

## ORIGINAL ARTICLE

# Mood disorder, anxiety, and suicide risk among subjects with alcohol abuse and/or dependence: a population-based study

Carolina D. Wiener,<sup>1,2</sup> Fernanda P. Moreira,<sup>1</sup> Alethea Zago,<sup>1</sup> Luciano M. Souza,<sup>1</sup> Jeronimo C. Branco,<sup>1,3</sup> Jacqueline F. de Oliveira,<sup>1</sup> Ricardo A. da Silva,<sup>1</sup> Luis V. Portela,<sup>4</sup> Diogo R. Lara,<sup>5</sup> Karen Jansen,<sup>1</sup> Jean P. Oses<sup>1,6</sup>

<sup>1</sup>Programa de Pós-Graduação em Saúde e Comportamento, Centro de Ciências da Vida e da Saúde, Universidade Católica de Pelotas (UCPel), Pelotas, RS, Brazil. <sup>2</sup>Programa de Pós-Graduação em Epidemiologia, Universidade Federal de Pelotas (UFPe), Pelotas, RS, Brazil. <sup>3</sup>Centro Universitário Franciscano (UNIFRA), Santa Maria, RS, Brazil. <sup>4</sup>Laboratório de Neurotrauma, Departamento de Bioquímica Instituto de Ciências da Saúde, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil. <sup>5</sup>Laboratório de Neuroquímica e Psicofarmacologia, Departamento de Biologia Celular e Molecular Faculdade de Biociência, Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Porto Alegre, RS, Brazil. <sup>6</sup>Tecnologia Aplicada às Neurociências, Mestrado em Engenharia Eletrônica e Computação, UCPel, Pelotas, RS, Brazil.

**Objective:** To evaluate the prevalence of alcohol abuse and/or dependence in a population-based sample of young adults and assess the prevalence of comorbid mood disorders, anxiety, and suicide risk in this population.

**Methods:** This cross-sectional, population-based study enrolled 1,953 young adults aged 18-35 years. The CAGE questionnaire was used to screen for alcohol abuse and/or dependence, with CAGE scores  $\geq 2$  considered positive. Psychiatric disorders were investigated through the structured Mini International Neuro-psychiatric Interview (MINI).

**Results:** Alcohol abuse and/or dependence was identified in 187 (9.60%) individuals (5.10% among women and 15.20% among men). Alcohol abuse and/or dependence were more prevalent among men than women, as well as among those who used tobacco, illicit drugs or presented with anxiety disorder, mood disorder, and suicide risk.

**Conclusion:** These findings suggest that alcohol abuse and/or dependence are consistently associated with a higher prevalence of psychiatric comorbidities, could be considered important predictors of other psychiatric disorders, and deserve greater public health attention, pointing to the need for alcohol abuse prevention programs.

**Keywords:** Alcohol abuse and/or dependence; anxiety; mood disorder; depression; suicide risk

## Introduction

Alcohol consumption is highly prevalent worldwide and has numerous negative consequences for health and quality of life, especially in the young population.<sup>1</sup> Alcohol use disorders (AUDs) are among the most frequently diagnosed disorders, with a 12-month prevalence rate of 8.5%.<sup>2</sup> In the United States alone, according to the 2013 National Survey on Drug Use and Health, 37.9% of young adults reported binge drinking (four or more drinks for women and five or more drinks for men on an occasion) at least once in the past 30 days.<sup>3</sup> Moreover, studies have shown a higher prevalence of cigarette smoking or drug

abuse among subjects who engage in heavy or frequent binge drinking.<sup>3-5</sup>

AUDs are highly comorbid with mood and anxiety disorders in adults and are associated with substantial societal and personal costs. In a study conducted by Grant et al., among adults seeking treatment for an AUD, 40.69% and 33.3% were diagnosed with at least one current comorbid mood disorder and anxiety disorder, respectively.<sup>6</sup> The diagnosis of current mood or anxiety disorders among individuals with AUD is challenging, because many symptoms of intoxication, for example, resemble those of mood and anxiety disorders.<sup>7</sup>

In addition to mood disorders and anxiety, other serious problems that can develop in people with AUDs include violent behavior and suicide attempts.<sup>8</sup> Alcoholics are 60 to 120 times more likely to attempt suicide compared to the general population.<sup>9</sup> Furthermore, studies demonstrate that 85 out of every 100 individuals who complete suicide had comorbid depression and/or alcoholism.<sup>10</sup> Individuals with AUDs should be evaluated for the risk of suicide whenever they present with depressive symptoms,<sup>11</sup>

Correspondence: Jean Pierre Oses, Laboratório de Neurociências Clínicas, Programa de Pós-Graduação em Saúde e Comportamento, Centro de Ciências da Vida e da Saúde, Universidade Católica de Pelotas, Rua Gonçalves Chaves, 373, sala 324, prédio C, CEP 96015-560, Centro, Pelotas, RS, Brazil.

E-mail: jean.pierre.oses@gmail.com

Submitted Nov 21 2016, accepted Feb 11 2017.

since proper treatment can achieve remission of depressive symptoms, reduce the odds of relapse, and mitigate suicide risk.

Within this context, the aim of this study is to evaluate the prevalence of alcohol abuse and/or dependence in a population-based sample of young adults and ascertain the prevalence of co-occurring mood disorders, anxiety, and suicide risk in the same population.

## Methods

This is a cross-sectional population-based study that identified young adults between 18 and 35 years of age. The sample consisted of 1,953 participants living in the city of Pelotas, state of Rio Grande do Sul, Brazil. Sample selection was performed by clusters, from June 2011 to October 2012, considering a population of 97,000 in the age range of interest in the 448 sectors of the city according to the latest census. To ensure the necessary sample size, 86 census-based sectors were systematically drawn.

Individuals were included in the sample after receiving information about the objectives of the study and providing written informed consent for participation. Those who were unable to understand and/or respond to the instruments, due to physical or cognitive reasons, were excluded from the study. This study was approved by the Universidade Católica de Pelotas (UCPel) ethics committee (protocol no. 15/2010).

Sociodemographic information was collected through a questionnaire. Economic status was assessed with the National Wealth Score, which considers ownership of material goods and educational attainment of the head of the household.<sup>12</sup> For anthropometric assessment, height was measured using a stadiometer, and weight, with a Tanita® BC-554 bioimpedance body composition monitor. The body mass index (BMI) was calculated as weight (in kg) divided by height (in m) squared, as recommended by WHO. Participants were stratified into two groups, normal-weight or obese/overweight, considering a BMI cutoff of 25. The International Physical Activity Questionnaire (IPAQ),<sup>13</sup> version 8.0, was used to evaluate engagement in leisure-time physical activities. Participants who reported over 150 minutes of weekly physical activity were considered active.

To evaluate alcohol abuse and/or dependence, the participants completed the CAGE questionnaire, which asks about the four consequences of drinking and is a validated screening test for alcohol abuse and dependence.<sup>14</sup> Briefly, patients score 1 point for each "yes" on the CAGE questionnaire and 0 points if all questions are answered "no." A score of 2 or higher ( $CAGE \geq 2$ ) is usually considered to be a positive screen for moderate-to-severe alcohol abuse and/or dependence.<sup>14</sup> The participants also answered about use of tobacco and illicit substances (marijuana, cocaine, and crack).

To screen for psychiatric disorders, trained psychologists administered the Mini International Neuropsychiatric Interview 5.0 (MINI), according to DSM-IV criteria.<sup>15,16</sup> All individuals with current depression and bipolar disorder were included in the mood disorder group. All anxiety

disorders covered by the MINI were included: social phobia, posttraumatic stress disorder, obsessive-compulsive disorder, panic disorders, and generalized anxiety disorder. The suicidality section inquires about several components of suicide risk with the following questions: "Over the last month: 1) Have you wished you were dead?" (Score: 1 point); 2) "Have you wanted to harm yourself?" (2 points); 3) "Have you thought of committing suicide?" (6 points); 4) "Have you planned how to commit suicide?" (10 points); 5) "Have you attempted suicide?" (10 points), and 6) "Have you ever attempted suicide?" (4 points). Risk of suicide was classified as low (score 1-5), moderate (score 6-9), and high (10 or higher). For analysis, scores were dichotomized as no suicide risk (low or absent risk) or suicide risk (moderate or high risk), as recommended by the MINI authors.<sup>15</sup> Respondents were questioned about the current presence of chronic diseases, which included systemic arterial hypertension, diabetes mellitus, heart disease, lung disease, cancer, renal disease, and thyroid dysfunction.

In this study, the following independent variables were considered: sex, ethnicity, age, marital status, employment, income, education level, obesity, and physical activity; suicide risk, tobacco use, illicit drug use, anxiety disorder, mood disorder, and chronic disease were included as comorbidities. The outcome was alcohol abuse and/or dependence.

Statistical analyses were performed in SPSS version 22.0 and Stata version 13.0. Initially, data were described as absolute and relative frequencies. The *t* and chi-square tests were used for comparisons as appropriate. Poisson regression was used for multivariate analysis. Confounders were defined as variables associated with alcohol abuse and/or dependence at a significance level of 20% or less. Association was considered significant at 5%.

## Results

The sample comprised 1,953 individuals with a mean (SD) age of 25.78 (5.21) years. Table 1 describes the sample according to sociodemographic characteristics, life habits, and morbidity. The majority of subjects were female (54.9%) and white (75.9%). In terms of habits, 21.7% reported tobacco use and only 26.5% were classified as physically active. Regarding comorbidities, 7.5% reported the use of other illicit drugs, 10.6% had a chronic disease, 27% had anxiety disorder, 4.7% had mood disorder and 13% reported suicide risk.

Alcohol abuse and/or dependence was identified in 187 (9.60%) individuals overall (5.10% of women and 15.20% of men) (Table 2). In Table 2 the results of the crude analysis are presented, as well as the adjusted results for alcohol abuse and/or dependence and confounders variables ( $p < 0.020$ ) in this study. In the crude analysis, the factors that were statistically significant for alcohol abuse and/or dependence were: sex ( $p < 0.001$ ), ethnicity ( $p = 0.035$ ), education level ( $p = 0.015$ ), tobacco use ( $p < 0.001$ ), illicit drugs use ( $p < 0.001$ ), anxiety disorder ( $p < 0.001$ ), mood disorder ( $p < 0.001$ ) and suicide risk ( $p < 0.001$ ).

Table 2 also shows the results of analysis adjusted for alcohol abuse and/or dependence. Alcohol abuse and/or

**Table 1** Sociodemographic and clinical characteristics of the sample

Variables	Sample distribution
Sex, female	1,073 (54.90)
Age, mean (SD)	25.78 (5.21)
Ethnicity (self-reported)	
White	1,483 (75.90)
Income*	
Low	648 (33.30)
Middle	655 (33.70)
High	641 (33.00)
Education level	
Years of schooling, mean (SD)	11.45 (3.46)
Marital status	
Single	1,186 (60.80)
Married/cohabiting	720 (36.90)
Separated/divorced	46 (2.40)
Currently working	1,158 (59.30)
Physically active	518 (26.50)
Alcohol abuse/dependence (outcome variable)	187 (9.60)
Obesity	860 (44.00)
Current comorbidities	
Tobacco use	421 (21.70)
Illicit drug use	146 (7.50)
Chronic disease, any	207 (10.60)
Anxiety disorder	527 (27.00)
Mood disorder	349 (17.90)
Suicide risk	253 (13.00)
Total	1,953 (100.00)

Data presented as n (%), unless otherwise specified.

SD = standard deviation.

\* Income was classified in sample terciles, according to the National Wealth Score.<sup>12</sup>

dependence remained more prevalent among men than women (prevalence ratio [PR] 2.97; 95%CI 2.17-4.06;  $p < 0.001$ ), as well as among those who used tobacco (PR 1.76, 95%CI 1.31-2.37;  $p < 0.001$ ) and illicit drugs (PR 1.72, 95%CI 1.22-2.43;  $p = 0.002$ ). In terms of comorbidities, alcohol abuse and/or dependence were also more prevalent among those with anxiety disorder (PR 1.66, 95%CI 1.25-2.20;  $p < 0.001$ ), mood disorder (PR 2.13, 95%CI 1.46-3.11;  $p < 0.001$ ), and suicide risk (PR 1.52, 95%CI 1.08-2.16;  $p = 0.016$ ).

## Discussion

The present study evaluated the prevalence of alcohol abuse and/or dependence and associated factors in young adults. We found that 9.6% of individuals in our sample had alcohol abuse and/or dependence, which is consistent with previous studies.<sup>6,17</sup> Moreover, in our study, alcohol abuse and/or dependence were associated with male gender, tobacco use, and illicit drug use, and was often comorbid with anxiety disorders, mood disorder, and risk of suicide.

Several studies have discussed the relationship between AUD and gender, in which males are more likely than females to engage in binge drinking, and therefore, to have AUDs.<sup>18,19</sup> A study performed in 2013 involving 6,478 subjects found that alcohol abuse and/or dependence were more prevalent among males (22.0%) than females (9.8%).<sup>19</sup> In our study, AUDs were also more

prevalent among males: the prevalence of alcohol abuse and/or dependence among men was three times higher than in women.

Alcohol consumption is socially acceptable and, in most cases, is the gateway to consumption of and addiction to other drugs (tobacco, marijuana, cocaine, etc.) In our sample, the prevalence of alcohol abuse and/or dependence among illicit drug users and tobacco users was higher than among those with no illicit drug or tobacco use. Our results are consistent with previous studies that have found higher prevalence of smoking and illicit drug use among individuals who consume too much alcohol.<sup>20,21</sup>

Alcohol abuse can have negative effects on mental health, in that it is frequently comorbid with mood disorders; in fact, this comorbidity can be a cyclic process.<sup>6,21-23</sup> According to Watts, most individuals with mood disorders abuse alcohol in search of pleasure and disinhibition or to reduce emotional, behavioral, and cognitive symptoms of depression.<sup>24</sup> However, the state of intoxication induced by alcohol abuse can increase impulsivity and promote thoughts and feelings of hopelessness and sadness, thus worsening mood disorder symptoms.<sup>24</sup> In a recent review, Pompili et al. found that mood disorders are frequently precursors of alcohol abuse, but alcoholism may also trigger or exacerbate mood disorders.<sup>10</sup> In our study, mood disorders were associated with alcohol abuse and/or dependence. However, we could not infer a causal relationship between these disorders. Likewise, we found a high prevalence of anxiety among individuals with alcohol abuse and/or dependence. It is important to note that having a comorbid diagnosis of anxiety or elevated sensitivity of anxiety has been associated with increased alcohol use severity, decreased likelihood to seek treatment, and higher rates of AUD treatment dropout.<sup>25-27</sup>

Furthermore, alcohol abuse can increase the risk of suicide.<sup>8</sup> A meta-analysis conducted recently by Darvishi et al. found evidence that AUD significantly increases the risk of suicidal ideation, suicide attempt, and completed suicide. The authors report that suicidal ideation and suicide attempt are two and three times more frequent in alcohol abusers than in the general population. Thus, AUD was considered an important predictor of suicide.<sup>8</sup> In our study, we also observed that the suicide risk was twofold among individuals with alcohol abuse and/or dependence (PR of alcohol abuse and/or dependence: 2.12 among those with suicide risk versus those with no suicide risk).

Some limitations must be acknowledged. First, we did not evaluate the frequency or quantity of intake in current or former alcohol abusers. Second, due to the study design, causality cannot be inferred. On the other hand, strengths of our study include the population-based design, which provides sample representativeness.

In conclusion, our study suggests that alcohol abuse and/or dependence are consistently associated with a higher prevalence of mood disorders, anxiety, and suicide risk. The comorbidity between alcohol abuse and psychiatric disorders warrants greater attention in public health and points to an unmet need for alcohol abuse prevention programs.

**Table 2** Factors associated with alcohol abuse among young adults, Pelotas, Rio Grande do Sul, Brazil, 2011-2012

Variables	Alcohol abuse/dependence (%)	Crude PR (95%CI)	Adjusted PR (95%CI)
Sex		p < 0.001	p < 0.001
Female	54 (5.10)	-	-
Male	133 (15.20)	3.00 (2.21-4.07)	2.97 (2.17-4.06)
Age, years		p = 0.957	
18-23	66 (8.70)	1.02 (0.71-1.46)	
24-29	72 (11.60)	1.36 (0.96-1.92)	
30-35	48 (8.50)	-	-
Ethnicity (self-reported)		p = 0.035	p = 0.183
White	130 (8.80)	-	-
Nonwhite	57 (12.30)	1.39 (1.03-1.86)	1.21 (0.91-1.61)
Income*		p = 0.800	
Low	64 (10.00)	1.02 (0.73-1.42)	
Middle	58 (9.00)	0.91 (0.65-1.29)	
High	63 (9.80)	-	-
Education level		p = 0.015	p = 0.899
Primary school diploma and/or incomplete secondary school	115 (8.50)	-	-
Secondary school or college diploma	72 (12.20)	1.42 (1.08-1.88)	1.01 (0.76-1.35)
Marital status		p = 0.090	p = 0.239
Single/divorced	128 (10.50)	1.30 (0.95-1.77)	1.19 (0.88-1.61)
Married/cohabiting	59 (8.30)	-	-
Currently working		p = 0.159	p = 0.438
No	66 (8.30)	-	-
Yes	121 (10.50)	1.23 (0.92-1.64)	1.11 (0.84-1.46)
Current tobacco use		p < 0.001	p < 0.001
No	116 (7.60)	-	-
Yes	71 (38.00)	2.20 (1.67-2.90)	1.76 (1.31-2.37)
Current illicit drug use		p < 0.001	p = 0.002
No	150 (8.40)	-	-
Yes	37 (19.80)	3.03 (2.20-4.16)	1.72 (1.22-2.43)
Current physical activity		p = 0.074	p = 0.399
No	126 (8.90)	-	-
Yes	60 (11.60)	1.30 (0.97-1.73)	1.14 (0.83-1.55)
Obesity		p = 0.719	
No	90 (9.80)	-	-
Yes	88 (10.30)	0.95 (0.71-1.25)	
Current chronic disease		p = 0.096	p = 0.283
No	174 (10.00)	1.58 (0.96-2.74)	1.34 (0.78-2.33)
Yes	13 (6.30)	-	-
Current anxiety disorder		p < 0.001	p < 0.001
No	113 (8.00)	-	-
Yes	74 (14.20)	1.78 (1.35-2.34)	1.66 (1.25-2.20)
Current mood disorder		p < 0.001	p < 0.001
No	130 (8.10)	-	-
Yes	57 (25.80)	2.91 (1.99-4.27)	2.13 (1.46-3.11)
Current suicide risk		p < 0.001	p = 0.016
No	142 (8.40)	-	-
Yes	45 (17.90)	2.12 (1.55-2.88)	1.52 (1.08-2.16)
Total	187 (9.60)	-	-

95%CI = 95% confidence interval; PR = prevalence ratio.

\* Income was classified in sample terciles, according to the National Wealth Score.<sup>12</sup>

## Acknowledgements

The authors would like to thank the research team from Programa de Pós-Graduação em Saúde e Comportamento at Universidade Católica de Pelotas (UCPel) for

their cooperation and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), and Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul (FAPERGS) for funding provided.

## Disclosure

The authors report no conflicts of interest.

## References

- 1 Wang ZY, Miki T, Lee KY, Yokoyama T, Kusaka T, Sumitani K, et al. Short-term exposure to ethanol causes a differential response between nerve growth factor and brain-derived neurotrophic factor ligand/receptor systems in the mouse cerebellum. *Neuroscience*. 2010;165:485-91.
- 2 Grant BF, Stinson FS, Dawson DA, Chou SP, Dufour MC, Compton W, et al. Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the national epidemiologic survey on alcohol and related conditions. *Arch Gen Psychiatry*. 2004;61:807-16.
- 3 Substance Abuse and Mental Health Services Administration (SAMHSA). Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings [Internet]. 2013. [cited 2017 Mar 13]. [samhsa.gov/data/sites/default/files/NSDUHresultsPDFHTML2013/Web/NSDUHresults2013.pdf](http://samhsa.gov/data/sites/default/files/NSDUHresultsPDFHTML2013/Web/NSDUHresults2013.pdf).
- 4 Harrison EL, McKee SA. Non-daily smoking predicts hazardous drinking and alcohol use disorders in young adults in a longitudinal U.S. sample. *Drug Alcohol Depend*. 2011;118:78-82.
- 5 Gubner NR, Kozar-Konieczna A, Szoltysek-Boldys I, Słodczyk-Mankowska E, Goniewicz J, Sobczak A, et al. Cessation of alcohol consumption decreases rate of nicotine metabolism in male alcohol-dependent smokers. *Drug Alcohol Depend*. 2016;163:157-64.
- 6 Grant BF, Stinson FS, Dawson DA, Chou SP, Ruan WJ, Pickering RP. Co-occurrence of 12-month alcohol and drug use disorders and personality disorders in the United States: results from the national epidemiologic survey on alcohol and related conditions. *Arch Gen Psychiatry*. 2004;61:361-8.
- 7 Crum RM, La Flair L, Storr CL, Green KM, Stuart EA, Alvanzo AA, et al. Reports of drinking to self-medicate anxiety symptoms: longitudinal assessment for subgroups of individuals with alcohol dependence. *Depress Anxiety*. 2013;30:174-83.
- 8 Darvishi N, Farhadi M, Haghtalab T, Poorolajal J. Alcohol-related risk of suicidal ideation, suicide attempt, and completed suicide: a meta-analysis. *PLoS One*. 2015;10:e0126870.
- 9 Sher L, Cooper TB, Mann JJ, Oquendo MA. Modified dexamethasone suppression-corticotropin-releasing hormone stimulation test: a pilot study of young healthy volunteers and implications for alcoholism research in adolescents and young adults. *Int J Adolesc Med Health*. 2006;18:133-7.
- 10 Pompili M, Serafini G, Innamorati M, Serra G, Forte A, Lester D, et al. White matter hyperintensities, suicide risk and late-onset affective disorders: an overview of the current literature. *Clin Ter*. 2010;161:555-63.
- 11 Cornelius JR, Clark DB, Salloum IM, Bukstein OG, Kelly TM. Interventions in suicidal alcoholics. *Alcohol Clin Exp Res*. 2004;28:89S-96S.
- 12 Barros AJ, Victora CG. [A nationwide wealth score based on the 2000 Brazilian demographic census]. *Rev Saude Publica*. 2005;39:523-9.
- 13 Matsudo SM, Araújo TL, Matsudo VKR, Andrade DR, Andrade EL, Oliveira LC, et al. Questionário Internacional de Atividade Física (IPAQ): estudo de validade e reprodutibilidade no Brasil. *Rev Bras Ativ Saude*. 2001;10:5-18.
- 14 Buchsbaum DG, Buchanan RG, Welsh J, Centor RM, Schnoll SH. Screening for drinking disorders in the elderly using the CAGE questionnaire. *J Am Geriatr Soc*. 1992;40:662-5.
- 15 Sheehan DV, Sheehan KH, Shytle RD, Janavs J, Bannon Y, Rogers JE, et al. Reliability and validity of the mini international neuropsychiatric interview for children and adolescents (MINI-KID). *J Clin Psychiatry*. 2010;71:313-26.
- 16 Amorim P, Lecrubier Y, Weiller E, Hergueta T, Sheehan D. DSM-IV-R psychotic disorders: procedural validity of the mini international neuropsychiatric interview (MINI). Concordance and causes for discordance with the CIDI. *Eur Psychiatry*. 1998;13:26-34.
- 17 Lhullier AC, Moreira FP, da Silva RA, Marques MB, Bittencourt G, Pinheiro RT, et al. Increased serum neurotrophin levels related to alcohol use disorder in a young population sample. *Alcohol Clin Exp Res*. 2015;39:30-3.
- 18 Welman T, Wong JM, Le Vay R, Kader P. Librium for bed 1, a bottle of scotch for bed 2. *BMJ Case Rep*. 2014 Mar 11;2014. doi: 10.1136/bcr-2013-202809.
- 19 Cheng HG, McBride O. A prospective evaluation of disability associated with alcohol use disorders in the United States: an application of the quantile regression approach. *Am J Addict*. 2013;22:551-7.
- 20 Li K, Simons-Morton B, Gee B, Hingson R. Marijuana-, alcohol-, and drug-impaired driving among emerging adults: changes from high school to one-year post-high school. *J Safety Res*. 2016;58:15-20.
- 21 Archie S, Zangeneh Kazemi A, Akhtar-Danesh N. Concurrent binge drinking and depression among Canadian youth: prevalence, patterns, and suicidality. *Alcohol*. 2012;46:165-72.
- 22 Bellos S, Skapinakis P, Rai D, Zitko P, Araya R, Lewis G, et al. Cross-cultural patterns of the association between varying levels of alcohol consumption and the common mental disorders of depression and anxiety: secondary analysis of the WHO collaborative study on psychological problems in general health care. *Drug Alcohol Depend*. 2013;133:825-31.
- 23 Timko C, Sutkowi A, Pavao J, Kimerling R. Women's childhood and adult adverse experiences, mental health, and binge drinking: the California women's health survey. *Subst Abuse Treat Prev Policy*. 2008;3:15.
- 24 Watts M. Understanding the coexistence of alcohol misuse and depression. *Br J Nurs*. 2008;17:696-9.
- 25 Buckner JD, Timpano KR, Zvolensky MJ, Sachs-Ericsson N, Schmidt NB. Implications of comorbid alcohol dependence among individuals with social anxiety disorder. *Depress Anxiety*. 2008;25:1028-37.
- 26 Gillihan SJ, Farris SG, Foa EB. The effect of anxiety sensitivity on alcohol consumption among individuals with comorbid alcohol dependence and posttraumatic stress disorder. *Psychol Addict Behav*. 2011;25:721-6.
- 27 Schneider FR, Foose TE, Hasin DS, Heimberg RG, Liu SM, Grant BF, et al. Social anxiety disorder and alcohol use disorder co-morbidity in the national epidemiologic survey on alcohol and related conditions. *Psychol Med*. 2010;40:977-88.