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ORIGINAL ARTICLE

Assessment of association of non- alcoholic fatty liver diseasewith micro and macrovascular complications in type 2 diabetes mellitus patients

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ABSTRACT:

Background: The rising prevalence of obesity and type 2 diabetes is likely linked to Non- Alcoholic Fatty Liver Disease (NAFLD), which is becoming the leading cause of chronic liver disease globally.The present study was conducted to association of non- alcoholic fatty liver disease (NAFLD) with micro and macrovascular complications of type 2 diabetes mellitus. **Materials & Methods:**94 type 2 diabetes mellitus patients were divided into fatty liver group (Group I) and non-fatty liver group (Group II). Body mass index (BMI), glycosylated haemoglobin (HbA1c), alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (AKP), total cholesterol (TC) triglycerides (TG), low density lipoprotein (LDL) and high- density lipoprotein (HDL) etc. were recorded. **Results:** In group I, males were 27 and females were 20 and in group II, males were 23 and females were 24. The mean waist circumference was 94.2 cms and 82.5 cms in group I and II respectively. The mean SBP was 145.6 mmHg and 132.4 mmHg, DBP was 92.8 mmHg and 74.2 mmHg, triglycerides was 178.2 mg/dl and 142.8 mg/dl, total cholesterol was 254.2mg/dl and 174.6 mg/dl, HDL was 36.2 mg/dl and 44.6 mg/dl, LDL was 112.4 mg/dl and 108.4 mg/dl, HbA1c was 7.6 % and 6.4%, AST was 35.9 IU/L and 23.1 IU/L, ALT was 40.7 IU/L and 22.9 IU/L and ALP was 80.2 IU/L and 78.4 IU/L in in group I and II respectively. The difference was significant (P< 0.05). Diabetic micro and macrovascular complications in group I and group II patients was retinopathy in 25 and 12, neuropathy in 23 and 11, nephropathy in 31 and 22, CAD in 15 and 8 and PVOD in 13 and 7 patients in group I and II respectively. The difference was significant (P< 0.05).CAD, triglyceride, BMI and HbA1c were significantly associated with NAFLD (P< 0.05). **Conclusion:** Type 2 diabetes people have a higher prevalence of NAFLD. Compared to type 2 diabetes patients without fatty liver, fatty liver patients are substantially more likely to be obese, have dysglycemia, dyslipidemia, increased liver enzymes, and coronary artery disease.

Keywords: diabetes, non- alcoholic fatty liver disease, obesity

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INTRODUCTION

The rising prevalence of obesity and type 2 diabetes is likely linked to Non- Alcoholic Fatty Liver Disease (NAFLD), which is becoming the leading cause of chronic liver disease globally.[1] Type 2 diabetes is becoming more commonplace worldwide, to the point where it's considered a pandemic in places like China and India.Liver disease has only lately been identified as a significant type 2 diabetes consequence, with cirrhosis having a typical death rate higher than that of cardiovascular disease.[2]

According to multiple studies, the prevalence is higher in people with obesity and diabetes mellitus, ranging from 35% to 75%.[3]The increasing occurrence of non-alcoholic fatty liver disease (NAFLD) in Asian nations can be ascribed to several factors such as improved lifestyle choices, altered dietary patterns, and the utilization of novel diagnostic methods.[4]A small percentage of NAFLD patients will develop cirrhosis, and some will get non- alcoholic steatohepatitis (NASH), which is characterized by necro- inflammatory alterations in the liver.[5] End stage liver disease may develop from this progressive fibrotic illness.Although NAFLD and NASH have been extensively studied in the western world, due to their asymptomatic nature, little is known about their aetiology or presentation in Asian populations.[6]The present study was conducted to association of non-alcoholic fatty liver disease (NAFLD) with micro and macrovascular complications of type 2 diabetes mellitus.

MATERIALS & METHODS

The present study was conducted on 94 type 2 diabetes mellitus patients of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. All patients underwent abdominal ultrasonography for NAFLD detection and grading. They were divided into fatty liver group (Group I) and non-fatty liver group (Group II). Body mass index (BMI), glycosylated haemoglobin (HbA1c), alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (AKP), total cholesterol (TC) triglycerides (TG), low density lipoprotein (LDL) and high- density lipoprotein (HDL) etc. were recorded. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II
M:F	27:20	23:24

Table I shows that in group I, males were 27 and females were 20 and in group II, males were 23 and females were 24.

Table II Assessment of parameters

Parameters	Group I	Group II	P value
Waist circumference (cms)	94.2	82.5	0.05
SBP (mmHg)	145.6	132.4	0.04
DBP (mmHg)	92.8	74.2	0.02
Triglycerides (mg/dl)	178.2	142.8	0.04
Total Cholesterol (mg/dl)	254.2	174.6	0.02
HDL (mg/dl)	36.2	44.6	0.01
LDL (mg/dl)	112.4	108.4	0.82
HbA1c (%)	7.6	6.4	0.02
AST (IU/L)	35.9	23.1	0.01
ALT (IU/L)	40.7	22.9	0.01
ALP (IU/L)	80.2	78.4	0.76

Table II shows that mean waist circumference was 94.2cms and 82.5cms in group I and II respectively. The mean SBP was 145.6mmHg and 132.4mmHg, DBP was 92.8mmHg and 74.2mmHg, triglycerides was 178.2mg/dl and 142.8mg/dl, total cholesterol was 254.2mg/dl and 174.6mg/dl, HDL was 36.2mg/dl and 44.6mg/dl, LDL was 112.4mg/dl and 108.4mg/dl, HbA1c was 7.6% and 6.4%, AST was 35.9IU/L and 23.1IU/L, ALT was 40.7IU/L and 22.9IU/L and ALP was 80.2IU/L and 78.4IU/Lin group I and II respectively.The difference was significant (P< 0.05).

Table III Prevalence of diabetic microand macrovascular complications

Complications	Group I	Group II	P value
Retinopathy	25	12	0.02
Neuropathy	23	11	0.05
Nephropathy	31	22	0.05
CAD	15	8	0.01
PVOD	13	7	0.01

Table III, graph I shows that diabetic micro and macrovascular complications in group I and group II patients was retinopathy in 25 and 12, neuropathy in 23 and 11, nephropathy in 31 and 22, CAD in 15 and 8 and PVOD in 13 and 7 patients in group I and II respectively. The difference was significant (P< 0.05).

Graph I Prevalence of diabetic micro and macrovascular complications

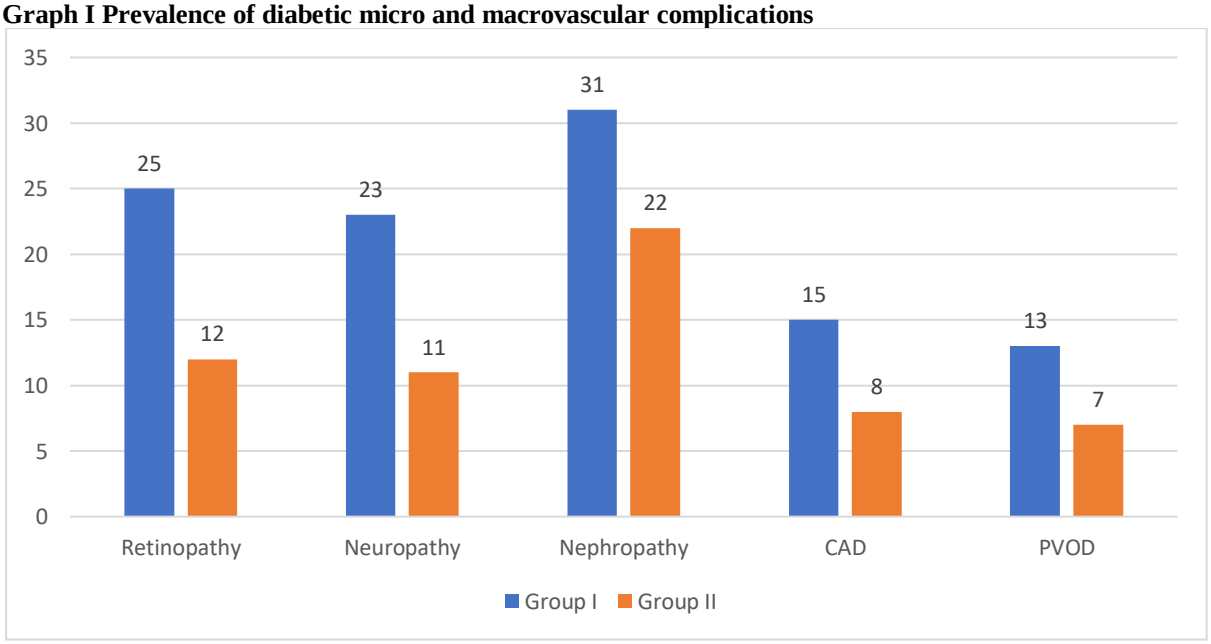

Table IV Multiple logistic regressionanalysis

Parameters	OR	95 % (CL)	P value
CAD	5.68	1.04	0.04
Triglyceride	1.05	1.09	0.01
BMI	1.72	1.03	0.04
HbA1c (%)	14.2	3.2	0.02

Table IV shows that CAD, triglyceride, BMI and HbA1c were significantly associated with NAFLD (P< 0.05).

DISCUSSION

NAFLD is more frequently observed in persons with type 2 diabetes and is undoubtedly a significant public health concern today.[7,8] There are prevalence reports on NAFLD from both India and other countries, however there is a dearth of information from India regarding the relationship between NAFLD and the micro- and macrovascular problems of diabetes.[9]The present study was conducted to association of non-alcoholic fatty liver disease (NAFLD) with micro and macrovascular complications of type 2 diabetes mellitus.

We found thatin group I, males were 27 and females were 20 and in group II, males were 23 and females were 24. Somalwar et al[10] in their study, 120 type 2 diabetic patients were submitted to a complete clinical and laboratory evaluation and abdominal ultrasonography for NAFLD detection and grading. They were divided into fatty liver group and non-fatty liver group and various laboratory and clinical variables were compared in these two groups. Out of 120 type 2 diabetic patients, 68 (56.66%) had fatty liver on ultrasonography. An increase in the waist circumference, BMI, systolic blood pressure, diastolic blood pressure and levels of HBA1c, AST, ALT, Total Cholesterol, Triglycerides and a decrease in HDL was observed in the fatty liver group as compared to non-fatty liver group. NAFLD group had higher prevalence of retinopathy (67.67% vs. 17.30%, P(67.67% vs. 17.30%, P <0.001), neuropathy (52.94% vs.19.23%, P = 0.0002), nephropathy (83.82% vs.53.84%, P = 0.0003). The prevalence of CAD (70.58% vs. 21.11%, P<0.0001) and POVD (10.25% vs. 0%, P <0.05) was higher in NAFLD patients. All patients with severe fibrosis hadraised BMI, HbA1c and hypertension. The results of multiple logistic regression analysis showed that NAFLD wasassociated with BMI, HbA1c, Triglyceride and CAD. Univariate analysis showed significant association betweenretinopathy, neuropathy, CAD, POVD and NAFLD.

We observed thatmean waist circumference was 94.2 cms and 82.5 cms in group I and II respectively. The mean SBP was 145.6 mmHg and 132.4 mmHg, DBP was 92.8 mmHg and 74.2 mmHg, triglycerides was 178.2 mg/dl and 142.8 mg/dl, total cholesterol was 254.2mg/dl and 174.6 mg/dl, HDL was 36.2 mg/dl and 44.6 mg/dl, LDL was 112.4 mg/dl and 108.4 mg/dl, HbA1c was 7.6 % and 6.4%, AST was 35.9 IU/L and 23.1 IU/L, ALT was 40.7 IU/L and 22.9 IU/L and ALP was 80.2 IU/L and 78.4 IU/L in in group I and II respectively. Leite et al[11] in their study, out of 180 type-2 diabetic patients, the prevalence of ultrasonographic NAFLD was 69.4%. Patients with NAFLD were more obese, had a higher waist circumference and serum triglyceride and alanine aminotransferase (ALT) levels than those without steatosis. Neither diabetic degenerative complication, nor glycaemic control was associated with liver steatosis. On multivariate analysis, a high serum triglycerides level and a high-normal ALT level were independently associated with hepatic steatosis, together with either the presence of obesity or of increased waist circumference.

We found that diabetic micro and macrovascular complications in group I and group II patients was retinopathy in 25 and 12, neuropathy in 23 and 11, nephropathy in 31 and 22, CAD in 15 and 8 and PVOD in 13 and 7 patients in group I and II respectively. Duseja et al[12] in their study one hundred NAFLD patients with increased liver enzymes were evaluated for clinical presentation, associated diseases, overweight/obesity, central obesity (n=54), presence of diabetes mellitus, lipid abnormalities, insulin resistance (n=39), metabolic syndrome (n=54), serum iron, serum ferritin, and transferrin saturation (n=60), and HFE gene mutations (n=30). Twenty percent of patients were overweight, 68% had obesity, and 78% had central obesity. Abnormal cholesterol, HDL, and triglycerides were present in 36%, 66%, and 53% of patients, respectively. Twelve percent of patients had diabetes mellitus and 16% patients had various associated diseases. All 22 (100%) patients studied by ITT and all but 1 (98%) studied by HOMA-IR were found to have reduced insulin sensitivity and 50% were found to have metabolic syndrome by the modified ATP III criteria. Two (3%) patients were found to have high serum iron, 4 (7%) patients had high ferritin, 5 (8%) patients had increased transferrin saturation, and 4 (13%) patients were found to be heterozygotes for H63D HFE gene mutation. Twenty patients of 38 (53%) had histological evidence of NASH (class 3=6, class 4=14). The other 18 (47%) qualified for class I (n=1) or class II (n=17) NAFLD. Four (10.5%) patients had bridging fibrosis and none had evidence of cirrhosis liver. Seventy-four (74%) patients achieved a biochemical response to lifestyle modification and UDCA. All 17 patients treated with metformin had a reduction in ALT level and 10 (59%) of them had normalization of their enzymes.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that type 2 diabetes people have a higher prevalence of NAFLD. Compared to type 2 diabetes patients without fatty liver, fatty liver patients are substantially more likely to be obese, have dysglycemia, dyslipidemia, increased liver enzymes, and coronary artery disease.

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