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"Prevalence Of Metabolic Syndrome In Alcohol Dependence: A Cross Sectional Study In Patients Coming To A Tertiary Hospital"

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Abstract

Background: Alcohol dependence syndrome (ADS) is associated with several physical health complications, including metabolic abnormalities. Metabolic syndrome (MS), characterized by central obesity, hypertension, dyslipidemia, and impaired glucose metabolism, increases the risk of cardiovascular disease and diabetes mellitus.
Aim: To determine the prevalence of metabolic syndrome among patients with alcohol dependence syndrome and to evaluate its clinical correlates.
Methods: This cross-sectional comparative study included 50 patients diagnosed with alcohol dependence syndrome and 50 age-matched non-alcohol-dependent controls attending a tertiary care hospital. Diagnosis of ADS was made using ICD-10 criteria. Severity of alcohol use was assessed using the Alcohol Use Disorders Identification Test (AUDIT). Metabolic syndrome was diagnosed using the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria.
Results: The mean age of patients with ADS was 38.9 ± 9.3 years, while that of controls was 36.9 ± 9.6 years. The prevalence of metabolic syndrome was 14% among patients with ADS compared with 4% among controls. Significant differences were observed between the groups in body mass index, waist circumference, and high-density lipoprotein cholesterol levels. Among patients with ADS, metabolic syndrome was significantly associated with body mass index, blood pressure, waist circumference, triglyceride levels, fasting blood glucose levels, and HDL cholesterol levels.
Conclusion: Metabolic syndrome is common among patients with alcohol dependence syndrome and occurs more frequently than in non-alcohol-dependent controls. Routine screening for metabolic abnormalities in patients with ADS may facilitate early intervention and help reduce future cardiovascular and metabolic complications.

Keywords: Alcohol dependence syndrome; metabolic syndrome; AUDIT; cardiovascular risk; substance use disorders.

Introduction

Alcohol use disorders are among the leading causes of preventable morbidity and mortality worldwide. Alcohol dependence syndrome (ADS) is characterized by impaired control over alcohol consumption, tolerance, withdrawal symptoms, and persistent use despite harmful consequences. [1,2] Harmful alcohol use contributes substantially to the global burden of disease and is associated with a wide range of medical, psychiatric, and social complications. [3]

Metabolic syndrome (MS) is a cluster of metabolic abnormalities comprising central obesity, hypertension, dyslipidemia, and impaired glucose metabolism.[4] Individuals with MS are at increased risk of developing type 2 diabetes mellitus and cardiovascular disease, resulting in significant morbidity and mortality.[4,5] The prevalence of metabolic syndrome has increased considerably in developing countries, including India, owing to rapid urbanization, changing dietary patterns, and sedentary lifestyles.[6]

The relationship between alcohol consumption and metabolic syndrome remains complex and incompletely understood. While moderate alcohol intake has been associated with favorable effects on certain metabolic parameters, heavy alcohol use and alcohol dependence have been linked to adverse metabolic and cardiovascular outcomes. Previous studies have reported variable prevalence rates of metabolic syndrome among alcohol-dependent

individuals, highlighting the need for further research in different populations.[7]
Data regarding metabolic syndrome among alcohol-dependent patients in India remain limited. Existing evidence suggests that metabolic abnormalities are common in this population and may contribute significantly to long-term health risks.[8] Early identification of metabolic syndrome in individuals with ADS may facilitate timely intervention and improve overall health outcomes.

The present study was undertaken to determine the prevalence of metabolic syndrome among patients with alcohol dependence syndrome attending a tertiary care hospital and to compare it with that among age-matched non-alcohol-dependent controls. The study also aimed to examine the sociodemographic and clinical correlates of metabolic syndrome in patients with ADS.

Objectives
1. To determine the prevalence of metabolic syndrome and its individual components among patients with alcohol dependence syndrome.
2. To assess the sociodemographic and clinical profile of patients with alcohol dependence syndrome who have metabolic syndrome.

Materials and Methods
Study design and setting
This cross-sectional comparative study was conducted in the Department of Psychiatry, Victoria Hospital, Bangalore Medical College and Research Institute, Bengaluru, India, between October 2014 and May 2016. The study protocol was approved by the Institutional Ethics Committee, and written informed consent was obtained from all participants prior to enrolment.

Participants
The study included 50 consecutive patients diagnosed with alcohol dependence syndrome (ADS) and 50 age-matched non-alcohol-dependent controls.

Inclusion criteria for cases

- Male patients aged 18–55 years.
- Diagnosis of alcohol dependence syndrome according to the International Classification of Diseases, Tenth Revision (ICD-10) diagnostic criteria.[9]
- Provision of informed consent.

Exclusion criteria for cases

- Presence of any comorbid Axis I psychiatric disorder.
- Dependence on substances other than alcohol and nicotine.
- Severe medical illness.
- Current use of medications known to affect metabolic parameters, such as corticosteroids or antipsychotics.

Inclusion criteria for controls

- Age-matched non-alcohol-dependent individuals.
- Provision of informed consent.

Exclusion criteria for controls

- Presence of any Axis I psychiatric disorder.
- Dependence on substances other than nicotine.
- Severe medical illness.
- Current use of medications known to affect metabolic parameters.

Study instruments
Sociodemographic and clinical proforma
A semi-structured proforma was used to record sociodemographic and clinical details.
Diagnosis of alcohol dependence syndrome
Alcohol dependence syndrome was diagnosed using ICD-10 diagnostic criteria.[9]
Alcohol Use Disorders Identification Test
Severity of alcohol use was assessed using the Alcohol Use Disorders Identification Test (AUDIT), a 10-item screening instrument developed by the World Health Organization for identifying hazardous, harmful, and dependent alcohol use.[10]

Assessment of metabolic syndrome

Metabolic syndrome was diagnosed using the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria.[11] Participants meeting at least three of the specified criteria were classified as having metabolic syndrome.

Anthropometric and metabolic assessment
Physical evaluation included measurement of body weight, height, body mass index (BMI), waist circumference, and blood pressure using standard procedures. Waist circumference was measured midway between the inferior costal margin and the superior border of the iliac crest at the end of normal expiration.
Blood pressure was measured using a standard mercury sphygmomanometer. Two readings were obtained at 5-minute intervals, and if elevated blood pressure was detected, a third reading was recorded after 30 minutes. The lowest reading was considered for analysis.
After an overnight fast, venous blood samples were collected under aseptic conditions for estimation of fasting blood glucose, serum triglycerides, and high-density lipoprotein cholesterol levels.

Participants identified with metabolic abnormalities were informed of the findings and advised regarding appropriate lifestyle modifications and further medical evaluation.

Results

A total of 100 participants were included in the study, comprising 50 patients with alcohol dependence syndrome (ADS) and 50 age-matched controls. All participants were male.

Sociodemographic characteristics

The mean age of patients with ADS was 38.9 ± 9.3 years, while that of controls was 36.9 ± 9.6 years. The majority of participants in both groups were between 26 and 45 years of age. Most patients with ADS were married (90%), belonged to rural backgrounds (56%), and were engaged in semiskilled or unskilled occupations. Compared to controls, patients with ADS had lower educational attainment, with only 6% having completed graduation or higher education.

Table 01 – Data Regarding Distribution Of Age

	Cases (n=50) N (%)	Control (n=50) N(%)
Less than 25 Years	05(10.0%)	07(14.0%)
26 to 35 Years	13(26.0%)	18(36.0%)
36 to 45 Years	17(34.0%)	10(20.0%)
46 to 55 Years	15(30.0%)	15(30.0%)
Total	100(100%)	100(100%)

Table 02 – Data Regarding Distribution Of Religion

RELIGION	CASES n=50 N (%)	CONTROL (n=50)
HINDU	45.0(90.0%)	38.0(76%)
MUSLIM	04.0(08.0%)	10.0(20%)
CHRISTIAN	01.0(02.0%)	02.0 (04.0%)
Total	50.0(100.0 %)	50.0(100%)

Majority belongs to Hindu religion in both case (90%) and control (76%) group.

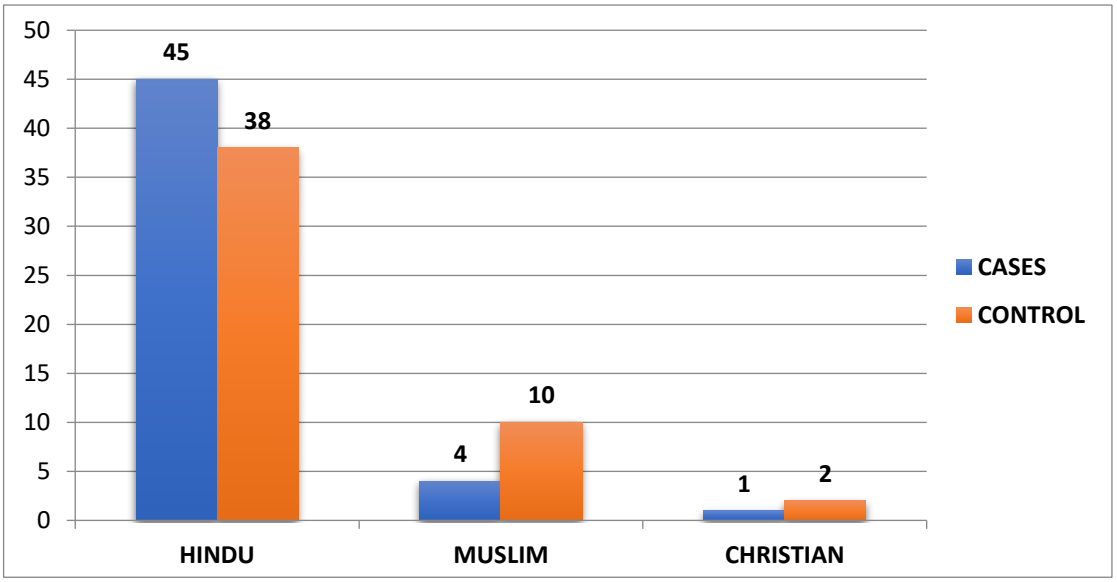

Figure 01- Religion distribution

Table 03– Data Regarding Clinical Variables and its significance in Case And Control Group.

Variables	Group(n=50)	Mean ± SD	t- test	P value
Age	Cases	38.9 ± 9.3	1.03	.304

	Control	36.9 ± 9.6		
BMI	Cases	22.8 ± 4.3	-3.57	.001
	Control	25.5 ± 3.1		
SBP	Cases	124.1±10.3	-.166	.869
	Control	124.4± 8.8		
DBP	Cases	82.2± 8.7	-.800	.425
	Control	83.4±6.0		
Waist Circumference	Cases	81.6±9.5	-2.20	.030
	Control	85.2±6.8		
TG	Cases	146.6±61.4	-.72	.471
	Control	156.6±76.4		
HDL	Cases	43.3±13.9	2.14	.035
	Control	38.26±9.7		
FBS	Cases	91.4±14.5	-.691	.491
	Control	93.7±18.4		

We found significant values in BMI, WC, and HDL. Less significant value with other clinical variables

Prevalence of metabolic syndrome

Metabolic syndrome was identified in 7 (14%) patients with ADS and in 2 (4%) controls. Thus, the prevalence of metabolic syndrome was more than three times higher among patients with alcohol dependence syndrome than among age-matched controls.

Comparison of metabolic parameters between cases and controls

The comparison of anthropometric and metabolic variables between the two groups is shown in Table 1. Patients with ADS had significantly lower body mass index (BMI) than controls (22.8 ± 4.3 vs. 25.5 ± 3.1 kg/m^2, p = 0.001). Waist circumference was also significantly lower among patients with ADS (81.6 ± 9.5 cm vs. 85.2 ± 6.8 cm, p = 0.030).

High-density lipoprotein cholesterol (HDL-C) levels differed significantly between the groups, with patients with ADS demonstrating lower HDL-C levels compared to controls (43.3 ± 13.9 mg/dL vs. 38.3 ± 9.7 mg/dL, p = 0.035). No significant differences were observed with respect to systolic blood pressure, diastolic blood pressure, fasting blood glucose, or triglyceride levels.

Characteristics of patients with metabolic syndrome within the ADS group

Among the 50 patients with ADS, seven fulfilled criteria for metabolic syndrome. Patients with metabolic syndrome had higher mean BMI, systolic blood pressure, diastolic blood pressure, waist circumference, triglyceride levels, and fasting blood glucose levels than those without metabolic syndrome. They also had lower HDL-C levels.

The mean age of onset of alcohol dependence was significantly higher among patients with metabolic syndrome than among those without metabolic syndrome (39.9 ± 9.0 years vs. 31.1 ± 8.1 years; p = 0.011). However, there were no significant differences with respect to age at first alcohol use, number of alcohol units consumed, or AUDIT scores.

Correlates of metabolic syndrome in ADS

Among patients with ADS, metabolic syndrome was significantly associated with BMI (p = 0.023), systolic blood pressure (p = 0.037), diastolic blood pressure (p = 0.009), waist circumference (p = 0.001), triglyceride levels (p = 0.028), HDL-C levels (p = 0.048), fasting blood glucose levels (p < 0.001), and age of onset of dependence (p = 0.011).

Of the seven patients with metabolic syndrome, five (71.4%) had HDL-C levels below the recommended threshold, six (85.7%) had elevated fasting blood glucose levels, five (71.4%) had elevated diastolic blood pressure, four (57.1%) had elevated triglyceride levels, and two (28.6%) had elevated systolic blood pressure

Table 04- Mean and SD patients with Met S and Without Met S in Case group.

Variables(Case)	MS (Yes-07, No- 43)	Mean ± SD

BMI	Yes	26.22 ± 4.054
	No	22.24 ±4.171
SBP	Yes	131.71± 6.873
	No	122.93± 10.405
DBP	Yes	90.00± 7.303
	No	80.93± 8.331
Waist Circumference	Yes	87.71± 12.763
	No	80.63± 8.680
TG	Yes	193.43± 98.363
	No	138.98± 50.859
HDL	Yes	33.86± 5.610
	No	44.93± 14.168
FBS	Yes	112.57± 17.300
	No	88.00± 10.858
Age1st Drink	Yes	22.86± 2.268
	No	20.65± 4.503
Age of dependency	Yes	39.86± 9.045
	No	31.05± 8.097
No of units Of Alcohol	Yes	21.43± 8.018
	No	22.60± 9.477
Audit	Yes	25.71± 3.302
	No	26.49± 4.205

The above table shows comparison of socio-demographic and clinical variables between ADS with MS and ADS without MS in case group.

Table 5 – t test and p value of clinical and few socio demographic variables

	t - test	P - value
BMI	2.35	0.023
SBP	2.88	0.037
DBP	2.98	0.009
WC	1.41	0.001
TG	1.43	0.028
HDL	2.02	0.048
FBS	5.08	0.000
Age OF 1ST DRINK	2.00	0.213
Age Of DEPENDENCE	2.62	0.011
NO OF UNITS	0.31	0.758
AUDIT	0.46	0.646

We found significant values in BMI, SBP, DBP, WC, TG, FBS, and Age of dependence. This has been shown below tables and diagrams.

Discussion

The present study evaluated the prevalence of metabolic syndrome (MS) among patients with alcohol dependence syndrome (ADS) attending a tertiary care hospital and compared it with an age-matched control group. The principal finding was that the prevalence of MS among patients with ADS was 14%, compared with 4% among controls. These findings suggest that individuals with alcohol dependence constitute a vulnerable group with an increased burden of metabolic abnormalities requiring routine clinical attention.

The prevalence of MS observed in the present study is comparable to that reported by Mattoo et al., who found a prevalence of 13.6% among substance-dependent men in North India.[12] Similarly, Aneja et al. reported a prevalence ranging from 18% to 27% among alcohol-dependent individuals depending on the diagnostic criteria employed.[13] The prevalence observed in the current study also falls within the range of 5%–31% reported in studies from Western populations.[14] This variability across studies may be attributed to differences in study populations, diagnostic criteria, patterns of alcohol consumption, and ethnic variations in metabolic risk factors.

In the present study, patients with ADS demonstrated a significantly higher prevalence of metabolic syndrome than controls. Although alcohol has

traditionally been associated with favorable effects on HDL cholesterol and insulin sensitivity, chronic heavy alcohol consumption may adversely influence multiple components of metabolic syndrome, including blood pressure, triglyceride levels, and glucose metabolism.[15,16] These findings support the view that the relationship between alcohol use and metabolic health is complex and depends on both the quantity and pattern of alcohol consumption.

Among the components of metabolic syndrome, fasting blood glucose and low HDL cholesterol emerged as important abnormalities in the present study. Patients with metabolic syndrome had significantly higher fasting blood glucose levels and lower HDL cholesterol levels compared with those without metabolic syndrome. Similar observations have been reported in previous studies of alcohol-dependent populations.[12,13] Yoon et al. demonstrated that although alcohol consumption was associated with higher HDL cholesterol levels, heavy alcohol use was also associated with increased odds of hypertriglyceridemia, hypertension, and impaired glucose metabolism.[17]

Waist circumference and body mass index were significantly associated with metabolic syndrome in the present study. Patients with metabolic syndrome had higher BMI and waist circumference than those without metabolic syndrome. These findings are consistent with previous reports identifying obesity-related measures as important predictors of metabolic syndrome among substance-dependent individuals.[12,18] Increased central adiposity contributes to insulin resistance and plays a pivotal role in the pathogenesis of metabolic syndrome.[5]

The present study also found significant associations between metabolic syndrome and systolic as well as diastolic blood pressure. Hypertension is a well-established component of metabolic syndrome and may be exacerbated by chronic alcohol consumption through sympathetic activation, endothelial dysfunction, and alterations in vascular regulation.[19,20] Previous studies have similarly demonstrated an association between heavy alcohol use and elevated blood pressure.[21]

Interestingly, the age of onset of alcohol dependence was significantly associated with metabolic syndrome, whereas age at first alcohol use, AUDIT scores, and quantity of alcohol consumed were not. This finding may indicate that prolonged exposure to alcohol-related physiological changes contributes to the development of metabolic abnormalities. However, given the relatively small sample size, this observation should be interpreted cautiously and warrants further investigation.

The findings of the present study have important clinical implications. In addition to the presence of metabolic syndrome, a substantial proportion of patients with ADS exhibited one or more metabolic abnormalities. This observation is similar to that reported by Mattoo et al., who emphasized that clinicians should not restrict screening efforts only to patients who fulfill criteria for metabolic syndrome but should also identify individuals at risk of progression to the syndrome.[12] Early identification and management of metabolic risk factors may reduce long-term cardiovascular morbidity and mortality in this population.

The present findings should be interpreted in light of certain limitations. The study was conducted at a single tertiary care center and included a relatively small sample size. All participants were male, limiting the generalizability of the findings to women with alcohol dependence. Furthermore, the cross-sectional design precludes conclusions regarding causality between alcohol dependence and metabolic syndrome. Despite these limitations, the study contributes to the limited Indian literature examining metabolic syndrome among patients with alcohol dependence syndrome. The inclusion of an age-matched control group and the use of standardized diagnostic criteria strengthen the validity of the findings. Future longitudinal studies with larger and more diverse samples are needed to clarify the temporal relationship between alcohol dependence and metabolic syndrome and to identify modifiable risk factors that may be targeted through preventive interventions.

Conclusion

The present study demonstrated that metabolic syndrome is more prevalent among patients with alcohol dependence syndrome than among age-matched controls. The prevalence of metabolic syndrome among patients with ADS was 14%, compared with 4% among controls. Patients with ADS exhibited significant abnormalities in metabolic parameters, particularly fasting blood glucose, high-density lipoprotein cholesterol, waist circumference, and body mass index.

Metabolic syndrome in patients with ADS was significantly associated with increased body mass index, waist circumference, blood pressure, triglyceride levels, fasting blood glucose levels, and lower HDL cholesterol levels. These findings indicate that alcohol-dependent individuals represent a high-risk population for the development of cardio metabolic disorders.

Routine screening for metabolic syndrome and its individual components should be incorporated into the comprehensive assessment of patients with alcohol dependence syndrome. Early identification and appropriate intervention may help reduce long-term cardiovascular morbidity and improve overall health outcomes in this population.

Clinical Implications

Patients with alcohol dependence syndrome constitute a vulnerable group with an increased burden of metabolic abnormalities. Routine metabolic screening, including assessment of blood pressure, fasting blood glucose, lipid profile, body mass index, and waist circumference, should be integrated into standard clinical care.

Early detection of metabolic abnormalities may facilitate timely lifestyle interventions and appropriate medical management, thereby reducing the risk of future cardiovascular disease and diabetes mellitus. Greater awareness among mental health professionals regarding the metabolic consequences of alcohol dependence may contribute to improved long-term patient outcomes.

Strengths of the Study

The present study has several strengths. First, it evaluated the prevalence of metabolic syndrome specifically among patients with alcohol dependence syndrome using standardized diagnostic criteria. Second, the inclusion of an age-matched control group allowed comparison of metabolic abnormalities between alcohol-dependent individuals and non-alcohol-dependent controls. Third, the study assessed multiple sociodemographic, clinical, anthropometric, and biochemical variables, providing a comprehensive evaluation of factors associated with metabolic syndrome in ADS.

Limitations

The findings of this study should be interpreted in the context of certain limitations. The study was conducted in a single tertiary care hospital, which may limit the generalizability of the findings to the wider community. The relatively small sample size may have reduced the ability to detect smaller associations between clinical variables and metabolic syndrome. In addition, only male participants were included, limiting the applicability of the findings to female patients with alcohol dependence syndrome. Finally, the cross-sectional design precludes determination of causal relationships between alcohol dependence and metabolic syndrome.

Future Directions

Prospective longitudinal studies involving larger and more diverse samples are required to better understand the temporal relationship between alcohol dependence and metabolic syndrome. Future research should include female participants and examine the influence of drinking patterns, duration of alcohol use, nutritional status, and treatment-related factors on metabolic outcomes. Studies evaluating the effectiveness of lifestyle and pharmacological interventions for reducing metabolic risk among patients with alcohol dependence syndrome are also warranted.

Declaration of Patient Consent

The authors certify that they obtained all appropriate patient consent forms. In the form, the participants provided consent for their clinical information to be used for research purposes. The participants understood that their names and identifying information would not be published and that efforts would be made to maintain confidentiality.

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Nil.

Conflicts of Interest

There are no conflicts of interest.

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