Original Article

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Evaluation of Non Alcoholic Fatty Liver Disease in T2dm Patients and Abnormalities in Liver Enzymes, Lipid Profile in Patients with Fatty Liver in Comparison with Patients without Fatty Liver

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Abstract

Introduction: The non-alcoholic fatty liver disease (NAFLD), seen in patients with T2DM. Recently, it has been documented that NAFLD prevalence has been increasing in paraller with increasing obesity and T2DM. NAFLD, the most common hepatic disease. This study aimed to determine the prevalence of NAFLD in T2DM patients, diagnosed by liver ultrasound and to see the differences in hepatic enzymes, lipid parameters between patients with NAFLD and individuals without NAFLD. **Subjects and Methods:** This study conducted at Department of Radiodiagnostics, BGS Global Institute of Medical Sciences, Kengeri, Bengaluru, Karnataka. A total of 200 subjects were involved in this study, among them 100 were T2DM patients as cases and 100 healthy subjects as controls. The physical and clinical examination was done for all the subjects. The patients were categorized into 2 groups, based on the liver size and echo texture. Group I include T2DM patients with NAFLD and group II include T2DM patients without NAFLD. Under aseptic condition, fasting venous blood samples were collected from all the subjects, centrifuged to obtain serum. The obtained serum was used for the estimation of fasting blood sugar (FBS), post-prandial blood sugar (PPBS), aspartate transaminase, alanine transaminase, alkaline phosphatase, gamma-glutamyl transferase and lipid profile. Fatty liver was diagnosed on USG based on echogenicity and liver size. The liver examination was carried by using Samsung Medison UGEO and GE voluson P8 with curvilinear array transducers starting with 3-7 MHz. The size of the liver was measured in midclaviclar line longitudinally and <14 cm was taken as controls and >14 was considered as hepatomegaly. **Results:** In this study, significantly increased age was observed in T2M patients with NAFLD and without NAFLD compared to healthy controls. The liver size, aspartate transaminase (AST), alanine transaminase (ALT), alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT) and serum cholesterol, triglycerides and LDL-cholesterol were increased significantly in T2DM patients compared to controls. In subgroup analysis, in group I, liver size, AST, ALT, ALP, GGT, serum cholesterol and triglycerides were significantly high when compared to group II patients. **Conclusion:** In the present study, NAFLD prevalence is 65% among T2DM patients. Dyslipidemia and increased heaptic enzymes such as AST, ALT, ALP and GGT are seen more frequently in group I than group II. Early detection and optimum control of diabetes mellitus is important to reduce the effect of diabetes on liver.

Keywords: Fatty liver disease, Liver enzymes, T2DM, Dyslipidemia

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Introduction

Non-alcoholic fatty liver disease (NAFLD), seen in T2DM patients and its prevalence ranged from 55%–68%.[1] Recently, it has been reported that NAFLD prevalence has been increasing in paraller with progressing obesity and T2DM.[2,3] The risk factors of NAFLD are MetS, obesity and physical inactivity.[4]

Many patients with NAFLD are without symptoms, although few may experience fatigue, malaise or pain in the right hypochondriac region of abdomen. Hepatomegaly, the most common finding in majority of patients. Diagnosis of NAFLD is based on histological examination of liver biopsy, but it is an invasive and costly procedure. NAFLD encompasses multiple liver disorders, including nonalcoholic steatohepatitis (NASH). NASH patients may develop into hepatic fibrosis and hepatocellular carcinoma (HCC).[5]

Therefore, NAFLD considered as the common chronic hepatic disease. The presence of NAFLD and T2DM increases the likelyhood of developing NASH and cirrhosis than the presence of NAFLD alone.[6,7]The NAFLD involvement as a predictor of cardiovascular disease (CVD) events remains debatable.[8]The fibrotic changes of liver indicates the predictor of liver-specific mortalityand although most of the patients with NAFLD may not fall into cirrhotic stage, T2DM patients progress faster, and are at greater risk of steatohepatitis (NASH).[9,10]

With recognition and control of risks linked with progression to fatty liver, irreversible cirrhosis can be prevented. Hyperglycemia in T2DM results in elevation in lipid profile, oxidative stress, elevated liver enzymes and inflammatory markers in NAFLD subjects. Due to this, identifying patients with, or at risk for advanced fibrosis among the NAFLD patients is useful for treatment. This study is aimed to determine the NAFLD prevalence among T2DM patients, diagnosed by liver ultrasound and to see the differences in hepatic enzymes, lipid profile between patients with NAFLD and individuals without NAFLD.

Subjects and Methods

This study conducted at Department of Radiodiagnostics, BGS Global Institute of Medical Sciences, Kengeri, Bangalore, Karnataka. A total of 200 subjects were involved in this study, among them 100 were T2DM patients as cases and 100 healthy subjects as controls. Age of the subjects ranged between 27 to 70 years. Patients with chronic hepatic disease, patients on hepatotoxic agents, alcoholism, T1DM, T2DM patients on insulin treatment, autoimmune diseases, congestive cardiac failure and renal diseases were excluded. The physical and clinical examination was done for all the subjects. Patients were sub-divided into two groups on the basis of liver size and echo texture. Group I includes T2DM cases with NAFLD and group II includes T2DM cases without NAFLD.

Under aseptic condition, fasting venous blood samples were collected from all the subjects, centrifuged to obtain serum. The obtained serum was used for the estimation of fasting blood sugar (FBS), post-prandial blood sugar (PPBS), AST, ALT, ALP, GGT and lipid profile parameters. Fatty liver was diagnosed on USG based on the echogenicity and liver size. The examination of liver was carried by using Samsung Medison UGEO and GE voluson P8 with curvilinear array transducers starting with 3-7 MHz. The size of the liver was measured in midclaviclar line longitudinally and <14 cm was taken as controls and >14 was considered as hepatomegaly.

Statistical analysis

The results were expressed as mean ±SD. P value <0.05 considered as significant.

Results

In this study, age was increased in T2M patients with NAFLD and without NAFLD than healthy controls. The liver size, liver enzymes such as AST, ALT, ALP, GGT and serum cholesterol, triglycerides and LDL-cholesterol were elevated significantly in T2DM patients than controls. In sub-group analysis. In group I, liver size, AST, ALT, ALP, GGT, Cholesterol and triglycerides were significantly high than group II as shown in [Table 1].

Discussion

T2DM patients were at greater risk of developing NAFLD and also higher risk to develop hepatic diseases.[11]NAFLD, hepatic disorder characterized by deposition of fat in liver parenchyma. The etiology of this disease is unknown, but the disease is associated with T2DM, abnormal lipid levels, obesity and elevated BP, all of them are components of the metabolic syndrome.[12]

T2DM associated with dyslipidemia and hepatic enzymes elevation. The liver fat content in T2DM patients could contribute to diabetic dyslipidemia. In fact, diabetic dyslipidemia, independent risk factor for development of CAD.[13]Obesity is a known to be linked with NAFLD. Distribution of body fat also play a key role in NAFLD pathophysiology. Enhanced transport of FA to the liver, more hepatic fat synthesis as well as reduced oxidation or removal of fat from the liver leads to accumulation of fat in liver.[14]Abnormal TGL storage and lipolysis in insulin-sensitive tissues like liver are early manifestations of IR.

In addition, insulin resistance induces lipid peroxidation which activates inflammatory cytokines and facilitates the steatosis to progress into steatohepatitis and hepatic fibrosis. Serum TGL and/or LDLC levels might be increased in NAFLD patients. Considering that hepatic steatosis is common in T2DM, it also shown to influence the severity, and composition of dyslipidemia.[15,16]

In this study, serum total cholesterol and serum TGL levels were high in NAFLD patients, indicating that they are risk factors for NAFLD development. T2DM patients reported to be linked with abnormalities in hepatic enzymes, especially raised ALT levels are the most common abnormality.[17]In the present study, hepatic enzymes such as AST, ALT, ALP, GGT were significantly high in T2DM cases with NAFLD. These findings were also reported in other studies.[18,19]

The possible reasons for the increased hepatic enzymes in NAFLD, due to dyslipidemia and IR causing the deposition of lipids in liver leads to induction of mitochondrial swelling, more lysosomal fragility and altered membrane integrity, which ultimately results in release of liver enzymes such as aspartate transaminase and alanine transaminase into

Table 1: Comparison of liver size, liver enzymes and lipid profile parameters between healthy controls, T2DM patients with NAFLD and T2DM patients without NAFLD

Parameters	Healthy controls (n=100) mean±SD	Group 1 T2 DM with NAFLD (n=65) Mean ± SD	Group 2 T2DM without NAFLD (n=35) Mean ± SD
Age	43.1±12.0	50.1±11.1 ^{a*}	53.1±11.1 ^{a*}
Liver size	13.9±1.5	22.1±4.2 ^{a*,b*}	15.5±0.8 ^{a*}
FBS (mg/dl)	90.5±8.9	180.2±35.3 ^{a*}	161.0±60.1 ^{a*}
PPBS (mg/dl)	110.1±20.1	294.1±50.1 ^{a*}	220.1±81.1 ^{a*}
Serum cholesterol (mg/dl)	161.1±30.1	210.1±55.1 ^{a*,b*}	170.1±32.1 ^{a*}
Serum Triglycerides (mg/dl)	131.1±55.8	251.2±40.2 ^{a*,b*}	159.2±82.1
HDL cholesterol (mg/dl)	36.1±12.3	38.4±10.2	39.9±10.6
LDL cholesterol (mg/dl)	90.1±27.1	120.3±55.5 ^{a*}	100.9±36.9 ^{a*}
AST (IU/L)	26.8±8.1	96.1±10.8 ^{a*,b*}	22.1±6.0
ALT (IU/L)	20.1±11.1	48.8±14.1 ^{a*,b*}	22.3±10.8
ALP (IU/L)	81.2±23.5	100.1±36.1 ^{a*,b*}	85.2±18.1
GGT (IU/L)	35.8±8.7	46.8±8.5 ^{b*}	30.5±9.2

a*: Control vsT2DM without NAFLD and T2DM with NAFLD
b*: T2DMwithout NAFLD vs T2DM with NAFLD

circulation. These enzymes serve as markers for hepatic injury.[20]

Most of the NAFLD patients are asymptomatic, although some may experience fatigue, malaise or pain in right hypochondriac region of abdomen. Hepatomegaly, the most common finding in many patients. In general, NAFLD is diagnosed by USG examination.[11]

In this present study, fatty liver was prevalence was found to be 65% in T2DM patients. Mishra et al, reported that the prevalence of MetS and NAFLD to be 24% and 14.8%, respectively, in non-alcoholic North Indian men.[21]Gupte et al, observed that NAFLD such as mild, moderate, and severe was observed in 65.5%, 12.5%, and 9.3% of asymptomatic T2DM, respectively.[22]A multiple components of the MetS which increased in T2DM with a more prevalence of NAFLD & NASH found by Prashanth et al.[23]On histologically, Banerjee et al, found that only fatty change was contemporary in 43%, NASH in 40% and more advanced disease in 23%.[24]

Conclusion

In this study, NAFLD prevalence is 65% among T2DM patients. Dyslipidemia and elevated hepatic enzymes like as AST, ALT, ALP and GGT are seen more frequently in group I than group II. Early detection and optimum control of diabetes mellitus is important to reduce the effect of diabetes on liver. Hence, estimation of hepatic enzymes and USG abdomen to detect NAFLD plays an important role and should be done in all patients with T2DM as preliminary diagnostic tests. Further large prospective studies are required to confirm these findings.

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