et al., though slightly higher than in Saudi Arabia (22%) by Khanagar et al. [27–29].

In contrast, countries like Serbia (43%) and Greece (47%) exhibit much higher smoking rates among dental students. Interestingly, e-cigarette use is most prevalent in Saudi Arabia, where 11.7% of students are dual users, while traditional smoking dominates in countries like Serbia and Greece. Gender differences are notably similar across studies, with males exhibiting higher nicotine use than females. The trend of increased awareness among senior students about the health impacts of nicotine and cessation methods is also observed [30].

The variability in nicotine use behaviors across different regions underscores the importance of tailored educational interventions that consider local cultural and environmental factors. This approach can improve both personal health outcomes for dental students and their capacity to provide informed guidance to patients. These comparisons highlight the variability in nicotine use behaviors across different cultural and educational contexts, reinforcing the importance of tailored interventions that address both traditional and emerging nicotine products [27–30].

Conclusions

This study underscores the significant prevalence of nicotine use among dental students, particularly with the increasing popularity of alternative nicotine products including e-cigarettes. Social factors

such ad peer influence and stress play a crucial role in both regular and occasional nicotine use. Despite high awareness of smoking's impact on oral health, the risks associated with novel nicotine products and effective cessation therapies should be implemented. These findings emphasize the need for early and comprehensive tobacco education focusing on both traditional and alternative nicotine products. Future research should focus on developing and accessing educational interventions that support behavior change. Given the role of dental professionals in promoting oral health, it is essential that they are well-informed and able to act as role models for healthy behaviors.

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Conflict of interest statement
The authors declare no conflict of interest.

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