

SERUM AST LEVEL IN METABOLIC SYNDROME PATIENTS WITH AND WITHOUT NAFLD

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Abstract

Background: This study was undertaken to evaluate the Serum AST level in MetS patients with and without NAFLD. The objective was to compare the change in serum AST level in those patients. **Materials and Methods:** The study was conducted in the Department of Biochemistry in association with Department of Medicine, National Institute of Medical Sciences and Hospital, Jaipur. At the same time adult diagnosed 150 MetS patients (75 with NAFLD & 75 without NAFLD) were taken. Anthropometric measurements were taken. AST was measured in serum in both groups. The data obtained was statistically analysed. **Result:** Serum AST was 50.03 ± 28.12 U/l in MetS with NAFLD while serum AST was 34.37 ± 8.39 U/l in without NAFLD. **Conclusion:** Increased AST level are highly significant (p value < 0.001) in MetS with NAFLD as compare to without NAFLD.

INTRODUCTION

Metabolic syndrome (MetS) is a cluster of several risk factors which is related to the high incidences of morbidity and mortality and result from various diseases such as diabetes mellitus, cardiovascular disease, myocardial infarction, cancers and stroke. MetS includes diabetes with raised fast plasma glucose, abdominal obesity, hypertension and hyperlipidemia.^[1-3]

According to IDF Criteria (2005),^[4] for clinical Diagnosis of Metabolic Syndrome, Central obesity is defined as waist circumference should be more than or equal to & it should be 90 cm in South Asian men & more than or equal to 80 cm in South Asian women should be more than or equal to 80 cm. Along with severe abdominal obesity any two factors which include increased Triglyceride (TG) level, reduced HDL cholesterol (High Density Lipoprotein- cholesterol), increased blood pressure & increased fasting plasma glucose (FPG) are associated with metabolic syndrome. Raised TG level should be more than or equal to 150 mg/dl or patient on treatment, reduced HDL cholesterol should be less than 40 mg/dl in males & less than 50 mg/dl in females or patient on treatment and systolic blood pressure should be more than or equal to 130mmHg or diastolic blood pressure should be more than or equal to 85 mmHg or on hypertension treatment and raised fasting plasma glucose (FPG)

should be more than or equal to 100 mg/dl or patient with diabetes mellitus.

It has been reported that the incidence of metabolic syndrome increases with the severity of obesity and has been observed in 50% of obese adolescents.^[5] In 1997, the WHO defined obesity as “a disease in which excess fat is accumulated to an extent that health may be adversely affected.” Obesity has been listed as a disease in the International Classification of Disease by the WHO since 1979. The standard classification of obesity is expressed in terms of body mass index (BMI). Obesity is defined as a $BMI \geq 30$ kg/m².^[6]

Non-alcoholic fatty liver disease (NAFLD) is a major cause of chronic liver disease worldwide. Its prevalence is estimated approx 33% of the global population,^[7,8] and prevalence of NAFLD varies according to gender, age and ethnicity. NAFLD is characterized by the presence of increased amounts of fat in the liver. Nonalcoholic fatty liver disease ranges from simple steatosis to nonalcoholic steatohepatitis (NASH) and to more serious conditions including cirrhosis and hepatocellular carcinoma. It was estimated that 2–3% of individuals in the general population will suffer from NASH,^[9,10] which can progress to cirrhosis and then progress to hepatocellular carcinoma.^[11]

Metabolic-associated fatty liver disease (MAFLD) is a recently proposed overarching terminology that addresses a spectrum of conditions associated with fatty liver disease and metabolic dysregulation. It

more accurately reflects the underlying pathogenesis of the disease than NAFLD.^[12]

Most of the NAFLD patients are asymptomatic and commonly occurring increased level of liver enzyme as markers of liver damage, like gamma glutamyl transferase (GGT), serum aspartate transaminase (AST) and serum alanine transaminase (ALT).^[13,14] Serum aspartate aminotransferase enzyme is mildly to moderately elevated and it is most common and often having laboratory abnormality in case of NAFLD.^[15] According to Thamer et al. AST is also correlated with hepatic fat independently of obesity.^[16]

Therefore, the purpose of this investigation was to estimate and compare the level of AST liver enzyme in Metabolic Syndrome patients with or without NAFLD.

MATERIALS AND METHODS

This study was approved by the ethical committee of the institution.

Study design: Comparative Cross-sectional study

Study Population: The study population comprised of multiethnic groups of patients from Jaipur district. The sample consisted of 150 MetS patients (75 with NAFLD & 75 without NAFLD) in the age range of 20 to 60 years of both sexes. The patients were taken from the outdoor patient department of medicine, NIMS Medical College and Hospital, Nims University, Jaipur, Rajasthan.

Clinical Assessment: Metabolic syndrome patients were selected according to IDF 2005,^[4] and diagnosed cases of NAFLD were taken. Weight, height, waist circumference and blood pressure were measured. Samples of blood were collected from all the patients for estimation of Serum TG, Serum TC, HDL-C, LDL-C, FBS and AST level. The level of AST in serum was compared in MetS patients with and without NAFLD. Serum AST was measured by using ready to use MDH-NADH reagent kit of Siemens Dimension EXL 200 (Kinetic method).^[17]

Inclusion Criteria

According to IDF 2005 guidelines 20-60 years old metabolic syndrome patients of both sexes and clinically diagnosed cases of NAFLD by Ultrasonography report were taken.

Exclusion Criteria

Smokers, patients with bone disorders & renal diseases, Pregnant & lactating Women, patients having anticonvulsants drug History, patient on Oral contraceptives therapy, and Patient who refused to sign the informed consent form were excluded from the study.

Statistical Analysis: The unpaired Student's t test was used to compare serum AST levels ($P < 0.001$) was considered significant. All standardized analysis was performed in SPSS software & Microsoft Excel.

RESULTS

Our study involved two groups, MetS with NAFLD and without NAFLD group. Each group has 75 subjects within 20-60 years age range. In which MetS with NAFLD group consisting of 49 males (65.3%) & 26 females (34.7%) and MetS without NAFLD consisting of 30 males (40%) & 45 females (60%).

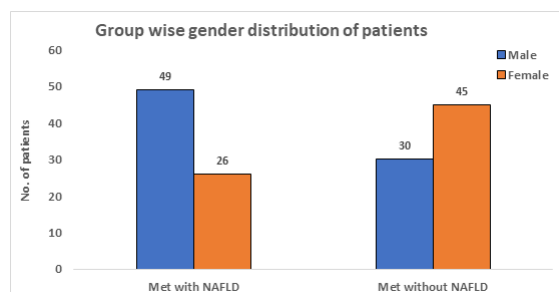


Figure 1: Descriptive presentation of gender of both groups

In [Table 2 and Figure 2] are shown descriptive statistics of age in MetS with and without NAFLD patients. The age range (23- 60) years, median value 48 year & Interquartile range (38, 52) years was found in MetS with NAFLD patients. The age range (20 – 60) years, median value 42 year & Interquartile range (32.5, 53) years was found in MetS without NAFLD patients.

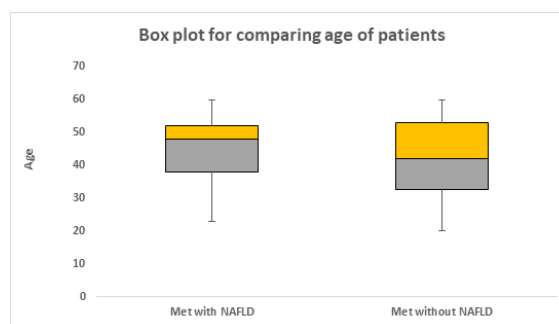


Figure 2: Descriptive statistics of age of patients

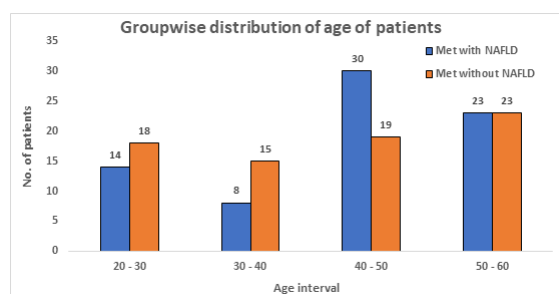


Figure 3: Group wise distribution of age of patients

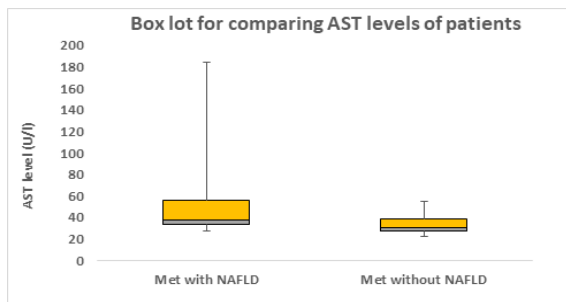


Figure 4: Descriptive statistics of AST of metabolic syndrome patients

Comparison of AST level, between metabolic syndrome with and without NAFLD is shown in [Table 4]. Mean \pm SD of serum AST in MetS with NAFLD patient was 50.03 ± 28.12 U/l and in MetS without NAFLD patients it was 34.37 ± 8.39 U/l. The level in MetS with NAFLD was higher and this was highly significant ($P < 0.001$). Hence, increase in serum AST is associated with NAFLD in MetS patients.

In [Table 5 and Figure 4] are shown descriptive statistics of AST levels in MetS with and without NAFLD patients. The AST range 28 - 184 U/l, median value 38 U/l & Interquartile range 34 U/l, 56 U/l was found in MetS with NAFLD patients. The AST range 23 - 55 U/l, median value 31 U/l & Interquartile range 28 U/l, 39 U/l was found in MetS without NAFLD patients.

In [Table 6 and Figure 5] Frequency distribution of AST levels in MetS with and without patients are shown. In case of MetS with NAFLD ≤ 30 U/l AST

level was present in 9 patients, 30 - 40 U/l was present in 31 patients, 40 - 50 U/l was in 12 patients, 50 - 60 U/l was present in 8 patients, 3 patients having 60 - 70 U/l & 70 - 80 U/l level was present in 4 patients, 80 - 90 U/l present in 4 patients and > 90 U/l present in 4 patients.

≤ 30 U/l AST level was found in 34 MetS without NAFLD patients, 30 - 40 U/l present in 24 patients, 13 patients having 40 - 50 U/l and 50 - 60 U/l present in 4 MetS without NAFLD patients. There is no any patient which having 60 - 70 U/l, 70 - 80 U/l, 80 - 90 U/l & > 90 U/l AST level in case of MetS without NAFLD.

Frequency distribution of AST levels analysis showed a significant highly level of AST in MetS with NAFLD patient compare to MetS without NAFLD.

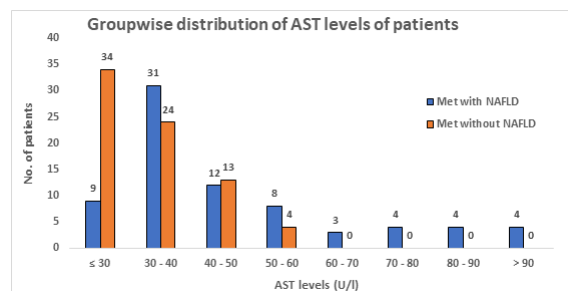


Figure 5: Frequency distribution of AST levels of MetS patients

Table 1: Descriptive presentation of gender of both groups

Groups	Male	Female
Met with NAFLD	49 (65.3%)	26 (34.7%)
Met without NAFLD	30 (40%)	45 (60%)

Table 2: Descriptive statistics of age (years) of patients

Groups	Minimum	Maximum	Median	IQR
Met with NAFLD	23	60	48	(38, 52)
Met without NAFLD	20	60	42	(32.5, 53)

Table 3: Frequency distribution of age of patients

Age Interval	Met with NAFLD	Met without NAFLD
20 - 30	14	18
30 - 40	8	15
40 - 50	30	19
50 - 60	23	23

Table 4: Comparison of AST between metabolic syndrome with and without NAFLD (Values are mean \pm SD)

Met with NAFLD	Met without NAFLD	t - test	P - value
50.03 ± 28.12 U/l	34.37 ± 8.39 U/l	4.62	0.000007

**Highly significant ($P < 0.001$).

Table 5: Descriptive statistics of AST of metabolic syndrome patients with and without NAFLD

Groups	Minimum	Maximum	Median	IQR
Met with NAFLD	28	184	38	(34, 56)
Met without NAFLD	23	55	31	(28, 39)

Table 6: Frequency distribution of AST levels of metabolic syndrome patients with and without NAFLD

AST Interval	Met with NAFLD	Met without NAFLD
≤ 30	9	34

30 - 40	31	24
40 - 50	12	13
50 - 60	8	4
60 - 70	3	0
70 - 80	4	0
80 - 90	4	0
> 90	4	0

DISCUSSION

Non-alcoholic fatty liver disease is a large enough to be noticed health issue in India. NAFLD is integrated with metabolic abnormalities which include high TG, low HDL cholesterol, high BP & high fasting plasma glucose and the metabolic syndrome, which are important factor of T2DM and CVD. The change in serum AST in MetS and NAFLD is well documented but whether changes occur in MetS with & Without NAFLD is not known. This study was conducted to see changes in serum AST in both groups.

The metabolic syndrome is associated with insulin resistance (IR), which in turn is related to elevated synthesis of free fatty acids from glucose in the liver.^[18] In obese patients there is an increased uptake of free fatty acids by the liver, where after the acids are subjected to esterification with glycerol to form triglycerides that play a role in the accumulation of fat in the liver.^[19] Bashu Dev Parde et al,^[20] concluded that according to NCEP ATP III criteria 13.6% of NAFLD were present with metabolic syndrome, where the risk estimate was significant.

In our study non alcoholic fatty liver found more in males (65.3%) compared to females (34.7%). which is supported by the study of Amarapurkar et al,^[21] which found more males (24.6%) with nonalcoholic fatty liver than females (13.6%). Males possess too much intra abdominal fat, and possibly also to the fact that the distribution of body fat is influenced by sex hormones so Nonalcoholic fatty liver is found more frequently in males compared to females.^[22] In contrast, De Lusong et al,^[23] in the Philippines in 2005 where it was also found that female NAFLD patients amounted to 71% of the 134 study subjects. The age range of the subjects in the present study was 20-60 years. We found that NAFLD was more common in the younger age groups. Similar results shown by Alwis & Day C consumption of soft drinks was associated with an elevated risk of NAFLD.^[24] Shibata M et al reported that rapid rise of NAFLD in the younger age groups is the result of awesternized life style, such as is reflected by a high-fat and high-calorie diet and a decline in physical activity.^[25] These results provide confirmatory evidence for our study. In obese patients there is an increased uptake of free fatty acids by the liver, where after the acids are subjected to α -oxidation or esterification with glycerol to form triglycerides that play a role in the accumulation of fat in the liver.^[26]

In our study the level of AST increases significantly ($p > 0.001$) in syndrome with NAFLD as compared to metabolic syndrome without NAFLD patient. The AST range 28 - 184 U/l, median value 38 U/l & Interquartile range 34 U/l, 56 U/l was found in MetS with NAFLD patients. The AST range 23 - 55 U/l, median value 31 U/l & Interquartile range 28 U/l, 39 U/l was found in MetS without NAFLD patients. The mean AST (mean \pm SD) of MetS patients with NAFLD was 50.03 ± 28.12 U/l and it was 34.37 ± 8.39 U/l in MetS without NAFLD patients. The difference in these both groups was statistically highly significant ($p < 0.0001$). The similar study was done by Nigam et al in 2013 which showed a significant association of AST with NAFLD with a P value of 0.001.^[27]

Our results show that serum AST was significantly high in MetS patient with NAFLD compare to without NAFLD with highly significant P value ($P < 0.001$) which showed significant difference in both groups. So we can use serum AST as a biomarker for liver disease as it is high in NAFLD.

Thus, a conclusion can be drawn that metabolic syndrome along with its individual components has greater association with Non alcoholic fatty liver disease. From the above observations, we can conclude that there is high levels of AST is associated with fatty liver in metabolic syndrome patients. Fatty liver is mostly asymptomatic in early stages. We can detect non alcoholic fatty liver by measure the AST level in metabolic syndrome patients. Metabolic syndrome diagnosis can be established from clinical and biochemical parameters, and some of the components of metabolic syndrome like waist circumference. We easily diagnose metabolic syndrome based on clinical and biochemical parameters, thus establishing the risk for fatty liver. We can take primary prevention by introducing life style modifications, thus modifying the disease course and delaying more serious complications like Cirrhosis of Liver and Hepatocellular Carcinoma.

CONCLUSION

Elevation of AST level in Patients with NAFLD was independent biomarker of the progression of NAFLD.

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