

The Study of Serum Levels of AST, ALT, GGT, Serum Bilirubin in Relation to OGTT in Patients with NAFLD

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Abstract

Background: Nonalcoholic fatty liver disease [NAFLD] is a very common disorder and refers to a group of condition where there is accumulation of the excess fat in the liver who drink no alcohol. The most common form of NAFLD is not a serious condition called Fatty liver. In fatty liver, fat accumulates in the liver cells. The presence of fat in the liver; it probably does not damage the liver. A small group of people with NAFLD can progress to a condition called Nonalcoholic steatohepatitis [NASH]. Thus World Gastroenterology Organisation guidelines proposes Aspartate Transaminase [AST], Alanine Transaminase [ALT], Gamma Glutamyl Transferase [GGT] and other markers of liver injury may be used to diagnose NAFLD. Now a days NAFLD is closely related to Obesity, insulin resistance, metabolic syndrome, IGT, Pre diabetes and diabetes. **Methodology:** This is a prospective study was conducted in the Department of Biochemistry at Tertiary Care Teaching Hospital over a period of 1 year. Study subjects were selected from department of Radiology and Medicine both outpatient and inpatient who are found to have fatty liver by ultrasound and the biochemical analysis was done in the department of Biochemistry. The study includes 30 people without NAFLD 30 patients with NAFLD. Age is more than 40 years and both males and females are taken. **Results:** In the present study the mean value of GGT in group1 is 23.50+6.83 and in group 2 is 55.77+11.44. p value is <0.001 which is statistically significant. In the present study the mean value of TSB in group1 is 0.75+0.13 and in group2 is 1.32+0.20. there is significant increase in the mean value in Group2 and the p value is <0.001 which is statistically significant. In the present study the mean value of FPG in group1 is 83.87+8.58 and in group2 is 117.83+8.51. There is increase in the mean value in Group2 when compared to Group1 and the p value is <0.001 which is statistically significant. In the present study the mean value of 1-Hour post glucose load in group1 is 138.13+7.61 and in group2 is 191.90+14.53. p value is <0.001 which is statistically significant. **Conclusion:** The serum levels of liver enzymes with glucose values of OGTT are compared; there is significant rise in the glucose values and the liver enzyme values in NAFLD cases. Hence NAFLD patients may benefit from early screening for Diabetes mellitus. NAFLD is the most common chronic liver condition in adults and is present in the majority of obese people. It may lead to serious medical complications ranging from cryptogenic cirrhosis to hepatocellular carcinoma as well as DM and CVD.

Keywords: Nonalcoholic fatty liver disease, Bilirubin, Nonalcoholic steatohepatitis.

INTRODUCTION

Nonalcoholic fatty liver disease [NAFLD] was first described by the Ludwig in 1980 is believed to be one of the most common causes of chronic liver disease in the world. The prevalence is likely to parallel the increasing prevalence of diabetes, obesity and other components of metabolic syndrome.^[1]

Nonalcoholic fatty liver disease [NAFLD] is a very common disorder and refers to a group of condition where there is accumulation of the excess fat in the liver who drink no alcohol.^[2] The most common form of NAFLD is not a serious condition called Fatty liver.

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In fatty liver, fat accumulates in the liver cells. The presence of fat in the liver; it probably does not damage the liver. A small group of people with NAFLD can progress to a condition called Nonalcoholic steatohepatitis [NASH].^[3]

In NASH, fat accumulation is associated with liver cell inflammation and different degrees of scarring. NASH may lead to Cirrhosis. Cirrhosis occurs when the liver sustains substantial damage and the liver cells are gradually replaced by the scar tissue. It can lead to the improper function of the liver.^[4]

The clinic pathological syndrome of NAFLD encompassing a spectrum of disorders ranging from simple Steatosis to inflammatory steatohepatitis and cirrhosis. Simple fatty Liver is asymptomatic and in this condition very little fat is stored in the liver cells.^[5] In NASH there is inflammation of liver along with the accumulation of fat in the liver cells [steato means fat and hepatitis means inflammation of liver]. This persistent hepatitis may eventually cause scarring of the liver leading to fibrosis. Cirrhosis is a serious condition where the normal tissue of the liver is replaced by lot of fibrosis.^[6]

The prevalence of NAFLD has doubled during last 20 years worldwide. It is diagnosed in clinical settings using commonly Ultrasound imaging and also as liver biopsy is practically difficult to conduct in each and every case of Fatty liver patients.^[7] In developing countries like India affordability of ultrasound imaging itself is a burden but as a screening marker ultrasound of Liver plays a significant role and is an important ideal marker.^[7]

Thus World Gastroenterology Organisation guidelines proposes Aspartate Transaminase [AST], Alanine Transaminase [ALT], Gamma Glutamyl Transferase [GGT] and other markers of liver injury may be used to diagnose NAFLD. Now a days NAFLD is closely related to Obesity, insulin resistance, metabolic syndrome, IGT, Pre diabetes and diabetes.^[8] Hence studies of these Liver enzymes along with Ultrasound plays a major role in the knowledge of Metabolic syndrome and diabetes mellitus.

METHODS

This is a prospective study was conducted in the Department of Biochemistry at Tertiary Care Teaching Hospital over a period of 1 year.

Study subjects were selected from department of Radiology and Medicine both outpatient and inpatient who are found to have fatty liver by ultrasound and the biochemical analysis was done in the department of Biochemistry.

Sample size: The study includes 30 people without NAFLD 30 patients with NAFLD. Age is more than 40 years and both males and females are taken.

Inclusion Criteria

1. The patients who were diagnosed as fatty liver by the ultrasound reports.
2. Age: More than 40 years
3. Sex: Both males and females are included in the study

Exclusion Criteria

1. History of Hepatitis
2. History of Alcoholism.

Sample Collection

After making the subjects comfortable and under aseptic precautions 3ml of fasting venous blood is collected into a clean dry test tube 75mg of glucose is mixed in 300ml of water is given. After 1- hour and 2-hours 3ml of blood is collected into two clean dry test tubes marked as 1-hour and 2-hour and then allowed to clot. Then the sample was centrifuged at 2500 rpm. Thus the separated serum was used for the estimation of liver enzymes, Bilirubin and plasma

Glucose levels on the same day.

Estimation of serum liver enzymes was done by the kinetic assay as given below.

The following investigations were done

1. Serum AST
2. Serum ALT
3. Serum GGT
4. Total serum Bilirubin
5. Oral glucose tolerance test

Statistical Analysis

The study was done on 60 people which are divided into two groups. Group1 includes people without NAFLD and Group2 includes patients with NAFLD. The data collected was entered in excel sheet [Microsoft office excel 2007]. The data was analyzed using unpaired t test and the results are as follows.

RESULTS

In the present study the mean value of serum AST in group-1 is 15.5+4.5 and in group-2 is 58.90+15.09 IU/L. p value is <0.001 and there is significant difference between two groups. In group 2 the value is significantly increased compared to group 1.

In the present study the mean values of ALT in group 1 are 16.53+5.29 and in group 2 is 76.17+17.83. p value is <0.001 which is statistically significant. The mean value of ALT in group 2 is increased when compared to group1 [Table 1].

In the present study the mean value of GGT in group1 is 23.50+6.83 and in group 2 is 55.77+11.44. p value is <0.001 which is statistically significant. [Table 2].

In the present study the mean value of TSB in group1 is 0.75+0.13 and in group2 is 1.32+0.20. there is significant increase in the mean value in Group2 and them p value is <0.001 which is statistically significant [Tables 3].

In the present study the mean value of FPG in group1 is 83.87+8.58 and in group2 is 117.83+8.51. There is increase in the mean value in Group2 when compared to Group1 and the p value is <0.001 which is statistically significant [Table 4].

In the present study the mean value of 1-Hour post glucose load in group1 is 138.13+7.61 and in group2 is 191.90+14.53. p value is <0.001 which is statistically significant. [Table 5]

In the present study the mean value of 2-Hour post glucose load in group1 is 119.43+5.28 and in group2 is 156.23+15.69. p value is <0.001 which is statistically significant. [Table 6]

Table 1: Mean AST values [IU/L] in two groups

GROUP	Mean ± SD	p value
GROUP 1	15.5+4.5	<0.001
GROUP 2	58.90+15.09	

Table 2: Mean values of ALT [IU/L] in two groups

Groups	Mean+SD	p value
Group1	16.53+5.29	<0.001
Group2	76.17+17.83	

Table 3: Mean values of GGT[U/L] in two groups

Groups	Mean+SD	p value
Group1	23.50+6.83	<0.001
Group2	55.77+11.44	

Table 4: Mean values of TSB[mg/dl] in two groups

Groups	Mean+SD	p value
Group1	0.75+0.13	<0.001
Group2	1.32+0.20	

Table 5: Mean values of FPG [mg/dl] in two groups

Groups	Mean+SD	p value
Group1	83.87+9.08	<0.001
Group2	117.83+8.51	

Table 6: Mean values of 1-Hour post glucose load[mg/dl] in two groups

Groups	Mean+SD	p value
Group1	138.13+7.61	<0.001
Group2	191.90+14.53	

Table 7: Mean values of 2-Hour post glucose load[mg/dl]

Groups	Mean+SD	p value
Group1	119.43+5.28	<0.001
Group2	156.23+15.69	

Table 8: comparison of parameters between the two groups

Parameter	Group1	Group2	p value
AST	15.50	58.90	<0.001
ALT	16.53	76.17	<0.001
GGT	23.50	55.77	<0.001
BILIRUBIN	0.75	1.32	<0.001
FPG	83.87	117.83	<0.001
1-HOUR POST GLUCOSE LOAD	138.13	191.90	<0.001
2-HOUR POST GLUCOSE LOAD	119.43	156.23	<0.001

DISCUSSION

Hyperinsulinemia occurring as a result of Insulin Resistance also increases intrahepatocytic fatty acids by increasing glycolysis and decreasing apolipoprotein B-100 thereby blocking the exocytosis of VLDL-c.^[9] With the development of hepatic insulin resistance, the inhibitory effect of insulin on glucose production is diminished, whereas the stimulatory effect of insulin on lipogenesis is retained.^[10]

Insulin resistance is thought to be the key factor in the development of hepatic steatosis due to the important action of insulin on skeletal muscle, adipocytes and the liver- all important organs in maintaining glucose and lipid homeostasis.^[11]

NAFLD appears to be associated with long standing insulin resistance, and likely represents the hepatic manifestation of the metabolic syndrome.^[12]

The lipolysis in the adipose tissue caused by insulin resistance in the adipocytes leads to accumulation of lipids within the liver and adipose tissue insulin resistance is positively correlated with liver fat content in nonalcoholic fatty liver patients.^[13]

Elevated plasma concentrations of insulin, glucose, and fatty acids then promotes hepatic fatty acid and triglyceride uptake,

de novo lipid synthesis (via the sterol regulatory element-binding protein (SREBP-1) and carbohydrate response element-binding protein (CREBP) and impairs β -oxidation of fatty acids by negative feedback.^[14]

Hyperinsulinemia occurring as a result of insulin resistance also increases intra hepatic fatty acids by increasing glycolysis and decreasing apolipoprotein B-100 thereby blocking the exocytosis of VLDL-c.^[15]

Development of insulin resistance with increasing age could be one of the causative factors for nonalcoholic fatty liver disease.^[16-21]

In the present study, mean value of serum AST in Group1 is 15.50+4.5 and in Group2 is 58.90+15.09. There is significant increase in the mean value of AST in Group2 [p <0.001].

The mean value of serum ALT in Group1 is 16.53+5.29 and in Group 2 is 76.17+17.83. There is significant increase in the mean value of ALT in Group2 [p<0.001] which is statistically significant.

The mean value of serum GGT in Group1 is 23.50+6.83 and in Group2 is 55.77+11.44. There, is significant increase in the mean values in Group2 and the p value is <0.001 which is statistically significant.

The mean value of serum bilirubin in Group1 is 0.75+0.13 and in Group 2 is 1.32+0.20. There is significant increase in

the mean value of serum bilirubin in Group2 and the p value is <0.001 which is statistically significant.

The mean values of fasting plasma glucose in Group1 is 83.87+8.58 and in Group2 is 117.83+8.51. There is significant increase in the mean value of FPG in Group2 and the p value is <0.001 which is statistically significant.

The mean value of 1-hour post glucose load in Group1 is 138.13+7.61 and in Group2 is 191.90+14.53. There is significant increase in the mean values of 1-hour post glucose load in Group2. The p value is <0.001 which is statistically significant.

The mean value of 2-hour post glucose load in Group1 is 119.43+5.28 and in Group2 is 156.23+15.69. There is significant increase in the mean value of OGTT 2-hour post glucose load in group2. The p value is <0.001 which is statistically significant.

There is positive correlation between AST and FPG, AST and 1-Hour post glucose load, AST and 2-Hour post glucose load; ALT and FPG, ALT and 1-Hour post glucose load, ALT and 2-Hour post glucose load; GGT and FPG, GGT and 1-Hour post glucose load, GGT and 2-Hour post glucose load; TSB and FPG, TSB and 1-Hour post glucose load, TSB and 2-Hour post glucose load

CONCLUSION

The serum levels of liver enzymes with glucose values of OGTT are compared; there is significant rise in the glucose values and the liver enzyme values in NAFLD cases. Hence NAFLD patients may benefit from early screening for Diabetes mellitus.

NAFLD is the most common chronic liver condition in adults and is present in the majority of obese people. It may lead to serious medical complications ranging from cryptogenic cirrhosis to hepatocellular carcinoma as well as DM and CVD.

By estimating all these parameters, we found that not only Fatty liver due to alcoholism but NAFLD also plays an important role in the insulin resistance and metabolic syndrome as that was observed in other studies mentioned in the review of literature and future studies with AST, ALT, GGT would be useful in understanding the risk factors of DM and metabolic syndrome. The above area of the research work is crucial and which if detected early can be managed accordingly and prevent the DM and its complications.

This study has given us an Birds eye view on the relation of Liver enzymes AST, ALT, GGT are significantly correlated with increasing glucose levels in blood and it needs further research on more population to consider its impact.

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