## Original Article

# Alcohol Misuse and Depression Symptoms among Males and Females

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**Abstract:**

**Background:** To examine the association between alcohol misuse and depression symptoms as it varies among male and female patients.

**Methods:** This was a cross-sectional survey of 412 randomly selected adult patients who sought care in the emergency department. The main predictor variables of alcohol misuse were created from AUDIT, RAPS4, binge drinking, alcohol abuse, and alcohol dependence measures. The outcome variable of depression symptoms was measured by the Center for Epidemiological Studies Depression Scale (CES-D, ≥16).

**Results:** There were 41% of women and 35% of men who reported greater depression and 34.1% of men and 9.2% of women reported alcohol misuse. Alcohol misuse, stress, and education level all correlated with greater depression in men whereas age was most significant for women. Men who misused alcohol were 2.5 times more likely to report greater depression (OR=2.47, 95%CI=1.37 – 4.45, $P \leq 0.05$). In women, a 10-year increase in age was associated with a 36% increase in the odds of depression (OR=1.55, 95%CI=1.12 – 2.13, $P \leq 0.05$).

**Conclusion:** While it may be unrealistic to expect emergency department providers to fully attend to all the mental health needs of their patients, they should use windows of opportunity to identify patients who present with symptoms of depression and/or alcohol misuse for potential intervention.

**Keywords**: Alcohol misuse, depression symptoms, gender, emergency department

## Introduction

Emergency Department (ED) patients are an often underserved population[1] and are at-risk for higher levels of depression due in part to the nature

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of living in high poverty areas[2]; high reported prevalence of at-risk drinking, problem drinking, binge drinking, alcohol abuse, and alcohol dependence (thereafter referred to as alcohol misuse),[3,4] and lack of access to primary care.[5] ED utilization, especially in urban areas, has expanded rapidly and EDs are used by many patients as a substitute for primary care.[6]

Financial estimates suggest that depression costs the U.S. over $50 billion annually in treatment expenses and lost productivity,[7] making it a substantial problem which needs attention by ED healthcare providers and services.[8] The rate of depression among ED patients at the time of admission has been reported between 20 to 30 percent, [9–11] therefore depressed patients would highly occupy the emergency beds.[12] However, the depression status of many of these patients may go undetected within the busy ED environment.[12]

The relationship between depressive symptoms and alcohol misuse has been reported by three gen-

eral mechanisms: 1) alcohol abuse leads to higher levels of depression and contributes to the inception, duration or recurrence of depressive disorders[13–15]; 2) depression leads to increased levels of alcohol consumption and the persistence of alcohol dependence as a form of self-medication[16–19]; and 3) there are common determinants, environmental, or genetic, for alcohol dependence and depression.[20,21]

Most epidemiological and correlational studies investigating the health consequences of alcohol consumption rely on the first mechanism and have focused on identifying how various patterns of drinking contribute to different physical and mental health outcomes.[22,23] However, previous studies have often failed to account for the diversity of ED patients with regard to their drinking behavior and depressive symptoms. Furthermore, we know that the report of problem drinking is more typical in male populations,[24] whereas depressive symptoms are more likely to be reported in female populations[25] whether or not they misuse alcohol.[26]

While correlation between problem drinking and depression symptoms has been previously reported, the majority of these studies have used various measures to define problem drinking[27–29] making comparison across studies difficult. Furthermore, given that a spectrum of patterns of alcohol consumption tend to characterize the ED patient population, ranging from risky drinking to alcohol dependency,[30] fewer studies have assessed the association between drinking and depression symptoms among male and female ED patients. Our understanding of the differences between how men and women report depressive symptoms, when exposed to alcohol, may be obscured if gender-related data are combined in the data analysis.[22] Taking into account the differential experiences of men and women as separate covariates in identifying an association between alcohol and depression can guide gender-based interventional studies for the prevention and treatment of depression. Repetto et al. suggest that men are more likely to use alcohol to self-medicate themselves against depression when exposed to stressful life situations, while for women the patterns of alcohol use may be different when exposed to similar stressful situations.[31] Heilemann et al. refer to the protective function of the "intrinsic strength factor" that may differ between men and women, and could be related to the different level or lack of depressive symptoms in men and women.[32]

In this study we propose to construct a single alcohol variable (alcohol misuse) from a list of four commonly used alcohol measures (AUDIT score, RAPS4, alcohol abuse, and alcohol dependence) in order to more sensitively describe the nature of drinking behavior in the sample subjects. This single variable will also allow us to avoid using multiple correlated alcohol measures in a multivariate model.

The primary objective of this study is to examine if the association between alcohol misuse and depression symptoms varies between males and females in a random sample of urban ED patients, while controlling for potentially confounding variables. The results of this study could elucidate outcomes with implications for gender sensitive mental health and alcohol misuse diagnosis and treatment in the ED setting.

## Materials and Methods

### Setting

Data for this study was collected daily, at various hours of the day, during a five-week period between March and April 2001, in an inner-city ED which served 1.8 million individuals of an economically disadvantaged urban community comprised of predominantly African-American (36.0%) and Latino (59.0%) residents.

Every other person who was ≥18 years of age that sought care in the selected urban medical center ED was approached for participation in the study. Individuals were ineligible for the study if they were in police custody, spoke a language other than English or Spanish, and showed any signs of permanent cognitive impairment. Approximately 97% of the respondents self-identified as Latino or African-American. Therefore in the final analysis this study excluded persons that identified with other racial categories.[33]

### Patient participation

A total of 412 eligible patients provided informed consent and completed the 45 minute study survey instrument for a 71.0% survey completion rate. The primary reasons for eligible patient refusal to participate with the interview (23%) were patient discomfort, hearing difficulties and medical conditions interfering with the ability to talk. We found no

statistically significant demographic (ethnicity, age, and gender) difference between the interviewed and non-interviewed patients.

Among those interviewed, 47.0% arrived between 00:01 am and 11:59 am, 33.0% arrived between 12:00 p.m. and 5:59 p.m., and 20.0% arrived between 6:00 p.m. and 00:00 a.m. No statistically significant difference was detected between the aforementioned demographic variables and time of arrival. This study received full review and approval by the Institutional Review Board of our institution.

**Main outcome measure**

Recent depressive symptoms were measured using the Center for Epidemiologic Studies Depression Scale (CES-D).[34] This scale provides an estimate of depressive symptom prevalence within the general population and numerous studies have found the scale to be valid and reliable for this purpose (coefficient alpha=0.80).[34,35] The final score is constructed from a list of 20 items referring to the ways respondents might have felt or behaved during the past seven days. Response to each item is scored from 0 (rarely) to 3 (most of the time) based on frequency of occurrence of the symptom. A response for each item was summed with the possible overall sum range from 0 to 60. Respondents with the overall sum of ≤14 were classified as 0 (not having depressive symptoms) and set as the reference group. Respondents with the overall sum values of 15 – 21 were classified as 1 (having mild to moderate depressive symptoms); and finally respondents with overall sum scores greater ≥22 were classified as 2 (having severe depressive symptoms).[36]

**Predictor measures**

*Alcohol misuse*

Alcohol misuse was a weighted average of four screening tools that, individually, each identifies a distinct facet of alcohol misuse. These alcohol measures include: 1) the Rapid Alcohol Problem Screening 4 (RAPS4) which is a 4-item screening tool for assessing problem drinking. Individuals were grouped into the "problem drinker" category if they scored ≥1, and "not having a drinking problem" for scores =0.[37] 2) Alcohol Used Disorders Identification Test (AUDIT) which helps to identify at-risk drinkers. The AUDIT scores of ≥8 group individuals into an "at-risk drinking" category.

For the purpose of this study at-risk drinkers were coded at-risk (1) vs. not at-risk (0).[38,39] 3) Alcohol abuse was operationalized by the diagnostic and statistical manual of mental disorders IV (DSM-IV) criteria for alcohol abuse.[40] A positive answer on any one or more of the six items in the index grouped individuals into alcohol abuse (1) vs. those who didn't abuse alcohol (0). 4) Alcohol dependence was operationalized by the DSM-IV criteria for alcohol dependence[41,42] using 19 items similar to those in the Alcohol Section of the CIDI core (Composite International Diagnostic Interview).[43] Items were related to seven domains, including: tolerance, withdrawal, unintended drinking, unsuccessful efforts to control, giving up pleasures or interests to drink, spending a great deal of time in drinking activities, and continued use despite problems. Each item was scored 0 vs. 1. A positive score on at least three out of seven domains placed individuals into an alcohol dependence group (1) vs. those with no alcohol dependence (0).

The weighted average was derived from the results of a principal component analysis that generated a weight for each of the four alcohol measures. The weights varied from 0.45 to 0.53; for which 75.6% of the total variation observed by all four alcohol measures were accounted for in the weighted average. Subjects with a weighted average greater than or equal to 1.02 were identified as an individual with alcohol misuse whereas those less than 1.02 were without alcohol misuse. A cut-off of 1.02 corresponded to an individual that scored positive on at least two of the four aforementioned alcohol measures.

*Confounding measures*

Other depression-related variables included impulsivity, stress, and socio-demographic factors such as ethnicity, gender, employment, education, marital status, and country of origin.

*Risk-taking/impulsivity*

For this study, a risk-taking/impulsivity scale[44] was used. The items included: 1) "I often act on the spur of the moment without stopping to think"; 2) "I get a real kick out of doing things that are a little dangerous"; 3) "You might say I act impulsively; 4) I like to test myself every now and then by doing something a little chancy"; and 5) "Many of my actions

seem to be hasty" (Cronbach's alpha of 0.8). Using a 4-point Likert scale (4=a lot of the time, 3=some of the time, 2=a little, and 1=not at all), the impulsivity score was computed by summing the five items. The values ranged from 5 to 20, with higher values corresponding to higher impulsivity. Respondents with a mean score of <9.01 were set to be the reference group as "less impulsive" (0), and respondents with a mean score ≥9.01 were set to represent the "high impulsive" group (1).

### Level of stress

The level of stress during the previous 12 months was indexed using 16 items which measured life strains (divorce, death in the family or of friends, domestic violence, jail term or arrest, problem with drugs or alcohol, major illness, financial strain, etc.). A response for each item was summed and a mean value calculated (mean=1.01). Respondents who reported a mean value <1.01 were recorded as 0 (having less stress) and those with a mean value of ≥1.01 were recorded as 1 (having more stress).

### Socio-demographic variables

Socio-demographic variables included gender (female vs. male); age group (18 – 35, 36 – 55, or 55 and older); education status (less than high school diploma vs. high school diploma or more); marital status (married or living with someone vs. single, separated or divorced, widowed); employment (full-time/part-time/self employed vs. unemployed). Ethnicity was categorized as African American (46.8%) and Latino (53.2%). Thirteen patients who identified themselves as White, Asian, Middle Eastern, and Native American Indian were excluded from the analysis in addition to four who refused to answer this question.

### Data analysis

The outcome of interest was the symptoms of depression for which respondents were categorized into three groups: 1) no symptoms of depression (CES-D ≤14); 2) mild to moderate depression (CES-D 15 to 21); and 3) severe depression (CES-D ≥21). A proportional odds logistic regression model for ordinal outcomes was used to identify predic-

**Table 1.** Distribution of covariates stratified by gender

| Variable | Females (*n*=163) | | Males (*n*=232) | |
|---|---|---|---|---|
| | *n* | Percentage | *n* | Percentage |
| Depression | | | | |
| No depression (ref.) | 63 | 38.7 | 110 | 47.5 |
| Mild to Moderate | 33 | 20.3 | 40 | 17.2 |
| Major | 67 | 41.1 | 82 | 35.3 |
| Alcohol misuse | | | | |
| No (ref) | 148 | 90.8 | 153 | 66.0 |
| Yes | 15 | 9.2 | 79 | 34.0 |
| Impulsivity | | | | |
| No (ref) | 111 | 68.1 | 136 | 58.6 |
| Yes | 52 | 31.9 | 96 | 41.4 |
| Stress | | | | |
| No (ref) | 133 | 81.6 | 168 | 72.4 |
| Yes | 30 | 7.6 | 64 | 27.6 |
| Ethnicity | | | | |
| Latino (ref) | 102 | 62.6 | 102 | 44.0 |
| African American | 61 | 37.4 | 130 | 56.0 |
| Education | | | | |
| HS or more (ref) | 70 | 42.9 | 124 | 43.5 |
| Less than HS | 93 | 57.1 | 108 | 46.5 |
| Marital status | | | | |
| Married (ref) | 94 | 57.7 | 144 | 62.1 |
| Single | 69 | 42.3 | 88 | 37.9 |
| Employment status | | | | |
| Unemployed (ref) | 109 | 66.9 | 144 | 63.1 |
| Employed/Full/Part | 54 | 33.1 | 88 | 37.9 |
| Age (Mean, SD) | 163 | (38.7, 14.2) | 232 | (37.6, 14.4) |
| **It is not necessary to put a | | | | |

**Table 2.** Ordinal logistic regression predicting depression stratified by gender

| Variable | Women | | Men | |
|---|---|---|---|---|
| | Odds ratio | 95%CI | Odds ratio | 95%CI |
| Alcohol misuse | | | | |
| No (ref) | | | 1.00 | |
| Yes | — | — | 2.47* | 1.3, 4.45 |
| Impulsivity | | | | |
| No (ref) | 1.00 | | 1.00 | |
| Yes | 4.97** | 2.43, 10.17 | 3.44* | 1.94, 6.10 |
| Stress | | | | |
| No (ref) | 1.00 | | | |
| Yes | 2.12 | 0.94, 4.77 | 2.84** | 1.56, 5.15 |
| Education | | | | |
| HS or mere (ref) | | | 1.00 | |
| Less than HS | — | — | 1.80* | 1.05, 2.07 |
| Marital status | | | | |
| Married (ref) | 1.00 | | | |
| Single | 1.68 | 0.90, 3.16 | — | — |
| Age (1 SD increment) | 1.55* | 1.12, 2.13 | — | — |
| *P value<0.05; **P value<0.01 | | | | |

tors of depression with "no symptom of depression" as the reference group. This type of regression allows for more than two outcomes and calculates the change in odds ratio when comparing a person with no or less depression to a more depressed person. Therefore it models the probability of being more depressed.

Potential predictors of depression included age, education, ethnicity, marital status, employment status, level of stress during the previous 12 months, impulsivity and alcohol misuse. The regression was stratified by gender to examine whether the demographic and clinical characteristics related to depression varied between males and females. A stepwise selection procedure was used to simultaneously consider all potential predictors but only retain those that were significantly associated with depression in a multivariable model. All statistical analyses were performed using software package SAS (release 9.1.3; SAS Institute Inc., Cary, NC), and were based on a two-sided hypotheses with a 5% significance level.

## Results

The distributions of demographic and clinical characteristics of the samples are provided in Table 1. In this study more women compared to men self-identified as Latino (62.2% vs. 44.0%) and reported symptoms of mild (20.3% vs. 17.2%) to major depression (41.1% vs. 35.3%). However, a greater proportion of men were identified as having alcohol misuse (34.0%), being impulsive (41.4%) and experiencing stress over the previous 12 months (27.6%). Slightly more men than women were married (62.1% vs. 57.7%), employed (37.9% vs. 33.1%) and had graduated from high school (53.5% vs. 42.9%). The mean ages were similar between men and women.

Table 2 displays the results of fitting a multivariable proportional odds logistic regression model with depression symptoms ordered as a three category response variable. The two models, stratified by gender, were generated using the results of a stepwise selection procedure. As shown in Table 2 the factors predictive of depression symptoms differ between men and women with the exception of impulsivity. For both genders impulsivity was significantly related to depression symptoms in that the odds of reporting greater depression symptoms increased among those identified as impulsive and this interpretation holds across all three categories of depression (female OR=4.97, 95%CI=2.43 – 10.17; male OR=3.44, 95%CI=1.94 – 6.10).

Alcohol misuse, stress, and education were all predictive characteristics of depression in men, whereas age was the significant factor among women. In men, the presence of stress was associated with a 3-fold increase in the odds of reporting greater de-

pression (95%CI=1.56 – 5.15). In addition, men who misused alcohol were 2.5 times more likely to report greater depression (95%CI=1.37 – 4.45).

Among women, a ten-year increase in age was associated with a 36% increase in the odds of depression (95%CI=0.08 – 0.70). Therefore the likelihood of being more depressed was greater among older women than younger women. In our sample, the predicted probability of not being depressed decreased by 36% when age changed from its minimum (18 years) to maximum (83 years) while holding all other covariates in the model at their respective means. However, the predicted probability of having major depression increased by 43% when age changed from its minimum to its maximum value.

## Discussion

The findings presented here demonstrate the magnitude of depressive symptoms and alcohol misuse in a population of ED patients receiving care in an underserved inner city community. Traditionally urban academic healthcare settings attract uninsured or underinsured patients with high levels of disease burden.[45] Patients who struggle with depression and/ or alcohol misuse problems, compounded with high levels of environmental and socioeconomic stressors, are likely to contribute strain to the cost and delivery of care in the ED setting.

Our results revealed that symptoms of major depression were prevalent across both genders (41% women vs. 35% men) and alcohol misuse was more prevalent among men (34%) than women (9%). These findings provide evidence in support of previous reports from community and clinical trials where depression has been more prevalent among women,[24] and alcohol misuse were most common among men.[26,46] What triggers the depression gap between men and women has been a source of discussion for decades. Current epidemiological findings support psychosocial theories which assert that part of the etiology of the depression gap has to do with men and women reacting differently to anxiety, frustration, and stress related to gender role.[47,48] While women have a tendency to internalize their frustrations, men are more likely to outwardly express their frustrations and may misuse alcohol to externalize their frustrations.[47] However, in this study we found that men who misused alcohol were

2.5 times more likely to report greater depression symptoms than men who did not misuse alcohol. This finding seems to negate the "tension reduction hypothesis" that assumes the use of alcohol among men is expected to provide them with more global positive effects[49] and is the mechanism that protects them against symptoms of depression. Longitudinal data are needed to further untangle the causal relationship between alcohol misuse and depression among men and women. Nevertheless, our findings confirm that alcohol misuse is more prevalent among men than women and also supports the notion that different mechanisms may be contributing to the different association between alcohol misuse and depression among men and women. It also implies that different types of interventions may be effective in men vs. women.

However, age provided the strongest support for explaining variation in depression symptoms among women in this study. Our findings revealed that a ten-year increase in age among women was associated with 36% increase in the odds of reporting greater symptoms of depression. This finding supports the current biological theory assertion that decreasing levels of estrogen seen with aging could be a trigger of depression and explain the greater likelihood of depression among older women when compared to younger women.[47]

Impulsivity was one common factor associated with depression in men and women. The relationship between impulsivity and depression has been reported in other studies and many believe that this mood and behavior correlation occurs via a common neurotransmitter pathway in the brain.[50,51] Some have also reported high levels of impulsivity in individuals with acute stress reactions,[52,53] and this relationship may prove to be particularly pertinent for individuals living in inner city areas where depression and stress are reported with high prevalence. This area of study certainly holds promise for future research.

While it may be unrealistic to expect ED providers to fully attend to all the mental health needs of their patients, they should use windows of opportunity to identify patients presenting with symptoms of depression and/or alcohol misuse for potential intervention. Since these patients tend to be high utilizers of emergency services, brief provider interventions might reduce the strain on emergency healthcare re-

sources. There is a greater need for the implementation of brief screening tools and intervention techniques for emergency providers that are applicable to diverse urban populations and patients of both genders. We recommend collaboration with mental health specialists and social welfare agents to evaluate the need for individual intervention, including the dissemination of educational and referral assistance for those who wish to seek treatment.

There are several methodological limitations in this study. We relied on a self-report assessment tool to determine depression symptoms and alcohol misuse that may be less accurate than a structured diagnostic interview conducted by a health professional and blood alcohol level measures. Although others have suggested that self-report assessments are as effective as more objective measures of current alcohol use in the ED setting.[54] Furthermore, our study suffers the same limitations as other cross-sectional studies; mainly lack of ability of this design to establish causality and to only identify associations between variables. Although certain cultural and ethnic groups have previously been understudied and therefore differences between groups have not always been evident, [55] our study addresses a specific population of predominately African-American and Latino inner city residents.

## Conclusion

In this sample of ED patients, we found symptoms of major depression to be prevalent across both genders, although somewhat higher among women than men, as expected. We also found men misuse alcohol more often than women.

ED practitioners are in a unique situation to respond to the unmet mental health needs of ED patients.[56] They can provide this population with brief mental health and social support interventions [57] that may improve long-term outcomes and simultaneously reduce strain on the ED healthcare system.[58]

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