

Oral Nicotine Pouch Use and Its Association with Smoking Cessation Status and Self-Reported Symptoms among Adult Tobacco and Nicotine Users in Al-Baha, Saudi Arabia

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Abstract:

Background: Tobacco consumption continues to represent a major public health concern, contributing substantially to preventable disease, premature mortality, and healthcare costs worldwide. Oral nicotine pouches (ONPs) are a relatively new category of tobacco-free nicotine products that have gained increasing popularity as alternatives to combustible tobacco. Despite their expanding use, evidence regarding their prevalence, safety profile, and potential role in smoking cessation within Saudi Arabia remains scarce.

Objective: This study aimed to determine the prevalence of oral nicotine pouch use among adult tobacco users in Al-Baha City, Saudi Arabia, examine its relationship with smoking cessation status, and assess self-reported adverse effects associated with their use.

Methods: A descriptive cross-sectional study was carried out among 441 adult tobacco users living in Al-Baha City. Information was obtained through a structured online questionnaire covering demographic characteristics, tobacco use history, oral nicotine pouch use, smoking cessation status, and self-reported adverse effects. Before launching the main survey, the questionnaire was pilot-tested with 30 participants to evaluate its clarity and content validity. Data analysis was performed using SPSS version 29. Descriptive statistics were used to summarize the data, while associations between categorical variables were examined using the Chi-square test. Statistical significance was established at $p < 0.05$.

Results: Oral nicotine pouch use was reported by 61.0% of the participants. The study population consisted predominantly of males (95.2%), Saudi nationals (93.8%), and individuals aged 18–30 years (55.5%). No significant differences in ONP use were observed across the examined sociodemographic variables. However, ONP use showed a statistically significant association with smoking cessation status ($\chi^2 = 92.574$, $p < 0.001$). Among users, the most frequently used nicotine strength was 10 mg (42.2%), while more than half (57.8%) reported using six to ten pouches each day. Most reported physical adverse effects—including tachycardia, gastrointestinal complaints, headache, weight gain, sleep disturbances, and gingival bleeding—were not significantly associated with ONP use. In contrast, anxiety, stress, depression, and other psychological symptoms were reported significantly more often among ONP users than non-users (23.8% vs. 14.0%, $p = 0.002$).

Conclusion: Oral nicotine pouch use was common among adult tobacco users in Al-Baha City and was associated with smoking cessation status. Although no significant relationship was identified between ONP use and most reported physical adverse effects, psychological symptoms were more frequently reported by users. Because of the cross-sectional design, causal inferences cannot be drawn. Longitudinal and controlled studies are needed to clarify the long-term safety and effectiveness of oral nicotine pouches as smoking cessation interventions.

Keywords: Oral nicotine pouches; nicotine replacement products; smoking cessation; tobacco harm reduction; nicotine; Saudi Arabia.

Introduction:

Tobacco use remains a major global public health concern and continues to be one of the leading preventable causes of disease and premature mortality. It is strongly associated with cardiovascular disease, chronic respiratory disorders, multiple forms of cancer, and numerous other health conditions that contribute substantially to healthcare expenditures and reduced quality of life. Despite decades of tobacco control policies and public health interventions, nicotine addiction continues to challenge smoking cessation efforts, with many smokers experiencing repeated unsuccessful quit attempts because of persistent nicotine dependence [1–3].

To address this challenge, several alternative nicotine delivery products have been introduced with the aim of reducing exposure to the harmful constituents generated by tobacco combustion. Among the most recent of these products are oral nicotine pouches (ONPs), which contain pharmaceutical-grade nicotine without tobacco leaf material. These products are placed between the gingiva and upper lip, allowing nicotine to be absorbed through the oral mucosa while avoiding combustion and inhalation. Their discreet use, ease of administration, and availability in different nicotine strengths have contributed to their increasing popularity in several countries [4–6].

The expanding market for oral nicotine pouches has generated considerable interest among researchers, clinicians, and regulatory authorities. Although these products eliminate exposure to many toxic compounds produced during cigarette smoking, they continue to deliver nicotine, a highly addictive substance with well-recognized cardiovascular, neurological, and behavioural effects. Consequently, ONPs are increasingly discussed within the framework of tobacco harm reduction, where they are considered potential alternatives for smokers who are unable or unwilling to quit nicotine completely [7–10].

Current evidence suggests that nicotine pouches generally expose users to substantially fewer combustion-related toxicants than conventional cigarettes. Nevertheless, their overall health impact has not been fully established. Laboratory investigations have detected low concentrations of potentially harmful chemicals in some products, while clinical studies have reported adverse effects such as oral irritation, increased heart rate, gastrointestinal discomfort, and other transient symptoms. In addition, concerns remain regarding the potential long-term consequences of sustained nicotine exposure, the risk of continued nicotine dependence, and the possibility that these products could attract individuals who have never previously used tobacco or nicotine products [11–16].

The prevalence of oral nicotine pouch use has increased in several countries, particularly among young adults. However, patterns of use differ considerably across populations because of variations in product availability, regulatory policies, cultural

factors, and public awareness. As a result, findings from one country cannot be readily generalized to another, highlighting the importance of region-specific epidemiological research [17–19].

In Saudi Arabia, research on oral nicotine pouches remains limited. Most published studies have focused on awareness, perceptions, or patterns of use among selected populations, particularly university students or residents of large urban centers. Evidence describing the prevalence of ONP use among adult tobacco users, its relationship with smoking cessation status, and the adverse effects experienced by users in other regions of the Kingdom is still insufficient. This lack of regional evidence limits the ability of healthcare professionals and policymakers to develop evidence-based recommendations regarding these emerging nicotine products [20–24].

A national survey was conducted to estimate the prevalence of nicotine pouch (NP) use among adults in the United States. The findings showed that NP use remained relatively low in the general adult population, although its prevalence has gradually increased over time. Use was significantly more common among individuals with a history of tobacco use than among non-users. Compared with the current study, which reported a prevalence of 61% among tobacco users, these findings suggest that the characteristics of the study population, particularly tobacco-use status, substantially influence prevalence estimates [25].

A study conducted in Riyadh included 831 adults from the Riyadh region. The results showed that 59.3% of participants were aware of nicotine pouches, while 14.2% had previously used them. Nicotine pouch use was more common among males and young adults. This study is particularly relevant to the current research because it was conducted in Saudi Arabia, allowing comparison between findings from the Al-Baha region and those from a major urban area such as Riyadh [26].

Nicotine pouches (NPs) are tobacco-free nicotine products that have gained increasing popularity worldwide. Despite their potential role in tobacco harm reduction, concerns remain regarding nicotine dependence, adverse effects, and long-term health risks, particularly in countries where evidence is still limited, such as Saudi Arabia.

Overall, nicotine pouch use in Saudi Arabia was particularly common among young adults and current or former smokers. Although many participants perceived nicotine pouches as beneficial for craving reduction and smoking cessation, the reported adverse effects and potential for nicotine dependence highlight the need for continued surveillance, public awareness, and further research on the long-term health effects of these products [27].

Accordingly, the present study aimed to determine the prevalence of oral nicotine pouch (DZRT) use among adult tobacco users in Al-Baha City, Saudi Arabia, examine its

association with smoking cessation status, and evaluate self-reported adverse effects related to ONP use. The findings are expected to provide region-specific evidence that may support future research, inform tobacco control policies, and contribute to the ongoing evaluation of emerging nicotine products within the Saudi healthcare context.

Subjects and Methods:

Study Design and Setting:

A community-based cross-sectional study was conducted among adult tobacco users residing in Al-Baha City, Saudi Arabia, between February and June 2026. Al-Baha was selected because limited evidence is available regarding the use of emerging nicotine products in this region compared with the larger metropolitan areas of the Kingdom.

Study Population:

The study targeted adults living in Al-Baha City who reported current or previous use of tobacco or nicotine products, including conventional cigarettes, electronic cigarettes, and other nicotine-containing products.

Inclusion Criteria:

Participants were eligible if they:

- were 18 years of age or older;
- resided in Al-Baha City;
- reported current or previous use of tobacco or nicotine products; and
- provided informed consent to participate voluntarily.

Both male and female participants were eligible.

Exclusion Criteria:

Individuals were excluded if they:

- were younger than 18 years;
- had never used tobacco or nicotine products;
- did not reside in Al-Baha City; or
- declined participation or submitted incomplete questionnaires.

Sample Size and Sampling Technique:

The required sample size was estimated using OpenEpi software at a 95% confidence level and a 5% margin of error. The calculation was based on an expected prevalence of 59% derived from a previous Saudi study investigating prevalence of nicotine pouches (20). The minimum sample size was calculated to be 372 participants. To account for possible non-response and incomplete questionnaires, the target sample was increased by approximately 18.5%. Ultimately, 441 eligible participants completed the survey and were included in the final analysis.

A non-probability convenience sampling approach was adopted. The survey questionnaire was distributed electronically through widely used social media platforms, including WhatsApp, X (formerly Twitter), Telegram, and local community groups targeting adult residents of Al-Baha City. Participation was voluntary, and only responses meeting the predefined eligibility criteria were included in the analysis.

Data Collection Instrument:

Data were collected using a standardized, self-administered questionnaire developed from previously published literature and relevant expert recommendations [20].

The questionnaire consisted of sections covering participants' sociodemographic characteristics, tobacco use history, patterns of oral nicotine pouch use, smoking cessation status, and self-reported adverse effects.

To establish face and content validity, the questionnaire was reviewed by consultant in public health and epidemiology. Their comments were incorporated before data collection. A pilot study involving 30 adult tobacco users was subsequently conducted to assess the clarity, comprehensibility, and feasibility of the questionnaire. Necessary modifications were introduced based on participant feedback before administration of the final version. Data obtained during the pilot phase were not included in the final analysis.

Statistical Analysis:

Data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS), version 29 (IBM Corp., Armonk, NY, USA). Descriptive statistics were summarized as frequencies and percentages. Associations between categorical variables were evaluated using the Chi-square test. Statistical significance was defined as a two-sided p -value of less than 0.05.

Ethical Considerations:

The study protocol was reviewed and approved by the Institutional Review Board of the Local Committee for Research Ethics in the Al-Baha Region (Approval No. BH26-02-01). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Participation was entirely voluntary. Before completing the questionnaire, all participants were informed about the purpose of the study and provided electronic informed consent. The questionnaire was completed anonymously, and all collected information was treated as confidential and used exclusively for research purposes.

Variable	Category	n	Percentage (%)
Gender	Male	421	95.2
	Female	20	4.8
Nationality	Non-Saudi	27	6.2
	Saudi	414	93.8
Age (years)	18–30	245	55.5
	31–43	166	37.7
	44–56	24	5.4
	Over 56	6	1.4
Occupation	Student	128	29.1
	Employees	266	60.3
	Housewife / Unemployed	47	10.6
Education level	High school	147	33.4
	Diploma	62	14.0
	Bachelor	173	39.2
	Postgraduate study	59	13.4
Marital status	Single	278	63.0
	Married	163	37.0
Overall total		441	100.0

Results:

A total of 441 participants were included in the study. Table 1 presents the sociodemographic characteristics of the participants. Most participants were male (95.2%), Saudi nationals (93.8%), and aged 18–30 years (55.5%). Employees represented 60.3% of the study population, while 39.2% held a bachelor's degree and 63.0% were single.

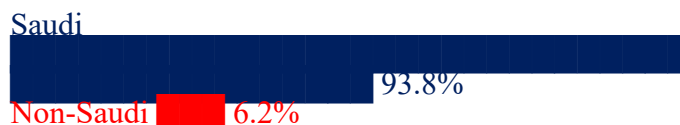
Table 1. Sociodemographic Characteristics of Study Participants (n = 441)

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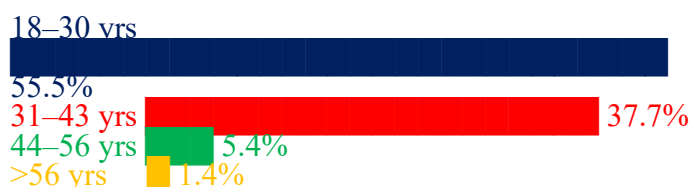
Panel A: Gender



Panel B: Nationality



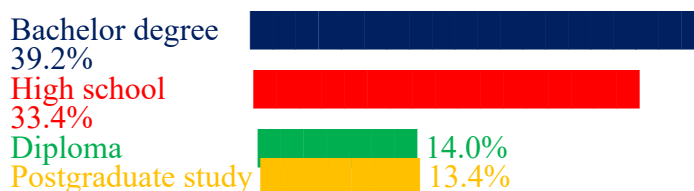
Panel C: Age Distribution



Panel D: Occupation



Panel E: Education Level



Panel F: Marital Status



Figure 1. Distribution of Sociodemographic Characteristics among Adult Tobacco Users in Al-Baha City, Saudi Arabia (n = 441)

Distribution of participants according to gender, nationality, age group, occupation, educational level, and marital status. Percentages represent the proportion of participants within each sociodemographic category.

Smoking Status :

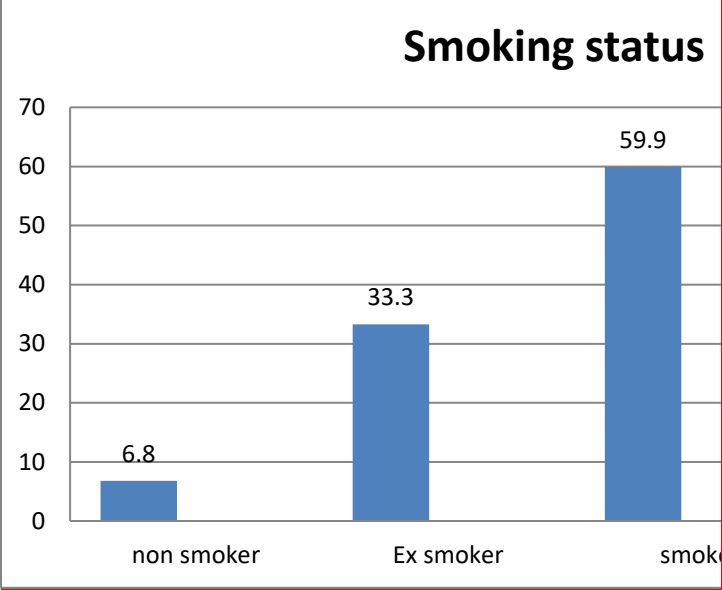


Figure 2 smoking status among the study population

Figure 2 show the smoking status of the study population showed that current smokers represented the largest proportion of participants (59.9%), followed by ex-smokers (33.3%) and non-smokers (6.8%).

Table 2. Smoking characteristics among current smokers (n = 264).

Variable	Category	n	%
Number of cigarettes smoked per day	Fewer than 5 cigarettes	25	9.5
	6–10 cigarettes	47	17.8
	11–15 cigarettes	63	23.9
	More than 15 cigarettes	129	48.9
Smoking duration (years)	Less than 1 year	13	4.9
	1–5 years	85	32.2

	6–10 years	78	29.5
	More than 10 years	88	33.3
Total		264	100.0

Table 2 presents the smoking characteristics of current smokers (n = 264). Nearly half of the participants reported smoking more than 15 cigarettes per day (48.9%), followed by those who smoked 11–15 cigarettes daily (23.9%). Regarding smoking duration, approximately one-third of the participants had smoked for more than 10 years (33.3%), while 32.2% had smoked for 1–5 years and 29.5% for 6–10 years. Only 4.9% reported a smoking duration of less than one year.

Prevalence of ONP Use:

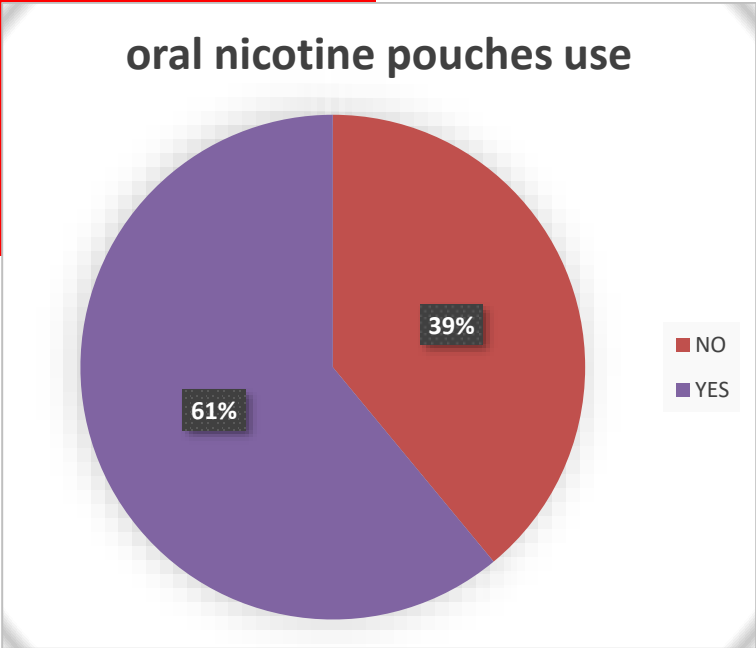


Figure 3 the prevalence of oral nicotine pouch use

Figure 3 show the prevalence of oral nicotine pouch use among study participants was 61.0%, whereas 39.0% reported never using oral nicotine pouches.

Table 3 summarizes the association between sociodemographic characteristics and oral nicotine pouch use. No statistically significant associations were observed between ONP use and gender, nationality, age group, occupation, educational level, or marital status.

Association Between Sociodemographic Characteristics and ONP Use:

Table 3. Association between sociodemographic characteristics and ONP use (n = 441)

Variable	Category	ONP use: Yes (n = 269)	ONP use: No (n = 172)	Total (n = 441)	χ^2	p-value
Gender	Male	253	168	421	3.180	0.075
	Female	16	4	20		
Nationality	Non-Saudi	18	9	27	0.389	0.533
	Saudi	251	163	414		
Age (years)	18–30	154	91	245	7.186	0.069
	31–43	101	65	166		
	44–56	9	15	24		
	Over 56	5	1	6		
Occupation	Student	88	40	128	5.619	0.060
	Employees	157	109	266		
	Housewife / Unemployed	24	23	47		
Education level	High school	94	53	147	6.344	0.096
	Diploma	35	27	62		
	Bachelor	97	76	173		
	Postgraduate study	43	16	59		
Marital status	Single	171	107	278	0.083	0.773
	Married	98	65	163		

Distribution of ONP Use According to Sociodemographic Characteristics:

Bars represent the percentage distribution of ONP users and non-users within each sociodemographic category. No statistically significant associations were observed between ONP use and gender, nationality, age, occupation, education level, or marital status (all $p > 0.05$).

Association Between ONP Use and Smoking Cessation:

A statistically significant association was identified between oral nicotine pouch use and smoking cessation ($\chi^2 = 92.574$, $p < 0.001$). Among participants who successfully quit smoking, 87.0% reported ONP use, whereas only 13.0% reported no ONP use. In contrast, among current smokers, 43.6% reported ONP use compared with 56.4% who did not use ONPs.

Table 4. Association between ONP use and smoking cessation (n = 441)

Smoking status	No ONP use (n = 172), n (%)	ONP use: Yes (n = 269), n (%)	Total group (n = 441), n (%)	χ^2	p-value
Quit smoking (ex-smokers)	23 (13.0%)	154 (87.0%)	177 (100.0%)	92.574	< 0.001
Current smokers	149 (56.4%)	115 (43.6%)	264 (100.0%)		

Distribution of oral nicotine pouch use according to smoking cessation status among adult tobacco users in Al-Baha City, Saudi Arabia:

Table 4 illustrates the distribution of oral nicotine pouch (ONP) use among participants according to smoking cessation status. Participants who reported quitting smoking had a higher proportion of ONP use compared with current smokers (87.0% vs. 43.6%, respectively). The association between ONP use and smoking cessation status was statistically significant ($\chi^2 = 92.574$, $p < 0.001$).

Association between ONP use and smoking cessation status Patterns of Oral Nicotine Pouch Use:

Patterns of ONP use are presented in Table 5. The most commonly reported nicotine concentration was 10 mg (42.2%), followed by 6 mg (24.7%), 7 mg (19.5%), and 3 mg (13.6%). Regarding daily consumption, the majority of users reported consuming 6–10 pouches per day (57.8%). Significant associations were observed between smoking cessation and nicotine concentration ($p = 0.005$), daily pouch consumption ($p < 0.001$), and duration of ONP use ($p < 0.001$).

Table 5. Patterns of oral nicotine pouch use among participants who used ONPs and quit smoking (n = 154)

Patterns of ONP use	n (%)
Concentration of nicotine in ONP	
3 mg	21 (13.6%)
6 mg	38 (24.7%)
7 mg	30 (19.5%)
10 mg	65 (42.2%)
Total	154 (100.0%)
Number of nicotine pouches consumed per day	
1–5	23 (14.9%)
6–10	89 (57.8%)
11–15	36 (23.4%)
More than 16	6 (3.9%)
Total	154 (100.0%)
Time taken to quit smoking after using ONP	
Less than 6 months	46 (29.7%)
From 1–2 years	55 (35.8%)
More than 2 years	53 (34.5%)
Total reported	154 (100%)

= 9.787, $p = 0.002$), which were significantly more frequent among ONP users (23.8%) than non-users (14.0%).

Self-Reported Side Effects Associated with ONP Use:

(A). Nicotine concentration of oral nicotine pouches used by participants who quit smoking ($n = 154$). Values are presented as percentages.

Table 6. Self-reported side effects associated with ONP use ($n = 441$)

Side effect	Status	No ONP use ($n = 172$), n (%)	ONP use: Yes ($n = 269$), n (%)	Total ($n = 441$), n (%)	χ^2	p-value
Tachycardia	No	126 (73.3%)	212 (78.8%)	338 (76.6%)	1.808	0.179
Tachycardia	Yes	46 (26.7%)	57 (21.2%)	103 (23.4%)		
Nausea or GIT symptoms	No	108 (62.8%)	162 (60.2%)	270 (61.2%)	0.291	0.589
Nausea or GIT symptoms	Yes	64 (37.2%)	107 (39.8%)	171 (38.8%)		
Weight gain	No	158 (91.9%)	247 (91.8%)	405 (91.8%)	0.000	0.988
Weight gain	Yes	14 (8.1%)	22 (8.2%)	36 (8.2%)		
Headache	No	122 (70.9%)	169 (62.8%)	291 (66.0%)	3.071	0.080
Headache	Yes	50 (29.1%)	100 (37.2%)	150 (34.0%)		
Anxiety, stress, or depression	No	148 (86.0%)	205 (76.2%)	353 (80.0%)	9.787	0.002
Anxiety, stress, or depression	Yes	24 (14.0%)	64 (23.8%)	88 (20.0%)		
Difficulty sleeping	No	153 (89.0%)	248 (92.2%)	401 (90.9%)	0.248	0.308
Difficulty sleeping	Yes	19 (11.0%)	21 (7.8%)	40 (9.1%)		
Gum bleeding	No	150 (87.2%)	237 (88.1%)	387 (87.8%)	0.078	0.780
Gum bleeding	Yes	22 (12.8%)	32 (11.9%)	54 (12.2%)		
No symptoms noticed	No	129 (75.0%)	201 (74.7%)	330 (74.8%)	0.004	0.948
No symptoms noticed	Yes	43 (25.0%)	68 (25.3%)	111 (25.2%)		

Table 6 summarizes self-reported side effects associated with oral nicotine pouch use. No statistically significant associations were observed between ONP use and physical parameters.

However, a statistically significant association was observed between ONP use and psychological symptoms, including anxiety, stress, depression, or other psychiatric symptoms (χ^2

Discussion:

The present study examined the prevalence of oral nicotine pouch (ONP) use, its relationship with smoking cessation status, patterns of product use, and self-reported adverse effects among adult tobacco users in Al-Baha City, Saudi Arabia. To the best of our knowledge, this is one of the first regional studies to investigate these outcomes within this population. Four principal findings emerged from the analysis. First, ONP use was common among tobacco users. Second, ONP use was significantly associated with self-reported smoking cessation status. Third, smoking cessation status was significantly associated with several patterns of ONP use, including nicotine strength, frequency of use, and duration of use. Fourth, no significant associations were observed between ONP use and most self-reported physical adverse effects, whereas psychological symptoms were reported more frequently among ONP users.

The prevalence of ONP use in the present study (61.0%) was higher than that reported in previous Saudi studies; however, direct comparisons should be interpreted cautiously due to differences in study populations and methodologies. A study conducted in Riyadh reported that 59.3% of adults were aware of nicotine pouches, whereas 14.2% had previously used these products, suggesting that awareness of ONPs is increasing, although actual use remains relatively limited among the general adult population [26]. The higher prevalence observed in the present study may be explained by the inclusion of individuals with a history of tobacco use, who represent a population more likely to seek alternative nicotine products during smoking reduction or cessation attempts.

A recent Saudi study among ONP users further supports this interpretation, reporting that users were predominantly young adults and current or former smokers [27]. This finding is consistent with the present study, where ONP use was observed mainly among individuals with previous tobacco exposure. The increasing visibility of nicotine pouches in Saudi Arabia may be attributed to greater product availability, growing public awareness of smoke-free nicotine alternatives, and marketing strategies promoting these products as alternatives to combustible tobacco. Nevertheless, increased awareness and product uptake should not be interpreted as evidence of long-term safety or confirmed effectiveness for smoking cessation, emphasizing the need for continued surveillance and further research.

A statistically significant association was observed between ONP use and self-reported smoking cessation status. Participants who

reported having quit smoking were more likely to use ONPs than those who continued smoking. This finding is consistent with previous observational studies suggesting that nicotine pouches may be used by some smokers as an alternative source of nicotine during smoking cessation attempts or while reducing cigarette consumption [5,13,15,24]. However, because the present study employed a cross-sectional design, the temporal sequence between ONP use and smoking cessation cannot be determined.

Therefore, it is not possible to conclude whether ONP use contributed to smoking cessation or whether individuals who had already quit smoking subsequently adopted these products. Prospective cohort studies and randomized controlled trials are required to clarify this relationship.

Several mechanisms may explain this association. Oral nicotine pouches deliver nicotine through the oral mucosa without exposing users to the toxic by-products generated during tobacco combustion. For smokers attempting to quit, they may help alleviate nicotine cravings and withdrawal symptoms while maintaining nicotine intake [4,14]. In addition, characteristics such as discreet use, absence of smoke or odor, and availability in different nicotine strengths may increase product acceptability among some adult smokers. Nevertheless, these characteristics alone should not be interpreted as evidence of clinical effectiveness for smoking cessation, as robust evidence from longitudinal and interventional studies remains limited.

Patterns of product use observed in the present study provide additional insight into user behavior. The 10-mg nicotine strength was the most frequently reported, and most users consumed between six and ten pouches daily. Furthermore, smoking cessation status was significantly associated with nicotine strength, frequency of pouch use, and duration of ONP use. These findings suggest that the intensity of nicotine pouch use may vary according to users' smoking behaviors and nicotine requirements. Similar findings have been reported in previous studies showing that nicotine delivery and user satisfaction vary according to nicotine strength and product formulation, factors that may influence continued product use [4,5]. However, the present findings should be interpreted as associations rather than evidence of a dose-response relationship because the cross-sectional study design does not permit causal inference.

With regard to adverse effects, the present study found no statistically significant association between ONP use and most self-reported physical adverse effects. However, psychological symptoms were reported significantly more frequently among ONP users than non-users. These findings suggest that, although ONP use was not associated with an increased frequency of common physical complaints in this study population, psychological effects may be more closely related to nicotine exposure or dependence. A recent Saudi study reported nausea and dizziness as the most commonly reported adverse effects among ONP users and highlighted concerns regarding nicotine dependence despite perceived benefits related to craving reduction and smoking cessation [27]. Differences between the two studies may be explained by variations in study populations, outcome measures, and patterns of ONP use. Unlike the present

study, which compared ONP users with non-users among tobacco users, the Saudi study included only ONP users and focused on their experiences with product use. Furthermore, because adverse effects were self-reported and the study design was cross-sectional, causal relationships cannot be established. Future longitudinal studies are needed to better evaluate the short- and long-term safety profile of oral nicotine pouches.

Strengths of the Study:

This study has several important strengths. It represents one of the first investigations to provide regional data on oral nicotine pouch use among adult tobacco users in Al-Baha City, Saudi Arabia, addressing a current evidence gap regarding emerging nicotine products outside major urban centers. The study included a relatively large sample size and assessed multiple aspects of ONP use, including prevalence, patterns of consumption, smoking cessation status, and self-reported adverse effects. By focusing specifically on tobacco users, the study provides practical insights into the behaviors and experiences of individuals who are most likely to consider alternative nicotine products. These findings add valuable preliminary evidence that may inform future research, tobacco control strategies, and public health policies related to emerging nicotine products in Saudi Arabia.

Limitations:

Several limitations should be considered when interpreting the findings of this study. First, the cross-sectional design limits the ability to determine temporal relationships or establish causal associations between oral nicotine pouch use and smoking cessation status. Therefore, the observed associations should be interpreted cautiously and require confirmation through longitudinal and interventional studies. Second, the use of a non-probability convenience sampling method may have introduced selection bias and may restrict the generalizability of the findings beyond tobacco users in Al-Baha City. Third, the reliance on self-reported information may have resulted in recall bias or social desirability bias, particularly regarding tobacco use behaviors, cessation status, and reported adverse effects. Finally, the study population was predominantly male (95.2%), which reflects the higher prevalence of tobacco use among men in the region but limits the extent to which the findings can be generalized to female tobacco users.

Recommendations:

Based on the findings of this study, several recommendations can be considered.

First, continuous surveillance of oral nicotine pouch use patterns, prevalence, and user characteristics among tobacco users is recommended to better understand the evolving landscape of emerging nicotine products in Saudi Arabia.

Second, public health education initiatives should be developed to provide accurate, evidence-based information regarding the

composition of nicotine pouches, their potential benefits and limitations, and the risks associated with nicotine dependence.

Third, healthcare providers involved in tobacco cessation services should routinely inquire about oral nicotine pouch use and provide individualized counseling regarding nicotine exposure, potential adverse effects, and evidence-based cessation approaches.

Finally, well-designed longitudinal studies, including prospective cohort studies and randomized controlled trials, are needed to determine the long-term safety profile, dependence potential, and effectiveness of oral nicotine pouches in supporting smoking cessation.

Conclusion:

This study provides preliminary evidence regarding the use of oral nicotine pouches among adult tobacco users in Al-Baha City, Saudi Arabia. with a prevalence of 61%. Oral nicotine pouch use was significantly associated with smoking cessation, and was significantly associated with self-reported smoking cessation status. Although most evaluated physical adverse effects were not significantly related to ONP use, psychological symptoms, including anxiety, stress, and depressive symptoms, were reported more frequently among users. Given the cross-sectional nature of the study, these findings should not be interpreted as evidence of a causal relationship between ONP use and smoking cessation or adverse outcomes. Further longitudinal and controlled studies are warranted to clarify the long-term safety, dependence potential, and possible role of oral nicotine pouches within tobacco harm-reduction and smoking cessation approaches.

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Conflict of Interest:

The authors declare that they have no competing interests.

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