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Alcohol and HIV Risk among Russian Women of Childbearing Age

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Abstract

Russia has one of the fastest rising rates of HIV among women in the world. This study sought to identify key factors in HIV transmission among women in Russia. Data were collected as part of a larger clinical trial to prevent alcohol-exposed pregnancies (AEP). Women at risk for an AEP were recruited at women's clinics; 708 women, aged 18 – 44 ($M = 29.04$ years), completed HIV risk surveys. Structural Equations Modeling (SEM) was used to test the relationships between alcohol use and sex behavior constructs with HIV/STI risk. While the model indicated that multiple factors are involved in women's HIV/STI risk, the independent alcohol use variable explains 20% of the variance in women's HIV/STI risk. The findings suggest that alcohol use directly and indirectly predicts HIV/STI risk among women, and its effect is mediated by alcohol use before sex.

Keywords

HIV/AIDS; women of childbearing age; at-risk drinking; structural equation modeling; Russia

INTRODUCTION

The HIV epidemic takes a significant toll on women, especially on young women of reproductive age. In 2011, among 820,000 15-to-24-year-olds newly infected with HIV in low- and middle-income countries, more than 60% were women.¹ Globally, adolescent girls

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Compliance with Ethical Standards

Disclosure of potential conflicts of interest: The authors declare that they have no other conflicts of interest.

Research involving Human Participants: The study was approved by the St. Petersburg State University and Oklahoma University Institutional Review Boards (IRBs). All procedures performed in the study were in accordance with the ethical standards of the IRBs and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent was obtained from all individual participants included in the study.

and young women are twice as likely to be at risk of HIV infection than are boys and young men in the same age group (15–24 years).² This higher risk of HIV is attributed to gender inequalities and unsafe and often unwanted sexual activity.² Although women are not at the highest risk for HIV in the short-term, compared with injecting drug users (IDU) and men who have sex with men (MSM), the number of HIV positive women has increased worldwide by 1.6 million since 2001. Long-term projections suggest that the role of heterosexual transmission will continue to increase.^{1,2} Conducting research on populations in which epidemiological evidence suggests a need for more effective HIV prevention and developing interventions for populations that are at lower risk currently, but which may be susceptible to engaging in high-risk behaviors and spreading HIV in the long-term.^{3,4}

While new HIV infections have declined worldwide, new HIV infections in Europe and Central Asia have risen.⁵ Russia has the largest number of HIV cases and one of the most rapidly increasing HIV epidemics in Eastern Europe and Central Asia, with new cases of HIV increasing by 7–8% every year.⁶ Although social, economic, and political environment have contributed to the spread of HIV, individual health behaviors play important roles.⁷ HIV infection has spread beyond the traditional risk groups, such as IDU and MSM, increasingly affecting young, sexually active women. There is a greater proportion of HIV infections among women than among men in the general population in Russia, with the highest proportion of 1.41% HIV positive among 30-to-34-year-old women.⁸ The proportion of women among people living with HIV in Russia increased from 20% to 36.4% between 2000 and 2013.⁸ The number of new HIV cases attributed to heterosexual contact continues to increase in Russia, reaching 41.7% in 2013; heterosexual contact is the second main factor after IDU, and attributed to 54.9% of cases.⁸ Young Russian women with high-risk sexual partners are considered to be an intermediate “bridge” population to the spread of HIV from injection drug users to the general population.⁹

Studies indicate that alcohol use is one of contextual factors associated with HIV risk¹⁰ and biological mechanisms may be involved in increased risks of STI/ HIV transmission among at-risk drinking women. There is increasing evidence that alcohol-induced inflammation and changes in vaginal flora increase women's susceptibility to HIV/STI.^{11,12} The fact that Russia has one of the highest rates of female alcohol consumption in the world¹³ may contribute to the HIV risk in the population. Our previous study indicated that a significant proportion of Russian women of childbearing age binge drink and do not use contraception, including condoms, consistently.¹⁴ Another study in Russia found that among women attending sexually transmitted diseases clinics, at-risk drinking and having sex after drinking was prevalent and associated with two major women's health outcomes, abortion and lack of condom use.¹⁵

A number of women-focused interventions have been found to be efficacious for reducing HIV-related risk and associated behaviors in the U.S. and Western countries.¹⁶ However, a recent review did not identify any interventions that addressed sociostructural barriers, such as stigma, discrimination, and marginalization from health services that limit access and utilization of prevention among women who use alcohol or drugs.¹⁶ In addition, the increase in HIV infection among young women in some parts of the world, including Eastern Europe and Russia, is concerning and may have a direct effect of the health and welfare of children.

Effective prevention is urgently needed to reduce sexual transmission and the important social sciences questions remain concerning how to prevent HIV among women globally.¹⁷

Patterns of risky behaviors are gender-specific, and cultural aspects need to be explored in order to develop effective gender-appropriate prevention interventions for women.^{18–20} Both alcohol consumption and sexual behaviors are influenced by social norms and expectations, and there may be complex gender-specific interactions between alcohol use and other factors, including partner or situational characteristics. Currently, there are limited data about risky sexual behaviors and related factors among women in the general population and a lack of evidence to suggest what types of prevention approaches may be effective in this population.

The objective of the current study is to utilize Structural Equation Modelling (SEM) to uncover the relationship between alcohol use and HIV risk behaviors among women in Russia. The study uses data from a larger international collaborative clinical trial of a brief physician intervention (BPI) to reduce the risk for an alcohol-exposed pregnancy (AEP) among at-risk women²¹ conducted through a consortium between the University of Oklahoma Health Sciences Center (OUHSC), St. Petersburg State University (SPSU), and Nizhniy Novgorod State Pedagogical University (NNSPU) in Russia.

METHODS

Study population

Study participants were recruited for the parent clinical trial at public OB/GYN clinics in two regions in Russia, a major city and a rural area in the central part of Russia. Russia has a well-established OB/GYN health care system, and 96% of women attend the clinics.²² Twenty clinics, ten at each location, participated in the study. The parent study inclusion criteria were: non-pregnant women of childbearing age (18–44 years) at risk for an AEP, that is, fertile, heterosexually active women who reported not using effective contraception methods or having unprotected intercourse at least once in the last 90 days, and reporting at-risk drinking. At risk drinking for a woman was defined as drinking ≥ 8 drinks per week on average, or ≥ 4 drinks on at least one occasion within 90 days prior to the study visit.^{23,24} Because details of the parent study are described in detail elsewhere,^{21,25} only procedures relevant to the HIV study are included here.

A total of 767 women were recruited for the parent study as consecutively enrolled eligible women. Study participants who completed the clinical trial procedures and were available for follow up ($N=722$) were offered participation in the HIV risk study. Forty-five women were not available for the HIV study, one died, and thirteen did not show or were lost to follow up, resulting in a sample of 708 women recruited to participate between January 2010 when the first HIV assessment and September 2012. Since non-pregnant women are not routinely tested for HIV in Russia, the HIV status of women enrolled in the study was unknown at the time of recruitment. Study participants received a gift card upon completion of the HIV risk survey (an equivalent of approximately \$25.00 U.S. dollars). The study was approved by St. Petersburg State University and the University of Oklahoma Health Sciences Center Institutional Review Boards.

Procedures and measures

Women participated in face-to-face 30–40 minutes structured interviews. Bi-lingual behavioral health experts performed the translation procedures to ensure that the study materials were culturally congruent, accurate, and would be correctly comprehended by Russian women. The survey measures were administered in the Russian language and underwent feasibility piloting before implementation. Several study procedures were employed to optimize the validity of self-report information. This approach included conducting surveys in private, recruiting interviewers who were female psychology graduate students approximately the same age as the study participants, and training the data collectors to conduct the interviews in a nonjudgmental, empathic style. There are no HIV or alcohol-use reporting laws in Russia. Participants were reassured about confidentiality.

HIV Risk Survey

The survey assessed HIV testing and status; women's and their partners' health risk behaviors, including drug use and sexual risk behaviors; knowledge about HIV and prevention; and perceptions of women's own risk. The survey was prepared by the project investigators with the help of U.S. and Russian project consultants, including Russian women. The survey items were drawn from U.S. and international measures utilized in studies with women,^{20,26} which were reviewed for cultural appropriateness by bilingual project investigators and then underwent standard forward and backward translation procedures.

Alcohol consumption measures

Self-reports about alcohol consumption were utilized. The use of self-reports in research has been supported by a number of studies.^{27–29} Additionally, there is no social stigma associated with alcohol use in Russia and no consequences if a woman reports alcohol use.

Quantity/Frequency measure—Participants were asked to describe their weekly drinking patterns, including the average number of drinks per day and the number of drinking days in a week. The U.S. definition of a standard drink (SD) defined as 14 grams (0.6 fluid ounces of pure alcohol) was utilized in the study.²³

Binge Drinking—To assess for binge drinking, women were asked “In the past 3 months how often did you have 4 drinks on one occasion?”. Several studies have found that a single binge drinking question identifies the majority of people with risky alcohol use in primary care.^{30–32} The National Institute on Alcohol Abuse and Alcoholism recommends utilizing a binge drinking question to screen for at-risk alcohol use, including at-risk drinking among women.^{33,34}

The Alcohol Use Disorders Identification Test (AUDIT)—AUDIT is a 10-item psychometrically sound scale developed by the World Health Organization and evaluated in several countries, including Russia.³⁵ Scores range from 0 to 40, with 8 suggestive of an alcohol problem. For this study, the AUDIT's binge drinking question was modified to use the current definition of binge drinking for women (i.e., 4 drinks on at least one occasion in the past 90 days).²⁴

Statistical methods

Structural equation modeling (SEM) was applied to test the relationships between alcohol use and HIV/STI risk. Following SEM procedures, we designed a-priori (hypothetical) model corresponding to initial hypotheses to indicate causal relationships between latent variables (described below). Then, we used software (e.g., IBM SPSS AMOS 21) to check the compliance of the model with basic data. Changes were made to the model until the best compliance of model to basic data was achieved.^{36–38}

Table 1 presents a description of the variables included in the hypothetical a-priori model. Because the SEM method assumes a normal distribution of variables, for each of 12 explicit variables, indicators of skewness and kurtosis were calculated. Values of skewness (from – 1.007 to 1.324) and kurtosis (from – 1.309 to 0.336) indicated that distributions of explicit variables did not deviate significantly from a normal distribution.³⁹ Some of the variables were transformed (summation and/or code conversion) from the initial codes for the purposes of simplification of interpretation, missing values minimization, and for abatement in skewness and kurtosis of their distributions.

Latent variables—Three hypothetical constructs as latent variables, alcohol use, alcohol before sex, and HIV/STI risk, were formed based on the set of measured and/or transformed variables as indicators of these constructs. *Alcohol use* is a latent independent variable that represents the items on alcohol-related measures, as follows: (1) AUDIT score, the sum of 10 items of AUDIT. Due to the high rates of skewness (1.87) and kurtosis (4.71), sums of values were recoded into a 10-grade scale (Mean=5.5; *SD*=2) by percentile points according to normal distribution; (2) Binge drinking episodes in last 3 months - A binary indicator of binge drinking (Yes—reported any frequency of binge drinking; No—no binge drinking reported) was used in the analyses. For those who reported any binge drinking, affirmative categories ranging from ‘Less than once a month’ to ‘Daily’ were selected and a continuous variable (ranging from 1- Not at All, to 8- Daily) was used. (3) Drinking days per week - number of days when alcohol was used during a week and number of drinks per day were used to calculate the number of drinks per week.

Alcohol use before sex is a mediator latent variable that represents the construct of alcohol use before sex created using the following alcohol and sex-related questions: (1) woman’s alcohol use before sex and (2) partner’s alcohol use before sex.

Woman HIV/STI Risks is an independent latent variable that represents the construct of woman’s HIV/STI risk and was created using the following HIV/STI-related items: (1) STD: being diagnosed with sexually transmitted disease, which is based on self-reports about STIs during lifetime. This question was recoded into the binary response, which was treated as a pseudo-quantitative variable. (2) HIV/STI risk perceptions: self-estimated risk, which is based on (a) current feeling of being at risk for getting HIV/STI because of anything that happened in the last 3 months, (b) current feeling of being at risk for getting HIV/STI because of anything that happened in the past, (c) feeling of being at risk for HIV/STI in the past, and (d) reporting specific reasons for feeling at risk, such as woman’s own or her partner’s sexual behavior, IDU, and blood transfusion. Ten potential reasons were assessed on a Likert-based 5-point scale. The sum of answers codes for ten questions

was coded into binary by a median, (e). Values below the median were otherwise categorized as 0 and 1. Then, HIV/STI risk perception was calculated as the sum of values in (a), (b), (c), and (e); (3) Number of partners: number of sexual partners reported by the woman in the last 12 months; (4) Condom use frequency: was based on the sum of answer codes to the questions on the frequency of condom use for vaginal and anal sex; (5) Correct condom use: was based on the answers about frequency of five correct condom use indicators, such as a new condom used every time. Categories ‘never’, ‘some of the time’ and most of the time were coded as zero, and ‘every time’ was coded as one. To calculate the aggregate correct condom use score, reverse-scored items were recalculated to reflect the same response direction. Then, if the sum of the recoded questions was equal to 5, it was coded as consistent correct condom use. Otherwise, condom use was coded as incorrect. (6) Partner’s HIV risk: a binary variable was coded (0–no risk, 1 – risk) based on answers to a group of questions about the partner. Each of the items was coded 0–no risk or 1–risk. If any of the risk parameters had an affirmative answer, the question was coded 1, and the partner’s risk variable was coded as 1. The partner’s risk items included (f) STD symptoms observed within the last 3 months (0–no/yes, 1–yes), (g) STD diagnosed within the last 3 months; (h) homosexual contacts; (i) being incarcerated; (j) being tested positive for HIV; (k) reported any drug use during lifetime; (m) IDU; (n) sexual relationship with another woman/women during the time of the current relationship. While checking the model compliance to basic data, the assessment of key parameters of model was made. At the same time, the model covariance matrix was calculated and was compared to an empirical one. This is an iterative procedure that ends at the achievement of minimum possible divergence of theoretical (model) and empirical matrixes.

RESULTS

Characteristics of the sample

Demographic characteristics of the study participants ($N = 708$) are shown in Table 2. Participants’ average age was 29 years. The majority were Russian, married, and employed. About half of the participants had higher education. The sample’s demographic characteristics were comparable to regional data.⁴⁰ Almost all participants reported at least one binge drinking episode in the last 3 months (700, 98.87%). Heavy weekly drinking (8 drinks on average per week) was reported by 49 (6.27%) participants. The average number of drinks per week was 4.23 (range: 0, 20) and the number of drinking ways was 1.81 days. One-third of participants had an AUDIT score of 8, which is suggestive of an alcohol problem.³⁵

A total of three (0.42%) participants reported being HIV positive. Twelve participants (3.29%) reported being diagnosed with other sexually transmitted diseases in the last 12 months. In addition, two participants reported having an HIV positive partner. While the majority of participants (589 out of 704) reported having an HIV test during their lifetime, including 83.66% ($n = 589$) who underwent testing in the previous 12 months, the majority of testing was not actively sought and was required for job health screening or prenatal care. Although 78.47% ($n=231$ in NN, $n = 221$ in SBP) of women reported having more than one partner during their lifetime, with 19.21% ($n=30$ in NN, $n=100$ in SBP) reporting more than

one partner in the last 12 months, condom use was limited. Among 48.73% ($n=345$) of participants who reported any condom use in the last 3 months, consistent condom was reported by 26.96% ($n=93$) which represented 13.14% of the total sample.

Structural Equation Modeling (SEM)

A-priori (hypothetical) model—The initial hypothetical (aprioristic) model is presented in Figure 1. The assessment of parameters was made using the Maximum Likelihood method.⁴¹ Verification of a multidimensional normality required for its application was made by means of Multivariate kurtosis indicators (MK) and its Critical ratio (CR). Sufficiently low values of M.K and C.R. indicated that this requirement was satisfied. Adequacy of sample size was determined by a ratio of number of estimated parameters and the sample size (N), which, according to Rex Kline³⁹, must considerably exceed 5, and would ideally reach 20. The Maximum Likelihood method⁴¹ for an assessment of parameters of the model allows missing values in data, when estimated means and intercepts are set. However, some indicators necessary for correction of a model, such as Modification Indices (M.I.), were not calculated in this case. Therefore, for an initial assessment of model correspondence to data and for modification of model, we used the data file in which missing values were replaced with average values of the corresponding variables. Results of such assessment are presented in Figure 1. Some indicators demonstrated an acceptable correspondence of the model to basic data ($RMSEA < 0.05$; $GFI > 0.95$; $AGFI > 0.9$; Figure 1).^{36,37} However, other indicators showed insufficient accordance ($p < 0.05$; $CMIN/df > 2$). Regression coefficients for the dependent Condom use frequency and Correct condom use variables were not statistically significant ($p > 0.05$). This is because, in this sample, women who were married were less likely to have multiple sexual partners ($\hat{\beta} = -0.0415$, 95% CI: $-0.575, -0.252$, $p < 0.001$) and use condoms ($\hat{\beta} = -1.132$, 95% CI: $-1.564, -0.721$, $p < 0.001$). Therefore, the model required modification. The modification of the model was made in two directions: a) statistically non-significant links were excluded and b) links with modification indices exceeding 4 were added.³⁶

Final (post-hoc) model—Parameters of the final model were estimated by means of initial data (without excluding missing values) with setting of a condition of estimated means and intercepts. The resultant post-hoc structural model of the relationship between dimensions of alcohol use, sex, and HIV/STI risk is presented in Figure 2. Condom use frequency and Correct condom use were removed from the model as they had no statistically significant connections with any other variables. This approach increased the sample size with values for all variables. Such a sample size exceeds the number of estimated parameters by more than 15 times, and has small CR and MK, resulting in the robust results of the post-hoc model assessment. All indicators of the post-hoc model (Figure 2) testified to a good correspondence of the model to basic data ($CMIN/df < 2$; $p > 0.05$; $NFI > 0.94$; $CFI > 0.95$; $RMSEA < 0.05$; $P > 0.5$).^{36,37} All coefficients of regression and covariance were statistically significant ($p < 0.01$). Variance of the independent Alcohol use variable and errors (e) were statistically significant ($p < 0.01$), except the error variance of $e5$ ($P = 0.597$). The final model confirmed the initial assumption that the corresponding sets of explicit variables were rather reliable indicators for three independent latent variables: Alcohol use before sex, Alcohol use, and Woman's HIV/STI risk. In the final post-hoc model, 20% of

variance of the model key dependent variable, Woman's HIV/STI risk, was explained by the influence of independent alcohol use variables included in the model (Alcohol use before sex, Alcohol use, and AUDIT). Eighty percent of the variance of this latent variable is explained by the influence of other factors that were not taken into account by the model. Among four indicators of the Woman's HIV/STI risk included in the model, the strongest effect of alcohol consumption was on HIV/STI risk perception ($r^2 = 0.13$) and the number of partners ($r^2 = 0.19$). In terms of the reliability as measured by the factor loadings, the manifest variables of alcohol use before sex and alcohol use seemed more reliable than those of HIV/STI risk.

Alcohol use: direct and indirect effects

Both alcohol use and alcohol use before sex were significant predictors of HIV/STI risk as indicated by significant standardized path coefficients ($p < 0.001$). For every one standard deviation increase in Alcohol use before sex, there was a 0.32 standard deviation increase in HIV/STI risk, when other latent variables in the model were adjusted. Similarly, a 0.24 increase in HIV/STI risk was observed per unit increase in standard deviation in Alcohol use ($\hat{\beta} = 0.24$, $p < 0.01$), while adjusting for other latent variables in the model. Alcohol use had a significant direct effect on the Woman HIV/STI risk variable ($\hat{\beta} = 0.21$, $p < 0.01$). However, the total effect of Alcohol use on the HIV/STI Risk is equal to 0.3072 ($0.24 + (0.21 \times 0.32)$).

Alcohol use before sex was a mediator of the indirect effect of the general Alcohol use on the Woman HIV/STI risk. Alcohol use was also a significant predictor of alcohol use before sex ($p < 0.001$). Alcohol use before sex was a significant moderate predictor of the HIV/STI risk. The indirect effect of alcohol use on the Woman HIV/STI risks through the Alcohol use before sex was equal 0.0672 (0.25×0.37). About 22 % ($0.0672/0.3072$) of the total effect of alcohol use on HIV/STI risks was mediated through alcohol use before sex. The findings suggested that the direct effects of alcohol use before sex on the HIV/STI risks was significantly greater than the direct effects of alcohol use.

DISCUSSION

The study indicates a strong effect of alcohol use on women's HIV/STI risk and supports previous reports that alcohol misuse is the major HIV transmission risk factor.^{12,42} Russian women's alcohol use directly and indirectly predicted their HIV/STI risk. The amount of alcohol used by a woman predicted her own and her partner's alcohol use, and was strongly associated with the woman's HIV/STI risk, including her number of sexual partners in the last 12 months, and women's perceptions of their STI/HIV risk. Similar to reports from other countries,^{10,43–49} this study indicates that increased alcohol use is associated with increased HIV risk among Russian women. These results are consistent with a recent review that reported the association between alcohol use and sexual risk behaviors among African American females.⁵⁰ Similar to findings from that study, the strong association between alcohol use and HIV risk in Russian women was observed across different levels of risky drinking; even non-abuse levels of drinking among Russian women were related to increased sexual risk-taking. Along with other health risks associated with at-risk drinking among

women, such as abortions¹⁵ and ultimate partner violence,¹⁸ our data indicate that alcohol has a central role in women's health risk behaviors.

Alcohol use before sex directly predicted HIV/STI risks and mediated effects of the general alcohol use. The association between alcohol use and HIV risk was strong. Women who drank at risk were more likely to drink prior to sex. However, the direct effect of alcohol use before sex on the HIV/STI risks was seven times greater than the direct effects of general alcohol use. This finding emphasizes the specific role of alcohol use before sex by a woman as a major women's health risk behavior to be targeted in prevention, and is consistent with another report that, among Russian women attending STD clinics, having sex after drinking was associated with sexually transmitted infections.¹⁵ In line with the recommendations of the 2014 Trans-NIH Plan for HIV-Related Research,⁴ our finding highlights the importance of behavioral intervention research that addresses the impact of alcohol on sexual encounters.

Although structural interventions aimed at increasing condom use have the potential for significant population impact and have demonstrated increased condom use and decreased STI rates,¹⁷ condom use did not appear as a significant determinant of the HIV/STI risk among women in our sample. It should be noted that none of our study participants reported female condom use, and utilization of male condoms was lower among women in our sample than in other population groups, including Russian women attending STD clinics. Fifty-two percent of women in our sample reported any condom use in the last 3 months, compared with 84% of women attending STD clinics.¹⁵ Our study found low condom use in women across all levels of the HIV/STI risk. Condom use did not stand out as a significant determinant of their HIV/STI risk. This finding suggests that interventions aimed at increasing condom use may have limited utility as HIV/STI prevention strategies among at-risk women in the general population. Similarly, a recent review of effectiveness of structural and community-level interventions found no clear evidence that structural interventions aimed at increasing condom use reduce the incidence of HIV and STI transmission in general or high-risk populations.⁵¹

This study provides formative data for developing prevention efforts for at-risk women in the general population in Russia. Findings from this study support other authors' conclusions that there is a need for multi-level prevention, gender-specific prevention interventions that are appropriate for specific population groups and can be utilized at different settings, and a variety of methods that can be utilized by women at different periods of life and with different^{17,20,52} partners.

There are several limitations of our study. First, the model does not identify the direction of causal associations. Testing the hypotheses on which of alternative models of causal connections is possible in SEM, even for non-experimental correlational data.⁵³ However, there are numerous measures that we should take into account before any casual inferences are determined. Results from this study may not reflect any casual associations. Second, this study is limited to at-risk drinking women who reported engaging in unprotected sex, e.g., trying to conceive or at risk for an unplanned pregnancy. Therefore, it includes women who may be at elevated risk compared with lower risk women. Although approximately one-third

of Russian women of childbearing age meet this criterion,¹⁴ the data cannot be generalized to lower risk women. Participants' HIV status information was collected based on self-reports, and underreporting was possible. In addition, because of the lack of HIV testing, a woman may be unaware about her own and be uninformed about her partner's status. Finally, this study targeted women in the general population and has limited generalizability to men or women who do not attend women's clinics, such as homeless women. As noted above, the majority of women in Russia attend women's clinics, and a representative sample of the general population women of childbearing age may be expected to be recruited at the clinics.

Exploring HIV risk in this group is an important step in reducing the risk for HIV transmission and preventing mother-to-child transmission. Based on the results of the present study, HIV/STI prevention efforts targeted at reduction of at-risk drinking among women in the general population are indicated. Specific contextual factors associated with at-risk drinking before sex need to be addressed in the prevention. Findings about the specific role of alcohol use before sex and the limited role of condom use in modeling HIV risk among women in the general population are important for developing culturally appropriate prevention interventions for women. Taking into consideration other health risks associated with women's at-risk drinking and integrating alcohol and HIV risk prevention into reproductive health care services for women of childbearing age are promising approaches.

CONCLUSIONS

Our findings support previous data about the central role of alcohol use in the behavioral HIV risk in women. Taking into consideration that a large majority of women consume alcohol and that at-risk drinking is prevalent among young women in many countries, reducing at-risk drinking among women is likely to lead to a reduction in HIV/STI transmission.

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CMIN=156.638; df=51; p=.000; NFI=.891; CFI=.923; RMSEA=.054; Pclose=.229

Figure 1.

Hypothesized aprioristic model of the relationship between dimensions of alcohol use, sex, and HIV/STI risk

CMIN=42.302; df=30; p=.067; NFI=.942; CFI=.982; RMSEA=.024; Pclose=.998

Figure 2.
Post-hoc structural model

Table 1

Variables and corresponding statistics

Variable Name	Description of coding	Variable codes
Alcohol use*		
AUDIT score	Sum for 10 questions from AUDIT scale	Continuous
Binge drinking	Binge drinking episodes in last 3 months (0-daily, 8-not at all)	0 → Daily 8 → Not at all
Drinking days per week	# of days per week when alcohol was used	Continuous
Number of drinks per day	# of drinks usually used for 1 occasion	Continuous
Alcohol use before sex*	Alcohol use before sex in last 3 months	
Woman's alcohol use before sex	binary	0 → Never 3 → Every time
Partner's alcohol use before sex	binary	0 → Never 3 → Every time
Woman HIV/STI Risks*	Woman HIV risk	
STD	Any sexually transmitted infections diagnosed by a healthcare provider at least once during lifetime	0 → No 1 → Yes
HIV/STI risk perception	Woman self-estimated risk for getting STI or HIV because of current situation or something that happened in the past	0 → No self-estimated risk 4 → High risk self-estimated risk
Number of partners	Number of sexual partners in the last 12 months	1 → None or 1 partner 2 → Two and more partners
Condom use frequency	Condom use frequency in vaginal/anal/oral sex among those who report using any condoms	0 → Never 1 → Sometime used
Correct condom use	Correct condom use among those who report using condoms	0 → Never 1 → Sometime
Partner's HIV risk	Partner's HIV risk factors (homosexual contacts, drug use, STI symptoms, imprisonment, etc.)	0 → Absence of partner's risk 3 → The maximal partner's risk

Table 2

Sample characteristics

Participants' (<i>N</i> =708)	Mean (<i>SD</i>) or %
Age (years), mean (<i>SD</i>)	29.04 (6.55)
Education	
School not completed	0.42%
School diploma	5.37%
Advanced middle level education	31.36%
Higher education not completed	16.38%
Higher education	46.47%
Russian	98.16%
Marital status	
Single	21.75%
Married/living together	69.77%
Divorced/windowed/separated	8.34%
Employed	78.24%
Living environment	
Urban area	85.22%
Rural area	14.68%
Income	
Less than 2000 rubles	0.14%
2,001–4000	12.01%
4,001–6,000	18.36%
6,001–8,000	13.28%
8,001–10,000	11.44%
10,001–15,000	14.27%
15,001–25,000	17.37%
25,001 and above	11.72%
AUDIT score 8 ^a	29.99%
AUDIT score (<i>SD</i>)	6.74 (4.53) ^a
% days abstinent during the 90 days prior to the interview	86.83(11.33)
Mean number of Standard Drinks (SDs) per drinking day during the 90 days prior to interview ^b	3.1 (1.57)

Note: AUDIT = Alcohol Use Disorders Identification Test (scores range from 0 to 40).

^a*n* = 707.

^bOne standard drink (SD) = 14 g absolute ethanol.