

Is rural-to-urban migration related to smoking, alcohol, and substance use a cross-sectional study among medical students

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Abstract

The prevalence of smoking, alcohol, and substance use and the factors associated with these behaviors show marked regional variations. This study aimed to determine the prevalence of these behaviors among medical students and examine their associations with migration and other related factors. All medical students at a faculty were invited to participate (n = 1056). Of these, 780 (73%) completed a self-report form. Of them, %58.8 (n=447) were male and %41.8 were female (n=313). The median age of the sample was 22. The form included Drug Use Disorders Identification Test (DUDIT), Alcohol Use Disorders Identification Test (AUDIT), the Childhood Trauma Questionnaire (CTQ-28), smoking characteristics, migration history, residential area characteristics, history of perinatal complications, and mental illness. Prevalence of smoking, alcohol use, risky drinking, and illicit substance use were assessed. Migration history was defined as relocation across provincial boundaries during childhood for reasons related to security threats or other social, familial, or economic factors. The prevalence of smoking among students was 33%, lifetime alcohol use was 30.5%, risky alcohol consumption in the past year was 2.0%, lifetime use of illicit substances was 4.3%, and problematic substance use in the past year was 2.5%. A history of mental illness was associated with all variables except smoking (p < 0.01). Other factors associated with smoking included a history of migration, the CTQ-28 score, and residence in a student house. In addition to well-known risk factors, the findings highlight relatively underrecognized factors such as internal migration and a history of perinatal complications.

Keywords: migration, smoking, alcohol, substance use, medical students

Main points

- Individuals who experienced mental health issues in the past five years, sought professional help, and received a diagnosis had a significantly higher risk of smoking, alcohol, and substance use, particularly risky alcohol consumption and problematic substance use.
- Problematic substance use was uncommon yet systematically associated with early rural residence, mental illness, and perinatal complications, suggesting the importance of early developmental context.
- A history of migration and frequent childhood relocations was significantly associated with higher rates of smoking and alcohol use, indicating that residential instability is an important contextual risk factor for substance-related behaviors in this population.
- Smoking was highly prevalent among medical students (33.3%) and showed robust associations with male gender, academic progression, migration history, and all forms of childhood trauma, while alcohol use was common but risky drinking remained rare and was primarily associated with personal mental illness and perinatal complications, highlighting distinct high-risk subgroups.

Introduction

The use of psychoactive substances remains an increasingly important public health concern worldwide. Tobacco and

alcohol consumption are among the leading preventable causes of death (World Health Organization [WHO], 2023a, 2023b). Medical students receive extensive theoretical and practical training regarding the harms of tobacco, alcohol, and

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substance use throughout their six-year medical education. Although it might be assumed that increased knowledge would protect this population from psychoactive substance use, several studies have reported similar or even higher rates of use among medical students compared to the general population (Bahji et al., 2021).

In the present study, medical students were selected primarily as a convenience sample within a single institution. However, this population also represents a strategically important group: as future physicians, their personal substance use patterns may influence clinical decision-making, attitudes toward substance-using patients, and their likelihood of providing preventive counseling. Thus, examining substance use among medical students offers insights not only into an at-risk youth population, but also into a group that will soon be responsible for patient education and intervention.

In Türkiye, considerable regional differences exist in the prevalence of smoking, alcohol, and substance use. Factors associated with alcohol and substance use disorders often vary across regions due to cultural, economic, geographic, and sociopolitical differences (Koç et al., 2020). Examining the prevalence of smoking, alcohol, and substance use among medical students in a medical school located in Eastern Türkiye may therefore highlight characteristics specific to this region and enable comparisons with other regions.

Migration is one such regional characteristic. Migration encompasses complex economic, political, social, and cultural elements, and it represents a major life event. Evidence suggests that migration is associated with higher levels of psychosocial stress, acculturation difficulties, disruptions in social networks, and exposure to adversity, all of which increase vulnerability to psychoactive substance use (Manhica et al., 2016). Moreover, migration and childhood trauma are interrelated; migration-related stress increases the risk of childhood adversity, and childhood trauma is a well-established risk factor for later alcohol and substance use disorders (Conway & Lewin, 2022). Eastern Türkiye experiences significant domestic (particularly rural-to-urban) and international migration, yet research on migration and psychoactive substance use in this region remains scarce (Yilmaz et al., 2022).

Perinatal complications represent another early vulnerability factor. These complications are associated with oxidative stress and long-term neurodevelopmental outcomes, including increased risk for psychiatric conditions such as attention-deficit/hyperactivity disorder, impulse control disorders, and schizophrenia (Mansur et al., 2017). Individuals with such conditions may be more prone to substance use through mechanisms involving impaired impulse control, altered reward processing, and vulnerability to stress. To our knowledge, no prior study has examined the relationship between perinatal complications and alcohol or substance use.

Medical education itself is demanding and stressful. Burnout, depressive symptoms, and psychological distress are

commonly reported among medical students, and mental health difficulties are associated with increased substance use. The self-medication hypothesis suggests that individuals may use substances to manage negative affect, anxiety, mood symptoms, or reward deficiencies (Salisbury et al., 2024).

In summary, migration, perinatal complications, and current mental health status were selected *a priori* as predictors, as they represent different domains such as developmental, psychosocial, and emotional that may contribute to psychoactive substance use. They were not identified *post-hoc* but rather were incorporated into the study design based on theoretical and empirical relevance.

This study aimed to examine the prevalence of smoking, alcohol use, risky drinking, lifetime illicit substance use, and problematic substance use among medical students at a medical school in Türkiye, and to explore their associations with migration, income, housing status, childhood traumas, perinatal complications, and personal or family histories of mental illness.

Methods

The study was approved by the Non-Interventional Clinical Research Ethics Committee of Van Yüzüncü Yıl University (Date: December 6, 2019; Approval No: 2019/17-08). The study population consisted of all students (from first to sixth year) enrolled at the Faculty of Medicine of Yüzüncü Yıl University ($n = 1056$). This cross-sectional study was conducted between May 2020 and October 2020. The inclusion criteria were being a volunteer and being over 18 years of age. After informing participants about the purpose and methods of the study, informed consent was obtained from those who volunteered. The participants themselves completed anonymous forms. Students not present at the faculty were contacted via their peers to facilitate participation. Data were collected in person.

A sociodemographic information form was used to gather data on age, gender, year of study, history of migration and its reasons, lifelong residential characteristics, income (Below minimum wage: low income, 1–3× minimum wage: moderate income, Above 3× minimum wage: high income) and accommodation status (Dormitory or student housing, because these two living arrangements reflect differing social environments: dormitories represent high-structure/low-autonomy settings, whereas student housing represents low-structure/high-autonomy settings), history of perinatal complications, personal and family history of mental illness, and smoking status. Migration status was examined in three categories: no migration, migration due to security threats, and migration due to other reasons. Migration was defined as the movement of individuals or groups from one location to another, either domestic or international, with the intention of settling temporarily or permanently. Several primary items related to migration, such as place of birth, type of residence (urban/rural) at different developmental periods, and self-reported reasons for relocation were developed specifically for this study, based on previous epidemiological surveys

examining population mobility in Turkey (Sirkeci & Cohen, 2015), but they did not originate from a validated instrument. The “number of displacements” variable was derived from participants’ reports of each period during which they resided in a different province. Migration reasons were collected as a single open-ended question referring to the primary reason for the most significant childhood relocation rather than for every move.

Alcohol use was assessed through the Alcohol Use Disorders Identification Test (AUDIT), which shows high internal consistency ($\alpha = .75-.95$), good test-retest reliability, and well-supported two- or three-factor structures capturing alcohol consumption and related consequences. It has well-established criterion validity and performs reliably in university populations. The first three questions of the AUDIT were employed, which evaluate risky drinking (Saatçioğlu et al., 2002). Risky drinking was defined as consuming more than 14 standard drinks per week for men and more than 7 standard drinks per week for women. The Drug Use Disorders Identification Test (DUDIT) was used to assess participants’ substance use. DUDIT is an 11-item self-report scale evaluating the frequency of substance use and associated problems over the previous year. DUDIT similarly demonstrates excellent internal consistency ($\alpha > .85$), stable factor structure, and high sensitivity and specificity for identifying problematic drug use across both clinical and general samples. The first nine items are scored on a 0–4 scale, while the last two can be scored 0, 2, or 4. The total possible score ranges from 0 to 44. For women, a score of 2 or above, and for men, a score of 6 or above indicates problematic use, while a score of 25 or above signifies high-risk use (Evren et al., 2014).

Childhood traumas were evaluated using the Childhood Trauma Questionnaire (CTQ-28). This is a five-point Likert-type self-report scale that assesses abuse and neglect during childhood. The Childhood Trauma Questionnaire (CTQ) displays consistently high internal consistency across its five subscales (emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect), strong convergent and discriminant validity, and a stable factor structure across cultures and languages. In its Turkish adaptation, cutoff scores were set as follows: 5 points for sexual and physical abuse, 7 points for physical neglect and emotional abuse, 12 points for emotional neglect, and 35 points for the total score (Sar et al., 2012). The selection of key predictors was guided by a priori theoretical and empirical frameworks emphasizing life-course and developmental pathways to substance use and health-risk behaviors. Migration-related variables were treated as central exposures of interest due to their conceptual relevance to social stress, disruption, and adaptation processes. Perinatal complications and personal or familial mental health history were included as theoretically relevant vulnerability factors reflecting early biological risk and individual-level psychopathology. These variables were not selected based on statistical significance but were identified before analysis based on existing literature and clinical relevance.

STATA version 13 was utilized for all the statistical analyses in the study. The normality of continuous variables was

evaluated using skewness and kurtosis tests. Since none of the continuous variables exhibited a normal distribution, they are reported as medians and interquartile ranges (IQR). Categorical variables are presented as frequencies (n) and percentages (%). Logistic regression models were employed to examine the relationships between the dependent variables—the presence of smoking, the presence of alcohol use, risky drinking, the use of at least one non-alcohol substance, and problematic use—and the independent variables. These models were subsequently adjusted for age, sex, family history of mental illness, and total score on the Childhood Trauma Questionnaire-28 (CTQ-28). The Variance Inflation Factor (VIF) command in STATA was utilized to assess potential multicollinearity among the variables. All VIF values were below 5 and tolerance values exceeded .20, indicating no evidence of problematic multicollinearity except for age and study year. For consistency across models, we included only study year as the proxy for academic progression, and excluded age from all adjusted models. As a sensitivity analysis, we re-estimated the regression models after removing the most overlapping predictors. The results were consistent across model specifications, suggesting that the findings were robust to changes in predictor selection. The results are reported as odds ratios (OR) with corresponding 95% confidence intervals (CI). For smoking, all predictors were entered into a single multivariable model because the prevalence of smoking in the sample was sufficient to support a fully adjusted analysis. However, the prevalence of alcohol use and substance use was substantially lower (2–4%), and preliminary checks indicated that including all predictors simultaneously led to unstable estimates and convergence difficulties. To preserve model stability and interpretability, the analyses for alcohol and substance use were therefore conducted in two separate models, grouping predictors conceptually while reducing the number of variables entered at once. This analytic decision was driven by statistical power considerations and the need to avoid inflated standard errors. To account for multiple testing, we applied a Bonferroni correction, setting the threshold for statistical significance at $p < 0.01$ ($0.05 / 5$ outcomes).

Results

A total of 780 students completed the forms (corresponding to 73% of the target population). Also, 20 forms were excluded from the study due to incompleteness ($n=760$). Of the participants, 58.2% were male. Among medical school students, the point prevalence of smoking was 33.3%, lifetime prevalence of having tried alcohol at least once was 30.5%, risky alcohol use in the past year was 2.0%, lifetime prevalence of having used an illicit substance at least once was 4.3%, and problematic substance use in the past year was 2.5% ($n=19$). Two participants (0.3%) reported high-risk use, according to the DUDIT. The age at onset for smoking was 16.6 ± 3.74 , and for alcohol it was 17.55 ± 4.00 . Analysis of factors associated with smoking yielded significant relationships with age, year of study, being male, living in student housing, a history of frequent relocation and migration, a personal history of mental illness, and childhood trauma scores (Table 1).

Table 1. Sociodemographic and other factors associated with smoking among medical students

Whole Sample (s: 760, 100%)		Smokers (s: 253, 33.3%)	
	N (%) / Median (25-75 % range)	N (%) / Median (25-75 % range)	Or^a (95% CI)
Study years (continuous)	3 (2 - 5)	3 (2 - 5)	1.13 ^b (1.03-1.25)*
Accommodation			
With family	167 (22.2)	45 (27.0)	Ref
Dormitory	360 (47.7)	99 (27.5)	1.12 ^b (0.72-1.72)
Student house	227 (30.1)	106 (46.7)	2.5 ^b (1.59-3.94)**
Income			
Good	196 (25.8)	58 (29.6)	Ref
Moderate	490 (64.6)	162 (33.1)	0.89 (0.6-1.3)
Poor	73 (9.6)	33 (45.2)	1.08 (0.58-1.99)
Place of birth			
Village/town	117 (15.4)	48 (41.0)	Ref
County	193 (25.4)	64 (33.2)	1.1 (0.7 - 1.9)
Non-metropolitan provincial center	120 (15.8)	43 (35.8)	1.2 (0.7 - 2)
Metropolitan provincial center	292 (38.4)	85 (29.1)	1.01 (0.62- 1.64)
Abroad	38 (5.0)	13 (34.2)	0.74 (0.33- 1.66)
Place of residence from ages 0 to 5			
Village/town	155 (20.5)	62 (40.0)	Ref
County	197 (26.0)	61 (30.9)	0.91 (0.56- 1.46)
Non-metropolitan provincial center	128 (16.9)	39 (30.5)	0.83 (0.49- 1.4)
Metropolitan provincial center	277 (36.6)	91 (32.8)	0.98 (0.63-1.53)
Place of residence from ages 6 to 15			
Village/town	89 (11.7)	33 (37.1)	Ref
County	184 (24.3)	57 (31.0)	1.15 (0.65-2.04)
Non-metropolitan provincial center	146 (19.3)	55 (37.7)	1.39 (0.78-2.49)
Non-metropolitan provincial center	339 (44.7)	108 (31.9)	1.16 (0.69-1.97)
History of migration			
None	149 (19.6)	28 (18.8)	Ref
Migration due to security threats	54 (7.1)	23 (42.6)	2.52 (1.56-4.07)**
Migration due to other reasons	557 (73.3)	202 (36.3)	2.75 (1.33-5.67)*
Number of displacement (continuous)	2 (1 - 3)	2 (1 - 3)	1.15 (1.05-1.26)*
Perinatal complication history (present)	73 (9.6)	28 (38.4)	1.37 (0.8- 2.35)
Childhood trauma scale total score (continuous)	32 (28 - 39)	34 (29 - 41)	1.03 (1.01-1.05)**
Family history of mental illness (present)	196 (25.8)	73 (37.2)	1.34 (0.93-1.93)
Self-reported mental health problem (present)	213 (28.0)	89 (41.8)	1.61 (1.12-2.3)*
Psychiatric diagnosis (present)	103 (13.5)	48 (46.6)	1.67 (1.05-2.63)

* p < 0.01 (Significant after Bonferroni correction), ** p<0.001. OR: Odds Ratio.CI: Confidence Interval; a Adjusted for age, gender, family history of mental illness, and total childhood trauma score; b Adjusted for gender, family history of mental illness, and total childhood trauma score. Age was not included in these analyses as a confounding variable to avoid multicollinearity. DUDIT: Drug Use Disorders Identification Test

Furthermore, significant associations were observed between smoking and each of the five subdimensions of the CTQ-28 (emotional abuse, physical abuse, sexual abuse, physical neglect, and emotional neglect).

Examining the factors associated with having tried alcohol at least once indicated significant relationships with age, year of study, being male, living in student housing, a family history of frequent relocation and migration during childhood, having lived in an urban area before the age of 15, and a personal history of mental illness. Risky drinking was also significantly associated with a personal history of mental illness (Table 2, Table 3). Some variables include "N/A" in the regression tables

because no participants in certain subgroups reported the outcome, resulting in empty cells and preventing odds ratio estimation for those categories. Additionally, wide confidence intervals were observed for predictors with low frequency, therefore reflecting limited statistical power.

Lifetime substance use among students was significantly associated with a personal history of mental illness, a history of perinatal complications, and having lived in a village or small town between the ages of 0 and 5. Problematic substance use was significantly associated solely with a personal history of mental illness (Table 4, Table 5). Most participants reported a history of migration for reasons other than security

Table 2. Sociodemographic factors associated with alcohol consumption among medical students

Whole sample (s: 760, 100%)		Alcohol use (S: 232, %30.5)		Risky alcohol consumption (s:15, %2.0)	
	N (%) / Median (25-75 % range)	N (%) / Median (25-75 % range)	Or ^a (95% CI)	N (%) / Median (25-75 % range)	Or ^a (95% CI)
Study years (continuous)	3 (2 - 5)	4 (2 - 5)	1.17 ^b (1.06-1.28) *	3 (2 - 5)	1.04 (0.76-1.41)
Accommodation					
With family	167 (22.2)	45 (27.0)	Ref	2 (1.2)	Ref
Dormitory	360 (47.7)	79 (21.9)	0.77 ^b (0.5-1.19)	5 (1.4)	1.21 (0.23-6.33)
Student house	227 (30.1)	107 (47.1)	2.39 ^b (1.55-3.7) **	7 (3.1)	2.54 (0.66-8.96)
Income					
Good	196 (25.8)	69 (35.2)	Ref	5 (2.6)	Ref
Moderate	490 (64.6)	139 (28.4)	0.65 (0.45-0.94)	10 (2.0)	0.66 (0.21-2.03)
Poor	73 (9.6)	24 (32.9)	0.67 (0.36-1.24)	0 (0)	N/a
Place of birth					
Village/town	117 (15.4)	33 (28.2)	Ref	1 (0.8)	Ref
County	193 (25.4)	57 (29.5)	1.25 (0.7 - 2.1)	3 (1.5)	2.38 (0.23-23.65)
Non-metropolitan provincial center	120 (15.8)	35 (29.2)	1.2 (0.7 - 2.1)	2 (1.7)	2.27 (0.19-25.98)
Metropolitan provincial center	292 (38.4)	101 (34.6)	1.89 (1.14- 3.14)	9 (3.1)	5.03 (0.61-41.56)
Abroad	38 (5.0)	6 (15.8)	0.44 (0.16- 1.19)	0 (0)	N/a

* p < 0.01 (Significant after Bonferroni correction), ** p<0.001. OR: Odds Ratio.CI: Confidence Interval; a Adjusted for age, gender, family history of mental illness, and total childhood trauma score; b Adjusted for gender, family history of mental illness, and total childhood trauma score. Age was not included in these analyses as a confounding variable to avoid multicollinearity. DUDIT: Drug Use Disorders Identification Test

threats (73.3%, n=557), while 19.6% (n=149) reported no migration history and 7.1% (n=54) reported migration due to security threats. Migration due to non-security reasons was significantly associated with smoking, whereas no clear association was observed for migration due to security threats, likely due to the small size of this subgroup.

Bivariate associations between key variables are given in Supplementary Table 1. Bivariate associations between key variables are given in Supplementary Table 1.

Discussion

Prevalence of Smoking, Alcohol Consumption, Risky Drinking, Substance Experimentation, and Problematic Substance Use

Our findings suggest that one-third (33.3%) of medical students were active smokers, a rate that closely mirrors national figures and previous studies among medical students. The 2022 Türkiye Health Survey reported that 28.3% of individuals aged 15 and older smoked daily (Türkiye İstatistik Kurumu, 2023), while prior studies among medical students in different regions of Türkiye found tobacco use prevalences between 25.6% and 34.7% (Fakili et al., 2024). These similarities suggest that tobacco use among medical students is relatively consistent across regions and broadly reflects national patterns. In contrast, the alcohol and substance use rates observed in our sample were lower than those reported in several comparable studies. Although 30.5% of students had consumed alcohol at least once in their lifetime, only 2.0% reported risky alcohol use in the past year. Lifetime alcohol consumption among medical students in previous studies

ranged from 39.5% to 55.6%, and lifetime substance use ranged from 5.9% to 13.4% (Havaçeliği Atlam & Yüncü, 2017; Köşger & Altınöz, 2020). Our findings therefore fall below the upper end of previously reported ranges. When compared with population-level surveys, the lifetime prevalence of alcohol use in our sample (30.5%) was higher than that reported in the general population (22.1%), as was lifetime substance use (4.3% vs. 3.1%) (Türkiye Uyuşturucu ve Uyuşturucu Bağımlılığı İzleme Merkezi, 2018). However, the very low prevalence of risky alcohol use (2%) was substantially lower than figures observed among university students in European countries, where prevalence commonly exceeds 30% and can reach up to 66% (Loy et al., 2021). A likely explanation for these discrepancies is the regional variation in alcohol consumption within Türkiye, with the Marmara and Aegean regions showing the highest rates and Eastern and Southeastern Türkiye showing the lowest (T.C. Sağlık Bakanlığı, Türkiye Halk Sağlığı Kurumu, 2013). The relatively conservative alcohol culture and lower general population consumption in the Eastern Türkiye Region may therefore influence the patterns observed among medical students. These contextual factors should be considered when interpreting cross-study differences.

First-time Smoking and Alcohol Use

The results showed that students most frequently initiated smoking and alcohol use during their high school years. It has been reported that the age of onset for smoking, alcohol consumption, and other psychoactive substances typically coincides with adolescence and early adulthood, which often overlaps with the high school period (Salisbury et al., 2024). Other studies also indicate that among university and medical students, the average age of first cigarette use is around 15,

Table 3. Factors related to migration and health history associated with alcohol consumption among medical students

Whole Sample (s: 760. 100%)		Alcohol Use (s:232, %30.5)		Risky Alcohol Consumption (s:15. %2.0)	
	n (%) / Median (25-75 % range)	n (%) / Median (25-75 % range)	OR ^a (95% CI)	n (%) / Median (25-75 % range)	OR ^a (95% CI)
Place of residence from ages 0 to 5					
Village/town	155 (20.5)	40 (25.8)	Ref	2 (1.2)	Ref
County	197 (26.0)	64 (32.5)	1.64 (1.01- 2.67)	2 (1.0)	0.91 (0.12-6.66)
Non-metropolitan provincial center	128 (16.9)	32 (25.0)	1.09 (0.63- 1.9)	2 (1.6)	1.31 (0.17-9.57)
Metropolitan provincial center	277 (36.6)	96 (34.7)	1.81 (1.14-2.86)	9 (3.3)	2.94 (0.61-14.2)
Place of residence from ages 6 to 15					
Village/town	89 (11.7)	17 (19.1)	Ref	0 (0)	Ref
County	184 (24.3)	59 (32.1)	2.5 (1.32-4.72)*	2 (1.1)	N/a
Non-metropolitan provincial center	146 (19.3)	41 (28.1)	1.93 (1.01-3.73)	2 (1.4)	N/a
Metropolitan provincial center	339 (44.7)	115 (33.9)	2.69 (1.48-4.89)**	11 (3.2)	N/a
History of migration					
None	149 (19.6)	28 (18.8)	Ref	5 (3.4)	Ref
Migration due to security threats	54 (7.1)	18 (33.3)	1.7 (0.83-3.49)	0 (0)	N/a
Migration due to other reasons	557 (73.3)	186 (33.4)	1.88 (1.18-2.97) *	10 (1.8)	0.5 (0.16-1.56)
Number of displacement (continuous)	2 (1 - 3)	2 (1 - 3)	1.11 (1.02-1.21)	1.5 (1-3)	0.86 (0.6-1.2)
Perinatal complication history (present)	73 (9.6)	30 (41.1)	1.79 (1.09- 2.98)	4 (5.5)	3.7 (1.1-12.1)
Childhood trauma scale total score (continuous)	32 (28 - 39)	33 (28 - 41)	1.01 (0.99-1.03)	31 (29-34)	0.98 (0.92-1.05)
Family history of mental illness (present)	196 (25.8)	74 (37.8)	1.53 (1.07-2.18)	3 (1.5)	0.79 (0.2-2.86)
Self-reported mental health problem (present)	213 (28.0)	90 (42.3)	1.92 (1.36-2.73)**	9 (4.2)	4.86 (1.66-14.18)*
Psychiatric diagnosis (present)	103 (13.5)	53 (51.5)	2.45 (1.58-3.8)**	5 (4.9)	3.75 (1.21-11.58)

* p < 0.01 (Significant after Bonferroni correction), ** p<0.001. OR: Odds Ratio.CI: Confidence Interval; a Adjusted for age, gender, family history of mental illness, and total childhood trauma score; b Adjusted for gender, family history of mental illness, and total childhood trauma score. Age was not included in these analyses as a confounding variable to avoid multicollinearity. DUDIT: Drug Use Disorders Identification Test

while first alcohol and substance use occurs at approximately 17 (Fakili et al., 2024; Köşger & Altınöz, 2020).

In the present study, smoking and alcohol use were found to be significantly more prevalent among male students. Despite the higher prevalence of alcohol and substance use disorders among men, women typically initiate substance use at a later age but progress to addiction more rapidly. This accelerated progression, known as the telescoping effect, is attributed to biological differences (such as metabolism and hormonal fluctuations) and psychosocial factors (such as using substances as a coping mechanism for stress) (Towers et al., 2023). It has been shown that adolescent boys consume more alcohol than girls and that their substance use increases more rapidly. Masculinity has been identified as a risk factor for substance use disorders in both genders, with masculine male adolescents being at the highest risk. Social norms were found to predict alcohol and cannabis use, and the presence of alcohol in the home was identified as a risk factor for girls' intoxication (Mahalik et al., 2015). Furthermore, consistent with previous findings, our results suggest that both smoking and alcohol use are more common among students living

independently (i.e., in student housing) compared to those living with their families. These findings align with data from other studies conducted with medical students in Turkey and worldwide (Bahji et al., 2021; Fakili et al., 2024; Havaçeliği Atlam & Yüncü, 2017; Köşger & Altınöz, 2020; Salisbury et al., 2024). However, some studies have reported higher rates of alcohol consumption among preclinical medical students and have found no relationship between alcohol use and the academic year of study (Jackson et al., 2016; Papazisis et al., 2018).

Urbanism and Internal Migration

The present study found that the prevalence of substance use was significantly higher among students who had lived in a rural area before the age of five. In contrast, among those who had lived in a rural area before the age of 15, the prevalence of alcohol use was lower. In general, studies have associated urban living with psychoactive substance use. However, in some research conducted among university students in our country, similar to our findings, a higher prevalence of alcohol use has been reported among individuals who grew

Table 4. Sociodemographic factors associated with substance use among medical students

Whole Sample (s: 760. 100%)		Substance Users at Least Once (s:34, %4.5)		DUDIT Problematic Substance Use (s:19. %2.5)	
	n (%) / Median (25-75 % range)	n (%) / Median (25-75 % range)	OR ^a (95% CI)	n (%) / Median (25-75 % range)	OR ^a (95% CI)
Study years (continuous)	3 (2 - 5)	3 (2 - 5)	1.04 ^b (0.84-1.28)	4 (3 - 5)	1.07 (0.81-1.42)
Accommodation					
With family	167 (22.2)	5 (3.0)	Ref	2 (1.2)	Ref
Dormitory	360 (47.7)	11 (3.1)	1.07 ^b (0.36-3.18)	6 (1.7)	1.41 (0.28-7.11)
Student house	227 (30.1)	17 (7.5)	2.68 ^b (0.96-7.49)	11 (4.9)	4.22 (0.92-19.5)
Income					
Good	196 (25.8)	8 (4.1)	Ref	6 (3.1)	Ref
Moderate	490 (64.6)	18 (3.7)	0.77 (0.32-1.85)	9 (1.8)	0.58 (0.2-1.72)
Poor	73 (9.6)	7 (9.6)	1.75 (0.56-5.46)	4 (5.5)	1.51 (0.36-6.33)
Place of birth					
Village/town	292 (38.4)	10 (3.4)	Ref	7 (2.4)	Ref
County	120 (15.8)	5 (4.2)	1.13 (0.37 - 3.42)	2 (1.7)	0.69 (0.14-3.42)
Non-metropolitan provincial center	193 (25.4)	8 (4.2)	1.17 (0.45 - 3.04)	5 (2.6)	1.08 (0.34-3.5)
Metropolitan provincial center	117 (15.4)	8 (6.8)	1.55 (0.57-4.22)	4 (3.4)	1.17 (0.31-4.39)
Abroad	38 (5.0)	2 (5.3)	1.23 (0.25- 6.09)	1 (2.6)	0.89 (0.1-7.83)

* p < 0.01 (Significant after Bonferroni correction), ** p<0.001. OR: Odds Ratio.CI: Confidence Interval; a Adjusted for age, gender, family history of mental illness, and total childhood trauma score; b Adjusted for gender, family history of mental illness, and total childhood trauma score. Age was not included in these analyses as a confounding variable to avoid multicollinearity. DUDIT: Drug Use Disorders Identification Test

up in urban areas (Dayi et al., 2015). This observation may be related to the prohibition of alcohol in Islam, as well as to the potentially stronger traditional family structure and religious belief systems in rural regions.

Research examining the relationship between rural/urban residence and substance use has yielded contradictory findings. Some studies from the United States, consistent with our results, have found higher rates of smoking and substance use among those who grew up in rural areas (Gale et al., 2012). Conversely, other studies have linked substance use to urban residence (Çakıcı et al., 2017). Such discrepancies may stem from the unique characteristics of the regions where these studies were conducted. In our sample, the higher rate of substance use among those who lived in rural areas during ages 0–5 could be associated with increased internal migration rates (especially from rural to urban areas), especially given that our study was conducted in a major metropolitan center.

Although the relationship between migration and psychoactive substance use has long been debated, no studies have investigated this issue among medical school students in our country, and only a few have examined it among university students (Demirci & Eker, 2017). Migration involves the intersection of cultural values, sociocultural continuity, alienation, and adaptation challenges. Before the early 1980s, migration was mainly driven by mechanization in agriculture and industrial changes. In the 1980s and 1990s, it became more about forced migration, particularly affecting populations in the eastern and southeastern regions. The psychological impact of migration depends on the nature, extent, causes, and experiences throughout the process.

When families migrate or frequently relocate for various reasons, children in school may be adversely affected and struggle with adapting to new social environments (Şencan & Canatan, 2020). One negative outcome of migration is an increased susceptibility to psychoactive substance use (Yılmaz et al., 2022). Our study also observed significant relationships between having a migration history, the number of relocations, and cigarette and alcohol use. Although the association between the number of relocations and substance use did not reach statistical significance, the trend was similar.

Multiple studies in the literature have indicated that individuals with a migration history exhibit higher rates of smoking, alcohol, and substance use (Lau et al., 2012; Livaditis et al., 2001). However, most of these studies have focused on external migration, and there is a dearth of research examining the relationship between internal migration and psychoactive substance use. Moreover, the cross-sectional design of our study limits the ability to establish cause-and-effect relationships. Also, replication in larger samples is needed to suggest a stronger association.

Other Factors

In this study, individuals who experienced mental health issues in the past five years, sought professional help, and received a diagnosis had a significantly higher risk of smoking, alcohol, and substance use, particularly risky alcohol consumption and problematic substance use. Previous studies also show a strong link between mental disorders and psychoactive substance use (Köşger & Altınöz, 2020). Research on medical students similarly links burnout, stress, long hours, and

Table 5. Factors related to migration and health history associated with substance use among medical students

Whole Sample (s: 760. 100%)		Substance Users at Least Once (s:34, %4.5)		DUDIT Problematic Substance Use (s:19. %2.5)	
	n (%) / Median (25-75 % range)	n (%) / Median (25-75 % range)	OR ^a (95% CI)	n (%) / Median (25-75 % range)	OR ^a (95% CI)
Place of residence from ages 0 to 5					
Village/town	277 (36.6)	7 (2.5)	Ref	5 (1.8)	Ref
County	128 (16.9)	7 (5.5)	2.22 (0.76- 6.53)	2 (1.6)	0.91 (0.17-4.8)
Non-metropolitan provincial center	197 (26.0)	8 (4.1)	1.63 (0.58- 4.59)	6 (3.1)	1.71 (0.51-5.72)
Metropolitan provincial center	155 (20.5)	11 (7.1)	2.55 (1.01-6.88)*	6 (3.9)	2.19 (0.63-7.54)
Place of residence from ages 6 to 15					
Village/town	339 (44.7)	10 (2.9)	Ref	9 (2.7)	Ref
County	146 (19.3)	9 (6.2)	2.11 (0.83-5.36)	3 (2.1)	0.8 (0.21-3.03)
Non-metropolitan provincial center	184 (24.3)	9 (4.9)	1.73 (0.68-4.37)	4 (2.2)	0.82 (0.24-2.73)
Metropolitan provincial center	89 (11.7)	5 (5.6)	1.6 (0.52-4.91)	3 (3.4)	1.21 (0.3- 4.74)
History of migration					
None	149 (19.6)	8 (5.4)	Ref	3 (2.0)	Ref
Migration due to security threats	54 (7.1)	4 (7.4)	1.21 (0.34-4.3)	1 (1.9)	0.7 (0.06-7.05)
Migration due to other reasons	557 (73.3)	21 (3.8)	0.67 (0.29-1.57)	15 (2.7)	1.22 (0.34-2.56)
Number of displacement (continuous)	2 (1 - 3)	2 (1 - 3)	0.97 (0.78-1.19)	2 (1 - 4)	1.13 (0.91-1.41)
Perinatal complication history (present)	73 (9.6)	7 (9.6)	2.76 (1.13- 6.71)*	3 (4.1)	1.97 (0.54-7.11)
Childhood trauma scale total score (continuous)	32 (28 - 39)	34 (30 - 45)	1.03 (0.99-1.05)	34 (30 - 38)	1.02 (0.98-1.07)
Family history of mental illness (present)	196 (25.8)	10 (5.1)	1.24 (0.57-2.71)	8 (4.1)	1.91 (0.74-4.92)
Self-reported mental health problem (present)	213 (28.0)	18 (8.5)	3.17 (1.53-6.58)*	12 (5.6)	3.85 (1.44-10.25)*
Psychiatric diagnosis (present)	103 (13.5)	11 (10.7)	3.16 (1.43-6.95)*	7 (6.8)	3.01 (1.1-8.19)*

* p < 0.01 (Significant after Bonferroni correction), ** p<0.001. OR: Odds Ratio.CI: Confidence Interval; a Adjusted for age, gender, family history of mental illness, and total childhood trauma score; b Adjusted for gender, family history of mental illness, and total childhood trauma score. Age was not included in these analyses as a confounding variable to avoid multicollinearity. DUDIT: Drug Use Disorders Identification Test

economic difficulties with substance use (Bahji et al., 2021). Our results show that smoking and alcohol use increase as students progress to higher academic years, likely due to more on-call shifts, intense study hours, and residency exam stress. Future research on motivational factors behind substance use in medical students could help explain the high prevalence of tobacco, alcohol, and substance use in this group, given their future roles in prevention and treatment.

Our findings also show a significant relationship between perinatal complications and substance use. Previous studies have linked perinatal complications to mental disorders like ADHD, impulse control, and psychotic disorders, often co-occurring with substance use disorders (Mansur et al., 2017). However, no study has directly examined this link. We did not determine specific psychiatric diagnoses alongside substance use but only general mental health problems and past diagnoses, which could have influenced the results. The retrospective collection of perinatal data may have introduced recall bias, requiring caution. Prospective studies with more detailed evaluations are needed.

This study found a significant relationship between all CTQ-28 subscales and cigarette smoking, but no link between

childhood trauma and alcohol/substance use. Systematic reviews show associations between smoking and childhood trauma, and trauma is also linked to an increased risk of alcohol and substance use, with earlier onset and greater dependence severity (Conway & Lewin, 2022). Research additionally suggests that gender differences exist in the relationships between different types of childhood trauma and alcohol or substance use disorders. It is further recommended that a range of biopsychosocial dimensions, such as age, gender, ethnicity, marital status, culture, and family history, be considered when investigating the relationship between childhood trauma and alcohol/substance use (Cabanis et al., 2021). The lack of a significant association in our study could be due to confounding factors, sample characteristics, and the small number of individuals with risky alcohol or substance use, reducing statistical power.

Limitations and Directions/Suggestions for Future Research

Our study has several limitations but also notable strengths. A key strength of our study is the large sample, which includes most students from the faculty, enhancing

representativeness. This is the first study to explore cigarette, alcohol, and substance use among medical students in Eastern Türkiye, offering insights into region-specific factors and within-country comparisons. It also examines the relationship between substance use and factors like internal migration and perinatal complications. Regarding limitations, while the participation rate was high, non-respondents may have different substance use patterns, affecting the results. The small number of individuals with risky drinking or problematic substance use limits the statistical power, requiring replication. Due to low cell frequencies for some outcomes, several estimates could not be calculated and appear as "N/A" in Tables 2 and 3. Another limitation of this study is the low prevalence of several outcomes (2–4%), which reduced the statistical precision of the corresponding estimates. This is reflected in the wide confidence intervals observed in the regression analyses, and these results should therefore be interpreted with caution. Future studies with larger and more diverse samples would allow more stable estimation of effects for rare outcomes. The cross-sectional design prevents causal conclusions, and the results may not apply to the broader population. The study also relied on self-reports, which may lead to underestimation due to possible withholding of information. Finally, without biological measurements, self-reports remain the main data source, though research shows both methods yield consistent results.

The prevalence of alcohol use, risky alcohol use, substance experimentation, and illicit substance use among students at a medical faculty in Eastern Türkiye appears moderately lower compared to rates reported in Western Türkiye. However, these levels are still considerable and cannot be overlooked. Furthermore, the factors identified concerning tobacco, alcohol, and substance use (history of rural-to-urban migration, mental health history, perinatal complications, childhood traumas, gender, age, and place of residence) underscore the multidimensional nature of this issue.

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Author contributions

Conception: H.O.T., B.A., U.K.; Design: H.O.T., B.A.; Data acquisition: M.I., U.K.; Data analysis: M.I., U.K.; Data interpretation: H.O.T., B.A.; Drafting of the manuscript: H.O.T., B.A., M.I., U.K.; Critical revision of the manuscript: H.O.T., B.A. All authors reviewed the results, approved the final version of the manuscript, and agreed to be accountable for all aspects of this study.

Ethical approval

This study was approved by the Non-Interventional Clinical Research Ethics Committee of Van Yüzüncü Yıl University (Date: December 6, 2019, Decision/Protocol No: 2019/17-08). Informed consent was obtained from all participants involved in this study.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare that this study was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Generative AI statement

The authors declare that no generative AI or AI-assisted technologies were used in the writing or preparation of this study.

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