

Social and cognitive determinants of cigarette, e-cigarette, heated tobacco product and hookah use among university students in Armenia: A cross-sectional study

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ABSTRACT

INTRODUCTION Tobacco products have diversified globally in the past decade. This poses particular risk for young adults and those in low- and middle-income countries (LMICs) with high tobacco use prevalence. This study assessed factors associated with distinct tobacco product use and use intentions among university students in Armenia.

METHODS In Spring 2025, a cross-sectional electronic survey was conducted among students aged 18–30 years from four universities in Armenia, assessing: past-month use and next-year use intention (yes, no) for cigarettes, e-cigarettes, heated tobacco products (HTPs), and hookah (dependent variables); and sociodemographic, perceptions, marketing exposure, parents'/friend's use, and restriction knowledge (independent variables). Multivariable binary logistic regression analyses were conducted for all outcomes.

RESULTS A total of 505 university students, mean age 20.7 years (SD=2.1) and 57.8% female, completed the survey. Past-month use was: 19.0% cigarettes, 9.7% e-cigarettes, 6.3% HTPs, and 5.5% hookah. Use intentions were: 32.9% cigarettes, 23.7% e-cigarettes, 20.1% HTPs, and 27.8% hookah. Male sex was associated with all past-month use outcomes. Lower perceived addictiveness was associated with cigarettes (AOR=0.43; 95% CI: 0.29–0.65), HTP (AOR=0.42; 95% CI: 0.26–0.68), and hookah use (AOR=0.60; 95% CI: 0.36–1.00). Greater social acceptability and restriction knowledge were associated with cigarette use; greater perceived harm was associated with HTP use (AOR=2.03; 95% CI: 1.13–3.62); and peer e-cigarette use was associated with e-cigarette use (AOR=2.43; 95% CI: 1.06–5.58). Any past-month use was associated with all use intentions. Male sex was associated with cigarette and hookah use intentions. Social acceptability and marketing exposure were associated with e-cigarette use intentions; peer use of e-cigarettes and lower perceived addictiveness were associated with cigarette use intentions, while social acceptability was associated with hookah use intentions.

CONCLUSIONS In this sample, tobacco use and use intentions were associated with several demographic, social, and cognitive factors. These findings support further longitudinal research among Armenian university students.

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INTRODUCTION

The diversity of tobacco products used globally has increased in the past 15 years. The tobacco industry has continuously introduced new products, including heated

tobacco products (HTPs), hookah, and electronic cigarettes, also referred to as e-cigarettes, ‘vapes’, or electronic nicotine delivery systems (ENDS)¹. The WHO has highlighted an alarming rise in e-cigarette and HTP use among young people, with rates often exceeding those of conventional cigarettes in some countries^{2,3}. Hookah smoking has also experienced global growth, driven by its social nature, appealing flavored products, and the widespread belief that water filtration makes it less harmful⁴.

The growing diversity of tobacco and nicotine products does not eliminate tobacco-related health risks; instead, it introduces new and partly unknown patterns of harm compared to cigarettes¹. Recent findings from the American Heart Association highlight that young people who smoke e-cigarettes face increased risks for cardiovascular issues, including elevated arterial stiffness and higher blood pressure⁵. Long-term health effects of e-cigarette use remain uncertain¹; studies are ongoing to determine the chronic health impacts of prolonged exposure to e-cigarette aerosol^{6,7}; emerging evidence indicates HTPs still pose important health risks⁸; and hookah smoking exposes those who use it to many of the same toxic substances as cigarettes, thus, these products are not risk-free⁹.

Many determinants have driven the rapid increase in the use of new tobacco products, starting from marketing campaigns that utilize social media influencers to promote e-cigarette products by embedding branded content into lifestyle posts that normalize vaping and increase exposure among adolescents and young adults¹⁰. Flavors, which are critical factors for trying e-cigarettes, particularly those appealing to the youth – such as ‘fruit loops’ and ‘cotton candy’ or the cooling effect of mint – make e-cigarettes significantly more attractive than traditional cigarettes¹¹. These flavors not only mask the harshness often associated with nicotine but also downplay the perception of potential health risks¹⁰. Additionally, marketing often promotes the use of e-cigarettes and HTPs as smoking cessation or less harmful devices, which may lead to misunderstandings among young people that these products are entirely harmless¹². Such marketing and misperceptions shape cognitive factors, including perception of addictiveness, harm, and cessation beliefs, which can lead young adults to become

dependent without realizing it¹³.

Patterns of use vary across socioeconomic groups; patterns differ somewhat for e-cigarettes, HTPs, and hookah compared to conventional cigarettes. In recent years, use of these products has spread across socioeconomic groups, with some evidence suggesting higher uptake of HTPs and hookah among individuals with higher socioeconomic status^{14–16}. Social influences also play a critical role, as peer use and parental smoking or permissive attitudes are consistently associated with initiation and continued use among young adults¹⁷.

In Armenia, tobacco smoking in adult men is a leading risk factor for non-communicable diseases (NCDs) and is associated with nearly all top causes of death¹⁸. Armenia’s comprehensive smoking regulations were implemented gradually starting from 2020, with major provisions taking effect in 2022, extending the same restrictions to e-cigarettes and HTPs as for traditional tobacco products¹⁹. Despite these regulatory measures, a recent study using 2022 data found that a significant portion of Armenian adults reported encountering e-cigarette and HTP advertisements across various platforms²⁰. Approximately 12.9% of adults reported exposure to e-cigarette advertisements via digital media²⁰. The exposure to these advertisements was associated with higher intentions to use e-cigarettes among the Armenian population²⁰.

Guided by the Social Determinants of Health (SDH) framework and Social Cognitive Theory (SCT), this study aims to explore the social and cognitive determinants associated with cigarette, e-cigarette, HTP, and hookah use and use intentions among university students in Armenia.

METHODS

Study setting

This study was conducted in three major cities in Armenia – Yerevan, Gyumri, and Vanadzor. University students were recruited from key universities across these three cities. In Yerevan, recruitment focused on students from Yerevan State University (YSU) and the American University of Armenia (AUA), in Gyumri at Shirak State University (SSU), and in Vanadzor at Vanadzor State University (VSU). Participation was voluntary, and electronic informed consent was obtained from all participants before they accessed

the questionnaire. Prior to the start of the study, the protocol was reviewed and approved by the Institutional Review Board (IRB) of AUA.

Study design and participants

We conducted a cross-sectional, self-administered survey. Data were collected electronically among university students aged 18–30 years from the four universities. Data collection occurred onsite over 20 days starting from 7 April 2025, with the goal of obtaining approximately one-third of the projected sample size with completed surveys per city. Participants were recruited using convenience sampling by trained data collectors who approached students at high-traffic locations within university campuses at different times of the day to enhance sample diversity.

Eligible individuals were invited to complete a self-administered electronic questionnaire (via Alchemer) on a tablet or mobile device. For eligible individuals who were unable to participate immediately, a QR code linking to the survey was provided to enable completion at a later time. The average completion time was 20 minutes, and the refusal rate was 9.78% among eligible students. The four participating universities had a combined enrollment of approximately 23900 students (YSU, approximately 17500; AUA, approximately 2300; SSU, approximately 2300; and VSU, approximately 1800). Overall, 636 students were recruited using convenience sampling with 505 completing the full survey; there were 131 partial responses which were excluded from analysis.

Measures

The structured questionnaire was developed based on existing literature, including measures adapted from the validated Electronic Cigarette Expectancy Scale for adolescents²¹, the Global Youth Tobacco Survey (GYTS)²², and the Population Assessment of Tobacco and Health (PATH)²³.

Independent variables

Sociodemographic variables

Sociodemographic characteristics included age, sex at birth (male, female), place of birth (Armenia, other), place of residence (Yerevan, Gyumri, Vanadzor, other), education level (undergraduate, or Master's/

doctorate), marital status (single, married), living with parents (yes, no), employment status (employed, unemployed), and parental education level (high school or lower, Bachelor's, Master's/doctorate). Employment status and parental education level were used as proxies of socioeconomic status (SES).

E-cigarette marketing exposure

We assessed e-cigarette marketing exposure with seven items asking 'In the last 30 days, how often have you noticed any of the following?' (0=never to 4=always): e-cigarette displays in shops, advertisements on television, advertisements on radio, advertisements on posters or billboards, advertisements on social media, special price offers in stores, and special price offers on social media. Responses were averaged to create a continuous composite score (range: 0–4), with higher scores indicating greater exposure.

Social influences

We assessed social exposure with four items: 'Do either of your parents currently smoke cigarettes?', 'Do either of your parents currently use e-cigarettes?', 'Do any of your close friends smoke cigarettes?', and 'Do any of your close friends use e-cigarettes?'. Response options were: yes, no, don't know, or refused. For analysis, each item was dichotomized as yes=1 versus other=0, given small numbers of 'don't know' or 'refused'.

Tobacco-related perceptions

For each product, participants rated four domains on 5-point Likert scales (0=not at all, to 4=extremely) using: 'How addictive do you think each of the following products is?', 'How harmful to your health do you think each of the following products is?', 'How socially acceptable among your peers do you think each of the following products is?', and 'If you wanted to, how easy would it be for you to get the following products?'. Each product-by-domain item was treated as continuous. Given that items within each domain were highly associated ([Supplementary file Table S1](#)), we created domain index scores by averaging the four product-specific items within each domain (range 0–4, higher scores indicate greater perceived addictiveness, harm, social acceptability, or ease of access).

Knowledge of use restrictions

Participants were asked: 'To your knowledge, are there any legal restrictions on the use of e-cigarettes and/or HTPs in public places in Armenia?'. Response options were: yes, no, or not sure.

Outcome variables

Use of tobacco products

Lifetime (ever) use of cigarettes, e-cigarettes, HTPs, and hookah was assessed as binary variables (yes, no). Participants who reported ever using cigarettes, e-cigarettes, HTPs, or hookah were asked about past 30-day use. In addition, we created an indicator of any past 30-day use, which we included as a covariate in all intention-to-use models to control for current use status.

Intentions to use tobacco products

For each product – cigarettes, e-cigarettes, HTPs, and hookah – participants reported how likely they were to try or continue using the product in the next year on a 5-point scale (0=not at all likely, to 4=extremely likely). Because responses were heavily skewed toward 0=not at all likely, we dichotomized intention as any intention to use versus no intention.

Statistical analysis

All analyses were conducted using IBM SPSS Statistics 21. Descriptive statistics were first computed to summarize participant characteristics. Bivariate analyses were conducted to examine associations between independent variables and two sets of binary dependent variables. For categorical predictors, Pearson's chi-squared tests were used. For continuous variables (e.g. age, perceived harm, addictiveness, access), independent-samples t-tests were performed to assess group differences. Variables with $p < 0.05$ in bivariate analyses were retained for multivariable models.

Multivariable binary logistic regression models were used to examine associations between independent variables and outcomes (past-month use and intention to use each product). Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) are reported. Model fit was assessed using the Hosmer–Lemeshow test and -2 log likelihood statistics. Sociodemographic variables were selected based on conceptual importance and significance

in the bivariate analyses. The multivariable models adjusted for age, sex, employment status, parental education level, marketing exposure, friends' tobacco use, parents' tobacco use, perceived social acceptability, perceived ease of access, perceived harm, perceived addictiveness, and knowledge of smoking restrictions. The model examining intentions to use additionally adjusted for past 30-day tobacco use. Statistical significance was defined as $p < 0.05$.

RESULTS

Participant characteristics

As shown in Table 1, participants had a mean age of 20.7 years ($SD=2.1$), were 57.8% female, 92.9% born in Armenia, and roughly evenly divided by current residence (30.7% Yerevan, 29.3% Shirak, 28.1% Lori). The majority of participants were undergraduate students (91.5%), single (94.1%), living with their parents (76.2%), unemployed (62.7%), and had college-educated parents (43.1% Bachelor's degree, 25.0% Master's/doctoral degrees).

Reported past-month use was 19.0% for cigarettes, 9.7% for e-cigarettes, 6.3% for HTPs, and 5.5% for hookah. Use intentions (>0 on a 5-point scale) were reported by 32.9% for cigarettes, 23.7% for e-cigarettes, 20.1% for HTPs, and 27.8% for hookah. Bivariate associations for reported past-month use and intention to use are presented in Tables 1 and 2.

Factors associated with past-month use

In multivariable binary logistic regression analyzing reported past-month use (Table 3), factors significantly associated with cigarette use included male sex compared with females ($AOR=27.28$; 95% CI: 11.58–64.23), each one-unit increase in perceived social acceptability, which was associated with higher odds of past-month cigarette use ($AOR=1.60$; 95% CI: 1.09–2.35), each one-unit increase in perceived addictiveness, which was associated with lower odds of past-month cigarette use ($AOR=0.43$; 95% CI: 0.29–0.65), and less uncertainty of tobacco-related restrictions (i.e. more accurate knowledge of tobacco-related restrictions) compared with greater uncertainty ($AOR=0.44$; 95% CI: 0.21–0.90). Factors significantly associated with e-cigarette use included male sex compared with females ($AOR=3.48$; 95% CI: 1.67–7.22) and having friends who use e-cigarettes

Table 1. Bivariate associations between sociodemographic and tobacco-related factors and past-month use of cigarettes, e-cigarettes, heated tobacco products, and hookah among university students in Armenia, April–May 2025 (N=505)

Variables	All n (%)	Cigarettes			E-cigarettes			HTPs			Hookah		
		No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p
Total	505 (100)	409 (81.0)	96 (19.0)		456 (90.3)	49 (9.7)		473 (93.7)	32 (6.3)		477 (94.5)	28 (5.5)	
Age (years), mean (SD)	20.7 (2.1)	20.6 (2.2)	21.1 (2.1)	0.040	20.7 (2.2)	20.9 (2.7)	0.636	20.8 (2.2)	20.6 (1.6)	0.634	20.7 (2.2)	20.9 (1.6)	0.765
Sex at birth				<0.001			<0.001			<0.001			<0.001
Male	213 (42.2)	125 (30.6)	88 (91.7)		177 (38.8)	36 (73.5)		185 (39.1)	28 (87.5)		191 (40.0)	22 (78.6)	
Female	292 (57.8)	284 (69.4)	8 (8.3)		279 (61.2)	13 (26.5)		288 (60.9)	4 (12.5)		286 (60.0)	6 (21.4)	
Place of birth				0.003			0.379			0.363			0.448
Armenia	469 (92.9)	378 (92.4)	91 (94.8)		425 (93.2)	44 (89.8)		438 (92.6)	31 (96.9)		444 (93.1)	25 (89.3)	
Other ^a	36 (7.1)	31 (7.6)	5 (5.2)		31 (6.8)	5 (10.2)		35 (7.4)	1 (3.1)		33 (6.9)	3 (10.7)	
Current residence				0.416			<0.001			0.002			0.002
Yerevan	155 (30.7)	113 (27.6)	42 (43.8)		124 (27.2)	31 (63.3)		137 (29.0)	18 (56.3)		138 (28.9)	17 (60.7)	
Shirak	148 (29.3)	127 (31.1)	21 (21.9)		141 (30.9)	7 (14.3)		144 (30.1)	4 (12.5)		144 (30.2)	4 (14.3)	
Lori	142 (28.1)	124 (30.3)	18 (18.8)		136 (29.8)	6 (12.2)		138 (29.1)	4 (12.5)		139 (29.1)	3 (10.7)	
Other ^b	60 (11.9)	45 (11.0)	15 (15.6)		55 (12.1)	5 (10.2)		54 (11.4)	6 (18.8)		56 (11.7)	4 (14.3)	
Education level				0.078			0.528			0.259			0.668
Undergraduate	462 (91.5)	379 (92.7)	83 (86.5)		416 (91.2)	46 (93.9)		431 (91.1)	31 (96.9)		437 (91.6)	25 (89.3)	
Master's/doctorate	43 (8.5)	30 (7.3)	13 (13.5)		40 (8.8)	3 (6.1)		42 (8.9)	1 (3.1)		40 (8.4)	3 (10.7)	
Marital status				0.076			0.064			0.486			0.171
Single	475 (94.1)	381 (93.2)	94 (97.9)		426 (93.4)	49 (100)		444 (93.9)	31 (96.9)		447 (93.7)	28 (100)	
Married	30 (5.9)	28 (6.8)	2 (2.1)		30 (6.6)	0 (0.0)		29 (6.1)	1 (3.1)		30 (6.3)	0 (0.0)	
Living with parents				0.575			0.414			0.787			0.823
Yes	380 (76.2)	309 (76.7)	71 (74.0)		345 (76.7)	35 (71.4)		355 (76.0)	25 (78.1)		112 (23.8)	7 (25.0)	
No	119 (23.8)	94 (23.3)	25 (26.0)		105 (23.3)	14 (28.6)		112 (24.0)	7 (21.9)		359 (76.2)	21 (75.0)	
Employment status				<0.001			0.001			0.022			0.067
Unemployed	316 (62.7)	275 (67.4)	41 (42.7)		296 (65.1)	20 (40.8)		302 (64.0)	18 (56.3)		303 (63.7)	13 (46.4)	
Employed	188 (37.3)	133 (32.6)	55 (57.3)		159 (34.9)	29 (59.2)		170 (36.0)	14 (43.8)		173 (36.3)	15 (53.6)	

Continued

Table 1. Continued

Variables	All n (%)	Cigarettes			E-cigarettes			HTPs			Hookah		
		No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p
Parents' education level				0.010			0.010			0.128			0.049
High school or lower	158 (31.9)	135 (33.7)	23 (24.2)		146 (32.7)	12 (24.5)		152 (32.7)	6 (19.4)		149 (31.8)	9 (32.1)	
Bachelor's	214 (43.1)	177 (44.1)	37 (38.9)		198 (44.3)	16 (32.7)		201 (43.2)	13 (41.9)		207 (44.2)	7 (25.0)	
Master's/doctorate	124 (25.0)	89 (22.2)	35 (36.8)		103 (23.0)	21 (42.9)		112 (24.1)	12 (38.7)		112 (23.9)	12 (42.9)	
Lifetime use													
Cigarettes	151 (29.9)	55 (13.4)	96 (100)	<0.001	113 (24.8)	38 (77.6)	<0.001	121 (25.6)	30 (93.8)	<0.001	129 (27.0)	22 (78.6)	<0.001
E-cigarettes	125 (24.8)	66 (16.1)	59 (61.5)	<0.001	76 (16.7)	49 (100)	<0.001	96 (20.3)	29 (90.6)	<0.001	99 (20.8)	26 (92.9)	<0.001
HTPs	81 (16.0)	30 (7.3)	51 (53.1)	<0.001	49 (10.7)	32 (65.3)	<0.001	49 (10.4)	32 (100)	<0.001	61 (12.8)	20 (71.4)	<0.001
Hookah	118 (23.4)	64 (15.6)	54 (56.3)	<0.001	81 (17.8)	37 (75.5)	<0.001	90 (19.0)	28 (87.5)	<0.001	90 (18.9)	28 (100)	<0.001
Marketing exposure, mean (SD)	1.1 (0.78)	1.08 (0.78)	1.16 (0.78)	0.410	1.07 (0.79)	1.34 (0.69)	0.021	1.08 (0.78)	1.27 (0.79)	0.200	1.08 (0.77)	1.41 (0.84)	0.029
Friends' use													
Cigarettes	335 (66.3)	261 (63.8)	74 (77.1)	0.013	296 (64.9)	39 (79.6)	0.039	310 (65.5)	25 (78.1)	0.145	312 (65.4)	23 (82.1)	0.069
E-cigarettes	278 (55.0)	210 (51.3)	68 (70.8)	0.001	240 (52.6)	38 (77.6)	0.001	256 (54.1)	22 (68.8)	0.107	255 (53.5)	23 (82.1)	0.003
Parents' use													
Cigarettes	236 (46.7)	181 (44.3)	55 (57.3)	0.021	213 (46.7)	23 (46.9)	0.976	218 (46.1)	18 (56.3)	0.265	222 (46.5)	14 (5.0)	0.721
E-cigarettes	41 (8.1)	31 (7.6)	10 (10.4)	0.360	35 (7.7)	6 (12.2)	0.266	40 (8.5)	1 (3.1)	0.285	41 (8.6)	0 (0.0)	0.106
Perception scores, mean (SD)													
Social acceptability	2.06 (1.09)	2.01 (1.12)	2.29 (0.91)	0.023	2.04 (1.11)	2.28 (0.89)	0.140	2.06 (1.10)	2.12 (0.79)	0.758	2.04 (1.10)	2.46 (0.92)	0.050
Ease of access	2.41 (1.24)	2.36 (1.27)	2.62 (1.08)	0.060	2.37 (1.25)	2.7 (1.05)	0.034	2.38 (1.25)	2.80 (0.98)	0.067	2.04 (1.09)	2.65 (0.96)	0.290
Harm	2.75 (1.10)	2.82 (1.12)	2.42 (0.93)	0.001	2.80 (1.11)	2.33 (0.91)	0.004	2.75 (1.12)	2.67 (0.59)	0.680	2.77 (1.11)	2.46 (0.83)	0.157
Addictiveness	2.69 (1.01)	2.82 (0.97)	2.14 (0.97)	<0.001	2.72 (1.01)	2.31 (0.93)	0.007	2.73 (1.00)	2.10 (0.92)	0.001	2.72 (1.01)	2.22 (0.92)	0.011
Restriction knowledge				<0.001			0.004			0.049			0.036
Yes	228 (45.1)	166 (40.6)	62 (64.6)		195 (42.8)	33 (67.3)		207 (43.8)	21 (65.6)		209 (43.8)	19 (67.9)	
No	101 (20.0)	84 (20.5)	17 (17.7)		96 (21.1)	5 (10.2)		96 (20.3)	5 (15.6)		99 (20.8)	2 (7.1)	
Not sure	176 (34.9)	159 (38.9)	17 (17.7)		165 (36.2)	11 (22.4)		170 (35.9)	6 (18.8)		169 (35.4)	7 (25.0)	

Continued

Table 1. Continued

Variables	All n (%)	Cigarettes			E-cigarettes			HTPs			Hookah		
		No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p
Past-month use													
Cigarettes	96 (19.0)	0 (0.0)	96 (100)	<0.001	63 (13.8)	33 (67.3)	<0.001	68 (14.4)	28 (87.5)	<0.001	82 (17.2)	14 (50.0)	<0.001
E-cigarettes	49 (9.7)	16 (3.9)	33 (34.4)	<0.001	0 (0.0)	49 (100)	<0.001	31 (6.6)	18 (56.3)	<0.001	33 (6.9)	16 (32.7)	<0.001
HTPs	32 (6.3)	4 (1.0)	28 (29.2)	<0.001	14 (3.1)	18 (56.3)	<0.001	0 (0.0)	32 (100)	<0.001	20 (4.2)	12 (42.9)	<0.001
Hookah	28 (5.5)	14 (3.4)	14 (14.6)	<0.001	12 (2.6)	16 (32.7)	<0.001	16 (3.4)	12 (37.5)	<0.001	0 (0.0)	28 (0.0)	<0.001
Use intentions													
Cigarettes	164 (32.9)	84 (20.9)	80 (488.8)	<0.001	127 (28.3)	37 (75.5)	<0.001	138 (29.6)	26 (81.3)	<0.001	147 (31.3)	17 (60.7)	<0.001
E-cigarettes	118 (23.7)	61 (15.7)	57 (59.4)	<0.001	77 (17.2)	41 (83.7)	<0.001	95 (20.4)	23 (71.9)	<0.001	100 (84.7)	18 (15.3)	<0.001
HTPs	100 (20.1)	53 (13.2)	47 (49.0)	<0.001	74 (16.5)	26 (53.1)	<0.001	78 (16.8)	22 (68.8)	<0.001	86 (18.3)	14 (50.0)	<0.001
Hookah	138 (27.8)	82 (20.4)	56 (58.9)	<0.001	106 (23.7)	32 (65.3)	<0.001	116 (25.0)	22 (68.8)	<0.001	113 (81.9)	25 (89.3)	<0.001

HTPs: heated tobacco products. ^a Other regions of birth include Artsakh (n=8), Russia (n=9), Georgia (n=6), Syria (n=4), Lebanon (n=2), Egypt (n=1), and the United States (n=1). ^b Other region of origin includes Kotayk (n=23), Ararat (n=12), Armavir (n=9), Aragatsothn (n=6), Gegharkunik (n=5), Tavush (n=3), Syunik (n=1), and Vayots Dzor (n=1). Bold indicates p<0.05.

Table 2. Bivariate associations between sociodemographic and tobacco-related factors and intentions to use cigarettes, e-cigarettes, heated tobacco products, and hookah among university students in Armenia, April–May 2025

Variables	Cigarette use intention (N=498)			E-cigarette use intention (N=497)			HTP use intention (N=497)			Hookah use intention (N=496)		
	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p
Total	334 (67.1)	164 (32.9)		379 (76.3)	118 (23.7)		397 (79.9)	100 (20.1)		358 (72.2)	138 (27.8)	
Age (years), mean (SD)	20.6 (2.2)	20.9 (2.2)	0.179	20.6 (2.1)	20.2 (2.4)	0.016	20.7 (2.1)	20.1 (2.6)	0.079	20.6 (2.1)	21.0 (2.3)	0.060
Sex at birth			<0.001			<0.001			<0.001			<0.001
Male	104 (31.1)	109 (66.5)		130 (34.3)	82 (69.5)		144 (36.3)	69 (69.0)		119 (33.2)	93 (67.4)	
Female	230 (68.9)	55 (33.5)		249 (65.7)	36 (30.5)		253 (63.7)	31 (31.0)		239 (66.8)	45 (32.6)	
Place of birth			0.753			0.160			0.916			0.995
Armenia	309 (92.5)	153 (93.3)		355 (93.7)	106 (89.8)		368 (92.7)	93 (93.0)		332 (92.7)	128 (92.8)	
Other ^a	25 (7.5)	11 (6.7)		24 (6.3)	12 (10.2)		29 (7.3)	7 (7.0)		26 (7.3)	10 (7.2)	
Permanent residence			0.097			0.144			0.641			0.010
Yerevan	94 (28.1)	60 (36.6)		108 (28.5)	46 (39.0)		119 (30.0)	35 (35.0)		97 (27.1)	57 (41.3)	
Shirak	103 (30.8)	45 (27.4)		114 (30.1)	34 (28.8)		116 (29.2)	31 (31.0)		108 (30.2)	37 (26.8)	
Lori	100 (29.9)	36 (22.0)		110 (29.0)	25 (21.2)		113 (28.5)	24 (24.0)		110 (30.7)	27 (19.6)	
Other ^b	37 (11.1)	23 (14.0)		47 (12.4)	13 (11.0)		49 (12.3)	10 (10.0)		43 (12.0)	17 (12.3)	
Education level			0.681			0.336			0.225			0.291
Undergraduate	306 (91.6)	152 (92.7)		351 (92.6)	106 (89.8)		368 (92.7)	89 (89.0)		332 (92.7)	124 (89.9)	
Master's/doctorate	28 (8.4)	12 (7.3)		28 (7.4)	12 (10.2)		29 (7.3)	11 (11.0)		26 (7.3)	14 (10.1)	
Marital status			0.494			0.347			0.339			0.324
Single	306 (91.6)	155 (94.5)		354 (93.4)	113 (95.8)		371 (93.5)	96 (96.0)		334 (93.3)	132 (95.7)	
Married	23 (6.9)	7 (4.3)		25 (6.6)	5 (4.2)		26 (6.5)	4 (4.0)		24 (6.7)	6 (4.3)	
Living with parents			0.530			0.387			0.741			0.498
Yes	257 (76.9)	122 (74.4)		292 (77.0)	86 (72.9)		304 (76.6)	75 (75.0)		275 (76.8)	102 (73.9)	
No	77 (23.1)	42 (25.6)		87 (23.0)	32 (27.1)		93 (23.4)	25 (25.0)		83 (23.2)	36 (26.1)	
Employment status			0.010			0.001			0.002			<0.001
Unemployed	222 (66.5)	89 (54.6)		253 (66.8)	58 (49.6)		263 (66.2)	49 (49.5)		242 (67.6)	67 (48.9)	
Employed	112 (33.5)	74 (45.4)		126 (33.2)	59 (50.4)		134 (33.8)	50 (50.5)		116 (32.4)	70 (51.1)	

Continued

Table 2. Continued

Variables	Cigarette use intention (N=498)			E-cigarette use intention (N=497)			HTP use intention (N=497)			Hookah use intention (N=496)		
	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p
Parental education level			0.071			0.073			0.108			0.011
High school or lower	112 (34.3)	42 (25.8)		126 (33.9)	28 (23.9)		130 (33.4)	24 (24.0)		121 (34.3)	32 (23.5)	
Bachelor's	141 (43.1)	71 (43.6)		159 (42.7)	52 (44.4)		167 (42.9)	44 (44.0)		153 (43.5)	58 (42.6)	
Master's/doctorate	74 (22.6)	50 (30.7)		87 (23.4)	37 (31.6)		92 (23.7)	32 (32.0)		78 (22.2)	46 (33.8)	
Lifetime use												
Cigarette	292 (87.7)	55 (33.5)	<0.001	74 (19.5)	76 (64.4)	<0.001	88 (22.2)	62 (62.0)	<0.001	71 (19.8)	78 (56.5)	<0.001
E-cigarette	45 (13.5)	80 (48.8)	<0.001	56 (14.8)	69 (58.5)	<0.001	74 (18.6)	49 (49.0)	<0.001	56 (15.6)	69 (50.0)	<0.001
HTP	20 (6.0)	61 (37.2)	<0.001	34 (9.0)	47 (39.8)	<0.001	41 (10.3)	40 (40.0)	<0.001	32 (8.9)	49 (35.5)	<0.001
Hookah	44 (13.2)	72 (43.9)	<0.001	57 (25.0)	59 (50.0)	<0.001	71 (17.9)	45 (45.0)	<0.001	40 (11.2)	76 (55.1)	<0.001
Marketing exposure, mean (SD)	1.05 (0.77)	1.20 (0.81)	0.043	1.05 (0.77)	2.62 (0.81)	0.005	1.07 (0.78)	1.22 (0.77)	0.094	2.34 (1.29)	2.60 (1.06)	0.036
Friends' use												
Cigarettes	218 (65.3)	117 (71.3)	0.175	250 (66.0)	83 (70.3)	0.377	263 (66.2)	30 (30.0)	0.476	230 (64.2)	105 (76.1)	0.012
E-cigarettes	185 (55.4)	71 (43.3)	0.781	204 (53.8)	74 (63.7)	0.090	218 (54.9)	42 (42.0)	0.579	188 (52.5)	88 (63.8)	0.024
Parents' use												
Cigarettes	145 (43.4)	90 (54.9)	0.016	172 (45.4)	63 (53.4)	0.128	180 (45.3)	54 (54.0)	0.121	156 (43.6)	77 (55.8)	0.015
E-cigarettes	29 (8.7)	12 (7.3)	0.602	31 (8.2)	10 (8.5)	0.919	32 (8.1)	9 (9.0)	0.760	24 (6.7)	15 (10.9)	0.122
Perception scores, mean (SD)												
Social acceptability	1.97 (1.12)	2.24 (0.98)	0.008	1.98 (1.11)	2.34 (0.99)	0.002	2.03 (1.10)	2.14 (1.01)	0.36	1.93 (1.10)	2.38 (0.97)	<0.001
Ease of access	2.31 (1.33)	2.60 (1.01)	0.014	2.35 (1.30)	2.62 (0.97)	0.041	2.37 (1.27)	2.14 (1.08)	0.212	1.93 (1.10)	2.38 (0.97)	0.031
Harm	2.80 (1.17)	2.64 (0.91)	0.115	2.81 (1.13)	2.57 (0.94)	0.031	2.81 (1.13)	2.51 (0.95)	0.015	2.61 (0.93)	2.80 (1.15)	0.070
Addictiveness	2.84 (0.98)	2.37 (0.99)	<0.001	2.79 (0.99)	2.36 (0.99)	<0.001	2.79 (0.97)	2.28 (1.00)	<0.001	2.35 (0.98)	2.81 (0.99)	<0.001
Restriction knowledge			0.004			<0.001			0.002			<0.001
Yes	134 (40.1)	91 (55.5)		152 (40.1)	73 (61.9)		164 (41.3)	61 (61.0)		142 (39.7)	84 (60.9)	
No	71 (21.3)	29 (17.7)		77 (20.3)	23 (19.5)		85 (21.4)	14 (14.0)		76 (21.2)	22 (15.9)	
Not sure	129 (38.6)	44 (26.8)		150 (39.6)	22 (18.6)		148 (37.3)	25 (25.0)		140 (39.1)	32 (23.2)	

Continued

Table 2. Continued

Variables	Cigarette use intention (N=498)			E-cigarette use intention (N=497)			HTP use intention (N=497)			Hookah use intention (N=496)		
	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p	No n (%)	Yes n (%)	p
Past-month use												
Cigarettes	16 (4.8)	80 (48.8)	<0.001	39 (10.3)	57 (48.3)	<0.001	49 (12.3)	47 (47.0)	<0.001	39 (10.9)	56 (40.6)	<0.001
E-cigarettes	12 (3.6)	37 (22.6)	<0.001	8 (2.1)	41 (34.7)	<0.001	23 (5.8)	26 (26.0)	<0.001	17 (4.7)	32 (23.2)	<0.001
HTPs	6 (1.8)	26 (15.9)	<0.001	9 (2.4)	23 (19.5)	<0.001	10 (2.5)	22 (22.0)	<0.001	10 (2.8)	22 (15.9)	<0.001
Hookah	11 (3.3)	17 (10.4)	0.001	10 (2.6)	18 (15.3)	<0.001	14 (3.5)	14 (14.0)	<0.001	3 (0.8)	25 (18.1)	<0.001
Use intentions												
Cigarettes	334 (100)	164 (32.9)	<0.001	59 (15.6)	105 (89.0)	<0.001	75 (18.9)	88 (88.0)	<0.001	63 (17.6)	101 (73.2)	<0.001
E-cigarettes	13 (3.9)	105 (64.0)	<0.001	379 (76.3)	118 (23.7)	<0.001	38 (9.6)	79 (79.8)	<0.001	28 (7.9)	89 (64.5)	<0.001
HTPs	12 (3.6)	88 (54.0)	<0.001	20 (5.3)	79 (67.5)	<0.001	397 (79.9)	100 (20.1)	<0.001	23 (6.4)	76 (55.5)	<0.001
Hookah	37 (11.2)	101 (61.6)	<0.001	49 (13.0)	89 (76.1)	<0.001	61 (15.4)	76 (76.8)	<0.001	358 (72.2)	138 (27.8)	<0.001

HTPs: heated tobacco products. **a** Other regions of birth include Artsakh (n=8), Russia (n=9), Georgia (n=6), Syria (n=4), Lebanon (n=2), Egypt (n=1), and the United States (n=1). **b** Other region of origin includes Kotayk (n=23), Ararat (n=12), Armavir (n=9), Aragatsotn (n=6), Gegharkunik (n=5), Tavush (n=3), Syunik (n=1), and Vayots Dzor (n=1). Bold indicates p<0.05.

Table 3. Multivariable logistic regression analyses of factors associated with past-month use of cigarettes, e-cigarettes, heated tobacco products, and hookah among university students in Armenia, April–May 2025 (N=505)

Variables	Cigarettes			E-cigarettes			HTPs			Hookah		
	AOR	95% CI	p	AOR	95% CI	p	AOR	95% CI	p	AOR	95% CI	p
Age (years)	0.93	0.82–1.05	0.250	0.96	0.82–1.11	0.553	0.81	0.65–1.01	0.057	0.96	0.79–1.16	0.645
Male (ref: female)	27.28	11.58–64.23	<0.001	3.48	1.67–7.22	0.001	10.86	3.39–34.79	<0.001	4.86	1.78–13.26	0.002
Employed (ref: unemployed)	1.76	0.96–3.23	0.068	1.66	0.83–3.32	0.150	1.83	0.76–4.40	0.175	1.20	0.49–2.94	0.697
Parental education >HS (ref: ≤HS)	1.05	0.53–2.09	0.889	1.07	0.50–2.30	0.857	1.45	0.51–4.14	0.492	0.80	0.32–2.04	0.643
Marketing exposure	1.16	0.78–1.71	0.470	1.46	0.95–2.24	0.085	1.54	0.92–2.57	0.103	1.66	0.97–2.81	0.062
Friends' use												
Cigarettes (ref: no)	1.34	0.63–2.86	0.454	1.38	0.55–3.47	0.488	1.76	0.55–5.64	0.341	1.43	0.41–4.99	0.570
E-cigarettes (ref: no)	1.80	0.92–3.49	0.085	2.43	1.06–5.58	0.035	1.28	0.49–3.32	0.613	2.57	0.83–7.89	0.101
Parents' use												
Cigarettes (ref: no)	1.60	0.85–2.93	0.152	0.71	0.35–1.44	0.347	1.44	0.59–3.32	0.439	0.94	0.39–2.27	0.881
E-cigarettes (ref: no)	2.19	0.72–6.77	0.175	2.24	0.77–6.45	0.137	0.34	0.39–2.98	0.332	*		
Perception scales												
Social acceptability	1.60	1.09–2.35	0.016	1.15	0.77–1.73	0.494	0.86	0.52–1.41	0.549	1.59	0.93–2.71	0.089
Ease of access	0.95	0.70–1.28	0.718	1.17	0.81–1.68	0.408	1.14	0.72–1.81	0.575	0.84	0.54–1.31	0.441
Harm	1.08	0.73–1.58	0.709	0.70	0.47–1.03	0.070	2.03	1.13–3.62	0.017	0.99	0.60–1.63	0.955
Addictiveness	0.43	0.29–0.65	<0.001	0.84	0.55–1.29	0.425	0.42	0.26–0.68	<0.001	0.60	0.36–1.00	0.049
Restriction knowledge (ref: yes)												
No	0.87	0.39–1.93	0.733	0.38	0.13–1.08	0.070	0.86	0.27–2.76	0.793	0.25	0.05–1.23	0.090
Not sure	0.44	0.21–0.90	0.025	0.61	0.28–1.33	0.210	0.53	0.19–1.49	0.227	0.62	0.23–1.63	0.330

AOR: adjusted odds ratio. HS: high school. HTPs: heated tobacco products. *Insufficient cell size for estimate.

Table 4. Multivariable logistic regression analyses of factors associated with intentions to use cigarettes, e-cigarettes, heated tobacco products, and hookah among university students in Armenia, April–May 2025

Variables	Cigarettes (N=498)			E-cigarettes (N=497)			HTPs (N=497)			Hookah (N=496)		
	AOR	95% CI	p	AOR	95% CI	p	AOR	95% CI	p	AOR	95% CI	p
Age (years)	0.96	0.86–1.08	0.523	1.04	0.93–1.17	0.492	1.03	0.91–1.16	0.636	1.00	0.90–1.12	0.954
Male (ref: female)	1.90	1.10–3.28	0.021	1.65	0.91–3.00	0.103	1.75	0.94–3.26	0.078	2.03	1.16–3.55	0.013
Employed (ref: unemployed)	0.88	0.53–1.48	0.639	1.09	0.64–1.85	0.747	1.16	0.68–1.99	0.588	1.40	0.85–2.30	0.183
Parental education >HS (ref: ≤HS)	1.24	0.74–2.09	0.417	1.35	0.76–2.39	0.297	1.37	0.76–2.46	0.295	1.38	0.81–2.36	0.241
Marketing exposure	1.3	0.94–1.80	0.114	1.46	1.04–2.05	0.028	1.29	0.91–1.82	0.158	1.22	0.89–1.67	0.227
Friends' use												
Cigarettes (ref: no)	1.07	0.60–1.92	0.822	0.89	0.47–1.68	0.727	1.03	0.54–1.96	0.934	1.44	0.78–2.64	0.244
E-cigarettes (ref: no)	0.47	0.26–0.81	0.007	0.85	0.48–1.68	0.578	0.67	0.37–2.69	0.179	0.88	0.51–1.51	0.638
Parents' use												
Cigarettes (ref: no)	1.65	0.99–2.72	0.050	1.19	0.70–2.02	0.530	1.30	0.76–2.23	0.338	1.30	0.78–2.11	0.336
E-cigarettes (ref: no)	0.65	0.26–1.64	0.364	0.99	0.39–2.47	0.976	1.07	0.43–2.67	0.889	1.90	0.80–4.36	0.149
Perception scales												
Social acceptability	1.26	0.96–1.64	0.094	1.39	1.03–1.87	0.033	1.01	0.75–1.36	0.947	1.78	1.31–2.42	<0.001
Ease of access	1.05	0.84–1.32	0.664	0.97	0.75–1.24	0.786	0.99	0.76–1.28	0.922	0.89	0.70–1.12	0.323
Harm	1.27	0.94–1.70	0.120	1.03	0.76–1.41	0.831	1.06	0.78–1.45	0.703	1.15	0.85–1.55	0.363
Addictiveness	0.62	0.46–0.85	0.003	0.72	0.52–1.00	0.052	0.73	0.53–1.01	0.058	0.55	0.40–0.76	<0.001
Restriction knowledge (ref: yes)												
No	1.00	0.52–1.91	0.999	0.96	0.50–1.85	0.165	0.58	0.28–1.22	0.393	0.76	0.40–1.44	0.860
Not sure	1.02	0.58–1.76	0.965	0.57	0.31–1.04	0.067	0.83	0.45–1.51	0.539	0.71	0.41–1.23	0.224
Past-month tobacco use (ref: no)	10.61	5.58–20.15	<0.001	5.49	2.50–10.21	<0.001	4.78	2.52–9.01	<0.001	3.12	1.73–5.65	<0.001

AOR: adjusted odds ratio. HS: high school. HTPs: heated tobacco products.

(AOR=2.43; 95% CI: 1.06–5.58) compared with participants whose friends did not use e-cigarettes. Factors significantly associated with HTP use included male sex (AOR=10.86; 95% CI: 3.39–34.79) compared with female, each one-unit increase in perceived harm, which was associated with higher odds of past-month HTP use (AOR=2.03; 95% CI: 1.13–3.62), and each one-unit increase in perceived addictiveness, which was associated with lower odds of past-month HTP use (AOR=0.42; 95% CI: 0.26–0.68). Variables significantly associated with hookah use included male sex (AOR=4.86; 95% CI: 1.78–13.26) compared with females and each one-unit increase in perceived addictiveness, which was associated with lower odds of past-month hookah use (AOR=0.60; 95% CI: 0.36–1.00).

Factors associated with next-year use intentions

Most participants reported no intention to use tobacco products in the next year, with 67.1% reporting ‘not at all likely’ for cigarettes, 76.3% for e-cigarettes, 79.9% for HTPs, and 72.2% for hookah. Table 4 presents multivariable binary logistic regression results for reported intention to use. Variables significantly associated with cigarette use intentions included male sex compared with females (AOR=1.90; 95% CI: 1.10–3.28), having friends who use e-cigarettes compared with those whose friends did not use e-cigarettes, which was associated with lower odds of cigarette use intentions (AOR=0.47; 95% CI: 0.26–0.81), each one-unit increase in perceived addictiveness, which was associated with lower odds of cigarette use intentions (AOR=0.62; 95% CI: 0.46–0.85), and reporting past-month tobacco use compared with no past-month tobacco use (AOR=10.61; 95% CI: 5.58–20.15). Factors significantly associated with e-cigarette use intentions included marketing exposure; each one-unit increase in marketing exposure was associated with higher odds of e-cigarette use intentions (AOR=1.46; 95% CI: 1.04–2.05), each one-unit increase in perceived social acceptability, which was associated with higher odds of e-cigarette use intention (AOR=1.39; 95% CI: 1.03–1.87), and reporting past-month tobacco use compared with no past-month tobacco use (AOR=5.49; 95% CI: 2.50–12.01). For HTP use intentions, only reporting past-month tobacco use was associated compared with no past-month tobacco use (AOR=4.78; 95% CI: 2.52–

9.01). Lastly, factors significantly associated with hookah use intentions included male sex compared with females (AOR=2.03; 95% CI: 1.16–3.55), each one-unit increase in perceived social acceptability, which was associated with higher odds of e-cigarette use intention (AOR=1.78; 95% CI: 1.31–2.42), each one-unit increase in perceived addictiveness, which was associated with lower odds of hookah use intentions (AOR=0.55; 95% CI: 0.40–0.76), and reporting past-month tobacco use compared with no past-month tobacco use (AOR=3.12; 95% CI: 1.73–5.65).

DISCUSSION

This study provides insights on social and cognitive determinants of the use of different tobacco products among university students in three major cities in Armenia. The findings show high use rates, especially for cigarettes, and emphasize the role of risk perceptions, perceived social acceptability, and peer and marketing environments in shaping both current use and intentions to use.

Male sex was a strong and consistent predictor of past-month use across cigarettes, e-cigarettes, HTPs, and hookah, reflecting strong gender disparities in tobacco consumption. These disparities are well-documented in Armenia and globally^{24,25}. A possible explanation is that females may under-report their use because of stigma around females who smoke. A study among adults in Georgia found substantial under-reporting of smoking among women, with verified smoking prevalence among women approximately seven times higher than self-reported smoking²⁶.

Participants living in Yerevan reported higher use of e-cigarettes, HTPs, and hookah, suggesting greater product availability and access. Additionally, regional variation in social norms may influence behavior; participants residing in the capital Yerevan may view these products more permissively compared with Gyumri and Vanadzor.

While proxies of SES (i.e. employment and parental education level) were initially associated with use, they were not significant in the model, suggesting that SES operates indirectly through other variables. Evidence from the literature shows mixed SES associations for newer tobacco products (i.e. e-cigarettes and HTPs), which suggests that SES

likely works through factors like advertising, product availability, urban exposure, and peer norms²⁷.

Marketing exposure showed a similar pattern, suggesting that the marketing effect similarly works through other factors like peer influence and lower perceived harm, which is consistent with evidence that e-cigarette advertising predicts initiation largely via peer influence and risk beliefs rather than direct effects²⁶. Additionally, the lack of association in multivariable models may reflect unmeasured forms of marketing, such as point-of-sale displays or product design, which may influence perceptions without being recognized as advertising^{20,28}.

Peer influence emerged as a key determinant, particularly for e-cigarette use, where having friends who use e-cigarettes was an indicator of individual use. The literature supports identifying peer use norms as robust correlates of e-cigarette initiation and current use¹⁷. These findings imply that e-cigarette behaviors are strongly influenced by social networks; thus, having friends who use e-cigarettes may increase exposure, making individuals more likely to use and normalize the behavior.

Cognitive factors, particularly perceptions of addictiveness and harm, were strongly associated with tobacco use. Lower perceived addictiveness of cigarettes, HTPs, and hookah was linked to greater use, reflecting widespread misinformation. This pattern is well-documented for e-cigarettes, where lower perceived harm or addictiveness aligns with higher susceptibility and use¹³. For HTPs, recent studies document rapid uptake and transitions between products and patterns of dual or poly-use^{29,30}. These misperceptions are consistent with a decades-long record of tobacco-industry deception about nicotine addiction and health harms³⁰. Thus, the positive association between perceived harm and HTP use may reflect conflicting public knowledge or cognitive dissonance among those who use tobacco who acknowledge risks yet continue consumption³¹.

Finally, those who reported past-month smoking were more likely to know the restrictions. This pattern suggests that those who smoke are more attentive to policies that directly affect them, resulting in greater awareness of restrictions. However, restrictions may be known but not consistently monitored or enforced.

Overall, patterns of intention to use tobacco products largely mirrored those observed for past-month use, and intentions were shaped by a combination of sociodemographic, social, and perceptual factors. After adjustment, male sex predicted intentions only for cigarettes and hookah, which suggests that newer products are less gendered and more shaped by other factors. The same socioeconomic factors that predicted use (i.e. marketing exposure and peer networks) also predicted intentions, which is consistent with both regional and global evidence^{20,32}.

An inverse association was observed between having friends who use e-cigarettes and the intention to smoke cigarettes. This suggests that peer networks dominated by those who use e-cigarettes may reduce the appeal or intention to use combustible cigarettes. Recent trend data show cigarette-smoking norms are becoming more negative while e-cigarette norms are less negative, mechanisms that could reduce cigarette appeal in vaping-dominant peer groups³³.

Consistent with patterns observed for past-month use, lower perceived addictiveness was linked to higher intentions to smoke cigarettes and to use hookah, underscoring how underestimating nicotine dependence increases willingness to initiate. This pattern aligns with studies showing that perceiving hookah as less addictive predicts higher intention to use, and that lower addictiveness perceptions generally raise susceptibility to tobacco products^{31,34}.

E-cigarette use and hookah intentions were also positively associated with perceived social acceptability. The observed association in our sample underscores the social nature of these products; emerging nicotine products are often experienced as lifestyle or ‘trendy’ activities rather than conventional smoking. In this context, e-cigarette and hookah use may serve as a way to signal social desirability or a ‘modern’ identity within peer groups, reinforcing intentions to use when such behaviors are perceived as normative or desirable³⁵.

Lastly, participants who reported any past-month tobacco or nicotine use had higher odds of intending to use – or continuing to use – all four products. This pattern is consistent with evidence that use of one tobacco product is linked to greater susceptibility or subsequent uptake of other products³⁶.

Strengths and limitations

To our knowledge, this study is among the first to apply an SDH- and SCT-informed framework to four tobacco or nicotine products among Armenian university students. We drew participants from four universities in different regions and used a theory-guided survey. The electronic, self-administered format may have reduced reporting bias. The inclusion of peer, marketing, and urban exposure measures also increases the relevance of the findings for understanding tobacco and nicotine product use among Armenian university students.

Our framework includes key SDH and SCT elements, but some SCT parts, especially self-efficacy (confidence to resist or quit) were not measured. As with all observational studies, the possibility of residual confounding cannot be excluded. The cross-sectional design prevents causal or two-way conclusions. In our context, direction could run from marketing exposure, risk perceptions, and peer use to intention to use or the reverse (i.e. stronger intentions increase attention to marketing, shift perceptions after use, or encourage vaping peer groups after smoking). Moreover, our marketing exposure measure was broad and not product-specific; for example, it did not capture HTP direct outreach, referral incentives, or experiential retail. In addition, all data were self-reported and therefore may be subject to information bias and misclassification. Finally, the use of a convenience sampling approach may have introduced selection bias and limits the generalizability of the findings beyond the study sample.

Implications

Further longitudinal and mixed-methods research is needed to better understand trajectories of use, including dual and poly-product behaviors, product switching, and quit outcomes. Future research should also assess the availability, accessibility, and effectiveness of cessation services for young adults in Armenia, given those products are often marketed as safer alternatives. Beyond standard marketing exposure measures, studies should examine indirect forms of marketing, such as product placement, brand-linked events, and retail display strategies. Research should also explore HTP-specific marketing exposure measures, as this emerging product category may

follow distinct promotion patterns. Finally, mediation analyses examining pathways from marketing exposure through norms and perceptions to use and intention outcomes would clarify mechanisms of influence.

CONCLUSIONS

Use rates among university students in Armenia are high, particularly for cigarettes and among males, reflecting gender norms. Residence in the capital Yerevan was associated with higher use of newer products such as e-cigarettes and HTPs. Perceptions, especially regarding addictiveness, harm, and social acceptability, alongside factors like friends' use and marketing exposure, were associated with both current use and intentions to use. These findings highlight the need for future longitudinal and mixed-methods research to clarify temporal relationships and better understand the causal pathways underlying tobacco product use, ultimately informing tailored, evidence-based tobacco control policies in Armenia.

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CONFLICTS OF INTEREST

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ETHICAL APPROVAL AND INFORMED CONSENT

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DATA AVAILABILITY

The data supporting this research are available from the authors on reasonable request.

AUTHORS' CONTRIBUTIONS

AB, VH, CJB and AA: research concept and design, writing the manuscript and critical revision of the article. AB, CJB and AA: data analysis and interpretation. AB: collection and/or assembly of data. All authors read and approved the final version of the manuscript.

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