

Fibro Scan Score and its Association with Various Stages of Non-Alcoholic Fatty Liver Disease

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ABSTRACT

Background: Non-alcoholic fatty liver disease has a histological spectrum involving simple steatosis and non-alcoholic steatosis hepatitis. It is a marked feature of metabolic syndrome. Around 20-30% global population is estimated to be afflicted by this disease. In India, the prevalence of NAFLD is estimated up to 09 -32% and found to have an association with non-communicable diseases. Liver stiffness measurement is a helpful tool for the diagnosis of hepatic fibrosis and its association with various stages of Non-Alcoholic Fatty Liver Disease. The normal range of fibro scans is between 2 to 7 kpa. Liver stiffness values below 6 kpa are considered normal. This study is an attempt to identify the association of fibro scan Liver stiffness with advancing stages of NAFLD. The study denoted that a fibro scan above the normal range denotes increased abnormal scarring with the progress of NAFLD.

Aims and Objectives: to find out the association of fibro scan stiffness score with advancing stages of NAFLD.

Method: 302 clinically diagnosed NAFLD subjects between the age group of 20 – 45 years, residing in Bhilai city and Bliaspur, Raipur, Durg district of Chhattisgarh state attending various hospitals and clinics were selected for the study. Stages of NAFLD were recorded as secondary data and a Fibro scan was done by a skilled professional and recorded. The data were analyzed using SPSS, chi Square, Pearson correlation, and descriptive statistics.

Results: The mean fibro scan scores for each stage of NAFLD *i.e.*, Stage I: 3.09, stage II: 3.62, Stage III: 5.62, Stage IV: 9.08, the Pearson correlation coefficient (r) of 0.689 indicates positive and linear relationship. The fibro scan scores above the normal range for various stages of NAFLD are Stage I 6.2%, Stage II 14%, Stage III 52.1%, and Stage IV 97.7% (p < .01).

Conclusion: The mean fibro scan scores for each stage clearly show a progressive and statistically significant elevation as the disease stage advances. There is a strong positive linear relationship, reinforcing the idea that as the NAFLD stage increases, the fibro scan score also tends to increase.

Key Words : NAFLD, Fibro scan, Liver stiffness score, Kilopascal, Elastography

INTRODUCTION

The liver is a large organ situated in the top right part of the abdomen. It is 3 pounds in weight and it stores glycogen, processes fats and protein from digested food, produces proteins required for blood clotting, and removes toxins from the body.

For the maintenance of overall health, it is important

to keep the liver in good working condition.

Non-alcoholic fatty liver disease is the most common chronic disease that affects about 1/4 of the global population.

According to Starley *et al.* (2010), Patients with NAFLD have a 20 to 50% risk of fibrosis, 30% of cirrhosis, and 5% of hepatocellular carcinoma.

NAFLD is also associated with extrahepatic conditions including cardiovascular disease, renal disease, and gastrointestinal neoplasia, which means uncontrolled, abnormal growth of cells in the body, which can be benign or malignant.

According to Tailor *et al.* (2020) mortality from NAFLD increases with the stage of fibrosis. Therefore, it becomes important to find out those patients who are at risk so that interventions to prevent liver and extrahepatic Complications can be started.

Transient Elastography is used to measure liver stiffness. A liver biopsy is an invasive procedure that may lead to complications, whereas a fibro scan is a non-invasive means in which nothing is put inside the body and can be used to find out the stage of liver disease. It is an efficient and cost-effective method.

During chronic liver disease, interstitial, liquid, and inflammatory infiltrate increase stress and stretch blood vessels and the Bile duct with the production of collagen (fibrotic tissue). This increases the stiffness of the liver reducing tissue elasticity.

Liver stiffness is measured in kilopascal (Kpa) The normal range for a fibro scan is between 2 to 7 KPA. The average normal result is 5.3 KPA.

Liver stiffness value below 6 Kpa is considered normal whereas LS of 8 and 12.5 denotes F3 and F4 fibrosis.

Liver stiffness of 12-15 Kpa denotes a high possibility of Cirrhosis.

Stage of fibrosis		
F0	Less than or equal to 7	No Scarring
F1	Less than or equal to 7	Mild Fibrosis
F2	More than or equal to 7.5	Moderate Fibrosis
F3	Less than or equal to 10	Severe fibrosis
F4	More than 14	Cirrhosis or advanced fibrosis

The normal range for a fibro scan is between 2 to 7KPA The average result is 5.3 KPA

F0- Denotes no Scarring

F1- Mild Fibrosis

F2- Moderate Fibrosis

F3 - Severe fibrosis

F4 - Cirrhosis or advanced fibrosis.

According to Stebbing *et al.* (2010), Liver stiffness measurement is helpful for the diagnosis of hepatic fibrosis and portal hypertension. Advanced chronic liver disease

is a dynamic condition and may progress with liver injury. This condition can be stabilized if the etiological factors are controlled. Measurement of Liver stiffness can motivate patients to modify their lifestyle which will help to control the severity of NAFLD.

Review of literature:

Braude *et al.* (2023) conducted a study on patients of NAFLD, NASH, Steatosis, and fatty liver disease. They found that liver stiffness is independently associated with mortality.

Reinoso-Pereira *et al.* (2022) conducted a study and found that high values of liver stiffness play an important role in the stratification of hepatocellular carcinoma. The use of transient electrography in chronic liver disease helps to stratify the degree of fibrosis, associated hepatic complications, and risk of HCC development.

Semmler *et al.* (2023) conducted a study on 2508 patients. They found that NAFLD was most prevalent among non-advanced chronic liver disease (Non-ACLD) *i.e.* LSM less than 10 KPA and compensated advanced chronic liver disease more than or equal to 10 KPA (CALCD) patients. patients with ACLD had a high proportion of alcohol-related liver disease. Their study denoted that a 20% increase in LSM is associated with appx. 50% increased risk of hepatic decompensation and liver-related death. Similarly, regression of LSM by 20% was associated with approximately 50% reduced risk of liver-related death. According to de Franchis *et al.* (2022) current guidelines recommend repeating LSM every 12 months in patients with compensated ACLD.

Foucher *et al.* (2006) in their study denoted that fibro scan measures the thickness or scarring of liver tissues. LSM evaluated by TE was independently associated with HCC. The cut-off value related to higher Hepatocellular carcinoma risk was 21.1 KPA. Patients with transient electrography LSM more than 21.1 had a 5.54 higher chance of developing H CC.

METHODOLOGY

Sample Selection:

A total of 302 subjects, diagnosed with NAFLD were selected for the study by purposive sampling method from Bilaspur, Raipur, Durg, and Bhillai.

Inclusion criteria:

Both males and females of age group 18 - 45 years, clinically diagnosed as NAFLD with voluntary

participation and documented informed consent were selected for the study.

Exclusion criteria:

The subjects below the age of 18 years and above 45 years, suffering from infective diseases *i.e.* retro positive, HBsAg positive, cancer, organ failure, and on prolonged contraindicated medication and treatment were excluded from the study.

Tools and Techniques Used:

Non-invasive and painless techniques were used for the study. NAFLD stage was confirmed by ultrasound technique carried out by registered medical professionals, and median stiffness was recorded by a trained professional skilled in operating the

Fibro scan machine. suitable statistical analysis methods were used *i.e.*, SPSS, chi Square, Pearson correlation, and descriptive statistics. The obtained results were correlated with the advancing stages of NAFLD with the fibro scan results.

RESULTS AND DISCUSSION

A non-invasive method Fibro scan is used to detect non-alcoholic fatty liver disease while evaluating liver stiffness. This technique is known as transient elastography.

In Table 1 the mean and S.D. for Fibro scan is given for patients in different stages of non-alcoholic fatty liver disease.

Table 1 : Descriptive Statistics of Scores on Fibro Scan Scored for Patients from Different Stages of Non-Alcoholic Fatty Liver Disease

Stages	N	Fibro scan (kPa)	
		Mean	S.D.
Stage I	65	3.09	1.48
Stage II	100	3.62	1.57
Stage III	94	5.62	2.34
Stage IV	43	9.08	1.50

Pearson r = 0.689**

Usually, Fibro scan scores of 2-7kPa are considered normal and over this mild degree of scarring starts.

Based on the information provided in Table 1, it is evident that Fibro scan scores

Table 1 Descriptive Statistics of Scores on Fibro scan Scores for Patients from Different Stages of Non-Alcoholic Fatty Liver Disease 1 Stages Stage I Stage II

Stage III Stage IV N 65 100 94 43 Mean 3.09 3.62 5.62 9.08 Fibro scan (kPa) S.D. 1.48 1.57 2.34 1.50 Pearson r = 0.689** Based on the information provided in Table 1, it is evident that Fibro scan scores increase with advancing stages of non-alcoholic fatty liver disease (NAFLD). The mean Fibro scan scores for each stage (Stage I: 3.09, Stage II: 3.62, Stage III: 5.62, Stage IV: 9.08) clearly show a progressive and statistically significant elevation as the disease stage advances. The Pearson correlation coefficient (r) of 0.689 further supports the strong relationship between the stages of NAFLD and Fibro scan scores. A correlation coefficient close to 1 indicates a positive and linear relationship, reinforcing the idea that as the NAFLD stage increases, Fibro scan scores also tend to increase. Considering that the normal range for Fibro scan is 2-7 kPa and the average score is around 5.5, the data shows that even Stage I patients, on average, fall within the 2 normal range. However, as the disease progresses to later stages, the Fibro scan scores surpass the normal range, indicating an escalation in liver fibrosis.

To further analyse the data and draw meaningful conclusions, it would be beneficial to perform crosstab calculations.

Table 2 Distribution of Patient Based on Fibro scan Normal Range and Stages of Non Alcoholic Fatty Liver Disease Stages of Non Alcoholic Fatty Liver Disease Fibro scan Range More than 7 Less than 7 Stage I 04 (6.2%) 61 (93.8%) Stage II 14 (14%) 86 (86%) Stage III 49(52.1%) 45 (47.9%) Stage IV 42 (97.7%) 01 (2.3%) Total 65 (100%) 100 (100%) 94 (100%) 43 (100%) 302 (100%) χ^2 (df=3) = 127.59, p<.01. In conclusion, the findings from Table 2 indicate a notable association between Fibro scan scores and the stages of non-alcoholic fatty liver disease (NAFLD). The chi-square statistics further emphasize the variability in Fibro scan results

Table 2 : Distribution of Patients Based on Fibro Scan Normal Range and Stages of Non-Alcoholic Fatty Liver Disease

Stages of Non-Alcoholic Fatty Liver Disease	Fibro scan Range		Total
	More than 7	Less than 7	
Stage I	04 (6.2%)	61 (93.8%)	65 (100%)
Stage II	14 (14%)	86 (86%)	100 (100%)
Stage III	49(52.1%)	45 (47.9%)	94 (100%)
Stage IV	42 (97.7%)	01 (2.3%)	43 (100%)
			302 (100%)

χ^2 (df=3) = 127.59, p<.01

based on different stages of the disease. The percentage distribution of Fibro scan scores above the normal range suggests a trend of increasing abnormal scarring as NAFLD progresses, supporting the utility of Fibro scan as a valuable measure for assessing liver fibrosis. However, it is crucial to acknowledge the limitations highlighted by the study. Despite Fibro scan's effectiveness in detecting liver scarring, approximately 20% of patients may not have accurate results. A study of Castera *et al.* (2010) attributes this discrepancy to factors such as obesity and metabolic syndrome, indicating that Fibro scan's accuracy might be compromised in these specific patient populations. These limitations underscore the importance of considering individual patient characteristics and potential confounding factors when interpreting Fibro scan results. While Fibro scan remains a valuable tool in assessing liver fibrosis in NAFLD, clinicians should exercise caution and possibly explore additional diagnostic methods in cases where Fibro scan results may be less reliable, especially in patients with obesity and metabolic syndrome. In summary, while Fibro scan shows promise as a reliable measure for liver scarring in NAFLD, clinicians should be aware of its limitations and consider a comprehensive approach, taking into account patient-specific factors to ensure accurate and clinically meaningful assessments.

Recommendations:

Obesity leads to the deposition of fat in the liver, increasing its stiffness, so emphasis should be on the maintenance of ideal body weight. This can be achieved by eating healthy foods, doing sufficient exercise, reducing the consumption of processed foods, quitting smoking, use of a balanced diet that is calorie-restricted and high in fiber helps in combating the disease.

- Foods that are high in saturated fats like deep-fried and red meat should be avoided
- Sugar intake, especially in the form of sugary drinks, and fruit juices can be controlled.
- Food that we consume should be free of pesticides to avoid additional stress on the liver.
- Overeating of cooking medium and re-heating should always be avoided.
- As alcohol is metabolized by the liver its consumption should be avoided.
- We must avoid infections by following simple rules of hygiene.

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