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Correlation Between Ultrasonographic Grading of Fatty Liver and Lipid Profile

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Abstract

Fatty liver disease can easily cause detrimental changes when it slolwly progressess towards the aggressive stages of liver fibrosis leading to cirrhosis, and it can also cause collateral damages in the form of cardiovascular diseases and atherosclerotic disease. The main purpose of this study is to analyze the correlation between the grading of fatty liver disease provided by the ultrasound with lipid profile work of the affected patient. A comparative analytical study was conducted on 138 patients affected with fatty liver disease,the patients were chosen by convenient sampling technique. Study was conducted at Radiology Department of General Hospital Lahore and Sheikh Zayed Hospital Rahimyar khan during July 2019 to October 2019. Total 138 patients data were analyzed. Out of 138 males were 65 (47.1%) males and females were 73 (52.9%) w.The study indicated that the total number of patients having grade 1 fatty liver was 84 (60.9%), patients having grade 2 fatty liver was 52 (37.7%) and patients having grade 3 fatty liver was 2 (1.4%). Out of 138 patients there were total 67 (48.6%)cases of patients with fatty liver disease and out of 138 patients, 71 (51.4%) were considered normal .Female patients were allegedly found to be more effected with fatty liver than males and majority of patients fell into the category of grade1 fatty liver. Since the majority of the patient fell into the category of grade 1 of fatty liver disese and there lipid profile test also indicated towards normal values so the risk of developing any cardiovascular disease among the patients was mininal.

Keywords: fatty liver disease; ultrasonography; lipid profile.

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1. Introduction

Nonalcoholic fatty liver disease (NAFLD) also known as hepatic steatosis is a chronic disorder associated with lipid accumulation particularly triglycerides in the hepatocytes raised the ordinary range of about 5-10% of the total net weight of liver when other etiologies of hepatic damage such as metabolic diseases, viruses are absent [1]. Fatty liver disease accounts for 14.7% among 1366 male/female age groups [2].Associated risk factors are increasing age, males with higher risk in Hispanics, menopause, hypertension, obesity, dietary factors such as high cholesterol, fructose and saturated fat intake and low carbohydrate intake and genetic factors Complications of fatty liver are detrimental as it can progress to liver fibrosis leading to cirrhosis and liver cancer [3]. Fatty liver is clinically silent and is often detected incidentally while performing abdominal ultrasound examination advised for other reasons or when lab results suggest abnormal LFTs [4]. However some patients present with general mild symptoms such as intermittent right upper quadrant pain, malaise, fatigue and dyspepsia [5]. The pathogenesis begins with fat deposition in the liver which causes irregularities in the normal glucose and lipid homeostasis [6]. Moreover, fatty liver associated atherogenicity and elevated body adiposity subjects these patients to Cardiovascular disease risk [7]. Diagnosis of NAFLD includes three main aspects which are medical history, laboratory findings and ultrasonography [8]. Liver biopsy is considered to be the gold standard for diagnosis and quantification of liver fat however its use is limited due to its invasiveness small sample sizes which are prone to sampling errors and associated complications of bleeding [9]. Ultrasound has been proposed as a reliable and accurate imaging tool for detecting moderate-severe fatty liver with reported sensitivity of 84.8% and specificity of 93.6% [10]. The sonographic protocol involves scanning the abdomen with patient in supine and left lateral decubitus position using the intercostal and subcostal approaches [11]. Frequently documented sonographic patterns include focal fat deposition in an otherwise normal liver, diffuse lipid deposition with or without focal sparing [12]. Sonographically, fatty liver has been graded into three categories based on echogenicity changes with GRADE 1 constituting the point where the hepatic echogenicity is slightly increased than normal, GRADE 2 in which the echogenic walls of the portal vein branches are not visible due to increased liver echogenicity and GRADE 3 where the highly echogenic liver parenchyma obscures the outlines of diaphragm [13]. Assessment of fatty liver on CT is based on the degree of attenuation in the liver parenchyma. Steatosis results in liver parenchyma appearing hypodense on CT due to reduction in liver attenuation. The reported sensitivity and specificity of CT in detection of moderate-severe hepatic steatosis is 82% and 100% respectively. However, both CT and US have limited diagnostic accuracy for detecting mild steatosis an addition, CT subjects the patient to high radiation doses. Proton magnetic resonance spectroscopy can most reliably and non-invasively quantify the fat content in liver by spectral tracing of each peak of signal intensities of fat and water arising from desired tissue voxels.MRS better correlates with the actual fat content compared to the histological examination and has sensitivity of (80-91%) and specificity of (80.2-87%).However, a major drawback of MRS is small sample size which is inconvenient when fatty liver changes are uneven. In addition MRS is costly than ultrasound and is not widely available [14]. Ultrasonography is therefore primarily employed for imaging fatty liver since it is a safe and radiation-free modality which is readily available and is cost-effective [15]. Serum ALT levels better correlate with liver fat independent of adiposity .However, S-ALT levels tend to be normal in 69% and 79% of cases in settings of increased fat liver content rendering LFTs insignificant [16]. Most patients with NAFLD remain asymptomatic until they develop

cirrhosis of liver when they complain of fatigue, infact before development of cirrhosis some patients suffer from right upper quadrant discomfort or pain due to hepatomegaly [17]. In the diagnostic studies suggesting fatty liver the positive findings may include hyper echogenicity of liver parenchyma that is bright liver relative to spleen and right kidney, hepatomegaly and blurring of vascular margins [18]. As compared to biopsy of liver which is invasive test for diagnosis, Ultrasonographic findings along with considerably raised fasting lipid profile are the most safe, cheap, easy and accurate available diagnostic tool for fatty liver disease [19].

2. Methods and Materials

After calculating the prevalence of fatty liver disease a total of 138 sample sizes of the patients were considered by keeping the lipid profile test as an essential. With the provisional diagnosis of fatty liver disease clinical manifestation were taken up for research grounds without any borderlines towards the difference of gender and difference of age for all the patients who were hospitalized. Toshiba Xario 100 ultrasound machine at the radiology department of Sheikh Zayed hospital was used for diagnostic investigation. All the protocol of general abdominal ultrasound was followed and 2-5MHz convex transducer was used in the procedure and certain parameters for grading the fatty liver was undertaken depending over echogenicity of the surrounding viscera, the fatty liver was graded 1, 2, and 3.

3. Results

A comparative analytical study conducted at sheikh zayed hospital radiology department which included overall 138 patients, the subjects were chosen on the basis of questionnaire filled by them, and there were 65 (47.1%) male subjects and 73(52.9%) female subjects..Table 1 explains the following frequency in the tabulated form.

Table 1: Gender wise distribution of the frequency and percentage of the case

	Frequency	Percentage
Male	65	47.1
Female	73	52.9

According to table 2 , out of 138 patients that were enrolled with provisional diagnosis of fatty liver disease on the basis of the clinical features and history , there were 84 (60.9%) patient who were diagnosed with grade 1 fatty liver disease on the basis of ultrasonographic feature of increased echogenecity of liver and 52(37.3%) were diagnosed with grade 2 of fatty liver disease with the highlighting ultrasonographic feature of much more intense echogenecity of liver which also affects the borders of portal vein and only 2(1.4%) subjects presented with grade 3 of fatty liver disease in which the increased echogenecity of fatty liver also infiltrates the diaphragmatic border.

According to the table 3, overall 138 patients with fatty liver disease were tested for lipid profile test and the patients evaluation of raised lipid profile values were generated on the basis of LDL values , subjects with LDL value more than 130 were considered disease

Table 2: Grading wise distribution of the frequency and percentage of the cases

Grades of fatty liver	Frequency	Percentage
1	84	60.9
2	52	37.7
3	2	1.4

Table 3: lipid profile wise distribution of the frequency and percentage of the cases

	Frequency	Percentage
Diseased	67	48.6
Normal	71	51.4

4. Discussion

It was a comparative analytical study, conducted in the ultrasound department of General Hospital Lahore and Sheikh Zayed Hospital Rahimyar khan that included 138 patients. The data was collected using consecutive technique from July 2019 to October 2019.Nadeem Ashraf, Tariq Sarfraz and his colleagues (2017) conducted study on "Prevalence of metabolic risk factors in non-alcoholic fatty liver disease" Military Hospital kharian in the Department of radiology. According to this study 110 total patients were examined. Mean age of patients was 49.95 years. There were 72 (65.5%) male patients and 38 (34.5%) female patients. On physical examination major number of individuals with NAFLD had no symptoms, but the percentage of those obese patients who may be at risk of developing steatosis was 20%. The study concluded that 90% of NAFLD patients represented features of metabolic syndrome. In comparison with this study, among 138 total patients, mean age was 40.62 years. 65 (47.1%) were males and 73 (52.9%) were females. The examination of lipid profiles with ultrasound of patients constituted that among total number of patients 67 (48.6%) had chances of developing disease and 71 (51.4%) were considered normal [20]. Muhammad Yahya Afzal and his colleagues (2016) conducted study on "Nonalcoholic fatty liver disease (NAFLD) Frequency in diabetes mellitus (DM) type – 2 patients" Sheikh Zayed Hospital, Federal post graduate medical institute Lahore in the Department of Radiology. This study concluded that increased number of diabetic females were at risk of NAFLD as compared to males. Total number of cases was 130 and 61% females had NAFLD, while 53% males were found to have NAFLD on ultrasound. Similar to their study we also concluded that the number of females with fatty liver was greater than males. The modality of ultrasound is considered to be the safest and most reliable imaging tool for detecting fatty liver. The chances of developing diseases like diabetes, CVD, etc were greater in females that is 42.5%, while males had 55.4% chances of developing disease [21]. Wajeeha Imran Andrabi and his colleagues (2016) conducted study on "Identifying nonalcoholic fatty liver disease on ultrasound and its co-relation with obesity" Department of Radiology Ghurki Trust Teaching Hospital Lahore. According to this study total number of patients was 100 among these patients 45 were males and 55 were females. Mean age was calculated to be 45.23 years. Majority of obese patients belonged to the age group of 41-50 years. The number of obese patients with grade 3 fatty liver was the highest that is 24 out of 100. 11 patients showed grade 2 NAFLD and 17 obese patients belonged to the group of grade 1 NAFLD. In comparison to their study, the number of grade 3 NAFLD

patients was the lowest in our analysis that is 1.4%. Percentage of patients having grade 1 fatty liver was 60.9% and patients having grade 2 fatty liver was 37.7% [22]. Anwar Ali Jamali and his colleagues (2018) conducted study on "Nonalcoholic fatty liver disease: Assessment of lipid profile estimation in different grades of fatty liver on ultrasound" Peoples University of Medical and Health Sciences for Women, Nawabshah in Department of physiology and medicine. The study was conducted on 300 patients, out of them 203 were males and 97 were females. According to the results acquired patients having abnormal LDL values were 117 (39%) and those having normal LDL values were 183 (61%). Similar to their study the number of patients having normal values of LDL was more in our research analysis. The patients having increased values of LDL were considered to be at risk of developing diseases such as CVD, atherosclerotic disease, etc. Total number of patients that is 138, 67 (48.6%) had chances of developing disease and 71 (51.4%) were considered normal [23]. Yong- Jian Zhou, Yu-Yuan Li and his colleagues (2007) conducted a study on "Prevalence of fatty liver disease and its risk factors in population of south china". According to this study 609 out of 3543 subjects were diagnosed with fatty liver disease. The data analysis showed that more number of males has FLD than females below the age of 50 years. Whereas more females have FLD above 50 years of age. However, in comparison to this study, our data analysis showed that out of 138 patients therewere 65 (47.1%) males and 73 (52.9%) were females. The number of females with fatty liver was greater than males. And majority of patients belonged to the age group above 40 years[24]Chang Wook Chon, Bum Soo Kim and his colleagues (2012) conducted a study on "Effect of non-alcoholic fatty liver disease on the development of type 2 diabetes in non-obese, non-diabetic Korean men." According to this study 107 subjects belonged to the category of fatty liver (FL), showed increased levels of fasting glucose, higher BMI and worse lipid profile as compared to 1054 subjects who were in the non-fatty liver (NFL) group. Also the FL group showed increased level of HbA1c. Overall study concluded that subjects with FL were at higher risk of developing type 2 diabetes and metabolic diseases [25]. As compared to this study, our data analysis showed that there was no major link between fatty liver and lipid profile. Although among 138 patients, diseased were 67(48.6%) and 71(51.4%) were considered normal after observing their lipid profiles. Overall our study concluded with positive results which diagnostically proved in our observed patients sample that, majority patients were suffering from grade 1 stage of non alcoholic fatty liver disease and they did not have raised lipid level in blood.

Figure 1: grade1 fatty liver on ultrasound

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