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Original Research Article

Comparative Analysis of Nonalcoholic 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: Obese people have a higher BMI and a lipid profile that is abnormal. The liver biopsy is the gold standard for detecting nonalcoholic fatty liver disease, however the noninvasive ultrasonography method is a safe, straightforward, noninvasive, affordable, and reproducible tool for liver research. The current study sought to investigate the ultrasonography grading of liver seatosis and BMI in a young adult population.

Material and Methods: The current cross-sectional investigation was carried out in 80 people over the course of a year at the Department of Radiology, Tertiary Care Teaching Institute of India. On a conventional clinical weighing equipment, height was estimated in centimetres and weight was measured in kilogrammes. BMI was computed by dividing weight in kilogrammes by height in metres squared. They are categorised based on BMI, and a liver ultrasound and lipid profile were performed on each participant.

Results: The majority of high BMI subjects had Grade 2 steatosis, followed by Grade 1. Around 54% of people with BMIs greater than 25 belong to Grade 2 and Grade 3, while 18% of people with BMIs less than 25 belong to Grade 2 and Grade 3. Serum triglycerides, cholesterol, VLDL, and LDL are significantly higher in the BMI greater than 25 group compared to the BMI less than 25, however serum HDL is significantly lower in the higher BMI group.

Conclusion: People with a high BMI had more steatosis. Simple semi-quantitative Ultrasound Grading of Liver Steatosis will aid in the earlier diagnosis of metabolic syndrome, and early therapies will lower cardiovascular risk and improve these patients' prognosis.

Keywords: Non-alcoholic fatty liver, Lipid Profile, Obesity, Steatosis.

Introduction

Obesity is a significant public health and medical care issue. Obesity rates in children and adolescents are quickly rising, and the WHO has designated obesity as a disease.[1] Although the amount of body fat is significant, the distribution of body fat, particularly abdominal obesity, is an essential risk factor for metabolic syndrome and cardiovascular disease.[2] Furthermore, since the frequency of NAFLD in children rises, quantifying their belly fat content is critical for assessing obesity. Visceral fat is crucial in the development and progression of NAFLD.[3,4] Fatty liver is a universal disease. Its incidence in the general population in Western countries has been estimated to be 20%-30%.5 It was once assumed to be a harmless illness, but it is now widely acknowledged as a major source of liver-related morbidity and mortality. Nonalcoholic fatty liver disease (NAFLD) has been linked to cirrhosis, liver failure, and hepatocellular cancer, according to research. Imaging is a simple way to diagnose fatty liver. Although liver biopsy is regarded as the gold standard for assessing NAFLD, its invasiveness and unsuitability for screening have limited its use.[6,7] Fatty liver is widespread in obesity, even in otherwise healthy people. Fatty liver affects 20 to 30% of the Western population.[8] Despite the fact that fatty liver is a benign illness, it has been identified as a major source of liver-related death and morbidity.[9] Imaging techniques can quickly detect fatty liver. Aside from the alcoholic fatty liver, Obese people are more likely to have nonalcoholic fatty liver disease.[10] Nonalcoholic fatty liver disease (NAFLD) is characterised as fatty infiltration of hepatocytes that exceeds 5% of liver weight and is not caused by alcohol or hepatitis.[11] The disease begins with simple hepatic steatosis and progresses to necroinflammatory alterations and progressive steatohepatitis.[12] While steatosis is a harmless condition, steatohepatitis is connected with fibrosis, cirrhosis, and liver failure, as well as an increased risk of cardiovascular disease and liver-related death.13 Nonalcoholic fatty liver disease leads to insulin resistance, visceral obesity, an elevated BMI, and type 2 diabetes mellitus.[14,15] It also progresses to hyperlipidemia, cardiometabolic changes, and arterial hypertension, all of which are referred to as metabolic syndrome.[16,17] Previous research found that the majority of people with nonalcoholic fatty liver disease are overweight or obese, have elevated triglycerides, and that nonalcoholic fatty liver disease is a hepatic component of metabolic syndrome.[18]

The liver biopsy is the gold standard for detecting nonalcoholic fatty liver disease, however the noninvasive ultrasonography method is a safe, straightforward, noninvasive, affordable, and reproducible tool for liver research. It is more easily conducted than other imaging techniques and is currently utilised as a frequent tool to diagnose hepatic steatosis in asymptomatic NAFLD patients.[19] Obesity is a primary cause of cardiovascular disease, which increases mortality and morbidity. Abnormal liver steatosis by ultrasound grading may be a precursor to future risk. Early intervention may be beneficial for a good outcome. The current study sought to investigate the ultrasonography grading of liver seatosis and BMI in a young adult population.

Material and Methods

The current cross-sectional investigation was carried out for a year at the Department of Radiology, Tertiary Care Teaching Institute of India. The study included normal healthy senior people ranging in age from 20 to 30.

Criteria for exclusion Known The study excluded subjects with chronic liver disease, hepatobiliary disease other than NAFLD, malignancies, ascites, use of medication known to induce hepatic steatosis, hypertensive patients, diabetic patients, those taking statins, and patients with human immunodeficiency virus (HIV) and viral hepatitis. Individuals who did not submit accurate information were excluded.

The study included 80 people. Patients and controls will be asked to provide informed consent. Demographic information was gathered first, followed by a history of current health state, medication history, drinking, and active smoking.

All participants were given a questionnaire, and a thorough clinical examination was undertaken. Height was calculated in centimetres and weight was measured in kilogrammes on a standard clinical weighing equipment for all subjects. BMI was computed by dividing weight in kilogrammes by height in metres squared. Abdominal ultrasound was used to record liver ultrasound scans (US) for each participant. Radiologists performed each US test with the US probe lubricated with gel. On ultrasonography, a fatty liver is depicted in grey scale and appears brighter than a renal cortex with deposited fat in the liver. As fatty deposition increases in the liver, ultrasound waves become significantly attenuated, resulting in poor visualisation of deeper areas of the liver. The higher echogenicity of the hepatic parenchyma in comparison to the right renal cortex is used to diagnose fatty liver. Other investigators evaluated the sharpness and clarity of the hepatic vein and diaphragm and classified it into four grades.[20] The liver and renal cortex had the same echogenicity and no steatosis, hence they were rated as Grade 0. Slightly brighter liver than renal cortex, clear visualisation of diaphragm and interface of hepatic veins with strong outlines, and mild steatosis rated as Grade 1. Brighter liver with attenuated US beam at deeper areas of the liver, diaphragm, and hepatic veins still visible but with softened contours with Grade 2 mild steatosis. With severe steatosis categorised as Grade 3, a very bright liver, severe US beam attenuation, diaphragm, or hepatic veins are not apparent.

Sample Analysis

Venous blood was drawn from all participants for biochemical examination. Total cholesterol, HDLc, and triglycerides were measured in the blood. The GPO-TRINDER end-point method was used to calculate serum triglycerides. The phosphotungstic acid method was used to quantify HDL cholesterol, from which VLDL and LDL were determined.

Statistical Analysis

The collected data was assembled and input into a spreadsheet programme (Microsoft Excel 2007) before being exported to the data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). The confidence level and level of significance for all tests were set at 95% and 5%, respectively.

Results

A total of 80 persons were enrolled in the current investigation. According to Table 1, the average age of the adult group was 22.10±3.25. The vast majority of subjects (72.5%) were men. According to Table 2, the majority of the participants (46.25%) had normal BMI, while 41.25% were overweight. The number of participants in both groups in the lower and higher BMI ranges was significantly lower. The majority of subjects in the BMI 25 group are in Grade 0 and Grade 1, whereas the majority of subjects in the BMI>25 group are in Grade 2, followed by Grade 1. Table 3 reveals that the mean Serum Triglycerides in the BMI>25 group (208.10±31.36) were substantially higher than in the BMI25 group (114.22±16.10). The mean cholesterol level in the BMI>25 group was substantially higher (181.50±23.16) than in the

BMI25 group (156.10±12.32). This upward trend was statistically significant. ($p \leq 0.05$) When compared to BMI25 (44.98±5.12), blood HDL was considerably lower in the BMI>25 group (36.48±6.34). When comparing BMI25 to BMI>25, the mean LDL and VLDL were considerably higher in the BMI>25 group.

Table 1: Demographic Profile of Adolescent and Adult Group

Variable	Adult
Number	80
Age (Mean±SD) years	22.10±3.25
Gender	
Male	58 (72.5)
Female	22 (27.5)

Table 2: Distribution of adult group according to BMI

BMI	Number	Percentage (%)
Under weight (<18.4)	4	5
Normal (18.5-24.9)	37	46.25
Overweight (25-29.9)	33	41.25
Obese (>30)	6	7.5
Total	80	100

Table 3: Comparative study of lipid profile based on BMI

Variable	BMI < 25 (n=40)	BMI > 25 (n=40)
Serum Triglycerides (mg/dl)	114.22±16.10	208.10±31.36
Serum total cholesterol (mg/dl)	156.10±12.32	181.50±23.16
Serum HDL-C (mg/dl)	44.98±5.12	36.48±6.34
Serum LDL-C (mg/dl)	89.10±15.22	104.65±27.39
Serum VLDL (mg/dl)	23.10±2.34	42.06±7.12

Discussion

We assessed liver ultrasound grading and lipid profile based on BMI in this study. This study included 80 people, 40 of whom had a BMI less than 25 while the remaining 40 had a BMI larger than 25. The majority of the high BMI patients in this study had Grade 2 steatosis, followed by Grade 1. Around 54% of BMI greater than 25 groups belong to Grade 2 and Grade 3, whereas 18% belong to BMI less than 25 categories. Serum triglycerides, cholesterol, VLDL, and LDL levels increased considerably in groups with BMI greater than 25 compared to groups with BMI less than 25. Serum HDL levels were considerably lower in people with a higher BMI.

Atypical dyslipidemia might result in fatty infiltration and a fatty liver. Although BMI is used to determine obesity, it does not account for the distribution of body fat. In Ghobad et al.'s study, the prevalence of obesity was 28.2%, with 44.1% of cases being overweight. According to a study conducted by Mohammad Aleem et al., rising grades of fatty liver were associated with increased weight. Juneja et al. discovered that 52.8% of people were overweight and 22.6% were obese in their study. Other research' findings corroborate this study's finding that persons with NAFLD have a higher frequency of overweight and obesity. Dhumal et al. discovered that rising grades of fatty liver were strongly associated with increasing levels of cholesterol, LDL, very LDL (VLDL), and lowering HDL in their investigation. Ghobad et al. discovered that only rising grades of TGL were substantially linked with increasing grades of fatty liver. In a prior study, higher grades of fatty liver were found to be substantially linked with increased levels of Cholesterol, VLDL, LDL, and lower HDL. High BMI participants also had a high-grade value and an aberrant lipid profile in our study. A previous study also found that there is an increase in triglycerides, as well as an increase in graded fatty liver and that 68% of fatty liver patients have hyperlipidemia.[24] In our study, there is an increase in triglycerides among participants with a high BMI and a wide range of fatty liver grades. Juurinen et al.'s prior investigation demonstrated that fatty liver disease induces metabolic abnormalities. According to a Marchesani et al. study, 80% of individuals with non-alcoholic fatty liver disease were obese. Another study found that 79% of people with NAFLD are overweight or obese. According to Goland et al., NAFLD patients had a higher body mass index and a high level of triglycerides.[25,26] NAFLD is also a hepatic component of metabolic syndrome, according to Dixon et al.[27] According to Mohammad Aleem et al.'s study, persons with fatty liver and diabetes mellitus had higher TGLs, VLDL, LDL, and lower HDL. Shivram Prasad et al. found that fatty liver was related with hyperlipidemia in 68% of patients.

Because non-alcoholic fatty liver disease leads to the development of metabolic syndrome, transabdominal ultrasound is a straightforward semiquantitative approach for detecting the degree of steatosis. Using this data, we can also estimate the severity of the metabolic syndrome.[28] Ultrasound identification in the early phases will aid in early correction, such as weight loss.[29] If high degree steatosis is found, additional diagnostic work is required to determine the severity.

The study's cross-sectional methodology hindered the measurement of age-related changes; hence, longitudinal analyses are required.

Conclusion

High BMI individuals have higher steatosis. Simple semi-quantitative Ultrasound Grading of Liver Steatosis will aid in the earlier diagnosis of metabolic syndrome, and early therapies will lower cardiovascular risk and improve these patients' prognosis.

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