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Original Research Article

Comparative Analysis of Non-alcoholic Fatty Liver Disease Diagnosed By Ultrasonography with Lipid Profile and Body Mass Index in Young Adults

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Conflict of interest: Nil

Abstract:

Background and Aim: Obesity has a major consequence of cardiovascular disease which leads to increased mortality and morbidity abnormal liver steatosis by ultrasound grading might throw a warning sign of the future risk. The present study was taken to study the ultrasound grading of liver seatosis and BMI in young adult group.

Material and Methods: Present cross-sectional; study was conducted at the Department of pathology as well as in Radiology at Tertiary Care Teaching Institute of India for the duration of 1 year. In 100 subjects, Height was estimated in centimeters and Weight was measured in kilogram on standard clinical weighing machine. BMI was calculated as Weight in kilogram divided by Height in meters squared. They are classified based on BMI and all the individuals liver ultrasound and lipid profile was performed.

Results: Mean age of the adult group was 20.86 years±2.40 the majority of subjects were male 70 %. The number of subjects in both groups in lower and higher spectrum of BMI was much less. Mean Serum Triglycerides was significantly higher in BMI>25 group (210.50±30.15) when compared with BMI25 group (181.36 ±21.15) compared with BMI 25 group (34.98 ±5.48) when compared with BMI25 group when compared with BMI<25.

Conclusion: There is an increased steatosis in high BMI subjects. Simple semi quantitative Ultra Sound Grading of liver steatosis will be help in earlier diagnosis of metabolic Syndrome and early interventions will reduce cardiovascular risk and improving prognosis of these patients.

Keywords: BMI, Cross-sectional; study, Obesity, Steatosis.

Introduction

Obesity is the major health problem in the world wide and it will leads to cardiovascular complication. Obesity individual have increased Body Mass Index (BMI) and abnormal lipid profile. The abnormal lipid profile will causes fatty infiltration in the hepatic cells and it will progress towards to fatty liver.[1]

Fatty liver is a common problem worldwide. Its prevalence has been estimated to be 20%–30% in general population in Western countries. [2] It was thought to be a benign condition but is now increasingly recognized as a major cause of liver-related morbidity and mortality. If the fatty infiltration of hepatocytes exceeding the 5% of liver weight other than the alcoholic and hepatitis it will be defined as Non-alcoholic fatty liver disease (NAFLD). [3] It starts with a simple hepatic steatosis to later leads to necroinflammatory changes and progressive steatohepatitis. [4] Steatosis is benign condition but steatohepatitis associated with fibrosis, cirrhosis and liver failure and carries a more risk for cardiovascular disease and liver related mortality. Nonalcoholic fatty liver disease will causes insulin resistance, visceral obesity, increased Body mass Index (BMI) and type 2 diabetes mellitus. [5,6]

Studies introduced that nonalcoholic fatty liver disease (NAFLD) may progress to cirrhosis, liver failure, and hepatocellular carcinoma.[7,8] Fatty liver can be easily diagnosed by imaging. Previous studies it reported that most of non-alcoholic fatty liver diseases are overweight and obese individuals and also reported that they have high triglycerides and concluded that non-alcoholic fatty liver disease is a hepatic component of metabolic syndrome. [9] Marchesani et al [10] showed that 80% of patients with NAFLD were obese. One study showed that 79% of people with NAFLD were overweight or

obese. Goland et al. showed that patients with NAFLD had a significant higher body mass index (BMI), higher blood glucose levels, and triglyceride (TGL) values than normal population. Juneja also showed almost similar results with elevated blood glucose values, lipid levels, and blood pressure values.

It can be easily performed than compare with other imaging techniques and its currently used common method to detect hepatic steatosis in asymptomatic patients in NAFLD. [11]

Obesity has a major consequence of cardiovascular disease which leads to increased mortality and morbidity abnormal liver steatosis by ultrasound grading might throw a warning sign of the future risk. Early intervention could be helpful for a healthy outcome. The present study was taken to study the ultrasound grading of liver seatosis and BMI in young adult group.

Material and Methods

Present cross-sectional; study was conducted at the Department of pathology as well as in Radiology at Tertiary Care Teaching Institute of India for the duration of 1 year.

Inclusion criteria: Normal healthy elderly individuals with age group 20 to 30 were taken for the study.

Exclusion criteria: Known Subjects with chronic liver disease, hepatobiliary disease other than NAFLD, malignancies, ascites, the use of medication known to induce hepatic steatosis, Hypertensive patients, diabetic patients, those who are using statins and Patients with human immunodeficiency virus (HIV) and Viral hepatitis were excluded from the study. Individuals who did not provide inform constant were excluded.

The study consists of 100 individuals Informed consent will be taken from the patients and controls. Demographic data was collected followed by history regarding current health status, history of medication, alcoholism and Active smoking.

A questionnaire was given to all participants and detailed clinical examination was performed. In all the subjects, Height was estimated in centimeters and Weight was measured in kilogram on standard clinical weighing machine. BMI was calculated as Weight in kilogram divided by Height in meters squared.

Liver ultrasound scans (US) recorded for each participant by performing abdominal ultrasound. Fatty liver on ultrasound displayed in the grey scale and appears brighter compare to the kidney cortex with accumulated fat in the liver. With increased fatty accumulation in the liver ultrasound waves become highly attenuated leads to low visualization of deeper parts of liver. Diagnostic of fatty liver is based on the increased echogenicity of the hepatic parenchyma as compared to the right renal cortex. Sharpness and visibility of the hepatic vein and diaphragm were assessed and dived into 4 grades based upon by other investigators. [12] Liver and renal cortex of the same echogenicity with no steatosis graded as Grade 0. Slightly brighter liver as compared to the renal cortex, clear visualization of diaphragm, and interface of hepatic veins with sharp contours with mild steatosis graded as Grade 1. brighter liver with attenuated US beam at deeper parts of the liver, diaphragm, and hepatic veins still visible but with blunted contours with moderate steatosis graded as Grade 2. very bright liver, severe US beam attenuation, diaphragm, or hepatic veins not visible with sever steatosis graded as Grade 3.

In all the participants' venous blood was collected for biochemical analysis. Serum total cholesterol, HDLc and triglycerides were analyzed. Serum triglyceride was estimated by GPO-TRINDER end point method. HDL cholesterol was estimated by phosphotungstic acid method from that VLDL and LDL was calculated.

Statistical analysis: The recorded data was compiled and entered in a spread sheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were described as means and standard deviations or median and interquartile range based on their distribution. Qualitative variables were presented as count and percentages. For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

In the present study was a total of 100 adult were included. Table 1 shows the mean age of the adult group was 20.86 years±2.40 the majority of subjects were male 70 %. Table 2 shows most of the subjects 45% had normal BMI followed by overweight BMI 45%. The number of subjects in both groups in lower and higher spectrum of BMI was much less. Table 3 shows the in BMI< 25 group most of the subjects are towards Grade 0 and Grade 1 whereas in BMI>25 most of the subjects are towards Grade 2 followed by Grade 1. Mean Serum Triglycerides was significantly higher in BMI>25 group (210.50±30.15) when compared with BMI25 group (181.36 ±21.15) compared with BMI 25 group (34.98 ±5.48) when compared with BMI25 group when compared with BMI<25.

Table 1: Demographic Profile of adolescent and adult group

Variable	Number
Age (Mean±SD) Years	20.86±2.40
Gender	N (%)
Male	70 (70)
Female	30 (30)

Table 2: Distribution of Participants according to BMI

BMI	Number	Percentage (%)
Under weight (<18.4)	6	6
Normal (18.5-24.9)	45	45
Overweight (25-29.9)	44	44
Obese (>30)	5	5

Table 3: Comparison Ultrasound graded Liver Steatosis based on BMI

Variable	BMI < 25 (n=50) n (%)	BMI > 25 (n=50) n (%)
Ultra Sound Grade 0 steatosis	17 (34)	5 (10)
Ultra Sound Grade 1 steatosis	25 (50)	17 (34)
Ultra Sound Grade 2 steatosis	5 (10)	20 (40)
Ultra Sound Grade 3 steatosis	3 (6)	8 (16)

Discussion

In the present study, we evaluated liver ultra sound grading and lipid profile based on BMI. This study comprised of 100 individuals in which 50 subjects have BMI less than 25 and remaining 50 subjects have BMI greater than 25. In this study most of the high BMI subjects have Grade 2 steatosis followed by Grade 1. In BMI greater than 25 groups around 56% are belongs to Grade 2 and Grade 3 whereas in case of BMI less than 25 group it is 16%. The serum triglycerides, cholesterol, VLDL and LDL increased significantly in BMI greater than 25 groups when compared with BMI less than 25.

Whereas serum HDL was significantly declined in higher BMI. The abnormal dyslipidemia can leads to fatty infiltration and leads to fatty liver. In the study done by Ghobad et al. as well, the prevalence of obesity was 28.2% and 44.1% cases were found to be overweight. In a study done by Mohammad Aleem et al., it was found that increasing grades of fatty liver was associated with increasing weight.

In a study conducted by Juneja et al., it was found that 52.8% were overweight and 22.6% were obese. In the previous study it was observed that increasing grades of fatty liver was significantly associated with increasing levels of Cholesterol, VLDL, LDL and decreased HDL. In our study also high BMI subjects have high grade value and also abnormal lipid profile. In earlier study also shown that there is an increased triglycerdies along with increased graded fatty liver also reported that 68% of fatty liver patients have hyperlipidemia. [16]

In the present study also there is increased triglycerides in high BMI group subjects where there is high spectrum of fatty liver grades The previous study by Juurinen et al. shown that fatty liver disease will causes metabolic disturbances. Marchesani et al., study shown that 80% of subjects with non-alcoholic fatty liver disease were obese. In another study it shown that 79% of subjects with NAFLD are overweight and obese. Goland et al. reported that NAFLD subjects have a higher body mass index and high level of triglycerides.6,10 Dixon et al. also reported that NAFLD is a hepatic component of metabolic syndrome8 Abdominal obesity is a vital determinant in NAFLD pathogenesis due to its association with insulin resistance and a possible source of free fatty acids. Although BMI is the standard for determining obesity, it does not reflect the distribution of body fat. Indeed, BMI is insufficient for assessing abdominal obesity in children because the amount of body fat varies with growth and development. [17-19]

Transabdominal ultrasound is a simple semi quantitative method for assessing the degree of steatosis by using this data we can also predict the severity of the metabolic syndrome because Non-alcoholic fatty liver disease leads to development of metabolic syndrome. [20] Ultra sound detection in early stages will helpful for the early correction such as weight loss. [21] If high grade steatosis was detected more diagnostic work is required to estimate the severity.

The major limitation of ultrasound is the lack of diagnostic sensitivity of mild steatosis. Because in case of mild steatosis only 20% of the heaptocytes are fatty transformed. [22] The US findings of suspected NAFLD include hepatomegaly, diffuse increases in the echogenicity of the liver parenchyma, and vascular blunting. With the development of computer technology, nowadays, it is possible to quantitatively determine the liver fat content by the US hepatic/renal ratio. [23,24] In addition, US provides a reliable and convenient

means of quantifying the visceral fat thickness (VFT) and ASFT. Ultrasound is an important imaging tool for the diagnosis and grading of fatty liver. It is the first line investigation modality for diagnosis of fatty liver. It is cheap, easy to use, and handle.

However, it has some limitations like observer dependency. Next limitation of ultrasound in the cases of fatty liver is its inability to quantify the fat in the liver. Quantification of fat using CT scan or MRI may be more reliable for estimation and quantification of fat deposition in the liver. This can further be correlated with lipid profile in patients. Studies using CT and MRI for the quantification of fat and correlation with lipid profile can be done in the future.

Limitation of the study is sample size is too small for generalization of the study findings. Since the study was conducted in a single institute, care should be taken while inferring the result to the general population.

Conclusion

There is an increased steatosis in high BMI subjects. Simple semi quantitative Ultra Sound Grading of liver steatosis will be help in earlier diagnosis of metabolic Syndrome and early interventions will reduce cardiovascular risk and improving prognosis of these patients.

Deranged lipid profile is associated with cardiovascular problems. Hence, increasing grades of fatty liver has indirect relationship with cardiovascular problems.

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