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Sonological grading of non-alcoholic fatty liver and comparison with liver enzymes

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Abstract

Background: Non-alcoholic fatty liver disease (NAFLD) is becoming more well acknowledged as a significant contributor to liver-related morbidity and mortality.

Objectives: To assess the sonological grading of non-alcoholic fatty liver disease and comparison with liver enzymes.

Methods: An analytical cross-sectional study was conducted from 2022 August to 2023 January among the patients referred to radiology unit for liver sonography with diagnosis of non-alcoholic liver disease. Ethical approval was obtained from the institutional review committee of Kathmandu Medical College (Ref. 12082022/06). A convenience sampling method was used. The sample size calculated was 107. Descriptive statistics (frequencies, means, and standard deviations) was used to describe the variables of interest. One-way analysis of variance was applied for comparison of serum liver enzymes in between various grades of NAFLD at 5% significance level.

Results: Mean age of the patients was 37.9 ± 17.8 years, with 60% females. Most patients had grade I NAFLD (82, 76.6%), whereas 23 (21.5%) were of grade II. Levels of liver enzyme: Serum glutamic pyruvic transaminase (SGPT) with p-value 0.02 and serum glutamic oxaloacetic transaminase (SGOT) with p-value 0.03 were associated with fatty liver grade.

Conclusion: Ultrasound-based grading of the severity of NAFLD was associated with abnormalities in the liver enzyme profile of patients. The SGPT and SGOT levels correlated with increasing severity of NAFLD based on ultrasound.

Key words: Enzymes; Liver; Non-alcoholic fatty liver; Sonological grading.

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is characterised by significant lipid accumulation (5-10%) in hepatic tissue in the absence of extensive chronic alcoholic use.[1] The NAFLD is the most common cause of diffuse liver disease, which can progress to liver cirrhosis and its complications, including other associated consequences from liver steatosis to non-alcoholic steatohepatitis (NASH).[2] It is related to metabolic risk factors such as obesity, diabetes, and dyslipidaemia in majority of patients.[3] The NAFLD is thought to affect 25.24% of people worldwide, and 40.76% of those cases progress to fibrosis.[4] The Middle East has the highest prevalence of NAFLD (31.8%), followed by Asia (27.4%), United States of America (24.1%), and Europe (23.7%), with Africa having the lowest prevalence (13.5%).[5] Hence, the most prevalent chronic liver disease worldwide is NAFLD.[6] The economic burden rises with increase in clinical effects of NAFLD, such as liver-specific, cardiovascular disease.[7] Compared to antiviral treatments for viral hepatitis, the management of NAFLDs is still underdevelopment.[8] Previously, liver biopsy was considered the gold standard for NAFLD diagnosis.[9] Ultrasonography is an important non-invasive tool in assessment for NAFLD.[10] The main aim

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of this study was to assess the sonological grading of NAFLD and comparison with liver enzymes.

METHODOLOGY

An analytical cross-sectional study was conducted among the patients referred to the department of radiology, Kathmandu Medical College (KMC) for liver sonography with diagnosis of non-alcoholic liver disease from 2022 August to 2023 January. Ethical approval was obtained from the Institutional Review Committee of Kathmandu Medical College (Ref. 12082022/06). Patient who had chronic alcohol abuse, severe chronic illness, and hepatobiliary diseases were excluded from the study.

The convenience sampling method was used and the sample size was calculated using the formula, Sample size (N) = Z^2pq/e^2; Where Z = 1.96 at 95% confidence level; p = 0.3412 (34.12%)[11]; q = 1-p = 0.6588; e = 0.09 (9% margin of error). The total sample size calculated was 106.60 ≈ 107.

All the participants were informed about the study in detail. Written informed consent was taken from each participant.

All patients with diagnosis of NAFLD referred to radiology department were considered. A copy of ultrasound report was kept for record. Informed consent was taken from the patients. The biochemical serum parameters of liver enzymes: total bilirubin, bilirubin direct, Serum glutamic pyruvic transaminase (SGPT), serum glutamic oxaloacetic transaminase (SGOT) of the particular patient was copied. Body mass index (BMI) of the patients was kept in record.

The criteria for grading of NAFLD that were used are as follows: Grade I (mild): increased parenchymal echogenicity with visible periportal and diaphragmatic echogenicity. Grade II (moderate): increased parenchymal echogenicity with obscuration of the echogenic walls of the portal vein branches, without obscuration of the diaphragm. Grade III (severe): increased parenchyma echogenicity with imperceptible periportal echogenicity and obscuration of the diaphragmatic outline (Figure 1).

The data were entered into a Microsoft Excel spreadsheet and later were exported to IBM SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, N.Y., USA) and coded for analysis. The analysis included both descriptive and inferential statistics. Descriptive statistics (frequencies, means, and standard deviations) was used to describe the variables of interest. One-way analysis of variance (ANOVA) was applied for comparison of serum liver enzymes in between various grades of NAFLD at 5% significance level.

RESULTS

The total number of cases included in this study was 107 that were referred as NAFLD patients who had met inclusion criteria of present study. Among them, 45 (42.1%) participants were male, and 62 (57.9%) were female. Mean age was 37.9 ± 17.8 years old with an average BMI of 25.4 ± 0.66. Most patients had grade I NAFLD (82, 76.6%), whereas 23 (21.5%) patients had grade II (Table 1).

The results of the liver function test profile revealed that most of the participants had an elevated total SGPT level (146.4 ± 313.6 U/L), SGOT level (194.1 ± 431.6 U/dL), and Alkaline Phosphate level (166.1 ± 136.6 U/L). The mean Total Bilirubin level is 3.1 ± 6.1 mg/dL. The mean direct Bilirubin level is 1.4 ± 3.2 mg/dL respectively (Table 2).

The findings of this study showed there was a statistically significant relationship between liver enzyme (SGPT and SGOT) levels and ultrasonographic findings (Table 3). The SGPT and SGOT levels were significantly higher in subjects with moderate NAFLD based on sonographic findings than the others. There was no significant relationship between Total Bilirubin, Direct Bilirubin level, and Alkaline phosphate with ultrasonogram (USG) grading of NAFLD.

Table 1: Demographic and ultrasonogram findings of the participants (n=107)

Variables	n (%)
Sex	
Male	45 (42.1)
Female	62 (57.9)
BMI	
<18.5	3 (2.8)
18.5-24.9	50 (46.7)
25-29.9	47 (44)
>30	7 (6.5)
USG grading	
Normal	2 (1.9)
Mild (Grade I)	82 (76.6)
Moderate (Grade II)	23 (21.5)

Table 2: Liver function test according to ultrasonogram grading of NAFLD (n=107)

USG grading	normal		mild		moderate	
Liver function test	Normal n (%)	Abnormal n (%)	Normal n (%)	Abnormal n (%)	Normal n (%)	Abnormal n (%)
Total bilirubin	-	2 (100)	47 (57.3)	35 (42.7)	15 (65.2)	8 (34.8)
Direct bilirubin	-	2 (100)	52 (63.4)	30 (36.6)	17 (73.9)	6 (26.1)
SGPT	-	2 (100)	19 (23.2)	63 (76.8)	4 (17.4)	19 (82.6)
SGOT	-	2 (100)	17 (20.7)	65 (79.3)	2 (8.7)	21 (91.3)
Alkaline phosphate	1 (50)	1 (50)	31 (30.4)	51 (69.6)	7 (36.4)	16 (63.6)

Table 3: Comparison of liver function test with USG grading of NAFLD (n=107)

Characteristics	USG grading Normal (Mean ± SD)	Mild (Mean ± SD)	Moderate (Mean ± SD)	p-value
Total Bilirubin (mg/dl)	0.60 ± 0.14	3.18 ± 6.26	3.37 ± 6.31	0.51
Bilirubin direct (mg/dl)	0.20 ± 0	1.39 ± 3.21	1.66 ± 3.36	0.24
SGPT (U/L)	20.50 ± 4.94	135.27 ± 344.26	197.39 ± 181.65	0.02*
SGOT (U/L)	32.5 ± 6.36	143.19 ± 349.42	266.91 ± 337.66	0.03*
Alkaline phosphate U/L	443.5 ± 456.08	165.29 ± 135.65	145.04 ± 72.82	0.83

*p-values: one-way ANOVA and statistically significant at <0.05.

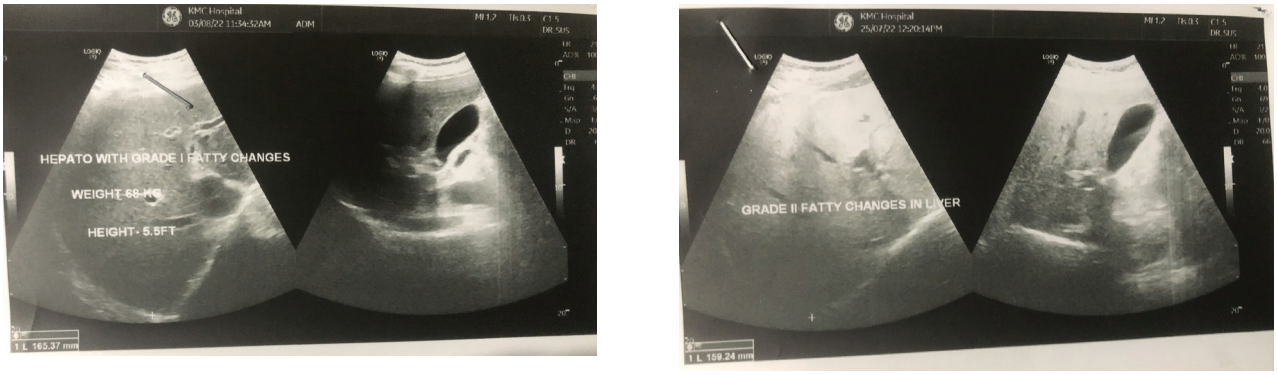

Figure 1: Ultrasonographic picture of fatty liver changes grade I (Left) above and Grade II (Right) below

DISCUSSION

In this study, the prevalence of NAFLD was 98.1%. Similar prevalence (97%) was seen in the study done among obese people in India.[12] The mean age of the patients was 37.9 ± 17.8 years and BMI in obese category was observed in 47 (43.9%) in this study. This was different from the study done in Nepal[13] where the mean age of the patients was 45.39 ± 11.99 years and BMI in obese category were only 23%.

In this study, most patients of mild (82, 76.6%) and moderate NAFLD (23, 21.5%) were included. The authors could not include severe form of NAFLD. Similar findings were found in the research from Nepal.[13] In another study conducted in Nepal,[14] only 6 patients were included as severe NAFLD. Another study done in Manipal[11] also showed mild and moderate level of NAFLD. This shows that the severe form of NAFLD is rare; so, it was also difficult for investigators of this research to include in this study with limited sample size.

There was little difference among females and males who had NAFLD. More females were affected with NAFLD than males in this study. Similar findings were found in study done in Manipal.[11]

This study revealed that SGPT and SGOT were the only liver enzyme showing statistically significant difference

in between NAFLD (p = 0.02, p = 0.03) suggesting the level of enzyme increased significantly with higher grades of NAFL. Similar association was seen in the study done by Saxena in India.[15] The level of SGPT was found significantly (p <0.001) increased in cases than in controls.

There are some limitations in the study. First the diagnosis of NAFLD was based on ultrasonography and not confirmed by liver biopsy histologically. Ultrasound is a highly operator dependent procedure with significant interobserver and intraobserver bias. Secondly, this study was based on data from a single local tertiary facility, which has limited sample size of participants, particularly those with different degrees of fatty liver. This may not be a good reflection and representation of the general population.

CONCLUSION

Ultrasound-based grading of the severity of NAFLD is associated with abnormalities in the liver enzyme profiles of patients. The elevation of SGPT and SGOT enzymes can be a particular and specific marker of non-alcoholic fatty liver disease. Because NAFLD is a highly frequent condition with increasing importance, this study contributed to the understanding of the relationship between liver enzyme profile and ultrasonology in NAFLD.

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