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Association between sociodemographic factors and alcohol consumption among adults aged 18–69 years in Kazakhstan: a cross-sectional study

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ABSTRACT

Objective The aim of this study is to analyse the prevalence and characteristics of alcohol consumption including the patterns of heavy episodic drinking, among the adult population of Kazakhstan (18–69 years old) and identify key socio-demographic and regional factors influencing alcohol use.

Design/methods A cross-sectional, population-based study was conducted from October 2021 to May 2022. Data were collected via face-to-face interviews using the standardised WHO STEPwise approach.

Setting and participants The sample included 6720 adults aged 18–69 years from all 17 regions of Kazakhstan.

Results Among participants, 54.1% had ever consumed alcohol, 42.5% in the past 12 months and 23.7% in the past month. Men had higher adjusted odds of alcohol consumption in the past 30 days (adjusted OR 1.57; 95% CI: 1.37 to 1.81) and heavy episodic drinking (adjusted OR 1.80; 95% CI: 1.44 to 2.24) compared with women. Younger adults (18–24 years) had lower odds of alcohol consumption (adjusted OR 0.61; 95% CI: 0.45 to 0.83) and heavy episodic drinking (adjusted OR 0.59; 95% CI: 0.37 to 0.94). Russians and Ukrainians had significantly higher adjusted odds of alcohol consumption (adjusted OR 1.48; 95% CI: 1.11 to 1.98 and OR 1.85; 95% CI: 1.14 to 3.01, respectively). Significant regional differences were found, with higher alcohol use in the northern regions and major cities. Smoking was strongly associated with alcohol consumption (adjusted OR 3.08; 95% CI: 2.65 to 3.57) and heavy episodic drinking (adjusted OR 3.72; 95% CI: 3.05 to 4.54). Education, occupation and marital status were not significant determinants.

Conclusions The findings highlight the complexity of alcohol consumption patterns in Kazakhstan and the need for targeted public health interventions tailored to gender, age, ethnicity and region.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ A nationally representative multistage, stratified, cluster sampling method was used to ensure the representativeness of the sample across all 17 regions of Kazakhstan.
⇒ A large sample size (n=6720) covering diverse population groups, including urban and rural residents and multiple ethnic groups, strengthens the reliability of the findings.
⇒ The standardised WHO STEPwise methodology was applied, allowing for comparability with international studies.
⇒ The cross-sectional design limits causal inference, and the associations observed should be interpreted as correlational rather than causal; additionally, selection bias is possible due to non-participation of individuals with potentially different alcohol consumption patterns.
⇒ The study was conducted during the COVID-19 pandemic (2021–2022), which may have influenced alcohol consumption behaviours, healthcare access and survey participation.

BACKGROUND

Globally, alcohol consumption remains a major public health concern. In 2016, the average annual consumption of pure alcohol per adult (≥15 years old) was 6.4 L, and by 2019, this figure slightly decreased to 5.5 L, according to the WHO Global Status Report on Alcohol and Health.[1 2] One in five adults reported at least one episode of binge drinking in the past month, increasing the risk of serious harm such as injury. Central, Eastern and Western Europe have higher per capita consumption (11.64, 11.55 and 11.13 L, respectively) and higher percentages of alcohol abuse (49.5%, 46.9% and 40.2%, respectively). In North Africa and the Middle East, the lowest per capita alcohol consumption (0.90 L of pure alcohol) and the lowest percentage of alcohol consumers reporting abuse (15.4%) were registered. In sub-Saharan Central Africa, the highest proportion of heavy drinking (78.9%) was noted despite relatively low per capita consumption (4.14 L).[2]

Alcohol dependence is the most common form of addiction. In 2015, an estimated 63.5 million cases of alcohol dependence were recorded worldwide. The global alcohol-related mortality rate was 33.0 deaths per 100 000 people per year. Alcohol consumption was ranked seventh among risk factors contributing to early death and disability globally.[3] The Global Status Report on Alcohol and Health by the WHO[1] for 2018 established that in 2016, harmful alcohol consumption caused approximately 3 million deaths (or 5.3% of all deaths), which is more than hypertension and diabetes combined. It is estimated that in 2016, 2.3 billion people currently consumed alcohol, and 283 million people aged 15+ had alcohol use disorders (5.1% of adults).

In 2002, the global economic burden associated with alcohol ranged from US$210 billion to US$665 billion.[4] When assessing the economic impact of alcohol in 12 countries, it was found to account for 0.45%–5.44% of gross domestic product.[5]

Among Central Asian countries, Kazakhstan leads in alcohol consumption levels. According to the 2018 WHO report, per capita alcohol consumption in Kazakhstan was 7.7 L, significantly exceeding the global average of 6.4L and the levels observed in neighbouring countries, such as Uzbekistan (2.7 L). However, the latest WHO report from 2024 recorded a decrease in alcohol consumption in Kazakhstan to 4.5 L per capita.[2 6] To address this public health issue, Kazakhstan has implemented a series of alcohol control policies. The national alcohol policy includes licensing restrictions that limit alcohol sales to licensed businesses, a minimum legal drinking age of 21 years, time restrictions on alcohol sales (prohibiting sales after 23:00), and a complete ban on alcohol advertising since 2004. Moreover, Kazakhstan introduced minimum pricing for alcoholic beverages to reduce affordability. In addition, the country has adopted the National Programme for 2020–2025, which focuses on preventing alcohol-related harm through evidence-based measures and promoting healthy lifestyles.[7]

Despite these regulatory efforts, the incidence of alcohol-related mental disorders remains high. In 2021, the rate was 58.1 per 100 000 population, with the highest rates observed in the Pavlodar region (174.5) and the lowest in the Turkestan region (16.0).[8] In 2010, 1.43% of Kazakhstan's population was diagnosed with alcohol dependence according to official data, whereas the WHO estimated the prevalence at 5.2%,[9] indicating the need for more objective and large-scale research on alcohol consumption in Kazakhstan.

Previous studies[10 11] have reported significant differences in alcohol-related mortality rates and alcohol and tobacco consumption among different ethnic groups in Kazakhstan. These studies reveal important trends, such as higher mortality rates among Slavic men and women and higher levels of alcohol and tobacco consumption among ethnic Russians. Cockerham *et al* confirm that non-Russians and non-Muslims in Kazakhstan consume alcohol less frequently than Russians and Muslims.[12] However, these studies cover limited samples and do not reflect the complete picture of Kazakhstan's population. A comprehensive study considering various demographic and social factors is necessary to determine the predictors of alcohol consumption.

The aim of this study is to analyse the prevalence and characteristics of alcohol consumption, including the patterns of heavy episodic drinking (HED), among the adult population of Kazakhstan (18–69 years old) and identify key sociodemographic and regional factors influencing alcohol use.

METHODS

Study design and sample

This cross-sectional, nationally representative study was conducted among the adult population of Kazakhstan between October 2021 and May 2022. A total of 6720 individuals aged 18–69 years were recruited from all 17 regions of the country, including the cities of Astana, Almaty and Shymkent. The primary hypothesis of this study was that sociodemographic characteristics (age, sex, marital status, education level and smoking status) are significantly associated with alcohol consumption patterns and HED among adults in Kazakhstan.

Study context

Kazakhstan is administratively divided into 14 regions, 3 cities of republican significance (Astana, Almaty and Shymkent) and 177 districts. The country's population of approximately 20 million people is predominantly urban, despite its low population density (6 people per square kilometre).[13]

Sampling

A multistage, stratified and cluster sampling method was employed in accordance with WHO STEPS methodology.[14] The target population consisted of adults aged 18–69 years, stratified into four age groups: 18–29, 30–44, 45–59 and 60–69 years. The sample size was calculated using the WHO STEPS sample size calculator, assuming a hypothesised prevalence of 50%, a SE of 5%, a design effect of 1.5, and an expected response rate of 70%, resulting in a minimum required sample size of 6585 participants.

Sampling steps

1. Selection of the primary sampling units (PSUs)—districts and cities.
   PSUs (clusters) were proportionally selected across all economic regions of Kazakhstan. Information about districts and cities was obtained from the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, Bureau of National Statistics. Using STEPSsampling.xls, we sampled 60 PSUs out of 266 cities and districts.
2. Selection of the secondary sampling unit (SSU)—primary healthcare facilities (PHCs).

In each of the 60 selected PSUs, we aimed for 4 PHC facilities, totalling 240 SSUs. Data were taken from The Republican State Enterprise on the Right of Economic Management 'Republican Center for Healthcare Development' under the Ministry of Health of the Republic of Kazakhstan. A register of PHC facilities was obtained, including the population served by each. From each selected PSU, using STEPSsampling.xls, four SSUs (PHC facilities) were randomly chosen with probability proportional to the population served.

3. Selection of the tertiary sampling unit (TSU)—households and respondents. Households served as the TSUs. The number of households per PHC facility was calculated as follows:
   Household size per PHC facility=6585/240=28.
   Then we calculated final total sample size:
   Total sample size=240×28=6720.

A list of households served by the 240 selected PHC facilities was obtained, and households were randomly selected using Randhold.xls. Within each selected household, respondents aged 18–69 were chosen via the Kish methodology, which employs a stratified random selection based on the gender and age of eligible household members.

Data collection

Data collection teams received prior training following WHO STEPS protocols. After obtaining informed consent, face-to-face interviews and physical/biochemical measurements were performed on the same day.

Data variables

The data collection instrument was a standardised WHO STEPS questionnaire[14] (https://www.who.int/publications/m/item/standard-steps-instrument). Data collection included three components. In the first stage, information on sociodemographic and behavioural risk factors was obtained, including age, sex, ethnicity, place of residence (urban/rural), education, occupation, marital status, tobacco use, alcohol consumption, physical activity and dietary habits (fruit and vegetable intake). In the second stage, physical measurements were performed, including weight, height, waist and hip circumference, blood pressure, and heart rate. The third stage involved biochemical assessments based on venous blood samples to determine fasting blood glucose and total cholesterol levels.

Assessment of alcohol consumption

Alcohol consumption patterns were assessed using the alcohol module of the WHO STEPS instrument. A standard drink was defined as containing 10 g of pure ethanol. Participants were asked about lifetime alcohol use, alcohol consumption in the past 12 months, cessation of alcohol use due to health reasons, alcohol consumption within the past 30 days and the frequency of heavy drinking occasions during the past month. Additionally, past-week alcohol consumption was assessed using a 7-day recall of daily intake. The survey also included questions on unrecorded alcohol consumption (homebrewed or smuggled alcohol, or alcohol not intended for drinking) and alcohol-related family problems in the past 12 months.

Dependent variables

Two main dependent variables were analysed in this study:

Alcohol consumption in the past 30 days—defined as self-reported consumption of any alcoholic beverages during the past 30 days (yes/no).

HED—defined according to the WHO criteria as the consumption of six or more standard drinks (equivalent to ≥60 g of pure ethanol) on at least one occasion within the past 30 days.[1] Participants reporting such consumption were classified as engaging in HED.

Independent variables

Independent variables included sociodemographic and behavioural factors: age, sex, ethnicity, geographical location, marital status, education level, occupation and smoking status.

Statistical analysis

Data were preprocessed in Microsoft Excel and analysed using SPSS V.24.0 for Windows. The Kolmogorov-Smirnov test was used to assess the normality of continuous variables. To evaluate differences in continuous variables between two groups, the Student's t-test was applied. For categorical variables, descriptive statistics, including frequencies and percentages, were computed to characterise the distribution of the data. The Pearson χ^2 test was employed to assess the statistical significance of differences across categorical variables. Statistical significance was determined at a two-sided p value threshold of <0.05. This criterion was consistently applied to guide the interpretation of all statistical analyses conducted in this study.

To assess the associations between independent variables and two dependent variables—alcohol consumption in the past 30 days and HED—binary logistic regression analysis was conducted. Both unadjusted (crude) and adjusted models were estimated. The adjusted binary logistic regression model included all independent variables as covariates to control for potential confounding. These variables were age, sex, ethnicity, geographical location, marital status, education level, occupation and smoking status. The results are presented as ORs with 95% CIs, allowing for the interpretation of both crude and adjusted associations.

Handling of missing data

Missing responses were classified as 'no answer' and were reported separately in the descriptive analyses to ensure transparency. For the logistic regression models, cases with missing responses in independent variables were excluded using listwise deletion. The proportion of missing data was low, accounting for 1.70% in education, 0.43% in occupation and 0.13% in marital status. Given the minimal percentage of missing values, their exclusion

was not expected to affect the representativeness of the sample or the validity of the findings.

To visualise the prevalence of alcohol consumption in various regions of Kazakhstan, a map was created based on survey data using the Datawrapper free tool.

RESULTS

The study sample consisted of 6720 participants aged 18–69 years (mean age=40.8 ± 13.9 years; median=39 years), of whom 3365 (50.1%) were men and 3355 (49.9%) were women. The majority were Kazakhs (65.1%) and Russians (23.1%). Among participants, 64.2% had higher or postgraduate education, 19.1% were current smokers, and 12.0% were former smokers.

In total, 54.1% (95% CI: 53.0% to 55.3%) of participants reported having ever consumed alcohol, 42.5% (95% CI: 41.2% to 43.7%) reported alcohol use within the past 12 months, and 23.7% (95% CI: 22.7% to 24.7%) reported alcohol consumption within the past 30 days (online supplemental table S1).

Men reported significantly higher alcohol consumption across all indicators. Ever alcohol consumption was reported by 61.2% of men and 46.9% of women ($\chi^2(1, N=6720)=137.8$, $p<0.001$). In the past 30 days, 59.1% of men and 50.9% of women consumed alcohol ($\chi^2(1, N=2858)=31.6$, $p<0.001$).

In the 18–24 age group, non-drinkers prevailed (64.3% (95% CI: 61.2% to 67.3%)), while higher drinking rates were observed in older groups ($\chi^2(4, N=6720)=179.7$, $p<0.001$). Ethnic differences were evident: Russians and Ukrainians exhibited the highest prevalence of alcohol consumption (74.0% (95% CI: 71.8% to 76.1%) and 80.0% (95% CI: 71.6% to 86.4%), respectively), while Uzbeks had the lowest (28.2% (95% CI: 22.5% to 34.8%)). Private sector employees and entrepreneurs were more likely to have ever consumed alcohol and to have consumed it in the past 12 months. The lowest proportion was among students and unemployed individuals unable to work.

Smoking was significantly associated with alcohol consumption. Among smokers, 81.4% (95% CI: 79.8% to 83.0%) had ever consumed alcohol vs 47.6% (95% CI: 46.0% to 49.2%) of non-smokers ($\chi^2(1, N=6720)=477.1$, $p<0.001$). Similar patterns were observed for consumption in the past 12 months and 30 days. Divorced, widowed and participants in civil unions also demonstrated higher alcohol consumption rates ($\chi^2(6, N=6720)=212.4$, $p<0.001$). Educational level did not show significant differences in alcohol consumption prevalence ($\chi^2(6, N=6720)=3.3$, $p=0.19$).

Regional analysis revealed significant geographical differences ($\chi^2(16, N=6720)=563.2$, $p<0.001$). The highest rates of ever drinking were observed in Akmola, Astana, Karaganda, Kostanay, Pavlodar and North Kazakhstan regions (76.5%–85.7%). In contrast, Atyrau and Shymkent reported the lowest rates (24.7% and 12.7%, respectively) (figure 1).

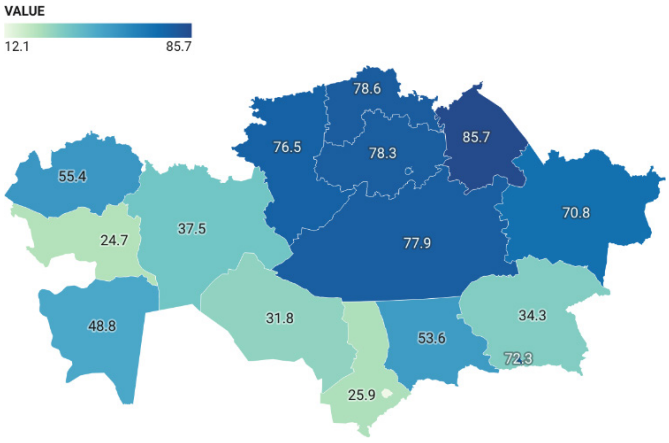

Figure 1 Distribution of respondents who have ever drunk alcohol by regions of Kazakhstan.

Regarding drinking patterns, 8.2% of respondents reported engaging in HED, with 5.8% reporting infrequent (1–2 episodes) and 2.4% frequent HED (>3 episodes) (table 1). Alcohol consumption peaked towards the weekend, with Saturday showing the highest average intake (2.99 standard drinks). Among past-month drinkers, 17.7% reported consuming unregistered alcohol.

Family problems related to alcohol were rare and did not differ significantly by gender ($\chi^2(4, N=3664)=2.1$, $p=0.15$). Among those who reported such problems, 4.2% experienced them 1–2 times in the past 12 months.

In the adjusted regression analysis (table 2), the odds of alcohol consumption in the past 30 days were 1.573 times higher among men compared with women ($p<0.001$). Participants aged 18–24 had significantly lower odds (OR=0.61, 95% CI: 0.45 to 0.83, $p=0.002$) compared with older groups. Ethnic minorities such as Russians and Ukrainians had higher adjusted odds compared with Kazakhs (adjusted OR=1.48, 95% CI: 1.11 to 1.98 and OR=1.85, 95% CI: 1.14 to 3.01, respectively). Regionally, the highest odds were observed in Akmola, Karaganda, Pavlodar and North Kazakhstan regions, while the lowest were in Atyrau and southern regions. Smoking remained a strong predictor of alcohol consumption (adjusted OR=3.08, 95% CI: 2.65 to 3.57, $p<0.001$).

For HED, men (adjusted OR=1.80, 95% CI: 1.44 to 2.24, $p<0.001$) and smokers (adjusted OR=3.72, 95% CI: 3.05 to 4.54, $p<0.001$) had higher odds. Younger participants (18–24 years) were less likely to engage in HED (adjusted OR=0.587, 95% CI: 0.37 to 0.94, $p=0.02$). Regionally, Akmola residents demonstrated the highest adjusted odds of HED (adjusted OR=3.45, 95% CI: 1.94 to 6.14, $p<0.001$). Education, occupation and marital status were not significantly associated with HED (table 3).

DISCUSSION

The results of this study provide a comprehensive overview of alcohol consumption patterns and the factors influencing them in Kazakhstan. The data show significant

Table 1 Characteristics and patterns of alcohol consumption in Kazakhstan

Variable	Sex			
	Men	Women	Both	χ^2(df, N), p value
Heavy episodic drinking in the past 30 days (n=6720)				
0 days	88.5 (87.5–89.6)	95.1 (94.3–95.8)	91.8 (91.1–92.4)	χ^2(3, N=6720)=179.7, p<0.001*
1 day	5.3 (4.6–6.1)	2.7 (2.1–3.2)	4.0 (3.5–4.5)	
2 days	2.5 (2.0–3.0)	1.1 (0.7–1.5)	1.8 (1.5–2.1)	
3 or more days	3.6 (3.0–4.3)	1.2 (0.8–1.6)	2.4 (2.0–2.8)	
Average consumption of one or more standard drinks among current drinkers, mean±SD				
Monday	2.32±1.5	2.41±2.9	2.37±2.4	≥0.05
Tuesday	2.47±2	1.93±1.6	2.34±1.9	≥0.05
Wednesday	2.31±2.6	1.72±1.1	2.16±2.4	≥0.05
Thursday	2.52±2.1	1.77±1	2.43±1.9	≥0.05
Friday	3.05±2.4	2.59±2.8	2.92±2.5	≥0.05
Saturday	3.13±2.4	2.66±2.9	2.99±2.6	≥0.05
Sunday	3.24±2.8	1.8±1.5	2.72±2.5	0.0001*
Consumed unregistered alcohol among participants who consumed alcohol in the last 30 days (n=1592)	9.3 (7.5–11.1)	7.8 (5.7–10.0)	8.7 (7.3–10.1)	χ^2(1, N=1592)= 2.5, p≥0.05
Family problems related to alcohol in the last 12 months (n=3664)				
Yes, more than once a month	0.5 (0.2–0.8)	0.9 (0.5–1.4)	0.7 (0.4–1.0)	χ^2(4, N=3664)=2.6, p=0.63
Yes, monthly	0.5 (0.2–0.8)	0.5 (0.2–0.8)	0.5 (0.3–0.7)	
Yes, several times, but less than once a month	1.0 (0.6–1.4)	1.1 (0.6–1.7)	1.1 (0.7–1.4)	
Yes, 1 or 2 times	4.1 (3.2–4.9)	4.4 (3.4–5.4)	4.2 (3.6–4.9)	
Never	93.9 (92.9–94.9)	92.9 (91.6–94.2)	93.5 (92.7–94.3)	

*Statistically significant difference

differences in the levels of alcohol consumption and HED across various demographic groups and regions, highlighting the complexity of alcohol-related behaviour in the country.

One of the most notable findings is the pronounced gender disparity in alcohol consumption and HED. Men were significantly more likely to have consumed alcohol in the past 30 days and to report episodes of HED compared with women, which is consistent with international studies showing that men generally exhibit higher levels of alcohol consumption and a greater prevalence of related behaviours.[15 16] These differences are driven by both biological and socio-cultural factors. Women are more sensitive to the toxic effects of alcohol due to physiological characteristics such as differences in metabolism, hormonal profiles and a lower percentage of body water.[15]

Sociocultural characteristics of Kazakhstani society also play a crucial role, where elements of patriarchy and traditional perceptions of gender roles persist. Alcohol consumption by men is often perceived as socially acceptable or even expected behaviour, while for women it may be condemned, especially in the context of excessive or public drinking. Women are more likely to perform traditional family and household roles, which reduces their involvement in alcohol-related practices.

Age plays an important role in the pattern of alcohol consumption. In our study, youth aged 18–24 years had significantly lower odds of alcohol use and HED, which is consistent with modern research showing a decline in alcohol consumption among young people in several countries.[17 18] In Kazakhstan, this trend may be explained by a combination of factors, including the persistence of strong family-oriented and religious values, especially in the southern and rural regions, where young people often continue living with their parents and adhere to traditional behavioural norms. Additionally, the growing religiosity among youth contributes to limiting their involvement in alcohol-related practices. Socioeconomic barriers also play an important role, as limited income among young people, combined with the high cost of alcoholic beverages, may reduce alcohol accessibility.

It is important to note that these findings contrast with trends documented in several Western countries, where youth continue to exhibit or even increase rates of high-intensity and binge drinking (high-intensity drinking).[19 20]

Table 2 Predictors of alcohol consumption in the past 30 days

Variable	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Gender				
Men	1.870 (1.666 to 2.099)	0.0001	1.573 (1.365 to 1.813)	0.0001
Women	1		1	
Age groups				
18–24	0.502 (0.399 to 0.632)	0.0001	0.610 (0.448 to 0.831)	0.002
25–34	1.061 (0.895 to 1.257)	0.495	0.888 (0.712 to 1.107)	0.291
35–44	1.361 (1.151 to 1.610)	0.0001	1.158 (0.932 to 1.439)	0.185
45–54	1.140 (0.954 to 1.364)	0.150	1.022 (0.818 to 1.277)	0.851
55+	1		1	
Ethnicity				
Kazakh	0.592 (0.459 to 0.764)	0.0001	0.841 (0.632 to 1.119)	0.235
Russian	1.608 (1.236 to 2.092)	0.0001	1.480 (1.106 to 1.980)	0.008
Uzbek	0.293 (0.174 to 0.494)	0.0001	0.819 (0.456 to 1.472)	0.505
Ukrainian	2.065 (1.319 to 3.231)	0.0001	1.852 (1.138 to 3.013)	0.013
Uyghur	0.857 (0.389 to 1.887)	0.702	0.804 (0.341 to 1.896)	0.618
Tatar	1.233 (0.779 to 1.951)	0.370	0.804 (0.341 to 1.896)	0.471
Other	1		1	
Education level				
No formal education	0.526 (0.266 to 1.039)	0.064	1.623 (0.778 to 3.382)	0.197
Completed primary education (4 grades)	0.326 (0.042 to 2.558)	0.286	0.155 (0.018 to 1.312)	0.087
Completed secondary education (9 grades)	0.865 (0.660 to 1.133)	0.292	0.644 (0.467 to 0.888)	0.007
Completed secondary education (11 grades)	0.885 (0.744 to 1.052)	0.167	0.821 (0.660 to 1.022)	0.078
Higher education	1.134 (0.972 to 1.323)	0.110	1.094 (0.910 to 1.316)	0.338
Master's/PhD/Doctorate	1		1	
Occupation				
Government employee	2.384 (0.714 to 7.963)	0.158	2.212 (0.595 to 8.223)	0.236
Private sector employee	3.580 (1.080 to 11.862)	0.037	2.508 (0.685 to 9.182)	0.165
Budget employee	2.240 (0.670 to 7.490)	0.190	2.205 (0.592 to 8.213)	0.239
Entrepreneur	3.705 (1.106 to 12.410)	0.034	2.476 (0.664 to 9.231)	0.177
Agriculture worker	1.651 (0.401 to 6.790)	0.487	1.411 (0.302 to 6.584)	0.662
Student	0.959 (0.273 to 3.365)	0.948	1.201 (0.304 to 4.748)	0.794
Housewife	1.505 (0.444 to 5.101)	0.511	2.092 (0.552 to 7.921)	0.299
Pensioner	2.179 (0.650 to 7.311)	0.207	1.719 (0.456 to 6.483)	0.424
Unemployed (able to work)	1.975 (0.579 to 6.735)	0.277	2.227 (0.585 to 8.475)	0.240
Unemployed (unable to work)	1		1	
Marital status				
Married	1.007 (0.892 to 1.135)	0.915	0.979 (0.846 to 1.133)	0.774
Not married	1			
Place of residence				
Astana city	0.968 (0.525 to 1.785)	0.916	5.246 (3.268 to 8.419)	0.0001
Almaty city	1.060 (0.581 to 1.935)	0.848	5.437 (3.416 to 8.654)	0.0001
Akmola	2.234 (1.179 to 4.234)	0.014	8.177 (5.056 to 13.224)	0.0001
Aktobe	0.273 (0.133 to 0.557)	0.0001	1.107 (0.609 to 2.011)	0.739
Almaty	0.528 (0.278 to 1.005)	0.052	1.740 (1.050 to 2.882)	0.032
Atyrau	0.761 (0.348 to 1.666)	0.495	0.886 (0.469 to 1.674)	0.710

Continued

Table 2 Continued

Variable	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
West Kazakhstan	1.817 (0.881 to 3.746)	0.106	4.745 (2.796 to 8.053)	0.0001
Zhambyl	1.311 (0.699 to 2.458)	0.398	4.247 (2.634 to 6.847)	0.0001
Karaganda	1.685 (0.916 to 3.096)	0.093	7.699 (4.808 to 12.328)	0.0001
Kostanay	1.920 (1.027 to 3.590)	0.041	10.919 (6.763 to 17.630)	0.0001
Kyzylorda	1.493 (0.713 to 3.130)	0.288	2.067 (1.214 to 3.521)	0.007
Mangystau	1.560 (0.802 to 3.035)	0.190	4.066 (2.461 to 6.717)	0.0001
Turkestan	0.603 (0.310 to 1.172)	0.136	1.354 (0.807 to 2.273)	0.251
Pavlodar	1.798 (0.964 to 3.354)	.065	8.915 (5.475 to 14.517)	0.0001
North Kazakhstan	1.329 (0.684 to 2.582)	0.401	6.533 (3.868 to 11.035)	0.0001
East Kazakhstan	1.277 (0.691 to 2.360)	0.435	5.659 (3.539 to 9.050)	0.0001
Shymkent city	1		1	
Smoking status				
Smokers	3.992 (3.506 to 4.544)	0.0001	3.075 (2.651 to 3.566)	0.0001
Non-smokers	1		1	

Ethnicity was found to be a significant predictor of alcohol consumption. Individuals of Russian and Ukrainian ethnic groups demonstrated significantly higher odds of both alcohol use and participation in HED. These findings are consistent with existing evidence indicating that alcohol has traditionally played a more prominent role in the culture and social practices of the Russian-speaking population of Kazakhstan.[10 11] Sharygin and Guillot[10] noted that processes of urbanisation, migration, and Russification during the Soviet and post-Soviet periods contributed to the preservation of behavioural patterns typical of Slavic countries, including a more liberal attitude towards alcohol consumption, which is further reinforced by cultural norms related to social interaction, leisure and celebrations.

In contrast, Kazakhs, Uzbeks and other Turkic ethnic groups generally display more restrained patterns of alcohol consumption. This is largely explained by the dominant influence of Islam, which imposes restrictions on the consumption of alcoholic beverages, as well as traditional behavioural norms within families and communities. Davletov *et al*[11] emphasised that these differences may partially account for the ethnic disparities observed in Kazakhstan in terms of mortality and morbidity rates, including alcohol-related mortality.

The study identified significant regional differences in alcohol consumption. Higher consumption rates were observed in major cities like Astana and Almaty and northern regions such as Akmola, Karaganda, Pavlodar and North Kazakhstan. In the northern regions of Kazakhstan, Russians make up about 30%–35% of the population, while Kazakhs predominate in the southern regions, where the proportion of Russians is 2%–6%.[13] According to the 2021 census, in urban areas, Muslims constitute 64.45% on average, with significant regional differences: 93.91% in Kyzylorda and 91.82% in Turkestan regions, compared with 34.74% and 35.72% in the cities of North Kazakhstan and Kostanay regions, respectively. The highest percentage of Christians in urban areas is recorded in these last two regions (59.83% and 44.86%, respectively), while the average share of Christians in Kazakhstani cities is only 20.59%.[21] These factors may explain the high alcohol consumption in the northern regions and the lower rates in the south.

A strong association was also found between smoking and alcohol consumption: smokers had significantly higher odds of both alcohol use and participation in HED. This finding is consistent with previous studies consistently identifying a close link between these two risk behaviours. According to Romberger and Grant,[22] approximately 80% of individuals with alcohol dependence are also smokers, and the co-use of alcohol and tobacco often reinforces both behaviours through both behavioural and biochemical mechanisms. The interaction between these substances involves shared neurobiological pathways contributing to dependence, as well as social and behavioural factors, such as the common habit of consuming alcohol and tobacco together in various social settings.

Moreover, studies show that smokers tend to engage in higher and more regular alcohol consumption. For example, Britton *et al*[23] demonstrated that among daily smokers, the likelihood of alcohol use and participation in HED is significantly higher compared with non-smokers and that the greater the intensity of smoking, the higher the probability of consuming large amounts of alcohol. This supports the hypothesis of a synergistic effect between smoking and alcohol consumption.

Despite its strengths, several methodological limitations should be considered. The cross-sectional design does not allow for establishing causality between alcohol consumption and its associated factors, limiting interpretation to

Table 3 Predictors of HED in the past 30 days

Variable	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Gender				
Men	2.520 (2.085 to 3.045)	0.0001	1.800 (1.444 to 2.244)	0.0001
Women	1		1	
Age groups				
18–24	1.304 (0.962 to 1.768)	0.087	0.587 (0.368 to 0.935)	0.025
25–34	0.959 (0.765 to 1.203)	0.718	0.840 (0.612 to 1.155)	0.284
35–44	0.956 (0.766 to 1.193)	0.688	1.079 (0.793 to 1.468)	0.630
45–54	1.225 (0.973 to 1.543)	0.085	0.956 (0.691 to 1.322)	0.786
55+	1		1	
Ethnicity				
Kazakh	0.871 (0.633 to 1.200)	0.400	1.026 (0.656 to 1.604)	0.910
Russian	1.310 (0.940 to 1.824)	0.111	1.485 (0.945 to 2.336)	0.087
Uzbek	0.672 (0.345 to 1.309)	0.243	1.200 (0.572 to 2.519)	0.630
Ukrainian	1.548 (0.875 to 2.741)	0.134	1.506 (0.720 to 3.151)	0.277
Uyghur	0.726 (0.281 to 1.878)	0.509	0.502 (0.062 to 4.041)	0.517
Tatar	0.973 (0.546 to 1.736)	0.927	1.502 (0.698 to 3.232)	0.298
Other	1		1	
Education level				
No formal education	0.696 (0.248 to 1.947)	0.489	0.796 (0.270 to 2.350)	0.680
Completed primary education (4 grades)	1.182 (0.150 to 9.334)	0.874	1.147 (0.129 to 10.209)	0.902
Completed secondary education (9 grades)	0.886 (0.576 to 1.363)	0.582	0.847 (0.525 to 1.367)	0.497
Completed secondary education (11 grades)	0.918 (0.698 to 1.207)	0.539	1.002 (0.725 to 1.384)	0.992
Higher education	1.228 (0.966 to 1.561)	0.094	1.306 (0.999 to 1.707)	0.051
Master's/PhD/Doctorate	1		1	
Occupation				
Government employee	0.692 (0.204 to 2.349)	0.555	0.548 (0.147 to 2.042)	0.370
Private sector employee	1.007 (0.303 to 3.349)	0.991	0.643 (0.177 to 2.344)	0.504
Budget employee	0.575 (0.168 to 1.963)	0.377	0.488 (0.130 to 1.831)	0.288
Entrepreneur	1.238 (0.365 to 4.200)	0.732	0.788 (0.212 to 2.931)	0.722
Agriculture worker	0.754 (0.156 to 3.631)	0.724	0.454 (0.086 to 2.400)	0.352
Student	0.182 (0.043 to 0.772)	0.021	0.271 (0.057 to 1.281)	0.100
Housewife	0.418 (0.118 to 1.482)	0.177	0.586 (0.150 to 2.292)	0.443
Pensioner	0.480 (0.138 to 1.665)	0.247	0.376 (0.097 to 1.458)	0.157
Unemployed (able to work)	0.762 (0.217 to 2.682)	0.672	0.672 (0.174 to 2.591)	0.564
Unemployed (unable to work)	1		1	
Marital status				
Married	1.296 (1.067 to 1.574)	0.009	1.103 (0.885 to 1.375)	0.383
Not married	1		1	
Place of residence				
Astana city	1.620 (0.898 to 2.924)	0.109	1.129 (0.608 to 2.095)	0.701
Almaty city	1.368 (0.765 to 2.448)	0.291	0.951 (0.516 to 1.750)	0.871
Akmola	4.516 (2.627 to 7.762)	0.0001	3.453 (1.943 to 6.139)	0.0001
Aktobe	0.982 (0.485 to 1.987)	0.959	0.895 (0.434 to 1.849)	0.765
Almaty	1.557 (0.880 to 2.754)	0.128	1.554 (0.867 to 2.788)	0.139
Atyrau	1.055 (0.528 to 2.108)	0.879	1.032 (0.507 to 2.101)	0.930

Continued

Table 3 Continued

Variable	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
West Kazakhstan	2.093 (1.085 to 4.038)	0.028	1.885 (0.947 to 3.752)	0.071
Zhambyl	1.854 (1.041 to 3.303)	0.036	1.276 (0.698 to 2.332)	0.428
Karaganda	1.854 (1.041 to 3.303)	0.0001	1.276 (0.698 to 2.332)	0.019
Kostanay	4.324 (2.510 to 7.449)	0.0001	3.631 (2.040 to 6.462)	0.0001
Kyzylorda	1.894 (1.030 to 3.483)	0.040	1.628 (0.866 to 3.061)	0.130
Mangystau	1.505 (0.796 to 2.847)	0.209	1.172 (0.601 to 2.285)	0.641
Turkestan	1.784 (1.020 to 3.119)	0.042	1.523 (0.850 to 2.729)	0.154
Pavlodar	3.051 (1.733 to 5.373)	0.0001	1.807 (0.987 to 3.311)	0.055
North Kazakhstan	1.854 (0.944 to 3.642)	0.073	1.262 (0.603 to 2.641)	0.538
East Kazakhstan	2.214 (1.261 to 3.886)	0.006	1.563 (0.867 to 2.820)	0.138
Shymkent city	1		1	
Smoking status				
Yes	4.785 (3.997 to 5.729)	0.0001	3.722 (3.052 to 4.540)	0.0001
No	1		1	

HED, heavy episodic drinking.

associations only. Although the sampling was representative, selection bias is possible due to non-participation of certain subgroups, potentially affecting prevalence estimates. Self-reported alcohol use may also be underestimated, especially in social or ethnic groups where alcohol consumption is stigmatised. Moreover, the study was conducted during the COVID-19 pandemic, which may have temporarily influenced drinking patterns and participation rates. These limitations should be considered when applying the findings to policy and intervention planning.

Overall, this study provides one of the first nationally representative assessments of alcohol consumption patterns in Kazakhstan, simultaneously addressing both general alcohol use and HED and their associations with key demographic, social and regional factors. The results reveal a complex and multifaceted picture of alcohol consumption influenced by gender, age, ethnicity, region and smoking behaviour. These findings contribute important new evidence to the limited data available on alcohol use patterns in Kazakhstan. The identified disparities highlight the urgent need for comprehensive, culturally and socially tailored prevention strategies. Effective public health interventions should consider the biological and sociocultural characteristics of different population groups and integrate combined approaches to reducing both alcohol and tobacco use. Such targeted and culturally sensitive strategies are essential to reduce the prevalence and adverse health consequences of alcohol consumption in Kazakhstan.

CONCLUSIONS

This study provides valuable insights into the complex landscape of alcohol consumption in Kazakhstan. By highlighting the key demographic, social and regional factors associated with alcohol use, it sets the stage for more informed public health policies and interventions. Future research should continue to explore these relationships and assess the effectiveness of targeted intervention strategies in reducing alcohol-related harm in Kazakhstan.

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Ethics approval This study involves human participants. The S.D. Asfendiyarov Kazakh National Medical University Local Ethics Committee approved the study, as documented in Protocol No. 12 (118) (28 September 2021). Additionally, this research was registered at ClinicalTrials.gov under the identifier NCT05122832. All methods were performed in accordance with the relevant guidelines. Informed consent was obtained from all subjects and for uneducated participants, informed consent was obtained from their guardian/legally authorised representative. Research had been performed in accordance with the Declaration of Helsinki. Participants gave informed consent to participate in the study before taking part.

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