Original Article

Correlation of body mass index, risk factors and biochemical parameters in patients with non-alcoholic fatty liver disease: A cross sectional study

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Abstract

Introduction: Non-alcoholic fatty liver disease (NAFLD) is a major cause of chronic liver disease worldwide. Non-alcoholic fatty liver disease has been increasingly recognized as the most common pathological condition affecting liver. The metabolic syndrome including dyslipidemia, impaired glucose tolerance, hypertension and obesity has significant relationship with non-alcoholic fatty liver disease. So in this study we compared the Body Mass index (BMI), the levels of serum aminotransferases and other biochemical parameters of patients with non-alcoholic fatty liver detected by ultrasonography **(**USG**).** We also studied the risk factors associated with enzyme derangements in non-alcoholic fatty liver disease. **Materials and Methodology:** Patients who were clinically suspected to have fatty liver, screened using ultrasound and diagnosed to have non-alcoholic fatty liver disease,were included in the study from April 2016 to June 2016. Other causes of fatty liver were ruled out. Biochemical assays were performed for aspartate aminotransferase (AST), alanine aminotransferase (ALT), Fasting Blood Sugar (FBS), Total cholesterol (CHL), triglycerides (TG), low density lipoprotein (LDL) and Thyroid stimulating Hormone (TSH). The fatty liver was graded based on the USG. **Results:** Total number of patients were eighty one including 45 males (56 %) and 36 females (44 %) aged between 20 to 65 years. Most patients in our study were 30 to 50 years old, with median age of 42.8± 9.7 years and most of them had grade 1 fatty liver by ultrasonography. In our study there was significant relation between aminotrasferase (ALT) and Lipid profile (cholesterol, triglyceride and LDL) with a P value of < 0.01. We compared ALT with BMI and fasting blood sugar which yielded a significant P value of <0.01 and <0.05 respectively. There was statistically significant positive correlation between increased ALT and TSH (p<0.001). **Conclusion:** Patients with NAFLD, who had high Body mass index, elevated lipid profile and increased fasting blood glucose were found to exhibit increased levels of alanine aminotransferase. Further, although patients were not known to have underlying comorbids such as diabetes, hypertension and dyslipidemia, they were detected to have increased BMI, fasting blood glucose, and elevated lipids, which represents part of the metabolic syndrome.

Keywords: Non alcoholic fatty liver disease, aminotransferases,body mass index, cholesterol, triglyceride, low density lipoprotein, ultrasonography.

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INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is a major cause of chronic liver disease worldwide. Non-alcoholic fatty liver disease has been increasingly recognized as the most common pathological condition affecting liver. The metabolic syndrome including dyslipidemia, impaired glucose tolerances, hypertension and obesity has significant relationship with non-alcoholic fatty liver disease. During last 20 years there is almost two times increase in the prevalence of non-alcoholic fatty liver disease and is the number one cause of liver disease in the

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western countries[1]. Non-alcoholic fatty liver disaese is diagnosed in clinical settings using ultrasound imaging as a liver biopsy is not practically feasible. In India and other developing countries where people think twice before going for ultrasound imaging because of affordability, World Gastroenterology Organisation guidelines prescribe a resource-sensitive approach[1]. Aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma-glutamyl transferase (GGT) and other markers of liver injury may be useful markers of non-alcoholic fatty liver disease. The criteria for definition of Non-alcoholic fatty liver disease requires that (a) there is evidence of hepatic steatosis, either by imaging or by histology and (b) there are no causes for secondary hepatic fat accumulation such as significant alcohol consumption, use of steatogenic medication or hereditary disorders[2]. Non-alcoholic fatty liver disease (NAFLD) is a common liver disease in the west and an expanding disease in the world[3-6]. NAFLD means accumulation of ample fat (5%–10% of organ weight) in the liver in a person who consumes no more than 30 gr alcohol per day in men and 20 gr in women[7-8]. As non-alcoholic fatty liver disaese is closely related to metabolic syndromeand diabetes, there is need for testing of liver enzymes and considering a diagnosis of non-alcoholic fatty liver disease.There are many studies done outside India where novel cut-offs for liver enzymes as a qualifying criteria for patients to undergo ultrasonography for detection of non-alcoholic fatty liver disease but there is a paucity of data from Indian literature in this regard. So in this study we compared the profile of aminotransferase (ALT) of patients with non-alcoholic fatty liver disease daignosed on USG with BMI and other biochemical parameters.

MATERIALS AND METHODS

Study Designs

It was a prospective cross-sectional study.

Study Population

All patients attending the outpatient departemnt of a University teaching hospital were screened. Patients who were clinically suspected to have fatty liver, screened using ultrasound and diagnosed to have non-alcoholic fatty liver disease, were included in the study from April 2016 to June 2016. Other causes of fatty liver were ruled out.

Inclusion Criteria

Patients without alcohol use or occasional use (< 30gr alcohol per day in men, and < 20gr in women).

Exclusion Criteria

- Patients found to be positive for chronic hepatic disease (hepatitis B and C)
- Systemic comorbidities and neoplasm
- Hepatotoxic drugs during the past 6 months [9,10].

Sampling Frame:

- Patients attending general medicine Outpatient department at Chettinad hospital and research institute, Kelambakkam, TN, India over a period of three months.

Sample Size:

- Eighty one(81)

Body mass index of all cases were measured according to the World Health Organization (WHO) criteria [11] Patients' weight and then height was measured by using standard techniques. Body mass index (BMI; kg/m2) was calculated for all subjects by dividing a person's weight in kilograms by the square of their height in meters. Patients were classified as normal weight (BMI < 25.0 kg/m2), overweight (BMI ≥ 25.0 and ≤ 29.9 kg /m2), and obese grade 1(BMI ≥ 30.0 kg to 35 kg/m2), grade 2(BMI>35.0 to 40.0 kg /m2), grade (BMI>40.0). All the patients were checked for hepatitis B surface antigen, and Hepatitis C virus. Then the patients were checked for liver enzymes as alanine aminotransferase (U/L) (ALT), aspartate aminotransferase (U/L) (AST) and Fasting Blood Glucose (mg/dL) (FBS), triglyceride (mg/dL) (TG) and cholesterol levels (mg/dL) (CHL) were determined by using Auto Analyzer. Then all the patients were subjected to ultrasonography after laboratory tests. All risk factors and aminotranferase level were compared with the values obtained using one way ANOVA. P values < 0.05 were considered as statistically significant.

RESULTS

Eighty one cases including 45 males (56 %) and 36 females (44 %) aged between 20 to 65 years were studied. Most patients in our study were 30 to 50 years old, with median age of 42.8± 9.7 and most of them were in grade 1 fatty liver by ultrasonography. Overall, 39 cases were overweight (48.2 %), 21 cases hadgrade 1 obesity (33.3 %). and 12 cases had grade 2 obesity (14.8%).In co-morbid conditions DM was found in 25.9%, systemic hypertension and dyslipidemia was found in 22.2%, thyroid disease was there in 11.1%. The important clinical characteristics of patients with non-alcoholic fatty liver disease are described in Table 1. The odds ratio (OR) and P value in relation to ALT and pre-existing comorbdities (DM, SHT, Dyslipidemia, Thyroid disorders, smoking) were found to be non-significant. In the laboratory parameters which is shown in Table 2, ALT was raised in 29.6% of patients. Cholesterol was increased in 55.55% of patients, triglyceride was increased in 59.2%, LDL was increased in 85.1%, FBS was increased in 55.5% and TSH was increased in7.4% of patients with non-alcoholic fatty liver disease. We compared ALT with TG, CHL, LDL,FBS, BMI in

patients with non-alcoholic fatty liver disease by ultrasonography. Comparison of data was done by ANOVA (post-hoc tests).In our study there was significant relation between lab parameters ALT, cholesterol, triglyceride and LDL with a P value of < 0.01. We compared ALT with BMI and fasting blood sugar which yielded a significant P value of <0.01 and <0.05 respectively. There was statistically significant relation between increased ALT and TSH (p=0.001). Also when the GGT was compared with the same parameters found to have a positive relationship (p=<0.01). But there was no significant relation when we compared AST and GGT. These results are represented in Table 3.

Table 1:

Basic details	Percentage (%)
Age	
(20-40)yrs	48.14
(41-60)yrs	40.74
(>60)yrs	11.10
Male	56.00
Female	44.40
DM	25.9
SHT	22.2
Dyslipidemia	22.2
Thyroid disorders	11.1
Smoking	14.89
BMI	
(18.5-25)	3.7
(25.1-30)	48.2
(30.1-35)	33.3
(>35)	14.8

Table 2:

Lab Parameters	Percentage(%) of Abnormal values
ALT	29.6
Cholesterol	55.5
Triglyceride	59.2
Low density lipoprotein	85.1
Fasting Blood Sugar	55.6
TSH	7.4

Table 3:

Biochemical Parameter	P value
ALT vs BMI	<0.05
ALT vs FBS	<0.01
ALT vs CHL	<0.01
ALT vs TG	<0.01
ALT vs LDL	<0.01
ALT vs TSH	<0.001

DISCUSSION

In the present era, early diagnosis of Non-alcoholic fatty liver disease is an important goal, especially in obese people, because this disease is associated with severe liver disorder [12, 13]. In this study we evaluated liver enzymes ALT/GGT with other laboratorybiochemical parameters and BMI. We also compared liver enzymes ALT/GGT with risk factors (DM, SHT, Dyslipidemia, Thyroid disorders, smoking). Kumar R *et al* found that lean NAFLD patients have less severe disease, minor, or no insulin resistance, but are frequently dyslipidemic and have BMI higher than lean healthy control[14]. In our study most of the patients were either overweight or obese. Paschos P *et al* in their review article found that there was strong association of nonalcoholic fatty liver disease as a possible component in the metabolic syndrome[15]. Hamagushi *et al* in their prospective observational studyof apparently healthy individuals found that the MS is a strong risk factor for nonalcoholic fatty liver disease[16.] Hsiao *et al* demonstrated that the presence of severe fatty liver correlated significantly with the prevalence and degree of hypertension, abnormal glucose and triglyceride metabolism[(17)].In our study population, the previous history for comorbidities was not significant but on lab investigations most of them were found to have deranged blood sugar and lipid profile. Hence we suggest that patients with fatty liver, even with no prior comorbidities, should be screened for fasting hyperglycemia and dyslipidemia. Sundaram SS *et al* also found that there is high prevalence of NAFLD and elevated aminotransferases in obese adolescents with Insulin Resistance[18]. Constantine *et al* study states that there is important role of obesity and insulin resistances in a group of NAFLD patients[19]. In this study they also found that there is positive correlation between elevated ALT and increased FBS, which indicates presence of insulin resistance. In a study by Gökmen and Fatma they state that insulin resistance, enlarged waist circumference, elevated body mass index, higher FT3/FT4 ratio and hypertriglyceridemia are independent risk factors for NAFLD, whereas hypothyroidism is not directly related to the condition. However in our study, we found a strong association between ALT and TSH levels (p<0.001). Based on our study, in the South Indian population, patients detected to have fatty liver should be evaluated for diabetes, dyslipidemia and thyroid dysfunction. Also, those with elevated fasting blood glucose, higher lipid levels and high BMI are more prone for liver injury as evidenced by raised ALT in these patients.

CONCLUSION

Patients with NAFLD, who had high Body mass index, elevated lipid profile and increased fasting blood glucose were found to exhibit increased levels of alanine aminotransferase. Further, although patients were not known to have underlying comorbids such as diabetes, hypertension and dyslipidemia, they were detected to have increased BMI, fasting blood glucose, and elevated lipids, which represents part of the metabolic syndrome.

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