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Fatty Liver Index (FLI) as a predictor of non alcoholic fatty liver disease among the population visiting the master health check up of a tertiary care centre.

Dr.Kevin Danie Raja [1], Dr.Jayasingh [1] , Dr.Manju 2*.

1) Department of general medicine , Aarupadai veedu medical college , Vinayaka mission research foundation,Puducherry , India.
2) Department of biochemistry , Aarupadai veedu medical college , Vinayaka mission research foundation, Puducherry , India.
*) Corresponding author .

ABSTRACT

Background: Non-Alcoholic Fatty Liver Disease (NAFLD) is an important cause of liver disease in India. Epidemiological studies suggest its prevalence in around 9% to 32% of general Indian population, but with a higher prevalence in those having overweight / obesity and diabetes. Present study aimed to investigate the usefulness of 'Fatty Liver Index' an algorithm to predict the presence of Non Alcoholic Fatty Liver Disease among the Population visiting the Master Health Check-up of a tertiary care centre.

Material & Method: The present cross sectional diagnostic study was conducted among the patients more than 18yrs with fatty liver diagnosed by USG visiting the master health check-up of AVMC & H. After obtaining informed and written consent from the patients, detailed history, anthropometric measurements, clinical assessments and laboratory investigations were done. The predictors of Fatty Liver are obtained and the FLI calculated based on the formula and USG Abdomen done to correlate the prediction. All data were collected by the investigator and was analysed statistically to find the level of significance of the study.

Results: In present study total of 250 patients included with mean age of 48.96±12.95yrs of age. On assessment of gender, 36.4% were male and 63.6% were female patients. NAFLD was present in 31.2% of the patients and 68.8% without NAFLD on USG. AUC for FLI to detect NAFLD was found to be 0.775, $p<0.05$. the sensitivity was found to be 85.90, Specificity was found to be 53.14%, PPV was 36.81%, NPV was 83.82% and over all accuracy was found to be 69.60%.

Conclusion: The present study found the significant utility of fatty liver index in predicting the presence of non-alcoholic fatty liver disease among the patients presenting to hospital for health check-up.

Keyword: NAFLD, Fatty Liver Index, Prevalence, Prediction.

INTRODUCTION :

Fatty Liver is highly prevalent in our country. Non-Alcoholic Fatty Liver Disease (NAFLD) is an important cause of liver disease in India. Epidemiological studies suggest its prevalence in around 9% to 32% of general Indian population, but with a higher prevalence in those having overweight / obesity and diabetes.[1] The spectrum of NAFLD includes, simple steatosis without evidence of cell injury, which tends to be stable initially but over time leads to steatohepatitis, which progress to cirrhosis. NAFLD when diagnosed at early stage is potentially treatable and hence can prevent patients going into cirrhosis.

Studies have been done to determine the frequency and risk factors of NAFLD in no-alcoholic Indian type 2 diabetics based on elevated amino-transferase levels. Indian population has a higher body fat content and abdominal adiposity and the later is particularly associated with insulin resistance and hence NAFLD.[2] Recent data suggest that the prevalence of NAFLD may also be linked to increased coronary artery disease risk, independent of the risk conferred by the elements of metabolic syndrome.[3] 70% of patients with Fatty Liver develop metabolic syndrome in future leading to the development of insulin resistance, Hypertension, Hypercholestrolaemia.

The rationale of my study is that by validating Fatty Liver Index (FLI) as an accurate predictor of Fatty Liver,we can find out the presence of Non Alcoholic Fatty Liver Disease (NAFLD) in asymptomatic or mildly symptomatic patients by doing routine blood investigations and anthropometric measurements during screening and health checkup.

MATERIAL & METHODS:

This cross sectional diagnostic study after getting clearance from the institutional ethical committee was conducted in AVMC from October 2020 - October 2022.

The study involved patients both male and female above 18 years old attending the master health checkup in AVMCH. Patients who were below 18yrs of age, are alcoholics or having diabetes, thyroid disorders , chronic viral hepatitis and decompensated liver disease were excluded from the study. After obtaining informed and written consent from the patients, detailed history, anthropometric measurements, clinical assessments and laboratory investigations were done. The predictors of Fatty Liver are obtained and the FLI calculated based on the formula and USG Abdomen done to correlate the prediction. All data were collected by the investigator and was analyzed statistically to find the level of significance of the study.The study data were collected in pre-designed proforma and entered in Microsoft Excel sheet and analysed using SPSS v21 operating on Windows 10.

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STATISTICS:

The study data were collected in pre-designed proforma and entered in Microsoft Excel sheet and analysed using SPSS v21 operating on Windows 10. The demographic data were summarised as frequency, percentage, mean and standard deviation. The summarized data were represented using tables, figures, bar diagram and pie chart. The mean difference between the continuous data were analysed using unpaired t-test and the categorical data using chi-square test. The linear regression was used to assess the prediction and the diagnostic accuracy was calculated using the ROC curve for the diagnostic specifications at cut-off like sensitivity, specificity, accuracy, NPV and PPV. A p-value of <0.05 was considered statistically significant.

RESULTS:

In present study total of 250 patients fulfilling the inclusion criteria were included with mean age of 48.96 ± 12.95yrs of age. On assessment of gender, 36.4% were male and 63.6% were female patients. NAFLD was present in 31.2% of the patients and 68.8% without NAFLD on USG. On assessment of the FLI groups (FLI <30 and FLI >60), there is no significant difference in the mean age of the patients.

On comparison of Body Mass Index (BMI), there is no significant difference in the mean level between the FLI groups.On comparison of Blood pressure there is no significant difference between the FLI groups.On assessment of the lipid profile with FLI group, there is significant higher mean of Tg and significant lower mean of HDL among the patients with FLI >60.(p<0.05)

TABLE 1:COMPARISON OF BLOOD PARAMETERS BETWEEN FLI GROUPS

	FLI				p-value
	<30		>60		
	Mean	SD	Mean	SD	
FBS	228.5	70.8	229.1	69.0	0.52
RBS	304.6	89.2	312.9	94.1	0.63
T Cholesterol	191.0	29.0	193.8	29.6	0.65
TG	202.0	167.1	223.0	160.0	0.05*
HDL	42.6	8.3	40.8	6.3	0.05*
LDL	118.77	24.73	120.35	25.91	0.14

VLDL	46.86	39.88	50.18	37.71	0.51

On assessment of the liver profile there is no significant difference in the mean level between the FLI group.($p>0.05$)

On assessment of ROC analysis, study found the AUC for FLI to detect NAFLD was found to be 0.775, $p<0.05$.

TABLE 2 : ROC ANALYSIS FOR FLI TO DETECT NAFLD

Area	Asymptotic Significance	Asymptotic 95% Confidence Interval	
		Lower Bound	Upper Bound
.775	.000	.706	.844

In the study, 85.9% of the patients with NAFLD were having FLI more than 60 compared to the other patients, with $p<0.05$.

TABLE 3:COMPARISON OF FLI WITH NAFLD AMONG INCLUDED PATIENTS

		NAFLD				Chi-square (p-value)
		Absent		Present		
		Count	N %	Count	N %	9.82 (0.02)*
FLI	<30	57	33.1%	11	14.1%	
	>60	115	66.9%	67	85.9%	

* = P value .

The sensitivity was found to be 85.90, Specificity was found to be 53.14%, PPV was 36.81%, NPV was 83.82% and over all accuracy was found to be 69.60%.

TABLE 4 : DIAGNOSTIC ACCURACY OF NAFLD TO DETECT FLI

Statistic	**Value**	**95% CI**
Sensitivity	85.90%	76.17% to 92.74%

Specificity	53.14%	26.16% to 40.71%
Positive Predictive Value	36.81%	33.66% to 40.09%
Negative Predictive Value	83.82%	74.23% to 90.31%
Accuracy	69.60%	43.24% to 55.97%

Discussion:

Non-Alcoholic Fatty Liver Disease (NAFLD) is an important cause of liver disease in India. Epidemiological studies suggest its prevalence in around 9% to 32% of general Indian population, but with a higher prevalence in those having overweight / obesity and diabetes.[1] The spectrum of NAFLD includes, simple steatosis without evidence of cell injury, which tends to be stable initially but over time leads to steato hepatitis, which progress to cirrhosis. NAFLD when diagnosed at early stage is potentially treatable and hence can prevent patients going into cirrhosis. Recent data suggest that the prevalence of NAFLD may also be linked to increased coronary artery disease risk, independent of the risk conferred by the elements of metabolic syndrome.[3] 70% of patients with Fatty Liver develop metabolic syndrome in future leading to the development of insulin resistance, Hypertension, Hypercholestrolaemia.

FLI was found to be associated to the severity of fatty liver by abdominal ultrasound, predict fat component %, and NAFLD fibrosis score, particularly in female individuals. In a broad community survey, FLI might be used to select participants for abdominal US. To increase the sensitivity for choosing participants for abdominal US, the FLI cut-off point might be changed to 10 for female subjects and 20 for male patients

In study by Zelber S et al., FLI had a sensitivity of 85.5 percent, a specificity of 92.6 percent, a positive predictive value (PPV) of 74.7 percent, and a negative predictive value (NPV) of 96.1 percent when compared to SteatoTest. The majority of FLI <60 individuals (84.2 percent) had S0 and none had S3-S4. The correlation between HRI (1.5) and FLI (≥60) diagnosis of fatty liver was 0.43, indicating only moderate agreement. FLI vs HRI had a sensitivity of 56.3 percent, a specificity of 86.5 percent, a PPV of 57.0 percent, and an NPV of 86.1 percent. The area under the receiver operating characteristic curve (AUROC) of FLI for steatosis greater than 5%, as predicted by SteatoTest, was 0.97. (95 percent CI: 0.95-0.98). FLI's diagnostic accuracy for steatosis more than 5%, as predicted by HRI, provided an AUROC of 0.82. (95 percent CI: 0.77-0.87). FLI has a strong agreement with SteatoTest, as well as modest agreements with AUS or HRI. If intermediate data are eliminated, FLI has a high diagnostic value compared to AUS. [8]

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FLI was substantially greater in the NAFLD group (37.10 ±1.95), compared to the non-NAFLD group (17.70 ±1.04), P<0.01. FLI was associated with NAFLD (r = 0.372, P<0.001). In the prediction of NAFLD, the FLI algorithm got a ROC-AUC of 0.721. FLI was found to be strongly linked with NAFLD in a logistic regression study. The proportion of patients with CAD did not change across the FLI ≤30 (32.3 percent), 30-60 (31.0 percent), and ≥60 groups (35.3 percent).

Huang X et al., documented . The FLI for NAFLD has an AUROC of 0.834 (95 percent confidence interval: 0.825-0.842). The ideal FLI cut-off point for diagnosing NAFLD was 30, with a maximum Youden Index of 0.51, yielding a high sensitivity of 79.89% and a specificity of 71.51%. Individuals with FLI-diagnosed NAFLD had poorer metabolic parameters (waist circumference, BMI, blood pressure, serum lipids, and aminotransferases) than those with ultrasonography-diagnosed NAFLD (all P 0.05). In middle-aged and elderly Chinese, the FLI effectively identified NAFLD, and the ideal cut-off point was 30. Because FLI-diagnosed NAFLD patients had worse metabolism, metabolic regulation and therapy of NAFLD should get special attention.[10] Zhou K et al., documented FLI's ROC curve (AUC) was 0.701 (95 percent CI 0.686-0.716) in receiver operating characteristic (ROC) curve analysis, which was greater than that of its components. concluded that FLI-measured nonalcoholic fatty liver independently predicted incident hypertension in the Chinese population.

The fatty liver index (FLI) is a simple and accurate predictor of liver steatosis. However, FLI is not more helpful than WC in predicting NAFLD. Although FLI is a predictor of hepatic steatosis, it also has a favourable connection with liver fibrosis and may predict it as well.[15] FLI may be regarded as a simple, non-invasive marker for screening for NAFLD.

In the study, 85.9% of the patients with NAFLD were having FLI more than 60 compared to the other patients, with p<0.05.

The sensitivity was found to be 85.90, Specificity was found to be 53.14%, PPV was 36.81%, NPV was 83.82% and over all accuracy was found to be 69.60%.

CONCLUSION:

The present study found the significant utility of fatty liver index in predicting the presence of non-alcoholic fatty liver disease among the patients presenting to hospital for health checkup. The FLI shown a good AUC in predicting the presence of NAFLD and also the acceptable sensitivity, specificity, NPV, PPV and over all accuracy.

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