ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 08 | August - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EARLY PREDICTION OF ESOPHAGEAL VARICES ON THE BASIS OF ASPARTATE AMINO-TRANSFERASE (AST) TO PLATELET RATIO INDEX (APRI) AND TRANSIENT ELASTOGRAPHY IN PATIENTS OF CIRRHOSIS OF LIVER

General Medicine

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ABSTRACT

Objectives: To study the etiological profile in liver cirrhosis patients & to predict development of esophageal varices at the earliest with the help of Aspartate Amino-Transferase (AST) to Platelet ratio index (APRI) and Transient Elastography in these patients. **Methods:** The study was conducted on 100 patients with chronic liver disease from June 2019 to June 2021. Informed consent was taken from the patients and detailed history, physical examination, laboratory investigations were carried out & UGI endoscopies were performed. APRI scores & Transient Elastography (fibroscan) liver stiffness measurement (LSM) values were then correlated with 'presence or absence' of esophageal varices (EVs) and with the 'grading' of varices. **Results:** Among the 100 patients with liver cirrhosis, the overall prevalence of liver cirrhosis was higher in males (67.0%) than females (33.0%). The main cause of liver cirrhosis was alcoholic liver disease (39.0%) followed by chronic hepatitis B infection (15.0%). Different APRI cut-offs of 1.9, 1.4, 0.9 were taken & correlated with 'presence or absence' of EVs & with the 'grading' of EVs, but none shows satisfactory negative predictive value (NPV), proving that there is no satisfactory cut-off value of APRI to be used as a predictor of esophageal varices. However, as the APRI score is increasing, the grading of varices found on UGI endoscopy is increasing ($r = 0.605$, $p<0.001$). LSM cut-off values of 24KPa, 19KPa & 14KPa were taken & we observed NPV of 75.0% for predicting esophageal varices at LSM cutoff of 14 KPa. Also, as the LSM score is increasing, the grading of varices found on UGI endoscopy is increasing ($r = 0.842$, $p<0.001$). **Conclusion:** APRI scores correlate poorly with the 'presence or absence' of esophageal varices but it correlate significantly with the 'grading' of varices. Transient elastogram liver stiffness values correlate significantly with the 'presence or absence' of esophageal varices & also with the 'grading' of varices. Liver stiffness value of ≥14.0 KPa can be used as a guide for early prediction of esophageal varices & endoscopy should be done in these patients to prevent fatal GI bleed from esophageal varices by medical management to decrease portal pressure or by early endotherapy in the form of endoscopic variceal ligation (EVL) or sclerotherapy.

KEYWORDS

Esophageal Varices, APRI score, Transient elastography.

INTRODUCTION

Cirrhosis of liver is characterized by hepatic cell destruction followed by architectural changes in liver with formation of regenerative nodules causing increase pressure within the portal circulation which then leads to opening of porto-systemic shunts leading to sequelae like esophageal varices and life threatening hemorrhage and death in these patients[1].The complications that directly result from portal hypertension are the development of varices and variceal hemorrhage. Variceal bleeding is the most dramatic complication of cirrhosis. The prevalence of esophageal varices in cirrhotics is between 60 and 80%, and variceal bleeding determines a mortality rate of 17% to 57%.[2] Bleeding recurrence may reach 60% of patients in two years.[3] Considering the impact of upper gastrointestinal bleeding due to EV rupture in the prognosis of cirrhotic patients, AASLD (American Association for the Study of Liver Disease)[4] and the Baveno Consensus[5] suggest that every patient diagnosed with cirrhosis should be investigated for EV. From that moment on, endoscopy will be repeatedly performed in these patients with a frequency determined by their degree of liver dysfunction and by the presence of varices and their characteristics.[4,5] In order to spare patients from the discomfort and risks of endoscopy and to reduce costs, there is an effort to find non-invasive methods of screening of EV. Platelet count, spleen diameter, APRI score, portal vein diameter, Child-Pugh classification, prothrombin activity, presence of telangiectasias, presence of ascites, transient elastography and a model including spider angiomas, ALT (alanine aminotransferase) and albumin, among others have been studied.[6-10] Overall the most common results of these studies, the parameters are splenomegaly and thrombocytopenia**.** Platelet count remains normal in early stages of cirrhosis, but is decreased in advanced cirrhosis. Platelet count is reduced in advanced cirrhotics by different reasons: portal hypertension (through antibody-mediated platelet destruction (mostly in viral hepatitis), decreased thrombopoietin production and myelotoxic effects of alcohol and hepatitis virus.[11]

Aspartate aminotransferase-to-platelet ratio index (APRI) was first described for the non-invasive prediction of fibrosis in patients with hepatitis C.[12] After that, other authors used it in other clinical contexts and in patients with other causes of liver disease.[13] In a meta-analysis of 40 studies, investigators concluded that an APRI score greater than 0.7 had a sensitivity of 77% and specificity of 72% for predicting significant hepatic fibrosis. In addition, they concluded that an APRI score greater than 1.0 had a sensitivity of 76% and specificity of 72% for predicting cirrhosis.[14]

Since APRI is a predictor of fibrosis, which is the major cause of portal hypertension in cirrhosis, and uses platelet count on its denominator, a variable knowingly associated to the presence of EV, it is reasonable to think that APRI could be a good non-invasive method for the screening of EV. This index uses two easily obtained parameters, which are part of the routine laboratory workup of cirrhotic patients and, thus, would not increase costs. Moreover, AST and platelet count are not variables predisposed to significant measure errors.

Transient elastography (fibroscan) is a new, non-invasive, rapid, and reproducible method allowing evaluation of liver fibrosis by measurement of liver stiffness. Fibroscan may be used as an indirect tool to assess the presence of portal hypertension. Presence of esophageal varices can be predicted by measuring the liver stiffness in cirrhotic patients and may assist in selecting patients for upper GI endoscopy. The severe the cirrhosis, the greater will be the TE measurements and consequently greater chances of developing esophageal varices.

Hence keeping the magnitude of the problem in mind, this study is being taken with the aim to detect early esophageal varices with the help of two non-invasive techniques, **transient elastography (T.E.) and aspartate to platelet Ratio index (APRI),** to prevent morbidity and mortality occurring from bleeding esophageal varices.

MATERIAL AND METHODS

Study Population:

The study was conducted from June 2019 to June 2021 in the P.G. Department of Medicine at S.N. Medical College and Hospital, Agra, Uttar Pradesh. The study was done after getting clearance from the ethical committee of our institute and permission from the appropriate

authority. All patients of liver cirrhosis irrespective of its etiology were taken in the study (including alcoholic cirrhosis, non-alcoholic fatty liver disease, viral hepatitis induced cirrhosis, metabolic cirrhosis, cardiac cirrhosis, autoimmune liver disease).
The following patients were excluded from the study:

- Terminally Ill patients having refractory ascites
- Patients who have association with other systemic disorders
- Patients of hepatocellular carcinoma having refractory ascites

Clinical Assessment:
Total 100 patients who had liver cirrhosis on USG were selected after applying inclusion and exclusion criteria. Participating subjects after giving their written informed consent were checked for medical history & physical examination was done in all patients. In these patients, the following parameters were documented: age, sex, present or past history of melena, history of jaundice, present or past history of ascites, diabetes mellitus. Physical examination to look for pallor, icterus, abdominal & CNS examination were done.

Investigations:
Blood investigations including Complete blood count (CBC), liver function tests including Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), S. Bilirubin (T/D/I); Kidney function tests (urea, creatinine) ; viral markers (HbsAg, anti HCV, HIV); blood sugar, HbA1C , PT/INR, APTT, serum ANA, S. iron profile were done & APRI scores were calculated. All patients undergone transient elastography (fibroscan) to look for liver stiffness measurement (LSM) values. Upper GI endoscopy was done in all patients to look for presence and grades of esophageal varices (EVs).

Calculation of APRI score:
It is calculated by the following formula:

$$\text{APRI} = \frac{\text{AST (patient) (IU/L)}}{\text{AST (upper limit of normal) (IU/L)}} * 100$$
$$\text{Platelet count } (10^9/\text{L})$$

Liver stiffness measurement (LSM) using fibroscan:
The Fibroscan 502 touch was used for the measurement of liver stiffness. Liver Stiffness (LS) measurements were performed by one independent operator in the right lobe of liver through intercostal space with patient lying in dorsal decubitus position and right arm in full abduction. The tip of transducer was covered with coupling gel and placed on the skin in the intercostal space at the level of right lobe of liver. The operator located a portion of liver about 6 cm thick devoid of vasculature for the measurement. Once the area had been selected the operator pressed the button for measurements. Ten successful measurements were performed in each patient and the success rate was calculated by as the ratio of number of successful measurements over the total number of acquisitions. The results were expressed in kilopascals and the median value of successful measurements was considered as representative of LSM. Only LS measurements with success rate (SR) >60% and inter quartile ratio IQR <30% were considered reliable. The Castera transient elastography correlates with metavir scores as : <7.0: absent or mild fibrosis (F0-F1), 7.0-9.4: significant fibrosis (F2), 9.5-12.5: Severe fibrosis (F3), >12.5: Cirrhosis (F4).

Endoscopy :
Upper GI endoscopies were performed using Fujifilm endoscope. Esophageal varices were classified according to the American Association of Study of Liver Disease (AASLD) practice guidelines as:-

- Grade 0 (F0) - no varices
- Grade I (F1) -small straight sub mucosal veins
- Grade II (F2)- slightly enlarged tortuous EV occupying less than one-third of the esophageal lumen
- Grade III (F3)- large coil-shaped EV that occupied more than one-third of the esophageal lumen.

Statistical analysis :
All the data was analyzed on Statistical Package for the Social Sciences (IBM SPSS Statistics 23) software. Data analysis will be done by using standard statistical technique using T-test & chi-square test. Normal continuous variables were presented as mean ± standard deviation. All cut-offs will be compared by using sensitivity, specificity, PPV, NPV as variables & logistic regression will be applied. Statistical significance will be taken as a p-value of less than 0.05.

RESULTS
Total 100 patients of both sexes were enrolled in the study. The age of the patients in the study ranged from 23 years-61 years, mean age being 43.6 years. Out of these, maximum number of patients belonged to age group of 36-45 years (38.0%) (Fig. 1).

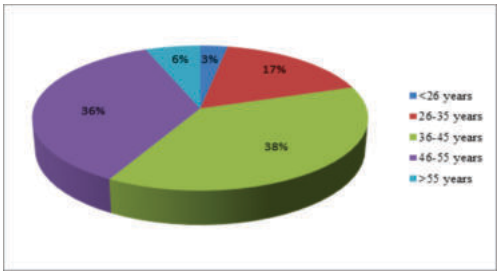

Fig 1. Age-wise distribution of study group

Out of 100 patients enrolled in study, 67 were males (67.0%) and 33 were females (33.0%) (Fig. 2)

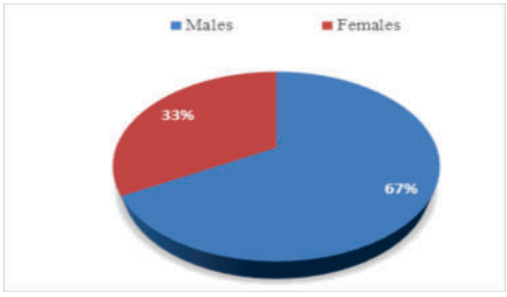

Fig. 2. Gender-wise distribution of study group

In our study, the main cause of liver cirrhosis was alcoholic liver disease (39.0%) followed by chronic hepatitis B infection (15.0%). Non-alcoholic fatty liver disease (NAFLD) accounts for 11.0% cases while chronic hepatitis C infection accounts for 10.0% cases of cirrhosis. Autoimmune liver disease accounts for 6.0% cases while cryptogenic cirrhosis accounts for 19.0% cases of liver cirrhosis (Fig. 3)

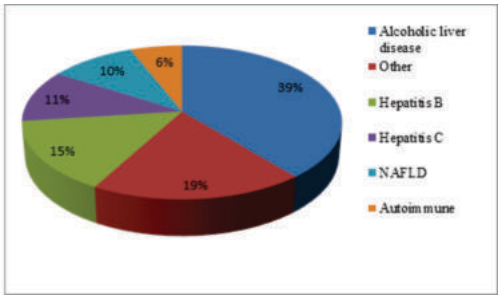

Fig 3. Cause of chronic liver disease in study subjects

UGI endoscopy revealed esophageal varices (EVs) in 76% patients. Majority of patients have grade 1 varices (35.0%). The percentage of grade 2 varices & grade 3 varices were 22.0% & 19.0% respectively. In our study, 24.0% patients didn't have any esophageal varices on endoscopy (Fig. 4).

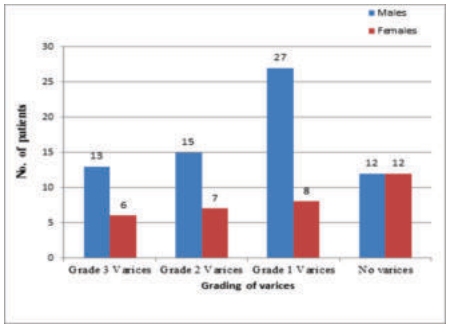

Fig 4. Upper GI endoscopy findings of subjects in study

In our study, patients with EVs had lower platelet count (mean ± SD = 91.68 ± 28.14 × 10^9/L) than those without EVs (Mean ± SD = 130.79 ± 40.30 x 10^9/L). This difference was statistically significant (p<0.001) among the groups. Mean APRI values and Transient elastogram Liver stiffness values were also higher among patients with esophageal varices than those without varices (Table 1)

Table 1. Comparison of study patients with and without varices according to investigations (n=100) :

Investigations	Esophageal Varices		P value
	Present	Absent	
Platelet count (×109 / L) (meanSD)	91.68 ± 28.14	130.79 ± 40.30	<0.001*
SGOT (IU/L) (meanSD)	76.04 ± 36.90	56.05 ± 24.45	0.033#
APRI (meanSD)	2.16 ± 1.25	1.26 ± 0.78	<0.001#
Liver stiffness values (KPa) (mean SD)	26.32 5.76	13.37 ± 5.47	<0.001#

* Unpaired t test was done to measure the level of significance
# Mann-Whitney U test was done to measure the level of significance.

In our study, as the APRI score is increasing, the propensity to find esophageal varices on UGI endoscopy is increasing (varices present in 60.0% patients with APRI score <0.9 compared to 87.23% patients with APRI score >1.8) (Table 2, Fig. 5).

Table 2. Correlation of different APRI values with the 'presence or absence' of esophageal varices in study subjects:

APRI	No.	Varices Present		No varices	
		No.	%	No.	%
<0.9	25	15	60.00	10	40.00
0.9-1.3	14	9	64.29	5	35.71
1.4-1.8	14	11	78.57	03	21.43
>1.8	47	41	87.23	06	12.77

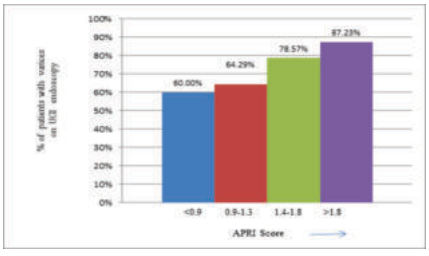

Fig. 5. Correlation of different APRI values with the presence of esophageal varices

As the APRI score is increasing, the grading of varices found on UGI endoscopy is increasing (grade 1 varices in 93.33% cases and grade 2 varices in 6.67% cases when APRI score is <0.9 v/s grade 1 varices in 24.39% cases, grade 2 varices in 34.15% cases and grade 3 varices in 41.46% cases when APRI score is >1.8) (Table 3, Fig. 6).

Table 3. Correlation of APRI scores with the 'grading' of esophageal varices:

APRI	No.	Grade 3 varices		Grade 2 varices		Grade 1 varices	
		No.	%	No.	%	No.	%
<0.9	15	0	0	1	6.67	14	93.33
0.9-1.3	9	0	0	3	33.33	6	66.67
1.4-1.8	11	02	18.18	04	36.36	05	45.45
>1.8	41	17	41.46	14	34.15	10	24.39
<0.9	15	0	0	1	6.67	14	93.33

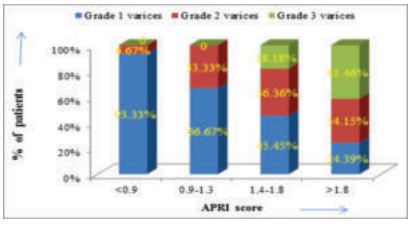

Fig 6. Correlation of APRI scores with the 'grading' of esophageal varices in study subjects

We evaluated the different cut-offs points for APRI as a predictor of esophageal varices with regards to sensitivity, specificity, Positive Predictive value (PPV), Negative Predictive Value (NPV), Likelihood Ratio (LR) & diagnostic accuracy (Table 4) and then plotted the ROC Curve for test accurateness of APRI for the prediction of esophageal varices based on our data (Fig. 7).

Table 4. Evaluation of different cutoff points for APRI as a predictor of Evs:

Stats.	Cut-off points for APRI		
	0.9	1.4	1.9
Sensitivity (%) (95% CI)	80.26 (69.54 - 88.51)	68.42 (56.75 - 78.61)	53.95 (42.13 - 65.45)
Specificity (%) (95% CI)	41.67 (22.11 - 63.36)	62.50 (40.59 - 81.20)	75.00 (53.29 - 90.23)
PPV (%) (95% CI)	81.33 (75.32 - 86.15)	85.25 (77.13 - 90.83)	87.23 (76.82 - 93.37)
NPV (%) (95% CI)	40.00 (25.71 - 56.22%)	38.46 (28.43 - 49.58)	33.96 (26.88 - 41.84)
+LR (95% CI)	1.38 (0.96 - 1.96)	1.82 (1.06 - 3.13)	2.16 (1.05 - 4.45)
-LR (95% CI)	0.47 (0.25 - 0.91)	0.51 (0.32 - 0.80)	0.61 (0.44 - 0.86)
Diagnostic accuracy (95% CI)	71.0 (61.07-79.64)	67.00 (56.88 -76.08)	59.0 (48.71 - 68.74)

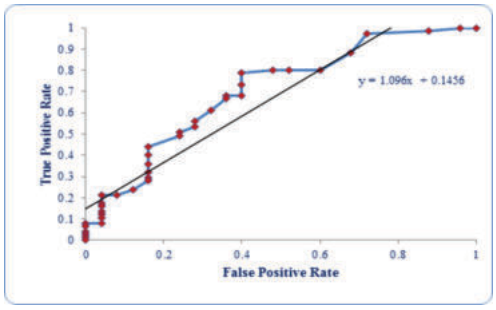

Fig 7. ROC Curve for test accurateness of APRI for the prediction of esophageal varices (AUC= 0.719 & p= 0.002)

In our study, as the Transient elastography (T.E.) score is increasing, the propensity to find varices on UGI endoscopy is increasing (varices in 25.0% cases when T.E. score is <14.0 KPa as compared to 97.01% cases when T.E. score is >24.0 KPa (Table 5, Fig. 8).

Table 5. Correlation of different transient elastogram liver stiffness values with 'presence or absence' of esophageal varices in study subjects :

Liver Stiffness value (KPa)	No.	Varices Present		No varices	
		No.	%	No.	%
<14.0	20	5	25.00	15	75.00
14.0-18.9	9	3	33.33	6	66.67
19.0-23.9	4	3	75.00	1	25.00
≥24.0	67	65	97.01	2	2.99

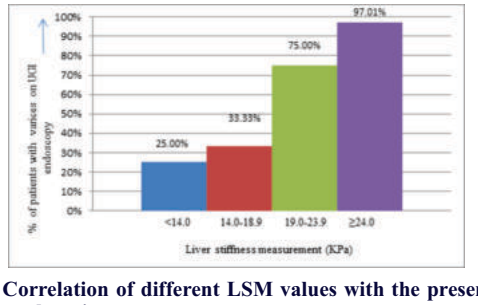

Fig 8. Correlation of different LSM values with the presence of esophageal varices.

As the T.E. score is increasing, the grading of varices found on UGI endoscopy is increasing (grade 1 varices in 100.0% cases when T.E.

score is <14.0 KPa v/s grade 1 varices in 38.46%, grade 2 varices in 32.31% and grade 3 varices in 29.23% cases when T.E. score is >24.0 KPa) (Table 6, Fig. 9).

Table 6. Correlation of LSM values with the 'grading' of esophageal varices:

Liver stiffness value (KPa)	No.	Grade 3 varices		Grade 2 varices		Grade 1 varices	
		No.	%	No.	%	No.	%
<14.0	5	0	0	0	0	5	100
14.0-18.9	3	0	0	0	0	3	100
19.0-23.9	3	0	0	1	33.33	2	66.67
≥24.0	65	19	29.23	21	32.31	25	38.46

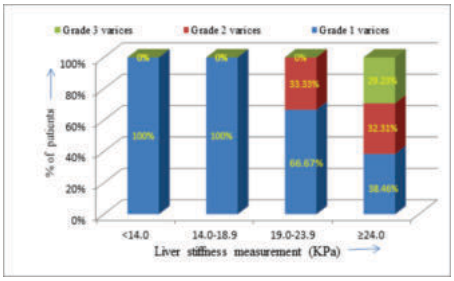

Fig 9. Correlation of LSM values with the grading of esophageal varices

We evaluated the different cut-offs points for transient elastogram (T.E.) liver stiffness value as a predictor of esophageal varices with regards to sensitivity, specificity, Positive Predictive value (PPV), Negative Predictive Value (NPV), Likelihood Ratio (LR) & diagnostic accuracy (Table 8) and then plotted the ROC Curve for test accurateness of T.E. for the prediction of esophageal varices based on our data (Fig. 10)

Table 8. Evaluation of different cutoff points for transient elastogram liver stiffness value as a predictor of esophageal varices :

Stats.	Liver Stiffness cut-off value (KPa)		
	14	19	24
Sensitivity (%) (95% CI)	93.42 (85.31-97.83)	89.47 (80.31 - 95.34)	85.53 (75.58 - 92.55)
Specificity (%) (95% CI)	62.50 (40.59 - 81.20)	87.50 (67.64 - 97.34)	91.67 (73.00 - 98.97)
PPV (%) (95% CI)	88.75 (82.43- 92.99)	95.77 (88.69 - 98.50)	97.01 (89.58 - 99.19)
NPV (%) (95% CI)	75.00 (54.90 - 88.09)	72.41 (57.26 - 83.72)	66.67 (53.33 - 77.78)
+LR (95% CI)	2.49 (1.48 - 4.19)	7.16 (2.48 - 20.69)	10.26 (2.71 - 38.81)
-LR (95% CI)	0.11 (0.04 - 0.26)	0.12 (0.06 - 0.24)	0.16 (0.09 - 0.28)
Diagnostic accuracy (95% CI)	86.00 (77.63 - 92.13)	89.00 (81.17 - 94.38)	87.00 (78.80 - 92.89)

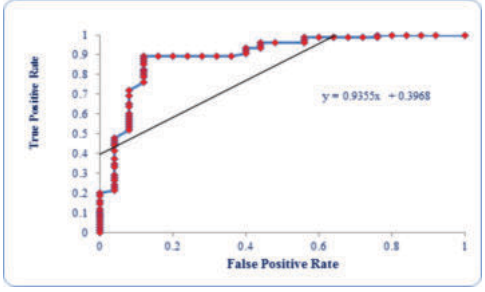

Fig 10. ROC Curve for test accurateness of T.E. for the prediction of esophageal varices (AUC= 0.9003 and p <0.0001)

DISCUSSION

Variceal bleeding is the most dramatic complication of cirrhosis. Endoscopy is the gold standard for the diagnosis of varices. Screening with Endoscopy to identify EVs in all cirrhotic patient at baseline as well as periodic intervals is recommended by the AASLD (American Association for the Study of Liver Disease)[4] and the Baveno Consensus[5] guidelines, necessitating other easier modalities for diagnosis and monitoring of portal hypertension. Thus methods of predicting the presence of EVs noninvasively are in great demand to avoid unpleasant endoscopy and to improve the management. Several non-invasive methods have emerged in recent years by assessing simple laboratory, clinical and sonographic parameter such as splenomegaly, platelet count, portal vein diameter, AST, ALT, APRI, transient elastogram. This study was being carried out with an aim to evaluate the relationship between APRI & Liver stiffness value with esophageal varices in cirrhotic patients.

In our study, the overall prevalence of liver cirrhosis was higher in males (67.0%) than females (33.0%). The main cause of liver cirrhosis was alcoholic liver disease (39.0%) followed by chronic hepatitis B infection (15.0%). Non-alcoholic fatty liver disease (NAFLD) accounts for 11.0% cases while chronic hepatitis C infection accounts for 10.0% cases of cirrhosis. Autoimmune liver disease accounts for 6.0% cases while cryptogenic cirrhosis accounts for 19.0% cases of liver cirrhosis. The results of our study were comparable to previous studies based on etiological profile of CLD in India.

Jain, et. al. (2011),[15] reported prevalence of alcoholic cirrhosis to be 26.2% while hepatitis B, hepatitis C and cryptogenic cirrhosis accounts for 15%, 10% and 48.8% respectively in Indian population.

In study by Vijay Kundal, et. al. (2017),[16] evaluating etiological profile of chronic liver disease in Indian population, their results were as follows: alcoholic (44.6%), followed by alcoholic plus Hepatitis B reactive (6.66%), autoimmune liver disease (6.66%), hepatitis B infection (6.0%), hepatitis C infection (6.0%). In their study, cryptogenic cirrhosis accounts for 30% cases.

The main cause of liver cirrhosis in males in our study was alcoholic liver disease (58.21%) followed by chronic hepatitis B infection (13.43%). The prevalence of chronic hepatitis C infection was 10.45%. Though less common, NAFLD was observed in 2.98% males as a cause of liver cirrhosis. Cryptogenic cirrhosis accounts for 14.93% cases of liver cirrhosis in males.

In our study, the main cause of liver cirrhosis in females was Non-alcoholic fatty liver disease (27.27%) followed by chronic hepatitis B infection (18.18%) & autoimmune liver disease (18.18%). The prevalence of chronic hepatitis C infection was 9.09% while cryptogenic cirrhosis accounts for 27.27% cases of liver cirrhosis in females.

In study by Vijay Kundal, et. al. (2017),[16] evaluating etiological profile of chronic liver disease in Indian population, their results showed etiological profile in males as: alcoholic (60.36%) followed by alcoholic with hepatitis B infection (9.01%), hepatitis B (5.41%), hepatitis C (4.50%) . The prevalence of cryptogenic cirrhosis in males was 20.72%. In female subgroup the etiology was as follows: Autoimmune (25.64%) followed by hepatitis C infection (10.26%), hepatitis B infection (5.41%). The prevalence of cryptogenic cirrhosis in females was 56.41%.

In our study, patients with EVs had lower platelet count (mean ± SD 71.38 ± 30.44 × 10^9/L) than those without EVs (mean ± SD 130.79 ± 40.30 x 10^9/L). This difference was statistically significant ($p<0.05$) among the groups.

Chalasani, et. al. (1999)[17], reported that thrombocytopenia is associated with the presence of LEV and supports the notion that portal hypertension leads to the hypersplenism and thrombocytopenia in most patients.

Sebastini, et. al. (2010),[18] found that the platelet count was lower in patient with esophageal varices (mean ± SD, 98.8±48.4 x109 /L) than patient without cirrhosis (mean ± SD, 142.8±70.1 x109 /L) which is almost similar to our results.

Evaluation of different cutoff points for APRI as a predictor of esophageal varices :

In our study, with APRI cut-off of 1.9, we observed sensitivity of 53.95%, specificity of 75.0%, PPV of 87.23% & NPV of 33.96% for

prediction of esophageal varices. Our results were quite comparable to study by Ângelo Zambam de Mattos, et. al. (2013),[19] where they observed sensitivity of 51.3%, specificity of 77.3%, PPV of 85.9% & NPV of 37.0% for prediction of esophageal varices at APRI cut-off of 1.9.

With APRI cut-off of 1.4, we observed sensitivity of 68.42%, specificity of 62.50%, PPV of 85.25% & NPV of 38.46%. We compared our results with previous studies. In study by Horia Stefanescu, et. al. (2011),[20] they observed sensitivity of 66.24%%, specificity of 44.59 %, PPV of 71.7 % & NPV of 38.4% for prediction of esophageal varices at APRI cut-off of 1.434, a value slightly different from our study.

When cut-off value of 0.9 was used in our study, we observed sensitivity of 80.26%, specificity of 41.67%, PPV of 81.33% & NPV of 40.0%. Our results were quite comparable to study by Debashis Kumar Sarkar, et. al. (2018).[21] At this cut-off value of 0.9, they observed sensitivity of 67.9%, specificity of 58.3%, PPV of 87.8% & NPV of 29.2% for prediction of esophageal varices in their study.

A screening tool, in a context of a serious situation as the presence of EV, which is responsible for the most dramatic complication of cirrhosis, variceal bleeding, must have an excellent negative predictive value (NPV) in order not to miss patients who could benefit from primary prophylaxis. From present study, we are able to evaluate a wide range of APRI cut-off points. This allowed us to prove that there is no satisfactory cut-off value of APRI to be used as a predictor for Evs.

Our study reports that as the APRI score is increasing, the grading of varices found on UGI endoscopy is increasing. On applying statistical spearman test, we observed a positive correlation between APRI score and the degree of esophageal varices with $r = 0.605$ & $p<0.001$.

Our finding is similar to those observed by Imam Suprianto, et. al. (2012),[22] where they observed a correlation between APRI score and the degree of esophageal varices with $p = 0.011$ ($p < 0.05$)

Evaluation of different transient elastogram liver stiffness cut-off values as a predictor of esophageal varices:

In our study, when transient elastogram LSM cut-off value of 24 KPa was taken in order to predict the existence of esophageal varices, we observed sensitivity of 85.53 %, specificity of 91.67%, PPV of 97.01 % & NPV of 66.67%. Our results on this cut-off were quite comparable to study by Syed Fayyaz Mehmood Gillani, et. al. (2012)[23]. They took various cut-offs for LSM and correlated them with presence of esophageal varices. At LSM cut-off of 26.64 KPa, a value slightly different from our study, they observed sensitivity of 81.0%, specificity of 86.0%, PPV of 76.0% & NPV of 89.0. However they have taken patients with HCV related chronic liver disease only, which might explain slight variation of results in our study as compared to theirs.

With LSM cut-off value of 19 KPa, we observed sensitivity of 89.47%, specificity of 87.50%, PPV of 95.77% & NPV of 72.41%. Our results on this cut-off were quite comparable to study by Syed Fayyaz Mehmood Gillani, et. al. (2012).[23] They observed sensitivity of 91.0%, specificity of 73.0%, PPV of 92.0% & NPV of 85.0% for predicting esophageal varices at LSM cut-off of 18.52 KPa, a value slightly different from our study.

With LSM cut-off value of 14 KPa, we observed sensitivity of 93.42%, specificity of 62.50%, PPV of 88.75% & NPV of 75.00%. Syed Fayyaz Mehmood Gillani, et. al,[23] observed sensitivity of 91.0%, specificity of 54.0%, PPV of 87.0% & NPV of 71.0% for predicting esophageal varices at LSM cut-off of 13.46 KPa, a value slightly different from our study.

Thus, even at lower cut-off value of LSM at 14 KPa, we can get a good NPV (75.0%).

We also observed that as the LSM score is increasing, the grading of varices found on UGI endoscopy is increasing. On applying statistical spearman test, we observed a positive correlation between transient elastogram LSM values and the degree of esophageal varices with $r = 0.842$ & $p<0.001$

Summary

100 patients having liver cirrhosis on USG were taken for study. In our study, the overall prevalence of liver cirrhosis was higher in males (67.0%) than females (33.0%). The main cause of liver cirrhosis was alcoholic liver disease (39.0%) followed by chronic hepatitis B infection (15.0%). In our study, patients with esophageal varices (EVs) had lower platelet count (mean ± SD 71.38 ± 30.44 × 10^9/L) than those without EVs (mean ± SD 130.79 ± 40.30 x 10^9/L).

From present study, we are able to evaluate a wide range of cut-off points of APRI as a predictor of EVs but we found no satisfactory cut-off value of APRI to be used as a predictor for EVs. However, we observed that as the APRI score is increasing, the grading of varices found on UGI endoscopy is increasing (r = 0.605 & p<0.001). When we correlated fibroscan liver stiffness measurement (LSM) scores with the EVs, we found significant correlation (p<0.001) with the 'presence or absence' of esophageal varices & also with the 'grading' of varices (r = 0.842, p<0.001).

CONCLUSION

In our study, the main cause of liver cirrhosis was alcoholic liver disease followed by chronic hepatitis B infection. The male preponderance was observed over females due to more alcoholism prevalent in males of Northern India. APRI scores correlate poorly with the presence or absence of esophageal varices but it correlate significantly with the grading of varices. Transient elastogram liver stiffness values correlate significantly with the presence or absence of esophageal varices & also with the grading of varices. Liver stiffness value of ≥14.0 KPa can be used as a guide for early prediction of esophageal varices & endoscopy should be done in these patients to prevent fatal GI bleed from esophageal varices by medical management to decrease portal pressure or by early endotherapy in the form of endoscopic variceal ligation (EVL) or sclerotherapy.

Acknowledgement

We are very much thankful to the patients taken up in the study for their kind cooperation.

Conflict of interest: Authors have declared that no conflict of interest exists.

Funding: This study was carried out in SN medical college Agra with no external funding source.

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