OPEN ACCESS
ORIGINAL ARTICLE

PERCEPTIONS AND KNOWLEDGE OF MEDICAL AND DENTAL STUDENTS REGARDING ORAL NICOTINE POUCHES

[1]RUQAYYA SANA, [2]AIMAN NIAZ, [3]SHAHBAZ, [4]LAILA TARIQ, [5]SUMAN MOHAMMAD WAZIR, [6]SADIA NIAZ

ABSTRACT

Objective: *To assess the knowledge and perceptions of medical and dental students regarding nicotine pouches. To determine the perceptions of medical and dental students regarding the health risks and benefits of nicotine pouches.*

Materials and Methods: *A cross-sectional study involving 355 students enrolled in medical and dental colleges of Peshawar was conducted. Data was collected using a self-administered questionnaire that underwent content validation and pilot testing. Participants were recruited through simple convenience sampling. Data analysis was performed using SPSS version 22. Frequency tables and percentages were generated for different categorical variables. To assess association between different variables chi-square test was used and p<0.05 was considered significant.*

Results: *Around 93.3% were aware of nicotine pouches, but knowledge gaps existed regarding their tobacco-free and addictive nature. Most participants (87.9%) recognized their addictive properties, and 88.2% linked them to oral cancer risk. Peer influence was identified as a major driver of use. While 73.3% felt confident counseling patients, 89.1% supported integrating nicotine-related topics into curricula to address misconceptions and health risks. Male participants demonstrated significantly greater knowledge about nicotine pouches and their addictive nature compared to females. MBBS students were more likely to attribute the popularity of nicotine pouches to peer influence than BDS students.*

Conclusion: *This study found that medical and dental students in Peshawar were aware of nicotine pouches but had misconceptions about their composition and health risks. To combat this issue, increased education and awareness campaigns are crucial, especially for young adults, who are particularly vulnerable to nicotine addiction.*

Keywords: *Nicotine, Medical Students, Oral Health, Dental, Perception, Knowledge*

This article may be cited as: Sana R, Niaz A, Shahbaz, Tariq L, Wazir SM, Niaz S. Perceptions and knowledge of medical and dental students regarding oral nicotine pouches. Pak Oral Dent J, 2024; 44(4):39-46.

INTRODUCTION

Oral nicotine pouches, e-cigarettes, gums, lozenges, and dissolvable tobacco products are gaining popularity as modern alternatives to traditional tobacco products.[1] Made from a blend of nicotine (usually derived from tobacco), flavoring agents, and a plant-based filler like cellulose, these products are encased within a fiber pouch.[2,3] Nicotine content ranges from 1.29 to 6.11 mg per pouch and can be as high as 3 to 32 mg, surprisingly equivalent to the nicotine content of traditional tobacco products.[2,4,5] While these products do not contain tobacco leaf, making them appear harmless, their nicotine content and pH are similar to conventional products like snus and snuff, raising concerns for tobacco control research, policy, and practice.[2,4]

Oral nicotine pouches deliver nicotine through the oral mucosa, being directly absorbed into the bloodstream when placed between the lip and gum.[2,3] While not directly secreted into the lungs, they are absorbed through the membrane of the buccal cavity into the systemic circulation, acting locally on various tissues of the human body, including the liver, kidneys, pancreas, esophagus, and microvasculature.[5] The effects

[1] Ruqayya Sana, BDS, MPH, MHR, Assistant Professor, Department of Community and Preventive Dentistry, Sardar Begum Dental College, Peshawar. Cell: 0333-9293037, Email: sana.ruqayya@gmail.com
[2] Aiman Niaz, BDS, MPhil community dentistry scholar, Khyber Medical University, Peshawar. Cell: 0340 9084424, Email: aiman.niaz57@gmail.com
[3] Shahbaz, 3rd year BDS student, Sardar Begum Dental College Cell: 0318 9555407, Email: shahbaz.sa6036@gmail.com
[4] Laila Tariq, BDS, MPhil scholar, Khyber Medical University. Cell: 0334 6000523, Email: lailatariq96@gmail.com
[5] Suman Mohammad Wazir, BDS, MPhil, Lecturer, Institute of Pathology and Diagnosis Medicine, Khyber Medical University. Cell: 0301 8588177, Email: sumanbwazir@gmail.com
[6] Sadia Niaz, MBBS, Medical Officer, Govt. Naseerullah Babar memorial Hospital, Peshawar. Cell: 03329223593, Email: sadianiaz@gmial.com

Received for Publication: Nov 04, 2024
Revised: Dec 20, 2024
Approved: Jan 01, 2025

of nicotine pouches are similar to smoking or vaping, but they lack the inhalation of smoke and combustion of tobacco products, making it an easier and quicker way to consume nicotine.[3] This method allows for a discreet and convenient way to consume nicotine. Nicotine pouches are available in a wide range of flavors such as menthol, fruit, dessert, coffee, spearmint, spice, aroma, and cinnamon, making them more acceptable and popular among younger adults compared to other tobacco products.[5,6] Compared to other nicotine products (cigarettes and vapes), nicotine pouches lack many tobacco-related chemicals but tend to be addictive, and due to limited research on nicotine pouches, their long-term use and effects are still unclear.[4,5]

Younger adults aged 18-24 are largely using nicotine pouches due to their discreet use, flavor variety, and perception as a "healthier" alternative to smoking, masking its actual addictive nature. The labeling of nicotine pouches as "tobacco-free" leads to the misconception of no associated risk.[7,8] Compared to the older generation, who usually stick to smoking cigarettes and cigars, the younger generation is more attracted to nicotine pouches.[3,9] Nicotine pouches are the second most used product after e-cigarettes among high school students.[7] The use of nicotine pouches as an alternative to e-cigarettes makes it a crucial area for public health concern.[1,5]

Almost 351.9 million people use oral nicotine pouches worldwide, with underdeveloped countries accounting for 95% of users.[8] Southeast Asian countries like India, Bangladesh, Sri Lanka, China, and Pakistan have shown an increasing trend in recent years.[8] In Pakistan, the prevalence of nicotine pouch use among adults is 17.2%[8], and 64.5% of university students are active users.[10] However, most of the general population is unaware of the main ingredients in nicotine pouches.[8,11] Almost 4% of young adults have used a nicotine pouch at least once.[2] Young adults often experiment with nicotine products, ignoring their adverse health effects.[6,11] Only 15% of young adult smokers are aware of nicotine pouches.[3] Sweden has seen a 10-fold increase in nicotine pouch use.[8] Nearly 85.4% of current nicotine users also use other tobacco products, and 34.3% use them with e-cigarettes.[7] Users can range from novices to experienced users 4, with at least half a million young adults being former users.[7] Around 30% of high school students have experienced tobacco use.[1,6] Nicotine pouch use varies among different categories, including former tobacco users (43%), current smokers (26%), and new users (4%).[3]

The oral health implications of nicotine pouches are a great concern. When placed between the lip and gum, they can cause gum irritation during nicotine release.[5] Long-term use and prolonged contact with the gum can lead to inflammatory responses in gingival epithelial cells, oral mucosal fibrosis, and periodontal diseases. Nicotine itself can affect cellular growth and tissue repair, contributing to oral cancer development.[5] Long-term use of nicotine pouches may increase the risk of asthma, respiratory distress, Parkinson's disease, cancer, birth defects, type 2 diabetes, increased heart rate, and cardiovascular diseases.[5,12] While the evidence is limited, nicotine content from cigarettes and vaping has been linked to similar risks, including oral cancer, heart attacks, strokes, and hypertension.[13]

One reason for the increased surge of interest among youth is aggressive marketing campaigns, especially on social media platforms and channels.[4] These marketing campaigns promote nicotine pouches as more fashionable and socially acceptable among young adults, leading to a rise in sales from 0.9% in 2018 to 4.4% in 2019.[5] Researchers use nicotine replacement therapy for tobacco cessation in cigarette users, but it has not been approved by the FDA due to unclear long-term effects.[8,14,13]

Healthcare students can play a vital role in promoting awareness by providing accurate information regarding the risks, benefits, and long-term effects of nicotine pouch use. As future doctors, medical and dental students must be well-informed about the use, safety, and long-term effects of nicotine pouches to effectively educate others and contribute to public health initiatives. This study will help to identify gaps in the knowledge of medical and dental students regarding oral nicotine pouches and their potential impact on oral and overall health and identify areas where additional education is needed. By studying the perceptions and knowledge of medical and dental students, we can contribute to a better understanding of this emerging health risk trend and develop effective strategies to address its associated challenges. The objective of this study is to assess the level of knowledge among medical and dental students concerning nicotine pouches and to explore their perceptions regarding the potential health risks and benefits associated with their use.

METHODOLOGY

A cross-sectional study among medical and dental students of Peshawar, Pakistan. A sample size of 355 students was calculated using the Open Epi calculator. The sample size was calculated assuming a proportion of 70% 15, a precision of 5%, and a 95% confidence interval, with a 10% non-response rate. Ethical approval was obtained from the ethical committee of Gandhara University (ethical certificate no: GU/2024/158). The inclusion criteria included participants enrolled in medical or dental colleges, while the exclusion criteria comprised individuals not enrolled in these programs or has recently migrated, any student who has medical

or psychological condition that could affect their ability to understand or respond correctly to the questionnaire or those who declined to provide informed consent.

The data was collected over a span of three months, from August to October 2024. Participants were recruited via simple sampling techniques. Questionnaires were distributed among medical and dental students of Peshawar. Written informed consent was obtained from each participant.

A structured self-administered questionnaire was used to collect data. Content validation of the questionnaire was done, and the questionnaire was pilot tested on 5% of the sample size. The questionnaire was initially developed based on a comprehensive literature review and expert input. A panel of four dental experts reviewed the items for content relevance and clarity. The Content Validity Index (CVI) was calculated using Lawshe's method, with a CVI score of 0.98 indicating excellent content validity. 16 Minor modifications were made to the wording of some items based on expert feedback. A pilot test was conducted with a small sample of participants to assess the clarity and feasibility of the questionnaire. No further modifications were made after the pilot test.

All the collected data was entered and analyzed using SPSS 22. Mean and standard deviation were calculated for the age of each participant. Frequency tables and percentages were generated for categorical variables. The Chi-square test was conducted to determine the association between different categorical variables and p-values less than 0.05 were considered significant.

RESULTS

A total of 355 questionnaires were distributed among medical and dental students in Peshawar. After data cleaning, 330 complete questionnaires were included in the study. The mean age of participants was 21.97 ± 1.85 years. Of the participants, 57.8% were male and 42.1% were female. Additionally, 54.5% of the participants were MBBS students and 45.5% were BDS students. The knowledge of participants regarding nicotine pouches is shown in table no 1.

When participants were asked how they learned about nicotine pouches, they identified multiple sources of initial exposure were recorded. However, peer/friends were the most frequent source, as shown in Figure 1.

Similarly, a greater number of males than females thought that peer influence was the primary reason for the popularity of nicotine pouches among young adults ($p=0.01$). Moreover, a greater number of MBBS students than BDS students thought that peer influence was the primary reason for the popularity of nicotine pouches among young adults ($p<0.05$).

When the medical and dental students were asked if they would feel confident counseling a patient about the health risks of nicotine pouches, 73.3% expressed full confidence, 10.9% were not confident, and 15.8% were unsure.

The medical and dental students' perceptions about the use of nicotine pouches were recorded through various questions added in the study. The respondents were asked about their perceptions of why people use nicotine pouches, and their responses were different, as shown in Table 2.

When asked about their perceptions of nicotine pouches as a safer alternative to smoking, 29.1% of participants considered them a safer alternative, while 56.1% did not. Moreover, 14.8% did not know. The medical and dental students were asked about their perceptions of whether nicotine pouches can help in quitting smoking. 45.5% gave a positive response, while 14.8% gave a negative response. However, several participants (39.7%) did not know about it.

When asked about their perception of the social acceptability of nicotine pouches compared to smoking, 58.6% considered them more socially acceptable, while 16.7% considered them less acceptable. However, 24.5% did not know about it. Around 88.8% of participants in the current study believed that the use of nicotine pouches has increased among young adults, while 3.6% did not believe that, and 7.6% were not sure.

When the respondents were asked if they had noticed any increase in the use of nicotine pouches among their peers or friends, 14.2% reported observing a significant increase, while 42.7% reported observing a slight increase. 18.5% and 24.5% either did not observe any increase or were unsure, respectively. Around 29.4% of participants considered nicotine pouches less harmful than smoking, while 70.6% did not. The participants were asked about the possible causes of the popularity of nicotine pouches. Various responses were recorded, as shown in Table 3.

The majority of the participants (87.3%) believed that the use of nicotine pouches will increase in the next 5 years, while 3.9% did not believe, or were not sure (8.8%). Similarly, most of the participants (79.1%) believed that they, as medical and dental students, are well-adequately prepared to understand the health impacts of nicotine pouches, while 11.8% did not believe that and 9.1% were unsure.

Similarly, when asked if they believe they are adequately informed about the oral health risks of nicotine pouches, 65.5% believed that they were, while 5.8% did not, and 28.8% were unsure.

When the participants were asked about the most

common misconceptions patients have about the use of nicotine pouches, several different responses were reported, as shown in Table 4.

Approximately 89.1% of the participants agreed that medical and dental school curricula should include more information about nicotine pouches and other nicotine products. Similarly, 92.4% of the participants believed it's very important for medical and dental professionals to play a role in the public health advocacy regarding nicotine pouches. Moreover, 90 % of the respondents thought that there should be public health campaigns about the health risks of nicotine pouches.

The participants were asked whether they think nicotine pouches should be regulated differently form cigarettes or vapes, 57.3% believed they should be regulated the same way, while 19.4% believed they should be regu-

TABLE 1: KNOWLEDGE OF RESPONDENTS REGARDING NICOTINE POUCHES

Statement	Response	Percentage	P value	
			MBBS VS BDS	MALE VS FEMALE
Awareness of nicotine pouches	Yes	93.3%	0.007	0.010
	No	4.5%		
	Unsure	2.1%		
Knowledge of nicotine pouches being tobacco-free	Yes	33.9%	0.11	0.06
	No	34.2%		
	Unsure	31.8%		
Knowledge of nicotine pouches being addictive	Yes	87.9%	0.10	0.004
	No	3.3%		
	Unsure	8.8%		
Belief that nicotine pouches increase oral cancer risk	Yes	88.2%	0.20	0.16
	No	5.2%		
	Unsure	6.7%		
Belief that nicotine pouches pose a risk to cardiac health	Yes	48.5%	0.18	0.07
	No	18.8%		
	Unsure	32.7%		
Knowledge of nicotine pouch delivery method	Oral tissues	81.8%	0.04	0.06
	Inhaled via lungs	10.3%		
	Digestive system	1.5%		
	Unsure	6.4%		
Belief that nicotine pouches cause gum disease	Yes	59.4%	0.22	0.42
	No	40.6%		
Belief that nicotine pouches cause tooth discoloration	Yes	40.6%	0.27	0.50
	No	59.4%		
Belief that nicotine pouches increase oral cancer risk	Yes	78.2%	0.14	0.25
	No	21.8%		
Belief that nicotine pouches cause tooth decay	Yes	14.2%	0.08	0.11
	No	85.8%		
Gum diseases are caused by regular use of nicotine pouches	Yes	59.4%	0.14	0.06
	No	40.6%		
Tooth discoloration is associated with regular use of nicotine pouches	Yes	40.6%	0.15	0.19
	No	5w9.4%		

Oral cancer is associated with regular use of nicotine pouches	Yes	78.2%	0.20	0.07
	No	21.8%		
Tooth decay is caused by regular use of nicotine pouches	Yes	14.2%	0.60	0.30
	No	85.8%		
Impact of nicotine pouches on oral health in comparison to other tobacco products such as cigarettes, snuff, and sheesha/hookah	No impact on oral health	0.9%	0.10	0.21
	Less harmful than other products	35.2%		
	Equally harmful as other products	48.2%		
	More harmful than other products	5.5%		
	Not sure	10.3%		
General health implications of nicotine pouches	Cardiac issues	29.1%	0.30	0.07
	Respiratory issues	15.2%		
	Oral cancer	81.5%		
	Lung cancer	12.1%		

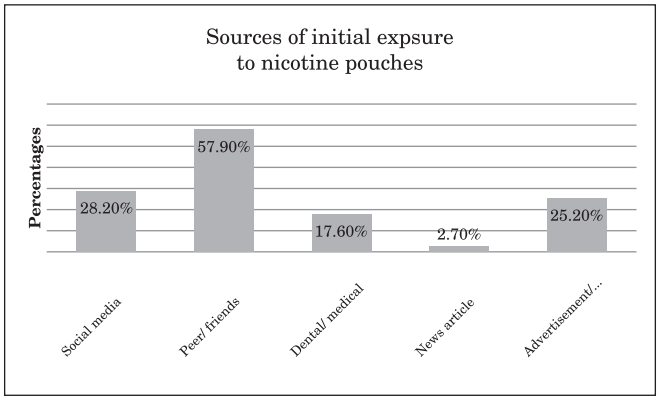

Fig 1: Sources of initial exposure to nicotine pouches.

TABLE 2: THE REASONS FOR THE USE OF NICOTINE POUCHES AS PERCEIVED BY YOUNG ADULTS

Perceived on reason for nicotine pouch use	Percentage (n)
Do not know	20.6 % (68)
To quit cigarette smoking	36.4% (120)
For pleasure and fun	29.4% (97)
As an alternative to smoking	13.6% (45)

lated more strictly.

DISCUSSION

Nicotine pouches have gained popularity among young adults in low and middle income countries in recent years, but the perceptions and knowledge about their role in health is still unclear. This study was conducted to gain a deep insight into the knowledge and perceptions of medical and dental students regarding oral nicotine pouches in Peshawar. The United States, the United Kingdom, Sweden, and some other developed countries[3] provide evidence regarding the use of nicotine pouches, but limited data is available from Pakistan.

TABLE 3: THE PERCEIVED REASONS FOR THE POPULARITY OF NICOTINE POUCHES BY YOUNG ADULTS

The primary reasons for the popularity of nicotine pouches	No	Yes
Less harmful than smoking	70.6 %	29.4 %
Easy to use discretely	54.8 %	45.2 %
Marketing campaigns	76.4 %	23.6 %
Peer influence	50.9 %	40.1 %

TABLE 4: THE MOST COMMON MISCONCEPTIONS ABOUT THE USE OF NICOTINE POUCHES

Perceived on reason for nicotine pouch use	Percentage (n)
Common misconceptions patients have about nicotine pouches	Percentage (n)
They are completely safe	37.0% (122)
Do not cause addiction	43.0% (142)
Do not affect oral health	7.9% (26)
They are tobacco-free	11.5% (38)
Less harmful	0.3% (1)
No opinion	0.3% (1)

Similar trends in the use of nicotine pouches and heated tobacco products have been observed in Korea and Japan, where usage persists despite limited awareness of nicotine pouches, highlighting a pattern consistent with our findings.[3,17,18]

As health professional students, the participants of the study revealed adequate knowledge of nicotine products (93.3%), which is higher compared to another study done in Karachi and Lahore, which revealed 61.8% and 70% of medical and non-medical university students having adequate knowledge of nicotine pouches.[10,15] In contrast, another study conducted in Pakistan reported only 40% knowledge of nicotine pouches among young individuals.[19] The higher level of knowledge (93.3%) about nicotine products among health professional students in this study can be attributed to their specialized education, which emphasizes a deeper understanding of health risks, including those associated with nicotine use.

Nicotine pouches are labeled as tobacco-free products, and this creates a false impression about their addictive nature. Only a small proportion of the participants (33.9%) of this study knew that nicotine pouches are tobacco-free. Similarly, a study on Pakistani youth found that 10% were active users but lacked understanding of the product's ingredients, underscoring the need for better educational efforts to clarify its potential health risks.[19]

Nicotine pouches have an addictive nature, and this is the reason they are not recommended for use in tobacco cessation by the Framework Convention on Tobacco Control. The participants of the current study were well aware of the addictive nature of nicotine pouches (87.9%), with a strong association with males ($p<0.05$) and MBBS students ($p=0.02$). Cytotoxicity associated with the use of nicotine pouches has also been documented in studies.[2] While another study revealed that 49.1% of individuals are unsure of the harmful effects of nicotine pouches.[11] The difference in awareness levels may be due to health professional students' academic exposure to addiction and substance use topics, which non-medical students typically lack.

Nicotine is associated with cardiovascular effects, although the risk is lower compared to other tobacco products, but this fact cannot be ignored.[2,5] Knowledge about the health risks of nicotine pouches was analyzed and revealed that adequate knowledge exists regarding the risk of oral cancer (88.2%) and regarding the risk to cardiac health, only 48.5% knew about it. Another study revealed that 50% and 62% of young adults believe in the association of nicotine pouches with chronic obstructive pulmonary disease and oral cancer, respectively.[5,15] A study also revealed that only 10% of participants having adequate knowledge of the health risks of nicotine pouches were active users, with 95% active smokers as well.[10] The variation in knowledge about the health risks of nicotine pouches, with higher awareness of oral cancer risk compared to cardiac health risk, may stem from the more immediate and visible oral health effects emphasized in dental and medical curricula.

The perception of harm related to the use of nicotine pouches is strongly related to its use, as shown by several studies.[1] Similarly, an increase in the odds of using nicotine pouches is noted in individuals who have a strong perception of harm related to e-cigarettes.[1] This association could be due to individuals perceiving nicotine pouches as a less harmful alternative to e-cigarettes, driven by marketing strategies or a lack of comprehensive knowledge about the health risks of nicotine pouches.

As future health professionals, medical and dental students should have good knowledge about the delivery mechanism of nicotine into the bloodstream. Almost 81.8% of participants responded that nicotine pouches are delivered through oral tissues (e.g., gums, cheeks). The strong understanding of the nicotine delivery mechanism among medical and dental students can be linked to their academic background, which provides comprehensive education on oral health, anatomy, and pharmacology, enabling them to recognize how substances interact with oral tissues.

The general health and oral health implications of the long-term use of nicotine pouches should be well-known by health professionals. Gum problems have been reported to be associated with nicotine pouch use. Several studies have shown gingival recession associated with nicotine pouch use.[2] Almost 50% of participants from another study reported an association of nicotine pouches with dental caries[15], while the results of the present study revealed that 14.2% of the respondents said that tooth decay is caused by regular use of nicotine pouches, while 85.8% gave a negative response. A strong belief (62.2%) about altered taste and smell, while a weak belief about bad breath associated with nicotine pouch use, is reported by another study.[15]

The health implications of nicotine products cannot be denied. Most of the participants from the current study believed that it is equally harmful as any other tobacco product, while other study participants agreed it to be less harmful compared to other products.[15,20] This is also reported in another study where 50.6% of participants agreed to the negative effects of nicotine pouches.[19]

Peer/friends were the most frequent source of information for most participants in the current study, also showing a positive association with the perceptions of

males in the study (p=0.01). The prominence of peers and friends as a source of information may be due to social interactions playing a critical role in shaping opinions and behaviors, especially among males, who might be more influenced by peer dynamics and social acceptance.

Medical and dental students felt confident in having enough knowledge to counsel a patient regarding the harmful effects of nicotine pouches (73.3%). This may be attributed to their specialized education and training, which provides them with a solid understanding of substance use and its health risks.

One of the reasons for the increase in the uptake of nicotine pouches among our generation is that it is not addictive in nature, which is also evident from the results of the study where the same misconception was recorded. The misconception likely contributes to their increased uptake, as many individuals, especially younger generations, may perceive them as a safer alternative without understanding the addictive properties, as reflected in the study's findings.

It is the duty of medical and dental schools to prepare students to be well-informed about the health risks of any type of addictive drug, whether they are tobacco products or tobacco-free products.[12] They should be in a position to provide information regarding the addictive properties of these products and long-term health impacts as well. The majority of the participants (89.1%) from this study stated that medical and dental school curricula should include more information about nicotine pouches and other nicotine products. This reflects the recognition that healthcare professionals must be well-equipped to educate patients about the addictive properties and long-term health risks associated with these products, ensuring they can provide accurate information and guidance to the public.

Most of them (92.4%) also believed that health professionals should play a vital role in public health advocacy regarding nicotine pouches. This may stem from the recognition that healthcare providers are trusted sources of information, and their involvement can significantly influence public awareness and behavior change regarding the risks associated with nicotine use.

Moreover, the majority of males from the current study support the idea that public health campaigns about the health risks of nicotine pouches (p=0.010).

We believe that there should be stricter rules regarding the sales and purchase of nicotine pouches in Pakistan, which can be one way to minimize the uptake among young adults. This was also agreed upon by the participants from the current study, 57.3% believed they should be regulated the same way, while 19.4% believed they should be regulated more strictly.

More BDS students think that nicotine pouches are more socially acceptable than smoking (p=0.01). These findings can be attributed to the fact that BDS students, as dental health professionals in training, might view nicotine pouches as a less harmful alternative to smoking due to their tobacco-free nature. More MBBS students thought that the primary reason for the popularity of nicotine pouches among young adults is due to peer influence than BDS students (p<0.05).

The higher awareness among third-year and fourth-year BDS students about the link between prolonged nicotine pouch use and oral cancer (p=0.001) may be attributed to their advanced level of dental education and clinical exposure. By this stage in their studies, BDS students are likely to have acquired more in-depth knowledge of oral health risks, including cancer, and have been exposed to relevant clinical cases that emphasize the importance of prevention and early detection. In contrast, students from earlier years or MBBS students, who may not yet have focused as much on oral health, could have less awareness of the specific risks associated with nicotine pouch use.

LIMITATIONS

The study's limitations include the reliance on self-reported data, which may be subject to bias. Cross-sectional design limits the ability to establish causal relationships. The findings may not be generalizable to other populations due to the specific regional context. Additionally, the focus on knowledge and perceptions may not fully capture actual behaviors. Finally, the self-administered questionnaire may have limitations in terms of response rates and potential for misunderstanding.

CONCLUSION

The study revealed a high level of awareness of nicotine pouches among medical and dental students in Peshawar. However, misconceptions persist regarding their composition and health risks. While most participants understood the addictive nature and potential oral health implications, knowledge gaps exist in areas such as cardiovascular risks and the delivery mechanism of nicotine. This highlights the need for comprehensive education and awareness campaigns to address these misconceptions and promote informed decision-making.

REFERENCES

1 Speciale Z, Rao S, Yang S, Nugent K. An analysis of nicotine pouch Use by middle school and high school students surveyed by the National Youth Tobacco Survey in 2021 and a review of the literature. J Prim Care Community Health. 2023 Apr;14:1-8.

2 M. Jackson J, Weke A, Holliday R. Nicotine pouches: a review for the dental team. Br Dent J. 2023 Oct 27;235(8):643-6.

3 Brose LS, McDermott MS, McNeill A. Heated tobacco products and nicotine pouches: a survey of people with experience of

smoking and/or vaping in the UK. Int J Environ Res Public Health. 2021 Aug 22;18(16):8852.

4 Stanfill S, Tran H, Tyx R, Fernandez C, Zhu W, Marynak K, King B, Valentín-Blasini L, Blount BC, Watson C. Characterization of total and unprotonated (free) nicotine content of nicotine pouch products. Nicotine Tob. Res. 2021 Sep 1;23(9):1590-6.

5 Shaikh SB, Newton C, Tung WC, Sun Y, Li D, Ossip D, Rahman I. Classification, perception, and toxicity of emerging flavored oral nicotine pouches. Int J Environ Res Public Health. 2023 Mar 3;20(5):4526.

6 Wang, T. W., Gentzke, A. S., Creamer, M. R., Cullen, K. A., Holder-Hayes, E., Sawdey, M. D., Anic, G. M., Portnoy, D. B., Hu, S., Homa, D. M., Jamal, A., & Neff, L. J. Tobacco Product Use and Associated Factors Among Middle and High School Students - United States, 2019. Morbidity and mortality weekly report. Surveillance summaries 2019;68(12):1–22.

7 Kramer RD, Park-Lee E, Marynak KL, Jones JT, Sawdey MD, Cullen KA. Nicotine pouch awareness and use among youth, national youth tobacco survey, 2021. Nicotine Tob. Res. 2023 Sep 1;25(9):1610-3.

8 Nawaz MT, Hameed AN, Yasin F, Angez M, Gul K, Irfan O, Khan JA. Knowledge, attitudes, practices, and prevalence of nicotine pouches in Pakistan: where do we stand. Int J Community Med Public Health. 2023;10(6):2037-46.

9 Tattan-Birch H, Jackson SE, Dockrell M, Brown J. Tobacco-free nicotine pouch use in Great Britain: a representative population survey 2020–2021. Nicotine Tob. Res. 2022 Sep 1;24(9):1509-12.

10 Khan M, Junaid N, Anwar Z, Timsaal Y, Mughal A. Prevalence and Frequency of the Use of Nicotine Pouches and Its Association With Stress Amongst Students of Medical and Non-Medical Universities of Karachi, Pakistan. Research square. 2022 May. PPR: PPR501909.

11 Vogel EA, Barrington-Trimis JL, Kechter A, Tackett AP, Liu F, Sussman S, Lerman C, Unger JB, Hughes Halbert C, Chaffee BW, Leventhal AM. Differences in young adults' perceptions of and willingness to use nicotine pouches by tobacco use status. Int J Environ Res Public Health. 2022 Feb 25;19(5):2685.

12 Shukla AK, Khaitan T, Gupta P, Naik SR. Smokeless Tobacco and Its Adverse Effects on Hematological Parameters: A Cross-Sectional Study. Adv. prev. med.2019;2019(1):3182946.

13 Fagerström K. Can alternative nicotine products put the final nail in the smoking coffin? Harm Reduct. J. 2022 Dec 1;19(1):131

14 McEwan M, Azzopardi D, Gale N, Camacho OM, Hardie G, Fearon IM, Murphy J. A randomised study to investigate the nicotine pharmacokinetics of oral nicotine pouches and a combustible cigarette. Eur J Drug Metab Pharmacokinet. 2022 Mar;47(2):211-21.

15 Manzar E, Zaidi AH, Muhammad A, Hassan H, Aziz MS, Anwar W, Ullah MS, Tariq A. Awareness and Perception of Nicotine Pouches and E-Cigarettes among Dental Students in Lahore. Pak. J. Med. Health Sci.15(12):3681–8.

16 Yusoff MS. ABC of content validation and content validity index calculation. Med Educ J. 2019 Jun 28;11(2):49-54.

17 Sutanto E, Miller C, Smith DM, O'Connor RJ, Quah AC, Cummings KM, Xu S, Fong GT, Hyland A, Ouimet J, Yoshimi I. Prevalence, use behaviors, and preferences among users of heated tobacco products: findings from the 2018 ITC Japan surveying J Environ Res Public Health. 2019 Dec;16(23):4630.

18 Kim SH, Cho HJ. Prevalence and correlates of current use of heated tobacco products among a nationally representative sample of Korean adults: Results from a cross-sectional study. Tob. Induc. Dis. 2020;18.

19 Awan T, Awan T, Khalid F, Awan I. Perception, beliefs and health effects of nicotine pouches. Khyber Med. Univ. J. 2024 Jun 30;16(2):177-8.

20 Vogel EA, Barrington-Trimis JL, Harlow AF, Wong M, Cho J, Han DH, Leventhal AM, Tackett AP. Prevalence of and disparities in adolescents' susceptibility to novel oral nicotine products marketed as "tobacco-free". Prev. Med. 2023 Jan 1;166:107387.

CONTRIBUTIONS BY AUTHORS

1. Ruqayya Sana	Conceptualization, planning and manuscript drafting
2 Aiman Niaz	Data analysis, interpretation and final review
3 Shahbaz	Data collection and coding
4 Laila Tariq	Data collection
5 Suman Mohammad Wazir	Data collection and review
6 Sadia Niaz	Data collection