

## ORIGINAL ARTICLE

# Multivariable Regression Analysis of Depression, Anxiety and Stress in Male Alcohol Dependence Patients: A Control Study

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**ABSTRACT**

**Background:** Alcohol dependence syndrome (ADS) frequently co-occurs with depression, anxiety, and stress, yet predictors in low-resource settings remain underexplored.

**Objectives:** To compare psychological distress between ADS patients and controls, and identify demographic, clinical, and alcohol-related predictors.

**Methods:** In this case-control study, 162 male ADS patients and 162 age and sex-matched controls were included, with their informed consent. Patients were admitted to the Psychiatry ward of a tertiary care hospital. A self-made sociodemographic data sheet, the MAST, the HDBQ, and the DASS were administered to all subjects. The Depression, Anxiety, and Stress scale was administered to the alcohol dependent patients after two weeks of abstinence in the hospital. Statistical analyses were performed using the t-test, chi-square test, Mann-Whitney U test, Spearman's correlation, and stepwise multiple regression.

**Results:** ADS patients had significantly higher scores on anxiety (12.43±3.34 vs. 6.04±2.35, p<0.001), depression (11.96±3.88 vs. 5.57±2.20, p<0.001), and stress (14.01±3.77 vs. 6.35±3.02, p<0.001) than the normal control group. Regression

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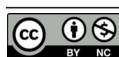
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identified stress, anxiety, duration, age, marital status, HDBQ, and FHADS as depression predictors. Depression, age, stress, MAST scores, and education were the positive predictors of anxiety. Depression and anxiety were positive predictors, while duration was a significant negative predictor of stress.

**Conclusion:** Alcohol dependence is associated with significantly higher levels of anxiety, depression, and stress compared to normal control subjects. Prolonged ADS duration and genetic loading predict distress, urging integrated screening in India.

## KEYWORDS

• Depression • Anxiety • Stress • Alcohol Dependence

## INTRODUCTION

Alcohol dependence syndrome (ADS) is a maladaptive pattern of alcohol consumption that results in clinically significant impairment or distress.<sup>1</sup> It imposes a staggering global burden, with 283 million people affected in 2016, contributing to 3 million deaths annually—5.3% of all fatalities.<sup>2</sup> In India, where per capita consumption has risen 38% since 2010, ADS prevalence among adult males reaches 5.7-14.6%, fueled by urbanization, unemployment, and easy access to cheap liquor.<sup>3,4</sup> This epidemic exacts socioeconomic costs exceeding ₹ 121,364 billion (US\$1867 billion) yearly, including lost productivity and healthcare overload.<sup>5</sup>

The bidirectional interplay between ADS and mental health disorders depression, anxiety, and stress is well-documented.<sup>6</sup> The self-medication hypothesis posits alcohol as a coping mechanism for underlying distress. At the same time, neuroprogression theory implicates chronic intoxication in kindling affective circuits via HPA-axis hyperactivity, glutamatergic excitotoxicity, and prefrontal hypoactivity.<sup>7,8</sup> Cross-sectional studies consistently report 30-50% prevalence of co-occurring depression and anxiety in ADS cohorts, yet few employ matched controls or multivariate models to delineate predictors.<sup>6,7</sup> Family history (FHADS) confers 3-4-fold genetic risk via GABA/serotonin polymorphisms, while early onset (<20 years) and prolonged duration amplify withdrawal severity, perpetuating a vicious cycle.<sup>9,10</sup> Despite this, Indian studies lag in multivariate modeling and the use of matched controls, often overlooking predictors such as marital

discord or education across diverse cohorts. The present case-control study aimed to compare distress (DASS-21) between ADS inpatients and community controls, matched for age, education, and income. Using correlations and stepwise regression on variables including MAST, HDBQ, duration, and FHADS, we delineate predictors to inform precision interventions amid India's rising ADS tide.

## MATERIAL AND METHODS

### Study Design

This cross-sectional study was conducted at a tertiary care hospital affiliated with a medical college. The institutional ethics committee approved the study protocol. All participants gave written informed consent.

### Sample

During the period of study, all patients meeting the DSM-5 criteria<sup>1</sup> for alcohol dependence and admitted for deaddiction treatment were recruited by a purposive sampling method as per the inclusion and exclusion criteria.

### Inclusion criteria for patients:

1. Diagnosis of Alcohol dependence by DSM-5 criteria.
2. In the age group of 18 to 60 years.
3. Willing to give informed consent.

### Exclusion criteria for patients

1. Patients with other comorbid psychiatric disorders.

2. Known cases of cardiorespiratory disease, hypertension, and diabetes.

3. Clinical evidence of cirrhosis, hepatocellular failure, and portal hypertension.

4. Dehydration and obvious malnutrition.

5. Previous history of psychiatric disorders and on psychotropic medications

The control group consisted of an equal number of age and sex matched non-addicted subjects without any physical or psychiatric illnesses.

## Tools

**Sociodemographic data sheet:** A self-prepared sheet was used to record age, sex, education, marital status, occupation, socioeconomic status, type of family, habitat, religion, and family history of alcohol dependence syndrome (FHADS; positive if a first-degree relative with ADS).

**Michigan Alcohol Screening Test (MAST):** The MAST is one of the most widely used measures for assessing alcohol abuse. The measure is a 25-item questionnaire designed to provide a rapid and effective screening for lifetime alcohol-related problems and alcoholism. The questions are answered in a yes/no format. The total score was calculated by adding the scores of each item.<sup>11</sup> The MAST has been used effectively across a variety of settings and with diverse populations.<sup>12</sup>

**The Hilton Drinking Behavior Questionnaire (HDBQ):** A 34-item self-report instrument designed to assess the severity of alcohol dependence and specific drinking behaviors. It is used to differentiate between levels of alcohol consumption, particularly by focusing on behaviors indicative of alcoholism.<sup>13</sup>

**DASS:** The DASS is a set of three self-report scales designed to measure the negative emotional states of depression, anxiety, and stress. Each of the three DASS scales contains 14 items, divided into 2-5 subscales with similar content. The Depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia. The Anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The Stress scale is sensitive to levels of chronic non-specific

arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset/agitated, irritable/over-reactive, and impatient. Subjects are asked to use 4-point severity/frequency scales to rate the extent to which they have experienced each state over the past week. Scores for Depression, Anxiety, and Stress are calculated by summing the scores for the relevant items.<sup>14</sup>

## Procedure

The patients and control subjects were initially interviewed, and the study's purpose was explained to them. They were assured of complete confidentiality regarding the information provided in the questionnaire. After obtaining written informed consent from the patients, two psychiatrists independently examined each patient and control subject to confirm the diagnosis and the absence of exclusion criteria, and were included in the study only after concurrence of both. Thereafter, the HDBQ and MAST were applied. The DASS was administered to the patients 10 days after admission when they were free from or having minimal withdrawal symptoms.

## STATISTICAL ANALYSIS

Statistical analysis was carried out using the Student's t-test, the chi-square test with Yates' correction, Fisher's exact test, and the Mann-Whitney U test, as appropriate. Spearman's correlation and Multiple regression were also carried out.

## RESULTS

In this case-control study, 162 male ADS patients and 162 age and sex-matched controls were included with their informed consent.

### Sociodemographic and clinical characteristics

There is no significant difference in the sociodemographic characteristics of the alcohol dependence and control groups, suggesting that all sociodemographic variables were well matched and validating the controlled nature of the study with respect to these factors (Table 1).

Tables 1 and 2 are about here.

**Table 1:** Demographic characteristics of alcohol dependence patients (n=162) and control subjects (n=162)

Variable	ADS Patients Mean(SD)/n(%)	Controls Mean(SD)/n(%)	t/χ <sup>2</sup>	p
Mean (±S.D.) Age in years	38.50 (±7.22)	38.25(±6.97)	0.305	0.760 NS
<i>Age distribution (in years)</i>	21-30	22	0	1.00
	31-40	72		NS
	41-50	58		
	51-60	10		
<i>Marital Status</i>	Married	146	5.56	0.062
	Unmarried	7		NS
	Separated	9		
<i>Education</i>	Illiterate	18	1.18	0.758
	1-5 class	42		NS
	6-12class	94		
	Graduates	8		
<i>Occupation</i>	Farmer	52	2.586	0.629
	Unskilled	66		NS
	Skilled	18		
	Service	14		
	Unemployed	12		
<i>Family income (in Rupees)</i>	< 5000	68	1.38	0.501
	5001-10000	78		NS
	>10000	16		

**Table 2:** Characteristics of alcohol use in patients with alcohol dependence

Variable	Alcohol dependence patients	
	Number	Percent
<i>Onset of alcohol consumption (in years)</i>	<20	66 40.74
	21-30	90 55.55
	31-40	6 3.71
<i>Duration of consumption (in years)</i>	1-5 years	4 2.47
	6-10	24 14.81
	11-15	52 32.09
	16-20	45 27.78
	>20	37 22.84

Table 2 depicts the alcohol use characteristics of the alcohol dependence patients. The majority of patients reported the onset of alcohol consumption between 21 and 30 years (55.55%), followed by <20 years (40.74%). The duration of consumption was highly variable, with the highest percentages in the 11-15 years (32.09%), followed by 16-20 years (27.16%), and >20 years (23.46%) categories. Comparison of Stress, Anxiety, and depression reveals a highly significant difference in the mean scores for all three mental health variables between the ADS patients and the normal controls

(Table 3).

**Table 3:** Comparison of stress, anxiety, and depression between alcohol dependence and normal control groups

Variable	Sample	Mean	SD	Mann Whitney U	Level of significance
Stress	ADS	14.01	3.77	1858.00	0.000
	Normal	6.35	3.02		
Anxiety	ADS	12.43	3.34	1654.00	0.000
	Normal	6.04	2.35		
Depression	ADS	11.96	3.88	1562.00	0.000
	Normal	5.57	2.20		

## CORRELATION ANALYSIS

Correlation Analysis revealed significant positive correlations ( $p < 0.01$ ) among Depression, Anxiety, and Stress scores (Table 4). Duration of Alcohol Consumption was positively correlated with Depression and Anxiety, and negatively correlated with HDBQ. Age was positively correlated with Anxiety. Family History of Alcohol dependence syndrome (FHADS) was significantly correlated with Withdrawal, MAST scores, HDBQ, and Depression.

**Table 4:** Correlations

		Age	Marital	Education	FHADS	Duration	With drawal	MAST	HDBQ	Depression	Anxiety
Marital	CC	.283**	—	—	—	—	—	—	—	—	—
	Sig. (2-tailed)	.000	—	—	—	—	—	—	—	—	—
Education	CC	.234**	-.033	—	—	—	—	—	—	—	—
	Sig. (2-tailed)	.003	.674	—	—	—	—	—	—	—	—
FHADS	CC	.045	.238**	.135	—	—	—	—	—	—	—
	Sig. (2-tailed)	.569	.002	.087	—	—	—	—	—	—	—
Duration	CC	.321**	.197*	.164*	.054	—	—	—	—	—	—
	Sig. (2-tailed)	.000	.012	.037	.497	—	—	—	—	—	—
Withdrawal	CC	-.042	.108	.144	.363**	-.010	—	—	—	—	—
	Sig. (2-tailed)	.595	.172	.067	.000	.895	—	—	—	—	—
MAST	CC	-.011	.171*	.136	.247**	-.154	.159*	—	—	—	—
	Sig. (2-tailed)	.891	.031	.087	.002	.051	.045	—	—	—	—
HDBQ	CC	-.050	.059	.005	.328**	-.159*	.700**	.058	—	—	—
	Sig. (2-tailed)	.531	.453	.954	.000	.044	.000	.468	—	—	—
Depression	CC	-.025	.219**	.146	.171*	.325**	-.008	.130	-.049	—	—
	Sig. (2-tailed)	.752	.005	.064	.029	.000	.921	.102	.539	—	—
Anxiety	CC	.241**	.160*	.237**	.152	.273**	.074	.207**	.008	.536**	—
	Sig. (2-tailed)	.002	.042	.002	.053	.000	.348	.009	.916	.000	—
Stress	CC	.044	.105	.006	-.013	.033	.047	.134	.081	.552**	.485**
	Sig. (2-tailed)	.580	.186	.939	.873	.676	.555	.092	.305	.000	.000

\*\*Correlation is significant at the 0.01 level (2-tailed). \* Correlation is significant at the 0.05 level (2-tailed).

HDBQ - Hilton drinking behavior questionnaire; FHADS - Family history of alcohol dependence syndrome; MAST- Michigan alcohol screening test.

**Table 5:** Stepwise multiple regression analysis for the predictors of depression, anxiety, and stress: coefficients

Dependent variable	Predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	Variance Inflation Factor
Depression	Stress	.473	.067	.461	7.038	.000	.341	.606	.753	1.328
	Anxiety	.276	.080	.238	3.437	.001	.117	.435	.671	1.490
	Duration	.183	.061	.190	2.999	.003	.062	.303	.807	1.240
	Age	-.131	.034	-.244	-3.846	.000	-.199	-.064	.802	1.248
	Marital	1.089	.540	.125	2.016	.046	.022	2.155	.837	1.195
	HDBQ	-1.535	.572	-.165	-2.685	.008	-2.664	-.405	.854	1.171
	FHADS	1.150	.505	.143	2.279	.024	.153	2.147	.815	1.226

Dependent variable	Predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	Variance Inflation Factor
Anxiety	Depression	.251	.068	.291	3.682	.000	.116	.386	.627	1.596
	Age	.116	.030	.250	3.819	.000	.056	.177	.910	1.099
	Stress	.237	.069	.267	3.455	.001	.102	.373	.653	1.532
	MAST	.259	.118	.141	2.200	.029	.026	.492	.946	1.057
	Education	.314	.150	.138	2.088	.038	.017	.611	.889	1.124
Stress	Depression	.478	.070	.492	6.864	.000	.341	.616	.751	1.332
	Anxiety	.299	.081	.265	3.689	.000	.139	.458	.747	1.339
	Duration	-.131	.061	-.140	-2.141	.034	-.252	-.010	.900	1.111

HDBQ - Hilton drinking behavior questionnaire; FHADS - Family history of alcohol dependence syndrome; MAST - Michigan alcohol screening test

## MULTIPLE REGRESSION ANALYSIS (TABLES 5)

**Predictors of Depression:** The model, including Stress, Anxiety, Duration, Age, Marital, HDBQ, and FHADS, accounted for 50.9% of the variance in Depression ( $F = 22.50$ ,  $p < 0.000$ ,  $R^2 = 0.509$ ). Stress, Anxiety, Duration of alcohol consumption, Marital status, and FHADS were significant positive predictors. Age and HDBQ score were significant negative predictors.

**Predictors of Anxiety:** The model, including Depression, Age, Stress, MAST, and Education, accounted for 39.8% of the variance in Anxiety ( $F = 20.395$ ,  $p < 0.000$ ,  $R^2 = 0.398$ ). Depression, Age, and Stress were the most influential positive predictors of anxiety. MAST scores and education were also significant positive predictors of anxiety.

**Predictors of Stress:** The model including Depression, Anxiety, and Duration accounted for 39.9% of the variance in Stress ( $F = 34.521$ ,  $p < 0.000$ ,  $R^2 = 0.399$ ). Depression and Anxiety were positive predictors, while duration was a significant negative predictor of stress.

## DISCUSSION

ADS patients exhibited markedly higher stress (mean  $14.01 \pm 3.77$  vs.  $6.35 \pm 3.02$ ;  $U = 1858.00$ ,  $p < 0.001$ ), anxiety ( $12.43 \pm 3.34$  vs.  $6.04 \pm 2.35$ ;  $U = 1654.00$ ,  $p < 0.001$ ), and depression ( $11.96 \pm 3.88$  vs.  $5.57 \pm 2.20$ ;  $U = 1562.00$ ,  $p < 0.001$ ) than controls (Table 3), aligning with meta-analyses reporting 2-3-fold odds ratios for these comorbidities.<sup>4,9</sup> This disparity underscores ADS as a potent risk factor for affective dysregulation, likely via chronic neuroinflammation and prefrontal cortex

atrophy.<sup>10</sup>

The high association of alcohol dependence with depression was similar to that of other studies in alcohol dependent and the general population. This finding is consistent with a few previous studies.<sup>15-19</sup> We also found that Anxiety rate is high among Alcohol dependents as comparison to general population and these are highly associated, it is similar to prior studies.<sup>16-18</sup> We found that Stress is high in Alcohol dependence Ehlers *et. al.* also reported an association of elevated acculturation stress with a lifetime diagnoses of alcohol and other substance dependence, and anxiety disorders.<sup>20</sup> This finding also aligns with previous studies.<sup>19,21</sup>

Correlational analyses revealed nuanced predictors: marital status was positively associated with depression, anxiety, and stress; education was associated with anxiety; family history of ADS (FHADS) was associated with marital status and withdrawal; duration was associated with depression and anxiety; and strong inter-scale links (e.g., depression-anxiety; stress-depression).<sup>14</sup> Drinking severity correlated with withdrawal and MAST scores, reinforcing the kindling hypothesis.<sup>22</sup>

Stepwise regression pinpointed key predictors for depression, stress, anxiety, duration of alcohol consumption, age, marital status, HDBQ score, and FHADS. Anxiety was predicted by depression, age, stress, MAST scores, and education. Stress predictors were anxiety and duration, inversely. Unexpected inverse duration-stress link may reflect adaptation. These findings extend prior work, highlighting duration and FHADS as modifiable targets beyond demographics.<sup>13,23</sup>

### Strengths, Limitations, suggestions for future

Strengths include matched controls and robust statistics, but limitations include a cross-sectional design (precluding causality), self-report bias, and the absence of longitudinal relapse data. Future research should integrate neuroimaging and pharmacotherapy trials (e.g., naltrexone for craving reduction). Clinically, screening for distress in early-onset, long-duration ADS with FHADS could guide integrated CBT and motivational interviewing, reducing India's ADS burden.

### CONCLUSION

It can be concluded that there were significantly more depression, anxiety, and stress in patients with alcohol dependence as compared to the normal control group. The predictors of depression were stress, anxiety, duration of alcohol consumption, age, marital status, HDBQ score, and FHADS. Anxiety was predicted by depression, age, stress, MAST scores, and education. Stress predictors were anxiety and duration, inversely.

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