

PREVALENCE AND KEY FEATURES OF NICOTINE-CONTAINING PRODUCT USE AMONG STUDENTS: THE ANALYSIS

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Despite restrictive measures adopted by many governments worldwide, nicotine addiction remains a serious global health problem. In recent years, adolescents and young people have been strongly encouraged to use nicotine-containing products (NCPs), as the market has seen the emergence of new nicotine delivery vehicles such as electronic cigarettes (e-cigarettes). This study aimed to analyze the patterns of use of NCPs by students. We surveyed 866 young people using standardized questionnaires, including the WHO Global Youth Tobacco Survey (GYTS) and the Fagerström Test. Over the course of their lives, 65.6% of respondents ($n = 568$) had consumed NCPs. E-cigarettes are the most popular product among current users (31.5% of respondents, $n = 273$), ahead of traditional cigarettes and hookahs. A significant portion of users (67.3%, $n = 233$) combine several types of NCPs. The median age at first nicotine use was 16.0 [14.0–18.0] years for boys and 17.0 [15.0–18.0] years for girls; among adolescents who had ever tried nicotine ($n = 256$), 44.4% reported e-cigarettes as their first product. High nicotine addiction was identified in 22.5% of users ($n = 78$). The main reason for the first try is curiosity (63.5%, $n = 366$), and continued (current) consumption is mainly motivated by the desire to relax and get distracted from problems. The results of this study emphasize the need to develop targeted prevention programs that take into account current trends and psychological mechanisms of formation of addiction in adolescents and youth.

Keywords: nicotine-containing products, students, electronic cigarettes, tobacco consumption, nicotine addiction, prevention

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АНАЛИЗ РАСПРОСТРАНЕННОСТИ И ОСНОВНЫХ ОСОБЕННОСТЕЙ ПОТРЕБЛЕНИЯ НИКОТИНСОДЕРЖАЩЕЙ ПРОДУКЦИИ СРЕДИ СТУДЕНЧЕСКОЙ МОЛОДЕЖИ

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Несмотря на принимаемые государствами активные ограничительные меры никотиновая зависимость по сей день остается серьезной проблемой глобального здравоохранения. В последние годы наблюдается интенсивное вовлечение в потребление никотинсодержащей продукции (НСП) подростков и молодежи за счет выхода на рынок новых средств доставки никотина, таких как электронные сигареты. Целью исследования было проанализировать потребление НСП студенческой молодежью. Проведено анкетирование 866 студентов с использованием стандартизированных опросников (GYTS ВОЗ, тест Фагерстрема и др.). Опыт потребления НСП в течение жизни имели 65,6% ($n = 568$) респондентов. Электронные сигареты являются наиболее популярным продуктом среди текущих пользователей (их использовали 31,5% опрошенных, $n = 273$), опережая традиционные сигареты и кальян. Значительная доля потребителей (67,3%, $n = 233$) сочетает несколько видов никотинсодержащей продукции. Медианный возраст первой пробы никотина составил 16,0 [14,0–18,0] лет для юношей и 17,0 [15,0–18,0] лет для девушек, при этом 44,4% подростков, когда-либо пробовавших НСП ($n = 256$), начали знакомство с никотином с электронных сигарет. У 22,5% потребителей ($n = 78$) выявлена высокая степень никотиновой зависимости. Основной причиной первой пробы является любопытство (63,5%, $n = 366$), тогда как текущее потребление в основном мотивировано стремлением к расслаблению и отвлечению от проблем. Полученные результаты подчеркивают необходимость разработки целевых профилактических программ, учитывающих современные тренды и психологические механизмы формирования аддикции у подростков и молодежи.

Ключевые слова: никотинсодержащая продукция, студенческая молодежь, электронные сигареты, потребление табака, никотиновая зависимость, профилактика

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The consumption of nicotine-containing products (NCPs) remains one of the most pressing public health problems. According to WHO estimates, tobacco use accounts for about 7 million preventable deaths worldwide each year [1, 2]. On average, smokers lose 10 years of life compared with people who never smoke; in the early 2000s, smoking was the leading cause of adult mortality from non-communicable diseases [3]. It has been found that when heavy smokers quit tobacco, their risk of premature death decreases significantly, and this effect is especially pronounced among those who quit before age 40 [4].

Nicotine consumption is still widespread, including among young people. According to the literature, in 2019, 155 million people aged 15–24 in 204 countries smoked tobacco. The prevalence of smoking in this age group was 20.1% among males and 4.95% among females. In 120 countries, the prevalence of tobacco smoking among men aged 15 to 24 years exceeded 20%, and Russia is one of them (31.6%) [5].

The restrictive and other measures adopted by states have achieved certain successes in the fight against smoking; however, the tobacco market has been undergoing transformation in recent years. We observe that new forms of consumption, such as electronic nicotine delivery systems (ENDS), are becoming increasingly widespread [6]. The popularity of these products is increasing rapidly, with e-cigarettes emerging as the most commonly used NCPs among adolescents and young people [1, 7, 8].

Due to their age and socio-psychological characteristics, young people are at increased risk of nicotine use. They are highly open to new experiences, seek social acceptance through peer imitation, experience high stress, and tend to engage in risky behavior. These factors make them especially vulnerable to marketing and environmental influences that promote e-cigarettes [9–11].

Existing anti-tobacco measures and prevention programs are more effective for older individuals; they do not fully account for youth as a target audience or for the potential risks of new nicotine-containing products, so these programs have clear limitations. School and short-term programs are not effective in the long run, especially in the absence of integrated digital components and involvement of family and community [12–15]. Taken together, these factors underscore the urgency of targeted research to identify the characteristics of nicotine use among young people.

This study aimed to analyze the patterns of use of NCPs by students.

METHODS

This single-stage cross-sectional study was conducted from November 2023 to June 2025 at Ural State Medical University. The study included 866 students in years 1–5 (532 females, 334 males); median age 20.2 years (19.7–21.3). We explored young people's use of NCPs, including prevalence, age at first use, frequency and intensity of use of different types of NCPs, reasons for using NCPs, and the prevalence of nicotine addiction symptoms among smoking students.

The study used an online questionnaire to collect data. The questionnaire was based on Tobacco Questions for Youth Surveys (TQS-Youth), a subset of the WHO Global Youth Tobacco Survey, and included the Fagerström Test, which assesses the degree of nicotine addiction.

The data were analyzed in jamovi 2.3 (<https://www.jamovi.org>) [16]. The Shapiro–Wilk test was used to assess the conformity of quantitative indicators to a normal distribution. Categorical

data were described with percentages, quantitative data — with medians and interquartile ranges. Proportions across fields in the multifield conjugacy tables were compared with Pearson's chi-square test (χ^2). The differences were considered significant at $p < 0.05$.

RESULTS

It was found that at the time of the survey, 65.6% of respondents ($n = 568$) had smoking experience (70.1% males ($n = 234$) and 62.8% females ($n = 334$), $\chi^2 = 4.82$, $p = 0.028$). The median age at the first try of NCPs was 16.0 [14.0–18.0] years for boys and 17.0 [15.0–18.0] years for girls.

Almost half of the smokers in the sample — 44.4% ($n = 256$) — tried e-cigarettes and vaporizers before other NCPs; the choice of product type did not depend on gender. Regular cigarettes were used for the first try by 47.5% ($n = 115$) of male and 39.3% ($n = 133$) of female participants. Hookah was first smoking experience for 9.1% ($n = 22$) of boys and 10.9% ($n = 37$) of girls. Only a small percentage of students were introduced to NCPs through tobacco heating systems (1.9%, $n = 11$) and smokeless tobacco products (0.5%, $n = 3$).

The current consumption of NCPs among young people can be described as follows: occasional use — 18.6% of students ($n = 161$), 20.7% of boys ($n = 69$) and 17.3% of girls ($n = 92$), $\chi^2 = 23.0$, $p < 0.001$; regular daily use of some type of NCP — 17.1% ($n = 148$), 24.0% of boys ($n = 80$) and 12.8% of girls ($n = 68$), $p < 0.001$.

During the 30 days preceding the survey, 17.6% of respondents ($n = 152$) smoked regular cigarettes or cigars: 29.0% of boys ($n = 97$) and 10.3% of girls ($n = 55$), $\chi^2 = 23$, $p < 0.001$. Daily cigarette smoking is more typical for boys than for girls: 7.8% of all respondents ($n = 26$) versus 1.7% ($n = 9$), $\chi^2 = 57.5$, $p < 0.001$. The most common daily dose, irrespective of gender, was 1–4 cigarettes. Only 3.0% ($n = 10$) of male and 0.2% ($n = 1$) of female participants smoked more than half a pack per day, and two boys — 0.6% of the sample — reported smoking more than one pack per day ($\chi^2 = 59.2$, $p < 0.001$).

During the month preceding the study, 20.9% of the respondents ($n = 181$) smoked hookah or pipe with tobacco: 24.3% ($n = 81$) of boys and 18.8% ($n = 100$) of girls ($\chi^2 = 3.69$, $p = 0.055$). Smokeless tobacco was used by 2.8% ($n = 24$) of students, with males preferring it more often than girls: 5.4% ($n = 18$) versus 1.1% ($n = 6$), respectively ($\chi^2 = 13.9$, $p < 0.001$). Tobacco heating systems were used by 7.2% of respondents ($n = 62$): 6.9% ($n = 23$) of boys and 7.3% ($n = 39$) of girls; the gender differences were insignificant.

As for e-cigarettes, in the 30 days preceding the survey they were used by 31.5% ($n = 273$) of the sample, including 38.9% ($n = 130$) of boys and 26.9% ($n = 143$) of girls ($\chi^2 = 26.1$, $p < 0.001$). Daily use was reported by 11.9% of the participants ($n = 103$), including 16.5% of boys ($n = 55$) and 9.0% of girls ($n = 48$). Among the respondents, 7.0% (8.1% of males and 6.4% of females) reported using e-cigarettes once or twice daily. Additionally, 4.4% of participants (5.7% of males and 3.6% of females) used e-cigarettes 10–14 times per day, and 7.6% (11.7% of males and 5.1% of females) reported using such NCPs 30 or more times per day. In a single use of an electronic cigarette or vaporizer, 24.4% of respondents (30.2% of boys and 20.7% of girls) take 1–9 puffs on average, and 2.8% of students (3.3% of boys and 2.4% of girls) take more than 30 puffs. In general, young men tend to resort to such NCPs more frequently and more intensively than young women (Table).

Only 32.7% of current smokers ($n = 113$) had limited themselves to one type of NCPs during the 30 days preceding

Table. Frequency of use of regular cigarettes, tobacco heating systems, and electronic cigarettes in the 30 days preceding the survey

NCP type	Gender		Haven't used	1–2 days	3–5 days	6–9 days	10–19 days	20–29 days	Bce 30 days
Regular cigarettes, cigars	Males	abs.	237	30	9	15	10	7	26
		%	71	9	2.7	4.5	3	2.1	7.8
	Females	abs.	477	21	10	4	9	2	9
		%	89.7	3.9	1.9	0.8	1.7	0.4	1.7
	Both genders	abs.	714	51	19	19	19	9	35
		%	82.4	5.9	2.2	2.2	2.2	1	4
Tobacco heating systems	Males	abs.	313	9	5	1	2	2	2
		%	93.7	2.7	1.5	0.3	0.6	0.6	0.6
	Females	abs.	490	13	6	4	4	3	12
		%	92.1	2.4	1.1	0.8	0.8	0.6	2.3
	Both genders	abs.	803	22	11	5	6	5	14
		%	92.7	2.5	1.3	0.6	0.7	0.6	1.6
E-cigarettes	Males	abs.	204	22	13	11	10	19	55
		%	61.1	6.6	3.9	3.3	3	5.7	16.5
	Females	abs.	390	23	14	10	17	30	48
		%	73.3	4.3	2.6	1.9	3.2	5.6	9
	Both genders	abs.	594	45	27	21	27	49	103
		%	68.6	5.2	3.1	2.4	3.1	5.7	11.9

the survey. The remaining 67.3% ($n = 233$) used several different types of NCPs during this period (66.5% ($n = 111$) of boys and 68.2% ($n = 122$) of girls) (Figure).

The majority of smokers in the sample — 72.8% ($n = 252$), 69.5% ($n = 116$) of boys and 76.0% ($n = 136$) of girls — exhibited mild or very mild nicotine addiction. High and extremely high levels of nicotine addiction were identified in 22.5% ($n = 78$) of nicotine users: 26.9% ($n = 45$) of boys and 18.4% ($n = 38$) of girls. Medium level of addiction was typical for 4.6% ($n = 16$) of the surveyed NCP consumers, 3.6% ($n = 6$) of boys and 5.6% ($n = 10$) of girls. A behavioral marker of addiction strength may be the inability to abstain from smoking in prohibited areas; 24.5% ($n = 39$) of boys and 18.8% ($n = 31$) of girls reported engaging in such behavior.

At the time of the survey, 53.5% of NCP users expressed a desire to quit smoking ($n = 185$; no significant gender differences). Over the past year, 51.5% ($n = 86$) of male smokers and 63.1% ($n = 113$) of female smokers — 57.5% ($n = 199$) overall — attempted to quit using NCPs (significant differences, $\chi^2 = 4.905$, $p = 0.27$). The question 'Do you think you could quit smoking/using NCPs if you wanted to?' received an affirmative answer from 73.7% ($n = 123$) of male smokers and 81.0% ($n = 145$) of female smokers, for a combined 77.5% ($n = 199$) of the sample ($\chi^2 = 6.619$, $p = 0.011$).

When asked why they first tried NCPs, the vast majority of students — 63.5% ($n = 366$), 60.1% ($n = 143$) of boys and 66.0% ($n = 223$) of girls — noted that they were interested in experiencing new sensations. The second most common reason is stress; it was reported by 18.8% ($n = 108$) overall, including 18.5% ($n = 44$) of boys and 18.9% ($n = 64$) of girls. Companionship and desire not to offend friends was mentioned as the reason for the first try of an NCP by 4.9% ($n = 28$) of the respondents, 7.1% ($n = 17$) of boys and 3.3% ($n = 11$) of girls. For 3.7% ($n = 21$) of respondents — 2.5% ($n = 6$) of boys and 4.4% ($n = 15$) of girls — the reason was peer pressure, for 2.4% ($n = 14$) — 3.4% ($n = 8$) of boys and 1.8% ($n = 6$) of girls — it was self-affirmation.

Currently, 28.4% of nicotine users ($n = 98$) indicated that nicotine helps them relax and unwind (26.5% ($n = 44$) of boys

and 30.2% ($n = 54$) of girls); 24.9% ($n = 86$) use nicotine to distract from problems (19.3% ($n = 32$) of boys and 30.2% ($n = 54$) of girls); 16.5% ($n = 57$) answered that nicotine use gives them pleasure (20.5% ($n = 34$) of boys and 12.8% ($n = 23$) of girls); 11.9% ($n = 41$) continue to use NCPs because they have grown addicted cannot quit (13.9% ($n = 23$) of boys and 10.1% ($n = 18$) of girls); 1.2% ($n = 4$) use NCPs for company (1.8% ($n = 3$) of boys and 0.6% ($n = 1$) of girls); 0.9% of respondents ($n = 3$) use NCPs to cope with stress — 1.7% of girls ($n = 3$).

DISCUSSION

The study revealed a number of aspects of student behavior related to the use of NCPs that are significant for the public health system. Among youth, the current prevalence of NCP use matches international findings (204 countries) for men and is nearly threefold higher than previously reported for women. [5]. Comparison of the data with findings from domestic studies revealed similar results regarding both the overall prevalence of nicotine use and the magnitude of gender differences in consumption frequency, with young men exhibiting higher rates of use than young women [5, 17–21].

An important result is the identification of complex, multi-product consumption model [22]. The fact that most smokers use several types of NCPs simultaneously indicates the transformation of nicotine addiction. It ceases to be tied to one specific product (cigarettes) and becomes universal, as different nicotine delivery devices and forms are used situationally. This creates a serious challenge to the prevention system, which has historically focused on traditional tobacco smoking. Moreover, the transformation requires additional research on the risk associated with the consequences of using several types of NCPs.

Another significant finding is the dominant position of ENDS in current smoking patterns among young people. They are highly popular, used daily and intensively, which indicates that they are perceived not as temporary fun, but as a full-fledged alternative to traditional cigarettes or even the main method

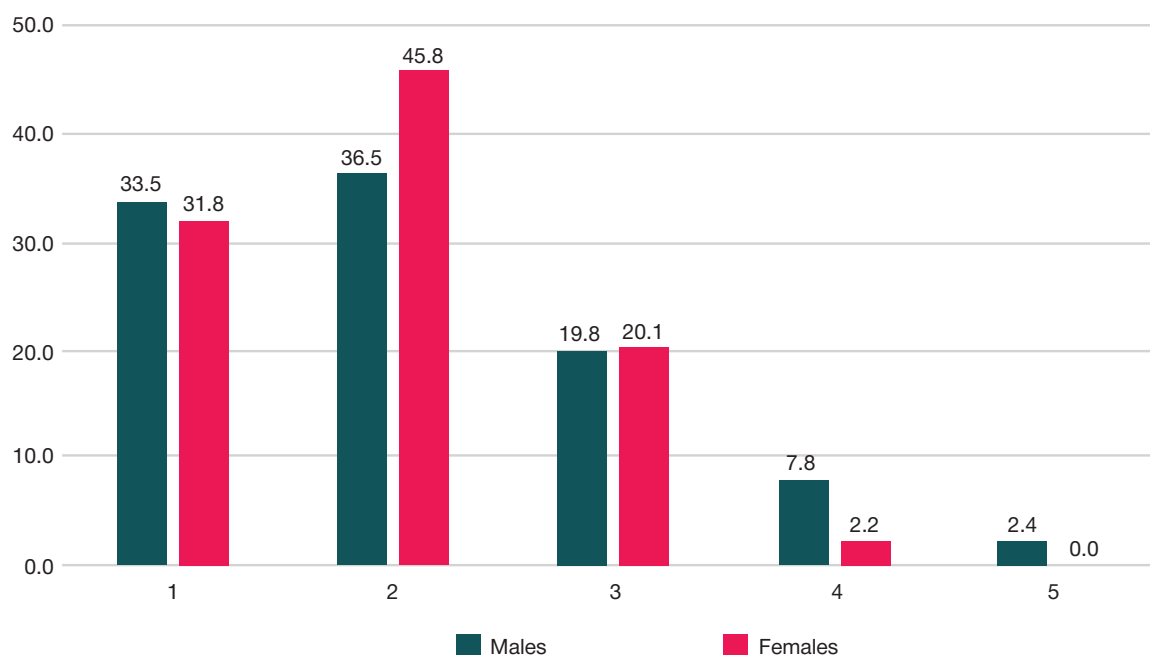


Fig. Number of types of NCPs used by a single person, % of the total number of NCP users (any frequency)

of nicotine consumption, as confirmed by data from similar studies [1, 7, 22–23].

Nearly one-third (29.9%) of young people start nicotine use with ENDS, confirming these devices' major role in recruiting new users, which is particularly concerning. The presented data strongly support applying comprehensive regulatory measures to all NCPs, including e-cigarettes, tobacco-heating systems, and hookahs; the updated Federal Law incorporates such provisions [24].

The analysis of motivation revealed an important shift in the causes of use: the first try of NCPs is commonly driven by curiosity, and their continued use is largely determined by the need for psychoemotional regulation. Nicotine is often seen as a tool for relaxation, distraction from problems, and stress management [25–28]. Therefore, high rates of consumption can be considered an indicator of weak adaptive coping skills among students and their inability to allocate effort properly and organize meaningful leisure activities. Thus, the problem goes beyond the purely medical framework and requires an interdisciplinary approach.

More than half of the respondents (53.5%) expressed a desire to quit using NCPs, which means that young people are aware of the problem and recognize the need for change. That said, 57.5% of participants attempted to quit over the past year, with girls doing so significantly more often (63.1%) than boys (51.5%), which may reflect their higher propensity for health-conscious behavior. However, the fact that a significant proportion of young people who are already motivated to quit continue to use NCPs indicates that the path to withdrawal contains obstacles. This clearly indicates that young people need targeted, scientifically based help and support to overcome nicotine addiction.

Another noteworthy finding is the discrepancy between smokers' history of quit attempts and their self-confidence in their ability to quit smoking. The overwhelming majority of respondents (77.5%) were confident they could stop using NCPs if they wanted to, with girls exhibiting this confidence significantly more often than boys (81.0% versus 73.7%). Against the background of the previously mentioned high percentage of unsuccessful attempts per year, this fact illustrates an important problem: young people tend to overestimate their

ability to give up a bad habit. This cognitive error, possibly stemming from the perception of nicotine addiction as weak or controllable by willpower, poses a serious risk. It can lead to a postponement of decisive action, an underestimation of the complexity of the nicotine withdrawal process, and, as a result, to disappointment and a consolidation of the habit after unsuccessful quit attempts.

Despite the popularity of NCPs, particularly e-cigarettes, among young people, prevention measures designed and tested for this age group remain insufficient. Educational campaigns in the mass media can be one of the measures aimed at prevention of use of NCPs. A randomized trial found that informational messages about the dangers of vaping and its addictive potential were effective. Participants found information about the hazards of smoking more convincing, reported reduced curiosity about vaping, and showed an increased desire to quit e-cigarettes or smoke less frequently [29].

The results of this study show that NCP use among students is a complex issue that extends beyond the medical domain and affects their psychological, behavioral, and social well-being. An effective control strategy should combine awareness of the dangers of NCPs, systematic identification of users, targeted assistance in quitting nicotine, and creation of conditions for a healthy and eventful student life. This will enable a comprehensive approach to the problem, addressing not only addiction but also the need to improve young people's health and quality of life.

CONCLUSIONS

The study revealed the following specifics of use of nicotine-containing products (NCPs) among students.

1. The use of NCPs is common in this population: two thirds of respondents have experience with such products. Young men have higher rates of episodic and daily use, as well as greater smoking intensity, for both traditional and electronic cigarettes.

2. For almost every third young individual, e-cigarettes are the first NCP tried, which puts them in second place after traditional cigarettes. This may indicate a shift in consumer preferences toward alternative nicotine products at the earliest

and most vulnerable stage of habit formation. The median age at first try (16 years for boys and 17 years for girls) confirms that adolescence is a critically important age from the perspective of preventive interventions.

3. The majority of users combine several types of NCPs, which indicates the formation of a complex nicotine addiction that is not tied to a single product.

4. E-cigarettes are the most popular product among current users, significantly outpacing traditional cigarettes and hookah.

5. Although most users were found to have mild nicotine

dependence, one in five students who use NCPs has a high or very high level of nicotine addiction.

6. The main reason for the first try of NCPs is curiosity, which indicates the importance of preventive measures that form an adequate perception of risks. Later on, the main motive for continued use becomes psychoemotional regulation — relaxation and distraction from problems. This allows considering the use of NCPs by young people not only as an addiction, but also as a maladaptive strategy for coping with stress and psychological load.

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