

ORIGINAL ARTICLE

Evaluation of fatty liver severity and endothelial function in Non-Alcoholic Fatty Liver Disease

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ABSTRACT:

Background: Non alcoholic fatty liver disease (NAFLD) is fast attaining the status of being the most common disease throughout the world. The present study was conducted to evaluate the association of fatty liver severity and endothelial function in Non-Alcoholic Fatty Liver Disease (NAFLD) patients. **Materials & Methods:** The present study was conducted on 60 non-alcoholic fatty liver disease subjects (group I) and 60 healthy volunteers (group II) without any fatty liver disease. Biochemical tests including liver function tests were performed. These include serum bilirubin, total serum protein, serum albumin, serum globulin, aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) and prothrombin index (PTI). Brachial artery diameter and its changes were determined by using a high resolution B mode ultrasonography system. Flow mediated vasodilatation (FMD) was also done. **Results:** There were 36 male and 24 female in group I and 32 male and 28 female in group II. The mean fasting blood glucose level in group I was 98.04 mg/dl and in group II was 95.18 mg/dl. The mean random blood glucose level in group I was 118.9 mg/dl and in group II was 112.5 mg/dl. The mean D1 in group I was 3.67 mm and in group II was 3.78 mm. The difference was non-significant ($p > 0.05$). The mean D2 in group I was 4.03 mm and in group II was 4.34 mm. The mean flow mediated vasodilatation in group I was 0.16 and in group II was 0.41. The difference was significant ($p < 0.05$). **Conclusion:** The mean FMD in brachial artery in patients with non-alcoholic fatty liver disease is below normal range.

Key words: Aspartate aminotransferase, Fatty liver disease, Flow mediated vasodilatation

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INTRODUCTION

Non alcoholic fatty liver disease (NAFLD) is fast attaining the status of being the most common disease throughout the world. The prevalence is as high as 20-30% of general population in western countries while in India the prevalence in various studies varies from 9-32% in different studies.¹ Non-alcoholic fatty liver disease is the most common cause of chronic liver disease in the general population and presents when fatty infiltration affects >5% of hepatocytes, in the presence of <20 g (2.5 U) of alcohol consumption per day, without evidence of other causes of liver disease. NAFLD is regarded by many to be the hepatic manifestation of metabolic syndrome and therefore it may be linked to cardiovascular disease. NAFLD disease is a fast emerging global epidemic which is recognized as a common metabolic disorder that is closely associated with obesity and insulin resistance.² The increasing prevalence of NAFLD is accompanying the increasing prevalence of other non-communicable diseases, including type 2 diabetes, cardiovascular disease, obesity-associated cancers, and advanced liver diseases such as hepatic cirrhosis and hepatic cancer.³ The increasing prevalence of these diseases is related to

unhealthy lifestyles and unhealthy diet, which drives the increase in cardiometabolic diseases, cancers, and NAFLD. Over nutrition and sedentary lifestyle often result in obesity and hepatic steatosis; however, these factors might not necessarily result in hepatocyte necrosis, inflammation, and fibrosis.⁴ The present study was conducted to evaluate the association of fatty liver severity and endothelial function in Non-Alcoholic Fatty Liver Disease (NAFLD) patients.

MATERIALS & METHODS

The present study was conducted in the department of Internal Medicine. It comprised of 60 non-alcoholic fatty liver disease subjects (group I) and 60 healthy volunteers (group II) without any fatty liver disease. The study protocol was approved from institutional ethical committee. All were informed regarding the study and written consent was obtained. Data such as name, age, gender etc. was recorded. General physical examination was done. Patients were subjected to random blood sugar and fasting blood sugar. All were investigated for fasting lipid profile and ultrasonographic evidence of fatty liver. Biochemical tests including liver function tests were performed.

These include serum bilirubin, total serum protein, serum albumin, serum globulin, aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) and prothrombin index (PTI).

Brachial artery diameter and its changes were determined by using a high resolution B mode ultrasonography system. Flow mediated vasodilatation (FMD), which reflects endothelium dependent

vasodilatation, was calculated as the percentage increase in diameter from baseline to the maximum value which is obtained after the cuff deflation using the following formula: $FMD = \frac{d2-d1}{d1} \times 100$, where d2= Brachial artery diameter at 5 min post deflation and d1 = Base line brachial artery diameter. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of subjects

Gender	Male	Female
Group I	36	24
Group II	32	28

Table I shows that there were 36 male and 24 female in group I and 32 male and 28 female in group II.

Table II Assessment of parameters

Parameters	Group I	Group II	P value
FBG (mg/dl)	98.04	95.18	0.5
RBG (mg/dl)	118.9	112.5	0.6
AST (units/l)	35.82	34.21	0.1
ALT (units/l)	45.3	30.9	0.01
ALP (units/l)	134.5	68.2	0.001
Total cholesterol	165.4	140.6	0.02
LDL	96.51	85.2	0.01
Triglyceride	148.12	140.91	0.05
HDL	52.23	51.32	0.21
VLDL	28.7	28.24	0.45

Table II, graph II shows that mean fasting blood glucose level in group I was 98.04 mg/dl and in groupie was 95.18 mg/dl. The mean random blood glucose level in group I was 118.9 mg/dl and in group II was 112.5 mg/dl. The difference found to be non- significant (p> 0.05). There was significant difference in lipid profile in both groups (P< 0.05).

Graph II Assessment of parameters

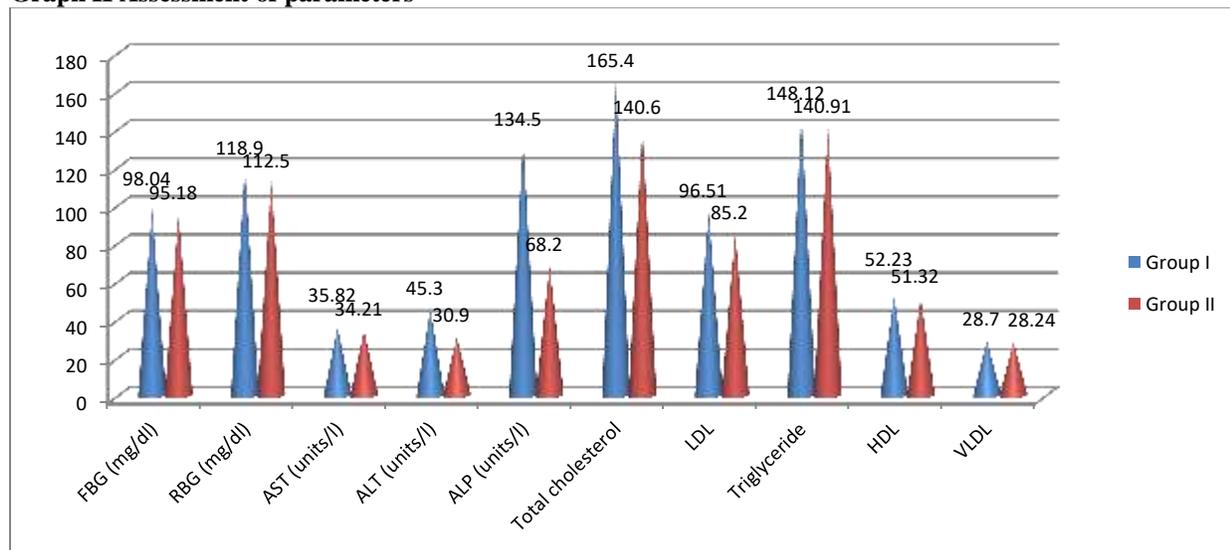


Table III Brachial artery diameter in both groups

Groups	Group I	Group II	P value
D1	3.67	3.78	0.07
D2	4.03	4.34	0.05

Table III shows that mean D1 in group I was 3.67 mm and in group II was 3.78 mm. The difference was non-significant ($p > 0.05$). The mean D2 in group I was 4.03 mm and in group II was 4.34 mm. The difference found to be significant ($p < 0.05$).

Table IV Flow mediated vasodilatation in both groups

Groups	Mean	P value
Group I	0.16	0.001
Group II	0.41	

Table XII shows that mean flow mediated vasodilatation in group I was 0.16 and in group II was 0.41. The difference was significant ($p < 0.05$).

DISCUSSION

Key lifestyle parameters, such as an increased intake of glucose, fructose, and saturated fat induce hepatic de-novo lipogenesis, subclinical inflammation in adipose tissue and liver, and insulin resistance in adipose tissue and skeletal muscle.⁵ These lifestyle parameters are also accompanied by an increased risk of type 2 diabetes, in which β -cell dysfunction is mediated.⁶ The presence of endothelial dysfunction with decreased nitric oxide (NO) production is considered to be the cornerstone for the development of NAFLD and cardiovascular diseases. Endothelial dysfunction is observed in patients with NAFLD, indicated by decreased brachial artery flow-mediated dilation (FMD).⁷ The present study was conducted to evaluate the association of fatty liver severity and endothelial function in Non-Alcoholic Fatty Liver Disease (NAFLD) patients.

In this study, there were 60 cases and 60 controls. Shukla et al included 32 cases and 16 control in their study. We found that mean fasting blood glucose level in group I was 98.04 mg/dl and in group II was 95.18 mg/dl. The mean random blood glucose level in group I was 118.9 mg/dl and in group II was 112.5 mg/dl. The difference found to be non-significant ($p > 0.05$). There was significant difference in lipid profile in both groups ($P < 0.05$).

Liu et al⁸ found that 32 cases and 16 age and sex matched controls were included in the study. Flow mediated vasodilatation of the brachial artery was studied in both cases and controls. Anthropometric, clinical and biochemical assessment was also done. It was found that NAFLD patients had a significant endothelial dysfunction as assessed by flow mediated vasodilatation as compared with controls. Percentage change in FMD among NAFLD patients ($13.54 \pm 3.65\%$) was found to be lower than that in controls

($16.84 \pm 4.61\%$) and difference was found to be statistically significant ($p 0.010$).

We observed that mean D1 in group I was 3.67 mm and in group II was 3.78 mm. The difference was non-significant ($p > 0.05$). The mean D2 in group I was 4.03 mm and in group II was 4.34 mm. The difference found to be significant ($p < 0.05$). The mean flow mediated vasodilatation in group I was 0.16 and in group II was 0.41. The difference was significant ($p < 0.05$).

Mohammadi et al⁹ found that a total of 1,583 study subjects were enrolled. The overall prevalence of non-alcoholic fatty liver disease was 18.1%. The results of analysing 1,215 qualified participants showed that for males, high frequency of animal oil and high intake of oil were positively related to non-alcoholic fatty liver disease while high consumption of tea was associated with a decreased risk.

It is found that both hyperinsulinemia and insulin resistance are central to NAFLD pathophysiology. Under normal conditions, pancreatic beta cells secrete insulin primarily in response to circulating glucose levels. Insulin acts on several metabolic tissues, including adipose tissue to promote esterification of fatty acids and storage into lipid droplets while inhibiting the opposing process of lipolysis. In hepatocytes, insulin has three primary actions: to promote glycogen storage, inhibit gluconeogenesis and activate key regulators of de novo lipogenesis. In NAFLD patients, the development of insulin resistance results in 1) increased adipocyte lipolysis and high circulating free fatty acids available for subsequent hepatic uptake, 2) reduced hepatic glycogen storage and 3) and increased gluconeogenesis. Perhaps in response to systemic insulin resistance (or preceding the development of insulin resistance, hyperinsulinemia

develops which augments hepatic de novo lipogenesis pathways.

CONCLUSION

Non-alcoholic fatty liver disease (NAFLD) is a growing global health problem, affecting almost a quarter of the world's population. The mean FMD in brachial artery in patients with non-alcoholic fatty liver disease is below normal range.

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