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Original Research Article

A Study to Compare Anthropometric Measurements, Liver Function Tests, Haemoglobin and Plasma Glucose Levels in Individuals with Alcohol Abuse and Normal Population

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Abstract

Aim: The aim of the present study was to compare anthropometric measurements, liver function tests, haemoglobin and plasma glucose levels in individuals with alcohol abuse and normal population.

Material & methods: The study was carried out in the Department of Medicine, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India in between the duration of 24 months. The study included 200 individuals with alcohol abuse recruited from department of General Medicine. A total of 100 patients, age, sex, height and weight matched healthy individuals were taken as controls.

Results: Patients with alcohol misuse averaged 43.7 years old, while controls averaged 42.08 years old. This age difference between cases and controls was not statistically significant. About 41% of alcohol abusers were 31-40 years old and 40% were 41-50. About 41% of non-alcoholics were 31-40 years old and 45% 41-50. About 16% of alcohol abusers had hypertension, 2% had dyslipidemia, 1% had intervertebral disc prolapse, 1% had obesity, and 80% had no comorbidity. About 8% of non-alcoholics had hypertension. It was statistically significant that 28% of alcohol abusers had binge drunk. The mean haemoglobin level of alcoholics was 13.6 gm% and of controls was 13.8. Not significantly different. Fasting plasma glucose averaged 85.4 mg/dl for alcoholics and 84.2 mg/dl for non-alcoholics. Not significantly different.

Conclusion: Alcohol abusers had higher bilirubin, AST, and ALT levels. Hypertension is more common in alcoholics.

Keywords: Fasting Blood sugar, Post parandial Blood Sugar, Body Surface Area, Body Mass Index. Alcohol abuse, Liver function tests, Plasma glucose

Introduction

Alcohol is recognised for its hepatotoxicity, and its widespread consumption worldwide is associated with many liver problems, such as cirrhosis, fibrosis, and hepatic failure. These effects of alcohol on the insulin-glucose axis cannot be disregarded. [1] Chronic alcohol consumption significantly reduces insulin sensitivity, particularly in those with obesity and atherosclerosis. [2,3] However, there is a negative connection between alcohol intake and BMI. Alcoholic cardiomyopathy, which is marked by cardiac enlargement and increased left ventricular mass, is closely linked to excessive alcohol use. This condition primarily affects people with type 2 diabetes mellitus. [4] Furthermore, the consumption of alcohol has been linked to hypertension, which in turn contributes to changes in the structure and function of the heart, ultimately

increasing the chance of developing coronary artery disease (CAD) and heart failure (HF).

Glycohemoglobin (HbA1c) was first identified in the 1960s and has served as an effective diagnostic tool for diabetes and prediabetes since 2010. [5] HbA1c is a naturally formed substance that results from the interaction between haemoglobin and glucose. It indicates the average level of glucose in the blood over a period of around 100-120 days, which is the lifespan of a red blood cell. The NHANES data indicate that males had higher levels of HbA1c compared to females, which aligns with the higher prevalence of T2DM in men. [6] A recent meta-analysis found that HbA1c levels are elevated among blacks, Asians, and Latinos when compared to whites. [7,8] It is worth noting that biomarkers indicating a lack of iron have been shown to be factors that can distort the results by potentially raising HbA1c values. [9,10] Authors have recently suggested a reevaluation of HbA1c readings to include variations in ethnicity, gender, age, and body mass index (BMI). [11] Alcohol use should be taken into account when clinically interpreting HbA1c levels. The ongoing work postulates that the consumption of alcohol reduces HbA1c levels, which could potentially affect the diagnosis of T2DM.

The degree of liver enzyme elevation does not have a strong correlation with the severity of alcoholic liver disease. However, the pattern of elevation in transaminases can be useful in diagnosing liver injury caused by alcohol. In cases of alcoholic liver injury, the level of AST is typically two to three times higher than that of ALT. [12] In addition, it is common for them to have a higher level of serum gammaglutamyltranspeptidase (GGT). [13] Adipose tissue-derived hormone, believed to have a significant impact on the control of insulin sensitivity and the metabolism of glucose and lipids. Adiponectin levels in the blood are directly related to how sensitive the body is to insulin and are inversely related to problems with glucose metabolism. Joosten et al conducted a study on postmenopausal women and found that consuming a modest amount of alcohol enhances insulin sensitivity, increases adiponectin levels, and improves lipid profile through transcriptional mechanisms. [14]

An effort was undertaken to compare anthropometric measurements, liver function tests, haemoglobin levels, and plasma glucose levels between patients with alcohol dependence and healthy controls.

Material & Methods

The research was conducted in the Department of Medicine, Anugrah Narayan Magadh Medical College and Hospital, located in Gaya, Bihar, India, over a period of 24 months. The study comprised a sample of 200 persons diagnosed with alcohol abuse who were recruited from the department of General Medicine. A cohort of 100 healthy adults, matched in terms of age, sex, height, and weight, were selected as controls. The controls were obtained from the medicine outpatient department, where they had undergone standard annual medical examinations. Prior to conducting the study, approval was obtained from the ethical committee. Participants were included as cases and controls after satisfying the inclusion and exclusion criteria and obtaining written, informed consent from all individuals.

Inclusion Criteria

• cases of individuals with alcohol abuse (as per DSM-IV criteria) within the age group of 18-70 years

Exclusion Criteria

• Patients with history of rheumatic/valvular heart disease, ischemic heart disease, congenital heart disease, diabetes mellitus, smoking and tobacco use

Procedure:

All the cases and controls underwent a detailed clinical examination, anthropometric measurements, blood pressure, haemoglobin, FBS, PPBS, serum bilirubin, AST and ALT. Blood pressure was measured in the arm after a five minute rest in sitting position, using mercury sphygmomanometer with standard cuff size (to the nearest 2 mmHg). Hypertension: >140/>90 mmHg. Weight was measured (to the nearest 0.5 Kg) with the participant standing motionless on the weighing machine. Height was measured (to the nearest 0.1 cm) using a standard non-elastic tape, measured with the participant standing erect against a wall, without shoes and the head looking straight.

Body mass index (BMI) classified as per BMI criteria for Indians:

• Normal BMI: 18.5-22.99

• Overweight BMI: 23-24.99

• Obesity BMI: ≥ 25Kg/m2

Under aseptic precautions venous blood samples were collected from cases & controls for above mentioned biochemical investigations.

Statistical analysis:

The data collected was compiled and analysed using statistical package for social services (SPSS 20). Statistical analysis of data was made using Chi-square test. P value of < 0.05 was considered to be significant.

Results

Table 1: Distribution of the study groups according to age

Age Group	Cases n (%)	Controls n (%)
Less than 30 years	18 (9)	9 (9)
31-40 years	82 (41)	41 (41)
41-50 years	80 (40)	45 (45)
More than 50years	20 (10)	5 (5)
Total	200 (100)	100 (100)
Mean ± SD	43.7±8.96	42.08±8.32
P value	0.525	

The mean age of the individuals with alcohol abuse was 43.7 years and mean age of controls (non-alcoholics) was 42.08 years. This difference was not statistically significant with respect to the age of the cases and controls. About 41% of the individuals with alcohol abuse belonged to 31-40 years and 40% belonged to 41- 50 years. About 45% of the non-alcoholics belonged to 41-50 years and 41% belonged to 31-40 years.

Table 2: Distribution of the study groups according to comorbidities

Comorbidities	Cases n (%)	Controls n (%)
Hypertension	32 (16)	8 (8)
Dyslipidemia	4 (2)	0
Prolapse intervertebral disc	2 (1)	0
Obesity	2 (1)	0
Absent	160 (80)	92 (92)

About 16% of the individuals with alcohol abuse had hypertension, 2% had Dyslipidemia, 1% had Prolapse intervertebral disc, 1% had obesity and 80% had no comorbidy. About 8% of the non-alcoholics had hypertension.

Table 3: Distribution of the study groups according to Binge drinking

Binge drinking	Cases n (%)	Controls n (%)
No	144 (72)	100 (100)
Yes	56 (28)	0
Total	200 (100)	100 (100)

There were 28% of the individuals with alcohol abuse had the history of binge drinking in this study which was statistically significant.

Table 4: Distribution of the study groups according to anthropometric measurements

Mean±SD	Cases	Controls	P value
Height (cm)	167.3±8.90	159.7±6.5	0.000
Weight (kg)	61.5±3.4	59.7±5.5	0.172
BMI ($kg/m^{2)}$	21.9±3.2	23.7±2.8	0.078
BSA (in m^2)	1.72±0.1	1.8±0.08	0.098

The mean height of the individuals with alcohol abuse was 167.3 cm and non-alcoholic was 159.7 cm. The difference in the heights of cases and controls was statistically significant. The mean weight of the individuals with alcohol abuse was 61.5 kg and controls were 59.7 kg. The difference was not statistically significant. The mean BMI of the individuals with alcohol abuse was 21.9 kg/m2 and 23.7 kg/m2 among the non-alcoholics. There was no statistically significant difference between the BMI of the cases and controls. The mean BSA among the individuals with alcohol abuse was 1.72 m2 and among the non-alcoholics was 1.8 m2. The difference was not statistically significant between the cases and controls in terms of anthropometric measurements.

Table 5: Distribution of the study groups according to haemoglobin levels, fasting plasma glucose and post prandial glucose

Mean±SD	Cases	Controls	P- value
Haemoglobin	13.6±1.2	13.8±0.9	0.28
FBS	85.4±13.5	84.2±14.4	0.713
PPBS	116.8±12.3	121.1±11.0	0.022

The mean hemoglobin level of the individuals with alcohol abuse was 13.6 gm% and among the controls was 13.8 gm%. The difference was not statistically significant. The mean fasting plasma glucose among the individuals with alcohol was 85.4 mg/dl and among the non-alcoholics was 84.2 mg/dl. The difference was not statistically significant. The mean post prandial glucose among the individuals with alcohol abuse was 116.8 mg/dl and among the controls was 121.1 mg/dl. The difference was statistically significant.

Table 6: Distribution of the study groups according to serum bilirubin, AST & ALT (liver function tests)

Mean±SD	Cases	Controls	P value
Serum bilirubin	1.1±12.3	0.7±0.3	0.000
AST	78.0±40.2	28.2±6.4	0.000
ALT	78.4±36.4	28.4±8.8	0.000

The mean serum bilirubin among the individuals with alcohol abuse was 1.1 mg/dl and among the non- alcoholics was 0.7 mg/dl, which was statistically significant. The mean Aspartate Transaminease (AST) among the individuals with alcohol abuse was 78 IU/l and among the controls was 27.2 IU/l. This difference was statistically significant. The mean Alanine Transaminase (ALT) among the individuals with alcohol abuse was 78.4 IU/l and 28.4 IU/l among the non- alcoholics, which was statistically significant.

Discussion

Type 2 diabetes was formerly classified by fasting plasma glucose (FPG) and 2-hour plasma glucose (PPG) level determined during an oral glucose tolerance test (OGTT). Glycated haemoglobin (HbA1c) is utilised as a reliable indicator of diabetes management. In June 2009, the International Expert Committee advised the use of the HbA1c test with a threshold ≥6.5% to diagnose diabetes, which has since been approved by the American Diabetes Association. [15,16]

The average age of individuals with alcohol abuse was 43.7 years, while the average age of controls (non-alcoholics) was 42.08 years. This difference was not statistically significant with respect to the age of the patients and controls. Approximately 41% of individuals with alcohol abuse were between the ages of 31 and 40, while 40% were between the ages of 41 and 50. Approximately 45% of individuals who do not consume alcohol were between the ages of 41 and 50, while 41% fell within the age range of 31 to 40. In a comparable study by Lazarevic et al [17] the mean age of patients with alcohol consumption was 45 years and controls was 44 years. In a study by Bell et al [18] the mean age of nondrinkers was 48.5 years, former drinker was 49.5 years, occasional drinkers was 48.1 years, moderate drinkers was 45.8 years, strong drinker was 45.8 years. Alcohol is also known dosage dependent cardiac toxin however myocardial damage may be consequence of direct toxic effects of alcohol or its metabolites by ethanol induced apoptosis linked hypertension. [19] Alcoholic cardiomyopathy is characterised by the enlargement of the heart, increased left ventricular mass, and ventricular dysfunction. It is reported that, moderate to heavy alcoholics patients would result in impaired insulin sensitivity which leads to hyperglycemias and reduce the influence of hepatic enzyme induction Alcoholic liver disease (ALD) particularly cirrhosis has been one of the most widespread and destructive illnesses induced by alcohol intake and one of the primary causes of alcohol related death. The pathogenesis of ALD is multi factorial.

About 16% of the persons with alcohol addiction had hypertension, 2% had Dyslipidemia, 1% had Prolapse intervertebral disc, 1% had obesity and 80% had no comorbidity. About 8% of the non-alcoholics had hypertension. A study by Ceccanti M et al [20] found prevalence of hypertension in 55% cases of chronic alcohol consumer group during early stage of abstinence. There were 28% of the persons with alcohol abuse had the history of binge drinking in this study which was statistically significant. Girish et al [21] in their study on pattern of alcohol use, also observed that 29% of alcohol consuming respondents in urban regions had history of binge drinking. The mean height of the persons with alcohol misuse was 166.4 cm and non-alcoholic was 158.6 cm. There was a statistically significant difference in the heights of the cases and controls. The study conducted by Lazaveric et al [17] found that the average body surface area of the control group was 2.0 m2, but among the drinkers, it was 1.9 m^2.

The average height of those with alcohol misuse was 167.3 cm, while the average height of non-alcoholic individuals was 159.7 cm. The disparity in the heights of the cases and controls exhibited statistical significance. The average weight of individuals with alcohol misuse was 61.5 kg, whereas the controls had an average weight of 59.7 kg. However, the difference in weight between the two groups was not statistically significant. The average BMI of those with alcohol misuse was 21.9 kg/m^2, while it was 23.7 kg/m^2 among those who do not abuse alcohol. There was no discernible change in BMI between the patients and controls that was statistically significant. The average body surface area (BSA) for those with alcohol misuse was 1.72 m^2, while for

non-alcoholics it was 1.8 m^2. There was no statistically significant difference in anthropometric parameters between the patients and controls. The average haemoglobin level of persons with alcohol addiction was 13.6 gm%, while the average haemoglobin level among the controls was 13.8 gm%. The observed change did not reach statistical significance. According to a study conducted by Kino et al [22], heavy drinkers had a mean haemoglobin level of 14.4 gm%, while moderate drinkers had a mean haemoglobin level of 14.9 gm%. The average fasting plasma glucose level for persons who consume alcohol was 85.4 mg/dl, while for non-alcoholics it was 84.2 mg/dl. The observed change did not reach statistical significance. The average blood glucose level after a meal was 116.8 mg/dl for persons with alcohol misuse and 121.1 mg/dl for the control group. The disparity was statistically significant. In their study, Kiechi S et al [23] found that consuming a low to moderate amount of alcohol on a daily basis enhances insulin sensitivity, while increasing the dose of alcohol leads to a drop in blood insulin concentration. In their investigation, Paulson QX et al [24] found that alcohol increases insulin sensitivity via up-regulating anti-inflammatory genes. The study conducted by Zilkens RR et al [25] found no significant alteration in insulin sensitivity among healthy males when exposed to alcohol.

The average blood bilirubin level in individuals with alcohol misuse was 1.1 mg/dl, while in non-alcoholics it was 0.7 mg/dl. This difference was shown to be statistically significant. The average Aspartate Transaminease (AST) level in individuals with alcohol misuse was 78 IU/l, while in the control group it was 27.2 IU/l. The observed difference was statistically significant. The average Alanine Transaminase (ALT) level was 78.4 IU/l in persons with alcohol misuse, compared to 28.4 IU/l in non-alcoholics. This difference was statistically significant. In their study, Lazaveric et al. [17] found that the AST levels were 22 IU/L in the control group and 37 IU/L in the group of individuals with alcoholism. The average ALT level was 31 IU/L in the control group and 40 IU/L in the group of individuals with alcoholism.

Conclusion

Thirty percent of alcoholics have a favourable binge drinking history. Individuals who misuse alcohol have a greater prevalence of hypertension than the general population. Compared to controls, those who misuse alcohol had higher serum bilirubin, AST, and ALT levels. It is highly advised that those who misuse alcohol or who binge drink stop drinking.

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