



OPEN Prevalence, safety, and role of nicotine pouches in smoking cessation among smokers and the public in Saudi Arabia

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Nicotine pouches are becoming increasingly popular. However, there's still a lack of comprehensive data on how widespread nicotine pouch use and its side effects in Saudi Arabia. This study aims to investigate the prevalence and associated side effects of the use of nicotine pouches among smokers and the public in Saudi Arabia. This study also investigated their utilization in smoking cessation. This study used an online cross-sectional questionnaire-based design. The study population included individuals over the age of 18 living in Saudi Arabia. The questionnaire was distributed through social media platforms. Statistical analysis was conducted using SPSS software. Descriptive statistics were used to generate means and percentages. Regression analysis was performed to predict factors associated with the use of nicotine pouches for the purpose of smoking cessation. A total of 657 participants were included in the analysis. Regarding age distribution, the majority were aged between 18 and 30 years. Most participants were male (422; 64.2%). Regarding the prevalence of nicotine pouches use, (21.2%) had tried the pouches before. Among those who had used nicotine pouches, 57 participants (41.0%) reported success in quitting smoking, while 53 participants (38.1%) experienced only a little success, and 29 participants (20.9%) were unsuccessful. The most common adverse effect was nausea (88, 13.4%), followed by fatigue (44, 6.7%) and headache (43, 6.5%). Participants who smoked 4–6 cigarettes per day, 7–9 cigarettes per day, or more than 10 cigarettes per day had higher odds of nicotine pouch use (OR = 3.70, 95% CI = 1.14–11.96, $p = 0.02$), (OR = 6.74, 95% CI = 1.71–26.5, $p = 0.006$) and (OR = 2.59, 95% CI = 1.07–6.26, $p = 0.03$). This study showed a promising result of the use of nicotine pouches and success in quitting smoking in Saudi Arabia population. Most of the side effects reported in the study were mild. However, future studies with larger sample size and analytical design are needed.

Keywords Nicotine, Smoking, Nicotine pouches, Smokers, Prevalence, Descriptive study, Saudi Arabia

Over the years, there has been a noticeable shift in the types of products containing nicotine, with a rise in their use among consumers^{1,2}. Oral nicotine pouches, small white pouches that deliver nicotine without tobacco, are

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among these emerging products³. These pouches typically contain nicotine, non-nicotine ingredients such as cellulose, flavors like mint or fruit, and additives including preservatives^{4,5}.

One U.S.-based study examined 118 adults who reported nicotine pouches use over a 30-day period, with an average use of 13 days. Notably, 74% of the participants also smoked tobacco cigarettes, and 53% used e-cigarettes, highlighting a trend of concurrent use with other nicotine products. The most reported adverse events included oral lesions (48%), stomach upset (39%), stomatitis (37%), sore throat (21%), and nausea (9%). While this study offers valuable insights, its small and relatively homogeneous sample size underscores the need for broader research to assess health effects and usage trends across more diverse populations³.

Globally, tobacco smoking remains a leading cause of preventable death, and Saudi Arabia is no exception. In response, the Saudi Ministry of Health (MOH) has implemented a range of tobacco control initiatives, including the establishment of smoking cessation centers nationwide. These centers provide a combination of medical treatment and behavioral support to assist individuals in quitting smoking⁶.

While some scientific reviews remain divided on the role of nicotine pouches in smoking cessation, it should be clarified that the U.S. Food and Drug Administration (FDA) recently authorized the marketing of 20 ZYN nicotine pouch products as modified risk tobacco products (MRTPs). This designation was based on the FDA's assessment that these products contain lower levels of harmful constituents compared to traditional tobacco products and may present a reduced risk of certain health conditions, such as cancer^{7,8}. However, this decision remains controversial, and several other public health agencies have issued more cautious or restrictive guidance regarding the use of nicotine pouches⁵.

Despite the increasing popularity of nicotine pouches, there remains a lack of comprehensive data on nicotine pouch use and its side effects in Saudi Arabia. This gap is especially concerning given the unique local context. In Saudi Arabia, where cultural and religious norms often discourage visible tobacco use, alternatives like oral nicotine pouches may be appealing to the population⁶. Furthermore, the regulatory framework for emerging nicotine products remains underdeveloped compared to traditional tobacco control laws, which may contribute to increased accessibility and misuse. These factors underscore the importance of assessing the prevalence and health effects of ONPs within the Kingdom.

Given these developments, this study aims to investigate the prevalence and reported side effects of nicotine pouch usage in Saudi Arabia. Additionally, it explores whether nicotine pouches are being utilized as a tool for smoking cessation in this population.

Methods

Study design and study population

This study used an online cross-sectional questionnaire-based design. The study population included adults over the age of 18 living in Saudi Arabia. The age criterion was set to include individuals who are legally recognized as adults and are eligible to purchase and use tobacco and nicotine products in Saudi Arabia. Only those who used tobacco, smokers, e-cig, types of tobacco products were included. The study was distributed through social media platforms. The questionnaire was distributed through major social media platforms (e.g., Twitter/X, WhatsApp, Instagram, and Snapchat) using a standardized invitation message with a link to the survey. Snowballing was encouraged by asking participants to share the link with others. To enhance representativeness and reduce selection bias, the recruitment strategy aimed to reach diverse population segments across various regions (urban and rural), age groups, and both sexes.

Sampling techniques and method of data collection

To calculate the sample size for this study, a non-probability convenience sampling technique was used. WHO recommendations on the minimum sample size required for prevalence investigation were the basis for estimating the target sample size⁷. 385 participants were needed. This fact was to achieve the required sample size using a 95% confidence interval, standard deviation of 0.5, and a margin of error of 5%. Although random sampling was not feasible, efforts were made to ensure a heterogeneous sample by targeting different regions and demographic groups.

The data were collected over three months from 1st of November 2024 to 1st of February 2025 via an online Google form. Prior to participation, individuals were presented with a clear explanation of the study's objectives and procedures on the initial page of the survey. Informed consent was obtained electronically, with participants required to actively indicate their agreement before proceeding. They were also explicitly informed of their right to withdraw from the study at any point without penalty, which they could do simply by closing the browser or exiting the survey. This ensured that participation was entirely voluntary and that ethical standards regarding informed consent and autonomy were upheld.

The questionnaire tool

This survey was adapted and built using a previously published questionnaire, previous literature, and experts' opinions. Three experts in the field (Pulmonologist, Respiratory therapist, and Epidemiologist) were involved in the design of the questionnaire^{9–11}. The questionnaire was initially developed in English and subsequently translated into Arabic using the backward-forward translation approach, carried out by bilingual authors with fluency in both English and Arabic. Face validity was assessed by piloting the questionnaire with 10 participants from the target population prior to the start of the study. Participants were asked to comment on the clarity, understanding, and acceptability of the questions. Based on this pilot, no major structural changes were needed, but slight adjustments were made to the wording of some questions to improve comprehension. The overall Cronbach's alpha reliability coefficient was 0.71, demonstrating a reliable tool. The questionnaire consists of five main sections: (1) demographic information such as age and gender, (2) smoking habits such as duration and

number of times smoking per day, (3) use of nicotine pouches, (4) side effects related to nicotine pouches, (5) desire and attempts to smoking cessation.

Data analysis

Descriptive statistics, including frequency and percentage, were calculated for categorical variables. The researchers were blinded to the questionnaire responses to avoid any bias, and analysis was performed objectively based on coded data. To examine the association between the prevalence of nicotine pouch use and reported side effects, a chi-square test was conducted. Multiple logistic regression was performed to identify factors associated with the prevalence of nicotine pouch use (outcome variable) and demographic characteristics (independent variables). The results of the regression analyses are presented as odds ratios (OR) with 95% confidence intervals (CI) and corresponding *p*-values. The level of significance was defined as $\alpha = 0.05$. All calculations and analyses were carried out with the SPSS (Statistical Package of Social Sciences Demo Version 27.0) program.

Results

A total of 657 participants were included in the analysis. Regarding age distribution, the majority were aged between 18 and 30 years (406; 61.8%), followed by those aged between 31 and 43 years (141, 21.5%). Most participants were male (422; 64.2%), while females accounted for 235 participants (35.8%). The majority of the participants were Saudi nationals (624; 95.0%). Regarding occupation, 254 participants (38.7%) were students, and 203 participants (30.9%) were employees in the government sector. Additional details about demographic characteristics are provided in Table 1.

The utilization of nicotine pouches and smoking cessation

A notable proportion of the participants (121, 18.4%) thought that nicotine pouches could aid in smoking cessation. Regarding the utilization of nicotine pouches, 139 participants (21.2%) had tried nicotine pouches before. Among those who had used nicotine pouches, 57 participants (41.0%) reported success in quitting smoking, 53 participants (38.1%) reported somewhat successful outcomes, and 29 participants (20.9%) were unsuccessful. Further details about the effects of nicotine pouch use are provided in Table 2.

Side effects associated with smoking

The prevalence of adverse effects varied among the participants. The most common adverse effect was nausea (88, 13.4%), followed by fatigue (44, 6.7%) and headache (43, 6.5%). The lowest frequent adverse effect were allergy and depression (7, 1.1%) and (10, 1.5%), respectively. Further details about the prevalence of adverse effects are provided in Table 3.

The Pearson Chi-square test was performed to assess the percentage of individuals who experienced adverse effects stratified by nicotine pouch usage. For instance, the results indicate a significant difference ($X^2 = 26.61$, $p < 0.001$) between using a nicotine pouch and tachycardia. Further examination of the table's data reveals that nausea (72; 42.1%) is more common with nicotine pouch use ($X^2 = 90.26$, $p < 0.001$). Additionally, the chi-square test revealed a significant difference in the percentage of individuals with fatigue and nicotine pouch ($X^2 = 49.01$, $p < 0.001$). Headaches are more common in nicotine pouch users (33, 19.3%) compared to non-users (10, 3.5%). These results revealed that there is a significant difference among users of nicotine pouch and non-users and headache ($X^2 = 30.74$, $p < 0.001$), Table 4.

Predictors of nicotine pouch use

A multiple logistic regression model was developed to assess the factors influencing the prevalence of nicotine pouch use. Females had significantly lower odds of using nicotine pouches (OR = 0.17, 95% CI = 0.05–0.59, $p = 0.005$). Participants aged between 44 and 56 years also demonstrated significantly lower odds of using nicotine pouches (OR = 0.17, 95% CI = 0.04–0.81, $p = 0.026$). Compared to students, participants working in the private section, those unemployed, and those self-employed had significantly lower odds of nicotine pouch use (OR = 0.19, 95% CI = 0.05–0.83, $p = 0.027$), (OR = 0.10, 95% CI = 0.01–0.71, $p = 0.021$) and (OR = 0.04, 95% CI = 0.00–0.39, $p = 0.005$), respectively. Conversely, participants with a monthly income between 11,000 and 17,000 SAR had significantly higher odds of using nicotine pouches (OR = 5.43, 95% CI = 1.13–26.03, $p = 0.034$). In addition, participants who smoked 4–6 cigarettes per day, 7–9 cigarettes per day, or more than 10 cigarettes per day had higher odds of nicotine pouch use (OR = 3.70, 95% CI = 1.14–11.96, $p = 0.029$), (OR = 6.74, 95% CI = 1.71–26.50, $p = 0.006$) and (OR = 2.59, 95% CI = 1.07–6.26, $p = 0.035$), respectively. Further details about factors influencing the nicotine pouch use are provided in Table 5.

Discussion

In this descriptive study on the prevalence and side effects of nicotine pouches in Saudi Arabia, self-reporting supported the usage of nicotine pouches for aiding smoking cessation, aligning with global trends. However, caution is warranted concerning previous studies endorsing nicotine pouches for smoking cessation, as many of these studies were funded by the tobacco industry, introducing a conflict of interest^{13–17}. Consequently, it is recommended that smokers seeking to quit smoking should utilize approved smoking cessation treatments rather than relying solely on nicotine pouches. Future research should focus on investigating the effectiveness of nicotine pouches in smoking cessation, relapse rates, and product acceptability through randomized controlled trials and longitudinal studies.

The findings from our study revealed that 21.2% of participants had tried nicotine pouches, with 18.4% of respondents believing that these products could aid in smoking cessation. Among those who had used nicotine pouches, 41.0% reported success in quitting smoking, while 38.1% experienced partial success, and 20.9% were

Variable		Frequency	Percentage (%)
Gender	Male	422	64.2
	Female	235	35.8
Nationality	Non-Saudi	33	5.0
	Saudi	624	95.0
Age (years)	18–30	406	61.8
	31–43	141	21.5
	44–56	88	13.4
	Over 56	22	3.3
Occupation	Student	254	38.7
	Employees in private sector	96	14.6
	Employee in governmental sector	203	30.9
	Housewife	26	4.0
	Unemployed	29	4.4
	Self-employed	19	2.9
	Retired	30	4.6
Region	Middle	139	21.1
	East	63	9.6
	West	352	53.6
	South	74	11.2
	North	29	4.4
Smoking (years)	Less than 1 year	34	13.3
	1–5 years	62	24.3
	6–10 years	65	25.5
	over 10 years	94	36.9
No. of cigarettes per day	1–3	83	34.3
	4–6	35	14.5
	7–9	30	12.4
	10 or more	94	38.8
Education level	High school	125	19.2
	Bachelor	447	68.8
	Grad	78	12.0
Income (SAR)	Less than 5000	321	49.2
	5000–10,000	120	18.4
	11,000–17,000	98	15.0
	Above 17,000	113	17.3
Marital status	Single	390	59.8
	Married	247	37.9
	Divorced or widowed	15	2.3
Current smoking status	Ex smoker	454	69.7
	Currently smoker	197	30.3

Table 1. Demographic characteristics of the participants.

unsuccessful. These results highlight that while nicotine pouches show promise in helping smokers reduce or quit smoking, their effectiveness may vary from person to person. This outcome is consistent with existing literature suggesting that cessation products, including nicotine replacement therapies, can yield mixed results, with some users experiencing greater success than others¹².

Our data also indicates a notable prevalence of nicotine pouch use among younger adults, as the majority of participants were aged 18 to 30 years (61.8%), and students had higher odds of nicotine pouch use compared to other occupational groups. This supports the assertion that oral nicotine pouches are an increasingly growing trend among youngsters¹². In the United States, Felicion et al. (2022) found that 19.5% of respondents had heard of nicotine pouches, with 3% having used them before and 0.9% currently using them¹⁸. Similarly, Hrywna et al. (2022) reported that 29.2% of adult smokers heard of them, 16.8% were interested in using them, and 5.6% had used them¹⁹. Despite these findings, research examining patterns of use and side effects in Saudi Arabia remains lacking.

Nicotine pouches were perceived as beneficial for smoking cessation in this study; however, it is crucial to recognize that they address smoking behavior specifically and not nicotine dependency. Nicotine use, particularly among adolescents, can have profound long-term effects on cognition and mental health, leading

Nicotine pouches perception, use, and side effects		Frequency	Percentage (%)
Do you think nicotine pouch can help in smoking cessation? (n = 657)	Yes	121	18.4
	No	536	81.6
Have you tried nicotine pouch? (n = 657)	Yes	139	21.2
	No	518	78.8
If the answer is yes, how successful were you in quitting smoking using nicotine pouches? (n = 139)	Not successful at all	29	20.9
	Somewhat successful [§]	53	38.1
	Extremely successful ^{§§}	57	41.0
Are you a diabetic patient? (n = 657)	Yes	32	4.9
	No	625	95.1
If the answer is yes, did you notice a recurrent increase in blood sugar levels after using nicotine pouches? (n = 32)	Yes	15	46.9
	No	17	53.1
Have you tried other products to quit smoking such as prescribed nicotine replacement therapy, varenicline, and/or bupropion? (n = 657)	Yes	68	10.4
	No	589	89.6
Number of nicotine pouches consumed per day (n = 139)	2–6	87	62.6
	7–11	30	21.6
	12–16	9	6.4
	More than 16	13	9.4

Table 2. Prevalence and effects of nicotine pouch use. [§] reduced cigarette smoking partially; ^{§§} completely quit smoking.

Adverse effects		Frequency	Percentage (%)
Tachycardia	No	615	93.6
	Yes	42	6.4
Nausea	No	569	86.6
	Yes	88	13.4
Fatigue	No	613	93.3
	Yes	44	6.7
Loss of appetite	No	631	96.0
	Yes	26	4.0
Lack of concentration	No	630	95.9
	Yes	27	4.1
Headache	No	614	93.5
	Yes	43	6.5
Allergy	No	650	98.9
	Yes	7	1.1
Anxiety and stress	No	633	96.3
	Yes	24	3.7
Depression	No	647	98.5
	Yes	10	1.5
Difficulty sleeping	No	637	97.0
	Yes	20	3.0
Gum bleeding	No	639	97.3
	Yes	18	2.7
Abdominal pain	No	622	94.7
	Yes	35	5.3

Table 3. Adverse effects profile for the study participants.

to addiction and potential difficulty in quitting later. Overdosing on nicotine can result in severe symptoms, and long-term use has been associated with various adverse health outcomes, necessitating vigilant monitoring and regulation^{20–25}. While the study findings suggest that nicotine pouches are viewed favorably for smoking cessation and harm reduction among smokers, legalization and stricter regulations on their use are warranted, especially due to the well-known side effects and long-term consequences of nicotine use. Further research and oversight are essential to better understand the risks and benefits associated with nicotine pouch use.

		Nicotine pouch				p value
		No		Yes		
		N	%	N	%	
Tachycardia	No	271	96.1	140	81.9	0.001
	Yes	11	3.9	31	18.1	
Nausea	No	266	94.3	99	57.9	0.001
	Yes	16	5.7	72	42.1	
Fatigue	No	276	97.9	133	77.8	0.001
	Yes	6	2.1	38	22.2	
Loss of appetite	No	276	97.9	151	88.3	0.001
	Yes	6	2.1	20	11.7	
Lack of concentration	No	275	97.5	151	88.3	0.001
	Yes	7	2.5	20	11.7	
Headache	No	272	96.5	138	80.7	0.001
	Yes	10	3.5	33	19.3	
Allergy	No	279	98.9	167	97.7	0.28
	Yes	3	1.1	4	2.3	
Anxiety and stress	No	276	97.9	153	89.5	0.001
	Yes	6	2.1	18	10.5	
Depression	No	278	98.6	165	96.5	0.14
	Yes	4	1.4	6	3.5	
Difficulty sleeping	No	277	98.2	156	91.2	0.001
	Yes	5	1.8	15	8.8	
Gum bleeding	No	277	98.2	158	92.4	0.002
	Yes	5	1.8	13	7.6	
Abdominal pain	No	274	97.2	144	84.2	0.001
	Yes	8	2.8	27	15.8	

Table 4. Nicotine pouch and adverse effects.

Adverse effects related to nicotine pouch use were noted in this study, although specific dosage information was not collected. Understanding the relationship between dosage and side effects is crucial for evaluating the safety profile of nicotine pouches. Importantly, these adverse events (AEs) may significantly influence the socioeconomic impact of nicotine pouches.

From a healthcare perspective, the frequency and severity of AEs may increase healthcare utilization and costs, especially if acute toxicity or chronic oral health issues become more common^{26–28}. Furthermore, symptoms such as mouth lesions and gastrointestinal discomfort could impair users' daily functioning, particularly among working-age adults, potentially reducing productivity and increasing absenteeism^{26,29}.

These impacts are even more pronounced in low socioeconomic status (SES) groups, who may adopt nicotine pouches as harm reduction alternatives. If adverse events are not effectively managed, the consequences could exacerbate existing health disparities among these vulnerable populations^{30,31}.

Contrary to the earlier studies that demographic characteristics did not clearly identify populations at higher risk for nicotine pouch use, our findings indicate that factors such as gender, age, occupation, and income are important predictors as seen in Table 5. Specifically, nicotine pouch use was more common among males, younger adults, particularly those in the 18 to 30 age group, and students compared to other occupational groups. Additionally, individuals with moderate monthly incomes showed higher odds of use. These demographic predictors highlight specific subgroups that may be more vulnerable to adopting nicotine pouches, which has important implications for public health efforts. Moreover, Our findings showed higher nicotine pouch use among individuals with moderate incomes (11,000–17,000 SAR), while those with higher incomes (>17,000 SAR) did not show increased use. This may be because middle-income individuals have enough disposable income to try nicotine pouches but may not have access to or prefer other cessation methods like higher-income groups. It also suggests that social or health awareness factors may differ across income levels. These findings highlight the need for targeted public health interventions focused on middle-income users who might be more vulnerable to nicotine pouch use.

Given the potential health risks associated with nicotine pouches and the lack of comprehensive long-term safety data, it is crucial to monitor these trends closely, especially in populations with differing socioeconomic statuses. Our study provides foundational data on the demographic correlates of nicotine pouch use in Saudi Arabia, offering valuable insight for developing culturally and demographically appropriate tobacco control strategies. It revealed that 24% of adults had heard of nicotine pouches¹, supporting prior work. Men were more likely to use nicotine pouches, and use was largely confined to those who also used tobacco products or e-cigarettes. Young or middle-aged adults aged 18–29 years are more likely to use nicotine pouches^{32–34}. This is

Variable		OR (95% CI)	p value
Gender	Male	Reference	
	Female	0.17 (0.05–0.59)	0.005
Nationality	Non-Saudi	Reference	
	Saudi	1.75 (0.39–7.91)	0.467
Age (years)	18–30	Reference	
	31–43	0.96 (0.28–3.28)	0.949
	44–56	0.17 (0.04–0.81)	0.026
	Over 56	0.09 (0.01–1.48)	0.092
Occupation	Student	Reference	
	Employee-Private	0.19 (0.05–0.83)	0.027
	Employee-Government	0.21 (0.04–1.05)	0.057
	Housewife	0.32 (0.01–8.31)	0.495
	Unemployed	0.10 (0.01–0.71)	0.021
	Self-employed	0.04 (0.00–0.39)	0.005
Education level	Retired	0.59 (0.05–7.03)	0.679
	High school or less	Reference	
	Bachelor	1.42 (0.53–3.79)	0.487
Income (SAR)	Graduate	0.96 (0.24–3.86)	0.953
	Less than 5000	Reference	
	5000–10,000	3.37 (0.81–14.07)	0.095
	11,000–17,000	5.43 (1.13–26.03)	0.034
Marital status	Above 17,000	3.39 (0.71–16.06)	0.124
	Single	Reference	
	Married	1.00 (0.33–3.09)	0.993
Region	Divorced or widowed	1.10 (0.08–15.69)	0.947
	Middle	Reference	
	East	2.50 (0.67–9.32)	0.172
	West	2.20 (0.87–5.55)	0.094
Smoking years	South	0.75 (0.19–2.93)	0.680
	Less than 1 year	Reference	
	1–5 years	1.95 (0.51–7.48)	0.332
	6–10 years	2.71 (0.64–11.44)	0.175
No. of Cigarettes	over 10 years	2.04 (0.45–9.17)	0.352
	1–3	Reference	
	4–6	3.70 (1.14–11.96)	0.029
	7–9	6.74 (1.71–26.50)	0.006
	10 or more	2.59 (1.07–6.26)	0.035

Table 5. Logistic regression analysis of demographic characteristics and the prevalence of nicotine pouch use.

concerning given the lack of knowledge about the long-term effects of oral nicotine pouches, potentially posing a threat to younger generations⁵.

Our study contributes to the emerging literature on nicotine pouch use in Saudi Arabia, highlighting the need for further research to fully understand long-term health impacts. Given the growing popularity and prevalence of side effects, regulatory measures and public health interventions are essential to protect vulnerable populations, especially youth, from harm. Moreover, surveillance and evidence-based policies are necessary to ensure that the promotion of nicotine-free alternatives does not inadvertently lead to a new wave of nicotine dependence. This study provides preliminary insights into the prevalence and self-reported side effects of nicotine pouch use in Saudi Arabia; however, several methodological limitations should be considered. The sample was recruited through social media platforms using a non-probabilistic sampling approach, which may introduce selection bias. Individuals with a particular interest in nicotine products or who are active on social media may have been more likely to participate. Additionally, the reliance on self-reported data introduces the potential for recall bias and social desirability bias, which could affect the accuracy of responses related to nicotine pouch use and side effects, thereby limiting the generalizability of the findings to the broader population. Furthermore, the study did not assess key behavioral variables such as concurrent tobacco or nicotine product use, levels of nicotine dependence (e.g., via validated tools such as the Fagerström Test for Nicotine Dependence), or participants' intentions to initiate or cease use. The absence of these variables limits the depth of analysis and the ability to interpret patterns of use or risk profiles. Additionally, the cross-sectional design precludes any causal inference between nicotine pouch use and reported side effects.

Future research should aim to utilize probabilistic sampling methods, incorporate validated measures of nicotine dependence and behavioral intent, and consider mixed methods approaches to capture the underlying motivations and contextual factors influencing use. Longitudinal studies will also be critical to evaluating the long-term health effects and potential for dependence associated with nicotine pouch products in this population.

Conclusion

This study showed a promising result of the use of nicotine pouches and success in quitting smoking in Saudi Arabia population. Most of the side effects reported in the study are mild. However, future studies with larger sample size and analytical design are needed.

Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Author contributions

Conceptualization: RA, ST and HA; Data curation: AN, RA, ST, AA, WA, JA, LA, and HA; Formal analysis: AN and HA; Investigation: HA; Methodology: HA; Project administration: ST, AA, WA, JA, LA and HA; Resources: HA; Supervision: HA; Validation: HA; Writing original draft: AN, ST, AA, WA, JA, LA, SM, AA, SK, MS and HA; Writing, review & editing: All authors approved the final manuscript.

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Declarations

Competing interests

The authors declare no competing interests.

Ethical approval and consent to participate

The ethics committee of Umm Al-Qura University approved the study and waived informed consent due to the retrospective nature of the study (approval No. HAPO-02-K-012-2024-12-2435). All procedures were performed according to the Helsinki declaration.

Consent for publication

Not applicable.

Additional information

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