International Journal of Radiology and Diagnostic Imaging

E-ISSN: 2664-4444
P-ISSN: 2664-4436
IJRDI 2019**;** 2(2): 16-19
Received: 12-04-2019
Accepted: 15-05-2019

Dr. JC Naidu
Associate Professor, Vizianagaram, Andhra Pradesh, India

Dr. J Muraliswar Rao
Associate Professor, Department of Radio Diagnosis, Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram, Andhra Pradesh, India

Dr. DSSK Raju
Assistant Professor, Department of Biochemistry, Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram, Andhra Pradesh, India

Corresponding Author:
Dr. J Muraliswar Rao
Associate Professor, Department of Radio Diagnosis, Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram, Andhra Pradesh, India

Comparative study of nonalcoholic fatty liver disease diagnosed by ultrasonography with lipid profile and body mass index in young adults

Dr. JC Naidu, Dr. J Muraliswar Rao and Dr. DSSK Raju

DOI: http://dx.doi.org/10.33545/26644436.2019.v2.i2a.33

Abstract
Background: Obesity individual have increased 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. Fatty liver is a benign condition it is identified as a main cause for liver related mortality and morbidity. Liver steatosis by ultrasound grading might throw a warning sign of the future risk.
Methods: A cross sectional study, containing 60 young adults. 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. They are classified based on BMI and all the individuals liver ultrasound and lipid profile was performed
Results: In the present study most of the high BMI subjects have Grade 2 steatosis followed by Grade 1. In BMI greater than 25 group around 56% are belongs to Grade 2 and Grade 3 whereas in case of BMI less than 25 group it is 16%. There is significantly increase of serum triglycerides, cholesterol, VLDL and LDL in BMI greater than 25 group compared to BMI less than 25. Whereas serum HDL was significantly declined in higher BMI.
Conclusion: Present study finding suggested that there is a more staetosis in overweight and obese individuals. Ultrasonography guided liver steatosis is a cost effective, noninvasive, easy and reproducible and early intervention prevent worst prognosis.

Keywords: Fatty liver, ultrasonography, obesity, lipid profile

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 the common in obesity even in the normal healthy individual. The prevalence of fatty liver is 20 to 30% in western population [2]. Even though Fatty liver is a benign condition it is identified as a main cause for liver related mortality and morbidity [3]. Fatty liver can easily detected by imaging techniques. Besides the alcoholic fatty liver Non alcoholic fatty liver disease is the more common in the obese individuals [4].

If the fatty infiltration of hepatocytes exceeding the 5% of liver weight other than the alcoholic and hepatitis it will be defined as Nonalcoholic fatty liver disease (NAFLD) [5]. It starts with a simple hepatic steatosis to later leads to necroinflammatory changes and progressive steatohepatitis [6]. 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 [7]. Nonalcoholic fatty liver disease will causes insulin resistance, visceral obesity, increased Body mass Index (BMI) and type 2 diabetes mellitus [8, 9]. It also progress towards hyperlipidemia, cardiometbolic alteration and arterial hypertension collectively called as metabolic syndrome [10, 11]. Previous studies it reported that most of non alcoholic fatty liver disease 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 [12].

The liver biopsy is the gold standard for the detection of Non alcoholic fatty liver disease can causes severe complication but the non invasive unltrasonography method is safe, simple, noninvasive, inexpensive and reproducible method for liver studies.

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 [13].
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.

Materials and Methods

Type of study
Cross sectional study.

Study population
Study population are patients and attendants who attend the Department of Radiology.

Selection criteria
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.

Study design
The study consists of 60 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.

Ultrasound of liver
Liver ultrasound scans (US) recorded for each participant by performing abdominal ultrasound. The US probe lubricated with gel each US exam was performed by two radiologist. 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. [14] 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.

Sample analysis
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 [15, 16]. HDL cholesterol was estimated by phosphotungstic acid method [17] from that VLDL and LDL was calculated.

Statistical analysis
Data will be expressed in Mean and Standard deviation (mean ±SD). Z test was used for comparison of means between controls and cases. The statistical significance was determined at 5% ($p < 0.05$) level.

Results
In the present study was a total of 60 adult were included.

Table 1: Demographic Profile of adolescent and adult group

	Adult
Number	60
Age (Mean±SD) years	21.12±2.18
Sex (Males %)	69
(Females%)	31

Table1 shows the mean age of the adult group was 21.12years±2.18. the majority of subjects were male 69 %

Table 2: Distribution of adult group according to BMI

BMI	n=60
Under weight (<18.4)	02 (3.5%)
Normal (18.5-24.9)	28(46.5%)
Over weight (25-29.9)	27 (45%)
Obese (>30)	3 (5%)

Table 2 shows most of the subjects 46.5% 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: Comparison Ultrasound graded Liver Steatosis based on BMI

	BMI < 25 (n=30)	BMI > 25 (n=30)
Ultra Sound Grade 0 steatosis	10 (34%)	3 (10%)
Ultra Sound Grade 1 steatosis	15 (50%)	10 (34%)
Ultra Sound Grade 2 steatosis	3 (10%)	12 (40%)
Ultra Sound Grade 3 steatosis	2 (6%)	5 (16%)

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.

Table 4: Comparative study of lipid profile based on BMI

Parameter	BMI < 25 (n=30)	BMI > 25 (n=30)
Serum Triglycerides (mg/dl)	113.82±17.83	209.80±32.43**
Serum total cholesterol (mg/dl)	157.26±14.17	182.46±22.12**
Serum HDL-C (mg/dl)	45.54±4.26	35.28±5.67**
Serum LDL-C (mg/dl)	88.96±13.65	105.22±26.15**
Serum VLDL (mg/dl)	22.76±3.56	41.96±6.48**

** p<0.001

Table 4 shows the mean Serum Triglycerides was significantly higher in BMI>25 group (209.80mg/dL±32.43) when compared with BMI<25 (113.82mg/dL±17.83). The mean Cholesterol was significantly higher in BMI>25 group (182.46mg/dL±22.12) compared with BMI<25 (157.26mg/dL±14.17). This increase was statistically significant (p<0.001).The serum HDL was significantly decreased in BMI>25 group (35.28mg/dL±5.67) when compared with BMI<25 (45.54mg/dL±4.26). The mean LDL and VLDL were significantly higher in BMI>25 group when compared with BMI<25.

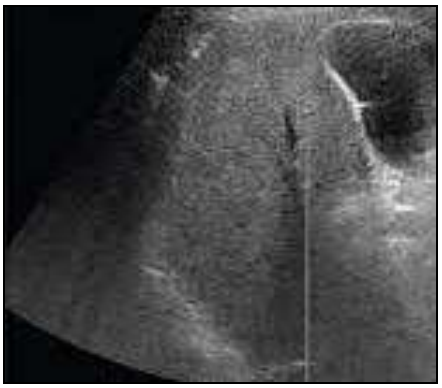

Fig 1: Ultrasound Scan showing Grade 1 fatty liver

Discussion

In the present study, we evaluated liver ultra sound grading and lipid profile based on BMI. This study comprised of 60 individuals in which 30 subjects have BMI less than 25and remaining 30 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 group 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 group 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 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 a increased triglycerdies along with increased graded fatty liver also reported that 68% of fatty liver patients have hyperlipidemia [18]. In our 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 [19, 20]. Dixon *et al*. also reported that NAFLD is a hepatic component of metabolic syndrome [21].

Transabdominal ultrasound is a simple semiquantitative 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 [22]. Ultra sound detection in early stages will helpful for the early correction such as weight loss [23]. 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. [24].

From the findings of present study, it was concluded that there is a 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.

Acknowledgements

The authors acknowledge the help and support provided by the Department of Radiology.

Declarations

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

References

1. Fabbrini E, Sullivan S, Klein S. Obesity and nonalcoholic fatty liver disease: biochemical, metabolic, and clinical implications. Hepatology. 2010; 51(2):679-689.
2. Bedogni G, Miglioli L, Masutti F, Tiribelli C, Marchesini G, Bellentani S. Prevalence of and risk factors for nonalcoholic fatty liver disease: The dionysos nutrition and liver study. Hepatology 2005; 42:44‐52.
3. Adams LA, Lymp JF, St. Sauver J, Sanderson SO, Lindor KD, Feldstein A *et al*. The natural history of nonalcoholic fatty liver disease: A population‐based cohort study. Gastroenterology. 2005; 129:113‐21.
4. Chen SH, He F, Zhou HL, Wu HR, Xia C, Li YM. Relationship between nonalcoholic fatty liver disease and metabolic syndrome. J Dig Dis. 2011; 12:125‐30.
5. Kneeman JM, Misdraji J, Corey KE, Secondary causes of nonalcoholic fatty liver disease, Therapeutic

Advances in Gastroenterology, 2012; 5(3):199-207.
6. Fargion S, Porzio M, Fracanzani AL. Nonalcoholic fatty liver disease and vascular disease: state-of-the-art, World Journal of Gastroenterology. 2014; 20(37):13306-13324.
7. Bambha K, Belt P, Abraham M. Ethnicity and nonalcoholic fatty liver disease. Hepatology. 2012; 55(3):769-780.
8. Bhatia LS, Curzen NP, Calder PC, Byrne CD. Nonalcoholic fatty liver disease: a newand important cardiovascular risk factor? European Heart Journal. 2012; 33(10):1190-1200.
9. Harrison SA, Torgerson S, Hayashi PH. The natural history of nonalcoholic fatty liver disease: a clinical histopathological study, American Journal of Gastroenterology. 2003; 98(9):2042-2047.
10. Chalasani N, Younossi Z, Lavine JE. The diagnosis and management of non alcoholic fatty liver disease: practice guideline by the American Association for the Study of Liver Diseases, American College of Gastroenterology, and the American Gastroenterological Association, Hepatology. 2012; 55(6):2005-2023.
11. Du S, Wang C, Jiang W. The impact of body weight gain on nonalcoholic fatty liver disease andmetabolic syndrome during earlier and later adulthood, Diabetes Research and Clinical Practice. 2016; 116:183-191.
12. Nomura H, Kashiwagi S, Hayashi J, Kajiyama W, Tani S, Goto M *et al*. Prevalence of fatty liver in a general population of Okinawa, Japan. JPN J Med. 1988; 27:142‐9.
13. Adams LA, Sanderson S, Lindor KD, Angulo P. The histological course of nonalcoholic fatty liver disease: Alongitudinal study of 103 patients with sequential liver biopsies. J Hepatol. 2005; 42:132‐8.
14. Van Werven JR, Marsman HA, Nederveen AJ. Assessment of hepatic steatosis in patients undergoing liver resection: Comparison of US, CT, T1-weighted dual-echo MR imaging, and point-resolved 1H MR spectroscopy, Radiology. 2010; 256(1):159-168.
15. Allain CC, Poon LS, Chan CS, Richmond W, Fu PC. Enzymatic determination of total serum cholesterol. Clin Chem. 1974; 20:470-475.
16. Burstein M, Scholnick HR, Morfin R. Rapid method for the isolation of lipoproteins from human serum by precipitation with polyanions. J Lipid Res. 1970; 11:583-595.
17. McGowan MW, Artiss JD, Strandbergh DR, Zak B. A peroxidase-coupled method for the colorimetric determination of serum triglycerides. Clin Chem. 1983; 29:538-542.
18. Mahaling DU, Basavaraj MM, Bika AJ. Comparison of lipid profile in different grades of non‐alcoholic fatty liver disease diagnosed on ultrasound. Asian Pac J Trop Biomed. 2013; 3:907‐12.
19. Singh SP, Nayak S, Swain M, Rout N, Mallik RN, Agrawal O. Prevalence of nonalcoholic fatty liver disease in coastal Eastern India: A preliminary ultrasonographic survey. Trop Gastroenterol. 2004; 25:76‐9.
20. Marchesini G, Brizi M, Bianchi G, Tomassetti S, Bugianesi E, Lenzi M. Nonalcoholic fatty liver disease: A feature of the metabolic syndrome. Diabetes 2001; 50:1844‐50.
21. Dixon JB, Bhathal PS, O'Brien PE. Nonalcoholic fatty liver disease: Predictors of nonalcoholic steatohepatitis and liver fibrosis in the severely obese. Gastroenterology. 2001; 121:91‐100.
22. Hernaez R, Lazo M, Bonekamp S. Diagnostic accuracy and reliability of ultrasonography for the detection of fatty liver: ameta-analysis. Hepatology. 2011; 54(3):1082-1090,
23. Dyson JK, Anstee QM, McPherson S. Non-alcoholic fatty liver disease: a practical approach to treatment, Frontline Gastroenterology. 2014; 5(4):277-286.
24. Mofrad P, Contos MJ, Haque M. Clinical andhistologic spectrum of nonalcoholic fatty liver disease associated with normal ALT values, Hepatology. 2003; 37(6):1286-1292.