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Gender differences in the relationship between alcohol use and depressive symptoms in St. Petersburg, Russia

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Abstract

Background—Gender differences in the relationship between alcohol use and depressive symptoms are inconsistent, and few studies have addressed this issue in Russia. Because this finding may have important implications for interventions to reduce alcohol misuse or alcohol related problems in Russia, we conducted a study to investigate whether the association between alcohol use and depressive symptoms differs by gender at high risk for HIV.

Methods—We used the Alcohol Use Disorders Identification Test (AUDIT) and the 10-item Center for Epidemiological Studies Depression Scale to measure alcohol use and depressive symptoms among 307 patients who attended a clinic for sexually transmitted infections in St. Petersburg, Russia. Logistic regression models were applied for the analysis.

Results—The comparison of data between men and women revealed a significant quadratic term of alcohol use and significant interactions between alcohol use and gender on depressive symptoms. Men with an AUDIT score in the first and fourth quartiles were more likely to report depressive symptoms in comparison to men in the second quartile. Their odds ratios (ORs) and 95% confidence intervals (CIs) were 7.54 (2.00–28.51) and 5.06 (1.31–19.63), respectively. Among women, a linear trend was observed such that those who misused alcohol were three times more likely to have depressive symptoms than those who did not misuse alcohol (OR = 3.03, 95% CI, 1.05–8.80).

Conclusion—The association between alcohol use and depressive symptoms differed by gender. Additional research is needed to investigate this relationship in Russia. Strategies to reduce alcohol-related problems in Russia may need to consider these differences.

Keywords

alcohol; depression; depressive symptoms; gender differences; Russia

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Declaration of interest

None declared.

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Introduction

Studies outside Russia have demonstrated that the association between alcohol problems and depression is well established [1–5]. Several possible explanations for this relationship have been proposed [2, 6, 7]. First, both alcohol problems and depression might share common environmental or genetic causes [8]. Second, alcohol problems may affect the development of depression through metabolic changes (e.g., alcohol problems reduce foliate metabolism, which is linked to an increased risk of depression) or through the negative effects that alcoholism has on a drinker's social, economic and legal circumstances (e.g., partner-relationship disruptions) [2, 9]. Third, because people with depression are more likely to drink alcohol to cope with negative feelings, depression might lead to alcohol problems [10]. Finally, although there appear to be more studies that support an alcoholism to depression pathway [2], there is also evidence that this association may be bidirectional; that is, both disorders simultaneously increase the risk of the other [11].

Moreover, studies in the U.S. have shown that both alcohol use and depression may differ by gender [12–16]. In general, men tend to consume more alcohol than women, and women are more likely to have depression than men [15, 16]. However, results from studies that have examined the association between alcohol use and depression by gender also show mixed and inconclusive results [17–20]. For example, one cross-sectional study observed a non-linear U-shaped relationship for men but a linear trend for women [17]. In this study, the mean HADS (Hospital Anxiety and Depression Scale) scores for depression were 4.4, 2.9, 2.6 and 5.6 for men who were non-drinker, moderate, hazardous, and harmful drinkers, respectively, suggesting a non-linear U-shaped relationship for men [17]. Another study observed a non-linear relationship among women [21], and a third study found a non-linear relationship among both men and women [7]. To our knowledge, no study in Russia has examined the existence of gender differences in the relationship between alcohol use and depression, particularly in men and women at high risk for HIV [1, 22]. A clarification of the relationship between alcohol use and depression may provide important information for interventions aimed at reducing alcohol use or alcohol related health risks.

To address these questions, we conducted a study to investigate whether the association between alcohol use and depressive symptoms differed by gender and whether a U-shaped relationship was present among 307 participants who visited a STI (sexually transmitted infection) clinic center and were enrolled in a randomized intervention trial in St. Petersburg, Russia between July 2009 and November 2010. This special group was selected because both alcohol use and depression have been linked to HIV-related behaviors and few studies have examined the association between alcohol use and depression in HIV high risk groups [23].

Materials and Methods

Participants and procedures

Four hundred seventy patients who visited a public clinic for STIs in St. Petersburg, Russia were screened for participation in a behavior intervention study. The institutional review boards of the Biomedical Center in St. Petersburg, Russia and Yale University in Connecticut, United States approved this study. An invitation was extended to the 338 adults who met the inclusion criteria of having multiple sexual partners or at least one casual partner three months prior to the interview. These potential participants were informed of the purpose of the study and were assured that the study was confidential and voluntary. Thirty-one patients refused to participate. Three hundred seven patients provided written

informed consent and completed a baseline assessment between July 2009 and November 2010. We used the baseline data before intervention for the present analysis.

A self-administered questionnaire collected data on demographics, alcohol use, drug use, sexual risk behaviors, and psychological factors. The demographics consisted of age, sex, marital status, education level, employment status, and monthly income. The Alcohol Use Disorders Identification Test (AUDIT) which includes 10 questions with a total score that ranges from 0 to 40 was used to measure alcohol use [24]. A score of 8 or higher is usually indicative of hazardous drinking [24]. The Cronbach's α for the AUDIT is 0.85 in the current sample.

The ten-item Center for Epidemiological Studies Depression Scale (CES-D-10), which is a shorter version of the 20-item CES-D that is widely used to screen for depression [25, 26], identified depressive symptoms. Each item on the CES-D-10 has four 4-point response options that range from 0 to 3. Thus, the total CES-D-10 score ranges from 0 to 30. A score of 10 or more is usually used as the cut-off value for depressive symptoms. The CES-D-10 has demonstrated good predictive accuracy when screening for depression in comparison to its full version [25]. The Cronbach's α for the CES-D-10 is 0.84 in the current sample.

Statistical analyses

Chi-square tests were used to examine whether the characteristics differed by gender. Fisher's exact test was used to compare these variables when the Chi-square test was inappropriate (i.e., in cases of small expected frequencies). A graph was plotted to preliminarily examine the effect of alcohol use on depressive symptoms by dividing the AUDIT score into quartiles and calculating the prevalence of depressive symptoms at each quartile. The quartiles were separately calculated for men and women because men and women might have different drinking patterns. The Mantel-Haenszel Chi-square test was used to preliminarily examine whether there was a linear relationship between the quartiles of alcohol use and depressive symptoms.

Multivariate logistic regression was used to examine the relationship between alcohol use and depressive symptoms. Higher order terms of continuous AUDIT scores and interaction terms between AUDIT scores and gender on depressive symptoms were included in the models to test whether there was a U-shaped relationship and whether the relationship differed by gender. If a significant interaction effect was observed, separate multivariate logistic regressions were used to determine whether alcohol use was associated with depressive symptoms for men and women. For the purpose of interpretation of the study results, AUDIT quartiles were used in the final model when a U-shaped relationship was observed, and dichotomized AUDIT (alcohol misuse vs. non-misuse) was used when a linear relationship was observed. The significance level was set at $p < 0.05$ and the data were analyzed using SAS 9.1 (SAS Institute Inc., Cary, NC).

Results

Of the 307 participants, 220 were men and 87 were women (Table 1). Men were less likely to be married and to have monthly income $< 15,000$ rubles (about 530 U.S. dollars) in comparison to women. No significant gender differences were observed for age, education, employment status, history of STIs, ever being a commercial sex worker, and intravenous drug use.

The mean (median) AUDIT scores for men and women were 13.4 (13.0) and 9.0 (7.0), respectively, and men were nearly twice as likely as women to misuse alcohol (84.1% of men vs. 44.8% of women, $p < 0.0001$). The mean (median) CES-D-10 scores for men and

women were 5.7 (5.0) and 6.9 (6.0), respectively, and men were less likely to have depressive symptoms in comparison to women (17.3% of men vs. 27.6% of women, $p = 0.04$).

The prevalence rates of depressive symptoms were 28.6%, 5.2%, 10.9% and 25.5% across the 1st to 4th quartiles of alcohol use in men, respectively (Figure 1). The Mantel-Haenszel linear trend test on these data was not significant ($p = 0.82$). The prevalence rates of depressive symptoms were 12.0%, 21.7%, 40.0% and 42.1% across the 1st to 4th quartiles of alcohol use in women, respectively. The Mantel-Haenszel linear trend test on these data, however, was significant ($p = 0.01$).

In the model with men and women included, the regression coefficients for the interaction between the first-order AUDIT score and gender ($p = 0.001$) and the interaction between quadratic term of AUDIT score and gender ($p = 0.004$) were significant. Stratification analysis was then conducted by gender.

To facilitate the interpretation of the results, we replaced the continuous AUDIT score with quartile levels of AUDIT score (Table 2). The model revealed that men in the 1st and 4th alcohol use quartiles were more likely to have depressive symptoms in comparison to those in the 2nd quartile (odds ratio [OR; and 95% CIs] for the 1st quartile: 7.54 [2.00–28.51]; for the 4th quartile: 5.06 [1.31–19.63]) after controlling for significant covariates, such as employment status, as well as histories of STIs and intravenous drug use. There were no significant differences between the 2nd and 3rd alcohol use quartiles.

Given the linear trend between continuous AUDIT score and depressive symptoms among women, a multivariate analysis directly investigated this relationship using alcohol misuse in place of continuous AUDIT score in order to obtain more intuitive results. In the multivariate analysis, women who misused alcohol were 3.03 times more likely to have depressive symptoms in comparison to those who did not misuse alcohol (95% CI = 1.05–8.80) after controlling for the number of sexual partners that these women had in the past three months (a significant covariate).

Discussion

The present study found a significant association between alcohol use and depressive symptoms, and this association differed by gender. Specifically, a non-linear, U-shaped relationship was present among men, whereas a linear trend was observed among women. To the best of our knowledge, this study is the first to specifically examine the existence of a non-linear relationship and gender differences between alcohol use and depressive symptoms in Russia.

The U-shaped relationship that was observed in the present study suggests that men who had higher AUDIT scores were associated with fewer depressive symptoms up to a point; above this threshold, men who had higher AUDIT scores were associated with more depressive symptoms. Although this U-shaped relationship has also been observed in previous studies, the mechanisms remain unclear [7, 17, 27–29]. The two sides of the curve might have different underlying mechanisms [29]. First, it is possible that alcohol misuse may lead to depressive symptoms on the right side of the curve (moderate to heavy drinking), whereas alcohol use might have a protective effect on the left side of the curve (light to moderate drinking) [28]. Second, it is possible that depressive symptoms might lead to either abstinence or the heavy use of alcohol [7]. For example, some people with depressive symptoms might cope with these symptoms with heavy alcohol use, whereas others might activate a self-evaluation process that motivates them to reduce their alcohol use [2, 30]. It is also possible that people who use alcohol at both ends of the curve might share common risk

factors for depression (e.g., unemployment and social isolation). For example, unemployment might cause either heavy drinking due to increased stress or abstinence due to financial hardship [31, 32]. Although we controlled for important potential confounders in the association between alcohol use and depressive symptoms, we missed others, such as economic or employment related stresses among those who were employed [33–35]. Future studies might need to elucidate the potential mechanisms that may affect the association between alcohol and depression.

Contrary to the studies that have observed a U-shaped relationship among both men and women [7], the present study observed a linear trend among women, which suggests that more alcohol use is associated with a greater likelihood of depressive symptoms. One previous study reported similar gender differences [17]. This gender difference indicates that the relationship between alcohol use and depressive symptoms is different for men and women. Recent evidence also suggests that women who consume alcohol develop depressive symptoms faster than men [2]. Our results suggest that there is a need for additional longitudinal studies to investigate and confirm the gender differences in the relationship between alcohol use and depression in Russia. Prevention programs to reduce the negative consequences of alcohol use might benefit from considering these differences.

The results from the present study should be interpreted in the context of several limitations. First, although the CES-D-10 scale is widely used to screen for depression, it is not a clinical evaluation. Furthermore, although the CES-D has been used and validated in many countries, including Russia [36, 37], the validity of the CES-D-10 has not been examined in Russia. Second, the participants (STI patients) were highly selective; thus, these findings should not be generalized to other populations such as non-clinic samples. Third, the different patterns of alcohol use and depression in the men and women might simply be due to different motivations for alcohol use. For example, it is possible that the more women self-medicate with alcohol the more depressed they become, thus generating a linear positive slope [38]. Men's depression on the other hand might be situationally brought on by the drinking. For example, in Russia, abstainers might be depressed because they feel excluded from men's peer groups [39]; those who are excessive drinkers may be unable to function in the economy and family life – making them depressed [32, 34]. We did not collect drinking motivation in the present study and thus we could not exclude these possibilities.

In summary, the present study demonstrated a non-linear U-shaped relationship between alcohol use and depressive symptoms among men and a linear trend among women. Additional research is needed to investigate relationships among alcohol use, depressive symptoms, gender differences, and other alcohol related risk factors in Russia. Preventive strategies for reduction of alcohol-related problems in Russia should consider these differences.

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Abbreviations

AUDIT	Alcohol Use Disorders Identification Test
CES-D	Center for Epidemiological Studies Depression Scale
CI	Confidence interval

OR	Odds ratio
STI	Sexually transmitted infection

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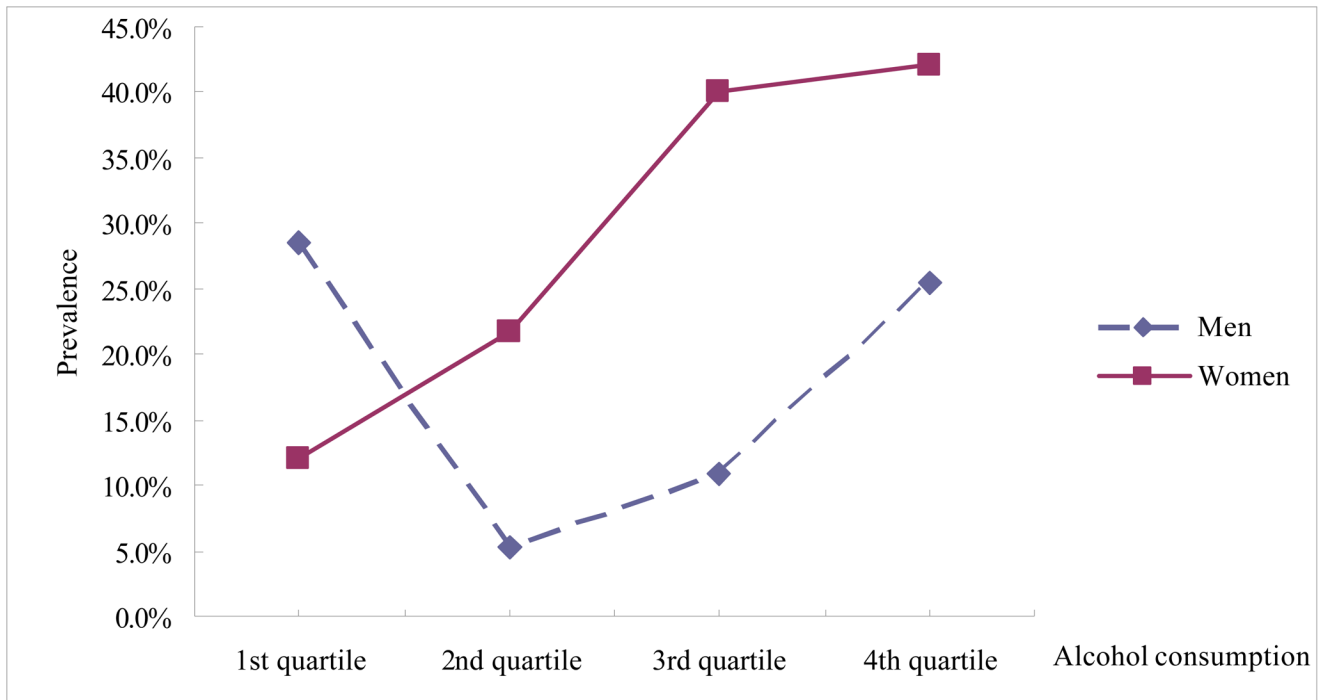


Figure 1. Prevalence of depressive symptoms by quartiles of alcohol consumption among men and women in St. Petersburg, Russia (N = 307)

The p-values of Mantel-Haenszel Chi-square test for a linear trend were 0.82 and 0.01 for men and women, respectively.

Table 1

Participant characteristics by gender in St. Petersburg, Russia (N = 307).

Characteristics	Men (n = 220)	Women (n = 87)	p-value ^a
Age (25 years or less)	56.8%	48.3%	0.18
Being married	16.8%	31.0%	0.006
Some higher education	48.6%	55.2%	0.30
Monthly income < 15,000 rubles	32.3%	69.0%	<0.0001
Unemployed	40.0%	47.1%	0.25
Ever had an STI ^b	34.1%	39.1%	0.41
Number of sexual partner, past 3 months			0.02
1	24.1%	36.8%	
2	29.1%	33.3%	
3 or more	46.8%	29.9%	
Commercial sex workers	4.1%	2.3%	0.73 ^c
Intravenous drug use	4.5%	1.1%	0.19 ^c
Alcohol misuse identified by AUDIT score ^d	84.1%	44.8%	<0.0001
Depressive symptoms ^e	17.3%	27.6%	0.04

^aObtained from the Chi-squared test without additional notes.

^bSTI: sexually transmitted infection.

^cObtained from Fisher's exact test.

^dAUDIT: the Alcohol Use Disorders Identification Test; scores ≥ 8 indicate alcohol misuse.

^eIdentified by the CES-D-10: Center for Epidemiologic Studies Depression Scale. The mean and median CES-D-10 scores were 6.1 and 5.0, respectively; CES-D-10 scores ≥ 10 indicate depressive symptoms.

Odds ratios (ORs) and 95 percent confidence intervals between alcohol use and depressive symptoms among men women in St. Petersburg, Russia (N = 307)

Table 2

Characteristics	Men (n = 220)		Women (n = 87)	
	Unadjusted OR	Adjusted OR	Unadjusted OR	Adjusted OR
Age (25 years or less)	0.93 (0.46–1.87)	—	1.39 (0.54–3.56)	—
Being married	0.91 (0.35–2.37)	—	0.89 (0.32–2.47)	—
Some higher education	0.49 (0.23–1.01)	—	0.95 (0.37–2.43)	—
Monthly income < 15,000 rubles	1.92 (0.94–3.92)	—	1.50 (0.52–4.34)	—
Unemployed	2.12 (1.05–4.30)	2.42 (1.12–5.26)	1.17 (0.46–3.01)	—
Ever had an STI ^a	2.25 (1.11–4.57)	2.47 (1.14–5.34)	1.16 (0.45–3.02)	—
Number of sexual partner in the past 3 months				
1	Reference	—	Reference	Reference
2	0.79 (0.32–1.94)	—	5.91 (1.45–24.09)	5.73 (1.36–24.06)
3 or more	0.54 (0.23–1.26)	—	6.04 (1.45–25.18)	4.46 (1.03–19.41)
Commercial sex workers ^b	1.39 (0.28–6.96)	—	—	—
Intravenous drug use ^b	3.45 (0.92–12.88)	4.66 (1.11–19.54)	—	—
Alcohol use ^c			3.48 (1.29–9.38)	3.03 (1.05–8.80)
1st quartile	7.33 (2.00–26.87)	7.54 (2.00–28.51)	—	—
2nd quartile	Reference	Reference	—	—
3rd quartile	2.25 (0.53–9.46)	2.32 (0.53–10.10)	—	—
4th quartile	6.27 (1.67–23.52)	5.06 (1.31–19.63)	—	—

^aSTI: sexually transmitted infections

^bCommercial sex worker and injection drug use were not included in the estimation among women due to small numbers.

^cAlcohol use was identified by using the Alcohol Use Disorders Identification Test (AUDIT). Since a significant linear trend was observed for women, we presented alcohol use as alcohol misuse vs. non-misuse for women (a score > 8 indicates alcohol misuse).