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Significant Diagnostic Markers in Liver Cirrhotic Patients of Tertiary Care Center

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Abstract

Aims: To identify the significant diagnostic markers in liver cirrhotic patients of Tertiary Care Centers (TCC).

Method: This study is an observational study conducted on 171 liver cirrhotic patients who visited the Depart ment of Digestive Health and Diseases-Government Kilpauk Medical College-Chennai for a checkup from Nov-2022 to Feb-2023. The patients were observed and the data such as Age, Gender, HB, Platelet, Urea, Creatinine, Na (Sodium), K (Potassium), TB, AST, ALT, T. Protein, Albumin, PT, INR, USG-abdomen, CXR, Ascitic fluid analysis for PMN, Protein, albumin, Viral Markers such as Hepatitis-B, and C, MELD, CTP were observed, investigated, and the results were recorded. Gender-based impact of clinical data was also analyzed and tabulated.

Results: A total of 171 liver cirrhotic patients were selected for this study among them males 142 (83.0%) were higher than females 29 (17.0%). 66.7% of patients were aged > 41 years, low HB level was found in 167 patients, throm bocytosis in 13 patients, and throm Bo cytopenia in 80 patients. Abnormal biological markers were identified in patients were (urea-29, creatinine-5, sodium-135, total bilirubin-164, AST-144, ALT-80, total protein-59, albumin-141, PT-67).

Liver histology identified patients with G0 were 11, G1-44, G2-81, and G3-35). Ultrasound-abdomen identified patients with G1 were 126, with a statistical significance of (Chi-square – 19.2059, p-value - 0.00001), G2-14 and G3 found in 31 liver cirrhotic patients with a statistical significance of (Chi-square – 3.919, p-value - 0.0477). Chest X-ray, identified patients with pleural effusion was 18, and gender-based association showed the statistical significance of (Chi-square – 2.873, p-value - 0.0471).

Hepatic Encephalopathy was identified by West Haven Criteria (WHC), and patients with (G0-115, G1-12, G2-32, and gender-based association showed a statistical significance of (Chi-square – 14.292, p-value - 0.0002). G3 was found in 12 liver cirrhotic patients, and gender-

based association showed a statistical significance of (Chi-square – 5.019, p-value - 0.019).

The ascitic fluid analysis identified cirrhotic patients with abnormal levels (PMN-43, protein-168, albumin-21, and gender-based association showed a statistical significance of (Chi-square – 5.418, p-value - 0.035). The ascitic fluid analysis also identified the pathogens isolated in 29 liver cirrhotic patients with a statistical significance of (Chi-square – 5.756, p-value - 0.0051).

Hepatitis B positive in 14, and gender-based association showed a statistical significance of (Chi-square – 7.2622, p-value - 0.007). Hepatitis C positive in 12 patients, and gender-based association showed a statistical significance of (Chi-square – 19.01, p-value - 0.0001).

MELD abnormal scoring in 164, and gender-based association showed a statistical significance of (Chi-square – 5.658, p-value - 0.032). Abnormal scoring of CTP-A in 21, CTP-B in 63, gender-based association showed a statistical significance of (Chi-square – 3.9157, p-value - 0.0478), and CTP-C in 87 patients. Abnormal levels of INR were found in 88 patients (51.5%), and 10 (5.8%) patients were found abnormal levels of potassium.

Conclusions: Diagnostic tools are the backbone of clinical practice, guiding the clinicians for early diag nosis of ill health conditions or diseases, and diagnostic tools must be early identifiable, accurate, non-invasive, and cost-effective, hence our present study concludes that diagnostic tests like ultrasound-abdomen, chest-X-ray, ascitic fluid analysis the predictive tools MELD, CTP are the early identifiable, and accurate diagnostic tools for cirrhotic patients.

Keywords: Liver Cirrhosis, Liver Histology, Ultrasound-abdomen, Chest X-ray (CXR), Ascitic Fluid Analysis (AFA), West Haven Criteria (WHC), Model for End-Stage Liver Disease (MELD), Child- Turcotte - Pughe (CTP).

Introduction

Liver cirrhosis is a life-threatening liver disease com monly producing symptoms only in the later stage of the disease and found in alcohol-using individuals, fatty liver patients, and patients with hepatitis.

Liver cirrhosis occurs due to necrosis, and also by the regeneration of specific cells called hepatocytes, which results in fibrosis and also the network of capillaries hepatic parenchymal cells, resulting in disorders in blood flow causing hepatic hypertension. Liver cirrhosis also causes ascites, disturbances in the renal system, cardiac system, and Hepato-Cellular Carcinoma (HCC).

In China alone, hepatitis B accounts for 130 million carriers, among them 30.01 million are in the chronic stage of hepatitis B, and among them, 24% were with cirrhosis and liver carcinoma[1,2]. Hirayuki, E et al describes that the etiology of liver cirrhosis are Non-alcoholic fatty liver disease (NAFLD), Non-Alcoholic Stea to Hepatitis (NASH), and Hepatitis C virus (HCV)[3].

Acute Chronic Liver Failure is also one of the acute stages of decompensation in liver cirrhotic patients, and due to unknown triggers leads to liver failure in the duration of 28 days, and Mochida, S et al reports that the testing for liver cirrhosis biological markers has become one of the fundamental diagnostic tests in Japan[4].

Younossi, Z et al reported that NAFLD is classified as lipid deposition in the liver due to alcohol consumption, NAFLD can lead to steatosis, NASH, fibrosis and finally leading to cirrhosis[5].

Periyasamy, S et al explain that liver cirrhosis is mor phologically classified into 3; micronodular cirrhosis chara cterized by <3mm uniform nodules, macronodular cirrhosis with >3mm nodules, and mixed cirrhosis was presented with a mixture of micro and macro nodules[6].

Nahon P et al, Li DK et al, and Innes H et al report clearly that 1.8% to 2.5% of patients were diagnosed with

HCC annually[7-9]. Kahn, J et al and Eslamparast, T et al describe that Sarcopenia in liver cirrhosis patients is loss of or lesser muscle due to aging and is also one of the fatal health conditions. Sarcopenic obesity is also the other reversed adverse predictor in increasing fat mass[10,11].

Schuppan, D et al describes that due to the lack of unmet or not clear medical needs such as the, not a proper set of evidence-based diagnostic tests for cirrhosis or fibrosis, not proper therapeutic approaches, and not proper recommendation makes the need for large-scale research, innovative approaches to save 45% of patients who die due to fibroproliferative diseases such as cirrhosis[12].

Thursz, M et al stated liver cirrhotic patients with ascites have less survival rate, in them the survival can be improved by a Trans jugular Portal Systemic Shunt (TIPS), and for the suitability of TIPS, MELD or Na-MELD biomarkers are significantly important. Biomarker MELD, not only predicts TIPS, but also sup ports the guidance of concentration of bilirubin, and platelet count[13].

Researchers Rauber, P et al and Erdem, M. G et al reported platelets dysfunction or abnormal platelets especially higher platelet count the thrombocythemia, play a vital role in cirrhotic patients, immaturity of platelet also make a vital role in cirrhotic patients[14, 15].

Jiménez-Rosales et al describe cirrhotic patient's fatality increases when they have re-bleeding especially with impaired mucosal issues, endo vascular dysfunction, and hyper - dynamic circulation, and also the author feels that lesser information is available in regards to the impact of platelet counts in cirrhotic patients who have been deceased with lesser platelets counts[16].

Aracil, C. F et al clearly describes the significance of platelet count in epistaxis patients, and in cirrhotic patient blood loss due to epistaxis (platelet count-89,000) is associated with higher mortality. In patients with throm Bo cytopenia, the insertion of a nasogastric tube leads them to bleed making them at high risk for fatality, hence biological makers have a significant impact on cirrhotic patients[17].

In cirrhotic patients, the decision of the physician performing ultrasound or MRI, or CT is based on the accuracy, stability, and time taken for performing the tests accounts. Ultrasound takes a lot of time to perform and apart from time, ultrasound is a good diagnostic tool[18].

Wu, L et al describes that contrast using CT is the best and most accurate diagnostic test for cirrhotic patients, and CT is especially very useful in liver cirrhotic patients with portal hypertension[19].

The other research by Morgan, J et al explains regarding cirrhosis in women cirrhotic patients have high chances of uterine bleeding, hence in them, the precise, and appropriate bio logical markers will guide the improve ment in women cirrhotic patients who are with uterine bleeding [20].

The above publish data reveals the necessitate for new, evidence-based, reliable data which can explain the significance of robust biomarkers in cirrhotic patients, hence we have observed the admitted cirrhotic patients, collected their data, and analyzed for further evidence which is tabulated in the result section. The results are further compared with other published data and discussed further in conclusion.

Inclusion criteria

- Patients visited the hospital with liver cirrhosis

Exclusion criteria

- Pregnant patients
- Moribund patients

Materials and methods

Methodology

Study Subjects

The 171 liver cirrhotic patients who visited the hospital for checkups were selected based on inclusion and exclusion criteria from Nov-2022 to Feb-2023 to conduct this study. The patients were observed and the clinical data were collected and recorded.

Data Collection

The 171 patients were observed and demographic details, and clinical details such as HB[21], Platelet[22], Urea[23], Cretenine [24], Sodium[25], Potassium,[26] Total Bilurubin[27], Aspartate transaminase (AST) [28], Alanine transaminase (ALT)[29], Total Protein[30], Albumin[31], Prothrombin Time[32], International Normalized Ratio (INR) [33], liver histology [34], ultra sound [35], chest X-ray (CXR) [36], ascitic fluid analysis [37], hepatitis B[38], hepatitis C[39], Model for End-Stage Liver Disease (MELD)[40], Child- Turcotte -Pugh (CTP)[41], West Haven Criteria (WHC)[42] were observed, investigated, and the results were recorded.

Analysis

The 171-study patient's clinical and demographic details were collected and recorded. The patients were cate gorized into 2 categories, based on gender, the impacts of clinical conditions were analyzed and the results were tabulated.

Statistical analysis of data:

SPSS version 21 was used to conduct the statistical analysis, and for descriptive variables, the data were expressed as the frequency.

The associations between gender and the significance of biological markers were analyzed with a Chi-square test and expressed with a P value of <0.05 which is considered statistically significant.

Results

A total of 171 liver cirrhotic patients were selected for this study. The basic biological marker profile of liver cirrhotic patients was expressed in Table 1. Among the 171 patients, males were 142 (83.0%) and females were 29 (17.0%). 66.7% of aged>41 years of patients were affected with liver cirrhosis, and <40 years 33.3% with liver cirrhosis.

Among the 171 liver cirrhotic patients, low HB level was found in 140 (81.9%) males and 27 (15.8%) females. Abnormal higher elevated platelet count (Throm bo cytosis) was found in 13 (7.6%) of patients, and lesser than the normal level of platelet count (Throm bo cytopenia) was found in 80 (46.8%) patients, and abnormal urea level was found in 29 (17.0%) of liver cirrhotic patients (Table 1).

We also did creatinine biological markers in liver cirrhotic patients and found 38 (22.2%) of male patients showed abnormal levels of creatinine, and 5 (3.0%) of females showed abnormal creatinine levels. Sodium was found with abnormal levels in 135 (78.9%) patients and abnormal levels of potassium were found in 10 (5.8%) of patients (Table 1).

The other biological marker such as total bilirubin was found abnormal level in 164 (95.9%) of patients, and among the liver function tests, AST abnormal level was found in 144 (84.2%) of patients, and ALT was found abnormal level in 80 (46.8%). Total protein abnormal level was found in 59 (34.5%) of patients (Table 1).

Albumin's abnormal level was found in 141 (82.5%) of patients, Prothrombin Time (PT) was found abnormal in 67 (39.2%), and abnormal levels of INR were found in 88 (51.5%). Liver histology also performed for study subjects and found G0 was found 11 (6.4%) of patients, G1 was found in 44 (25.7%) of liver cirrhotic patients,

G2 was found in 81 (47.4%) of patients, and G3 was found in 35 (20.5%) (Table 1).

Ultrasound was done for all the study patients, and G1 was found in 126 (73.7%), G2 was found in 14 (8.2%) patients, and G3 was found in 31 (18.1%) liver cirrhotic patients. In the chest X-ray (CXR), pleural effusion aspirated in 18 (10.5%) of study patients, and WHC identified hepatic G0 was found in major number (n=115, 67.3%) of patients, G1 in (n=12, 7.0%), G2 in (n=32, 18.7%), and G3 was found in (n=12, 7.0%) of liver cirrhotic patients (Table 1).

We have done an ascitic fluid analysis also, Poly mor phonuclear (PMN) abnormal level was found in 43 (25.1%) of patients, a protein abnormal level in the Ascitic fluid was found in 168 (98.2%) of patients, and an abnormal level of albumin in the ascitic fluid was found in 21 (12.3%) of patients, and in Ascitic fluid, the pathogens were isolated in 29 (17.0%) of liver cirrhotic patients (Table 1).

We also did other biological testing such as viral markers like hepatitis B and C. Hepatitis B was found positive in 14 (8.2%) of patients, and Hepatitis C was found positive in 12 (7.0%) of liver cirrhotic patients. With the data available, we have done MELD, and CTP scoring, and found MELD abnormal scoring found in 164 (95.9%) patients, CTP-A abnormal scoring was found in 21 (12.3%) patients, CTP-B abnormal scoring was found in 63 (36.8%) patients, and CPT-C abnormal scoring was found in 87 (50.9%) of patients (Table 1).

Table 1: Profile of Biological Markers in Liver Cirrhotic Patients.

Variables	No (%)
Gender (n=171)	
Males	142 (83.0)
Females	29 (17.0)
Age Categories (in years) (n=171)	
≤40 years	57 (33.3)
>41 years	114 (66.7)
Hemoglobin (HB) Low level (n=167)	
Males <14-18 g/dl	140 (81.9)
Females <12-16 g/dl	27 (15.8)
Platelet (Abnormal Level) (n=93)	
(Thrombocytosis) >450,000/microliter	13 (7.6)
(Thrombocytopenia) <1,50,000/microliter	80 (46.8)
Urea (Abnormal Level) (n=29)	
>60mg/dl	29 (17.0)
Creatinine (Abnormal Level) (n=43)	
Males->1.0 mg/dl	38 (22.2)
Females->1.2 mg/dl	5 (3.0)
Sodium (Abnormal Level) (n=135)	

<135 and >145 mEq/L	135 (78.9)
Potassium (Abnormal Level) (n=0)	
>5.2 mmol/L	10 (5.8)
Total Bilurubin (Abnormal Level) (n=171)	
>1.2 mg/dL	164 (95.9)
Liver Function test (Abnormal Value) (n=171)	
Aspartate transaminase (AST) >45 (units/liter)	144 (84.2)
Alanine transaminase (ALT) >56 (units/liter)	80 (46.8)
Total Protein (Abnormal Level) (n=171)	
<6.0 and >8.3 (g/dL)	59 (34.5)
Albumin (Abnormal Level) (n=171)	
<3.4 and >5.4 g/dL	141 (82.5)
Prothrombin Time (PT) (Abnormal Level) (n=171)	
>17 seconds	67 (39.2)
International Normalized Ratio (INR) (Abnormal Level) (n=171)	
>1.5	88 (51.5)
Liver Histology (n=171)	
G0	11 (6.4)
G1	44 (25.7)
G2	81 (47.4)
G3	35 (20.5)
Ultrasound (n=171)	
G1	126 (73.7)
G2	14 (8.2)
G3	31 (18.1)
Chest X-Ray (CXR) (n=171)	
Pleural Effusion Present	18 (10.5)
Pleural Effusion Absent	153 (89.5)
West Haven Criteria (WHC) identified Hepatic Encephalopathy (n=171)	
G0	115 (67.3)
G1	12 (7.0)
G2	32 (18.7)
G3	12 (7.0)
Ascitic Fluid Analysis (n=171)	
Polymorphonuclear (PMN) (Abnormal value) >250 cells/µL	43 (25.1)

Protein (Abnormal value) <2.5 g/Dl	168 (98.2)
Albumin (Abnormal value) >1.0 g/dL	21 (12.3)
Ascitic Fluid Culture (with the pathogen)	29 (17.0)
Viral Markers (n=171)	
Hepatitis B	14 (8.2)
Hepatitis C	12 (7.0)
Model for End-Stage Liver Disease (MELD) (Abnormal Score) (n=171)	
≥10	164 (95.9)
Child- Turcotte-Pugh (CTP) (Abnormal Score) (n=171)	
A	21 (12.3)
B	63 (36.8)
C	87 (50.9)

We have also done the gender-based association of these biological and expressed the basic biological markers in Table 2. In the age group of ≤40 years of age, males were 49 (85.9%), in females the percentage was 8 (14.1%), in the age group of >41 years, the males were 93 (81.6%), and the females were 21 (18.4%).

Out of 171 study patients, 167 patients showed lower levels of Hemoglobin, among them males were 140 (83.8%), and females were 27 (16.2%). Abnormal platelet was found in liver cirrhotic patients, increased number than the normal level of platelets and a lower level of platelets (Throm bocytosis) found in 135 (78.9%) male patients and 28 (16.4%) female patients. The lower level of platelets (Thrombocytopenia) was found in 7 (4.1%) of male patients, and 1 (0.6%) of female patients (Table 2).

In gender-based association, among 171 study patients, the abnormal level of total bilirubin was found in 164 patients, among them males were 135 (82.3%), and females were 29 (17.7%). Out of 171 study patients, 59 patients showed abnormal levels of total protein, among them males were 48 (81.4%), and females were 11 (18.6%) (Table 2).

Out of 171 study population, 141 patients showed abnormal levels of Albumin, among them males were 116 (82.3%), and females were 25 (17.7%). The chest X-ray (CXR) also is one best diagnostic marker for cirrhosis, and we found CXR identified 18 (10.5%) male patients who aspirated with pleural effusion, where none of the female patients were found with pleural effusion with statistical significance of (Chi-square – 2.873, p-value - 0.0471) (Table 2).

Table 2: Gender-based Association of Basic Biological Markers in Liver Cirrhotic Patients

Variables	Categories	Males (No=142 (%)	Females (No=29 (%)	Chi-square	P value
Age Categories (in years) (n=171)	≤40 years (n=57)	49 (85.9)	8 (14.1)	0.5191	0.4712
	>41 years(n=114)	93 (81.6)	21 (18.4)		
Hemoglobin (HB) Low level (n=167)	-	140 (83.8)	27 (16.2)	1.227	0.134
Platelet (Abnormal Level) (n=171)	-	142 (83.0)	29 (17.0)	0.2524	0.6154

Total Bilirubin (Abnormal Level) (n=164)	-	135(82.3)	29(17.7)	0.4994	0.1304
Total Protein (Abnormal Level) (n=59)	-	48 (81.4)	11 (18.6)	0.1816	0.67
Albumin (Abnormal Level) (n=141)	-	116 (82.3)	25 (17.7)	0.4913	0.4533
Chest X-Ray (CXR) (n=171)	Pleural Effusion Present	18 (10.5)	0 (00.0)	2.873	0.0471*

* **Statistically Significant**

We have analyzed the gender-based association of renal and liver markers in liver cirrhotic patients as described in Table 3. Out of 171 study patients, 29 patients showed abnormal levels of urea, among them 25 (86.2%) were males, and 4 (13.8%) were females. Out of 171 study population, 43 patients showed abnormal levels of creatinine, among them 38 (88.4%) were males, and 5 (11.6%) were females. None of the patients showed ab normal levels of potassium.

Out of 171 study patients, 144 patients showed abnormal levels of AST, among them 118 (81.9%) were males, and 26 (18.1%) were females. Out of 171 study subjects, 80 patients showed abnormal levels of ALT, among them 66 (82.5%) were males and 14 (17.5%) were females (Table 3).

In gender-based association, the Ascitic fluid analysis, PMN abnormal levels were found in 35 (20.5%) males and 8 (4.7%) females. Abnormal level of protein in the Ascitic fluid was found in 137 (80.1%) males, and 31 (18.2%) females with a statistical significance of (Chi-square – 5.418, p-value - 0.035). Abnormal level of albumin in the ascitic fluid was found in 20 (11.7%) males, and 1 (0.6%) females. Out of 171 patients, 29 (17.0) males were isolated with pathogens in the ascitic fluid, and none of the female patients were found with pathogens in ascitic fluid with the statistical significance of (Chi-square – 5.756, p-value - 0.0051) (Table 3).

Out of 171 study patients, 14 patients showed positivity for Hepatitis B, among them males were 8 (57.1%), and females were 6 (42.9%) with a statistical significance of (Chi-square – 7.2622, p-value - 0.007). Out of 171 study patients, 12 patients showed positivity for Hepatitis C, among them males were 4 (33.3%), and females were 8 (66.7%) with the statistical significance of (Chi-square – 19.01, p-value - 0.0001) (Table 3).

Table 3: Gender-based Association of Renal and Liver Markers in Liver Cirrhotic Patients

Variables	**Categories**	**Males (No=142 (%)**	**Females (No=29 (%)**	**Chi-square**	**P value**
Urea (Abnormal Level) (n=29)	-	25 (86.2)	4 (13.8)	0.0516	0.7885
Creatinine (Abnormal Level) (n=43)	-	38 (88.4)	5 (11.6)	1.1593	0.2816
Sodium (Abnormal Level) (n=135)	-	111 (82.2)	24 (17.8)	0.3052	0.5806
Potassium (Abnormal Level) (n=0)	-	10 (00.0)	0 (00.0)	0.06142	0.6112
Liver Function test (Abnormal Value) (n=171)	Aspartate transaminase (AST) (n=144)	118 (81.9)	26 (18.1)	0.3636	0.3003
	Alanine transaminase (ALT) (n=80)	66 (82.5)	14 (17.5)	0.0312	0.8597
Ascitic Fluid Analysis	Polymorphonuclear	35 (20.5)	8 (4.7)	0.1105	0.7396

(Abnormal value) (n=171)	(PMN)				
	Protein	137 (80.1)	31 (18.2)	5.418	0.035*
	Albumin	20 (11.7)	1 (0.6)	1.638	0.2061
	Ascitic Fluid Culture (with the pathogen)	29 (17.0)	0 (00.0)	5.756	0.0051*
Viral Markers (n=171)	Hepatitis B (n=14)	8 (57.1)	6 (42.9)	7.2622	0.007*
	Hepatitis C) (n=12)	4 (33.3)	8 (66.7)	19.01	0.0001*

* **Statistically Significant**

We have analyzed the gender-based association of predictive scoring markers such as Prothrombin Time (PT), International Normalized Ratio (INR), Model for End-Stage Liver Disease (MELD), and Child-Turcotte-Pugh (CTP) in liver cirrhotic patients and described in Table 4. Out of 171 patients, 67 patients showed abnormal levels of PT, among them males were 54 (80.6%) and females are 13 (19.4%). None of the patients showed abnormal levels of INR.

MELD abnormal level was found in 164 patients, out of 171 study subjects, among the 164, males 139 (81.3%), and females 25 (14.6%) with a statistical significance of (Chi-square – 5.658, p-value - 0.032). CTP-A abnormal levels were found in 21 patients, among them males were 17 (9.9%), and females were 4 (2.3%). CTP-B abnormal levels were found in 63 patients, among them males, was 57 (33.3%), and females 6 (3.5%) with a statistical significance of (Chi-square – 3.9157, p-value - 0.0478). CTP-C abnormal levels were found in 87 patients, among them males were 68 (39.8%), and females were 19 (11.1%) (Table 4).

Table 4: Gender-based Association of Predictive Scoring Markers in Liver Cirrhotic Patients

Variables	**Categories**	**Males (No=142 (%)**	**Females (No=29 (%)**	**Chi-square**	**P value**
Prothrombin Time (PT) (Abnormal Level) (n=67)	-	54 (80.6)	13 (19.4)	0.4672	0.4943
International Normalized Ratio (INR) (Abnormal Level) (n=0)	-	49 (00.0)	18 (00.0)	0.3912	0.3647
Model for End-Stage Liver Disease (MELD) (Abnormal Score) (n=164)	-	139 (81.3)	25 (14.6)	5.658	0.032*
Child- Turcotte- Pugh (CTP) (Abnormal Score) (n=171)	A (n=21)	17(9.9)	4 (2.3)	0.0015	0.7534
	B (n=63)	57 (33.3)	6 (3.5)	3.9157	0.0478*
	C (n=87)	68 (39.8)	19 (11.1)	2.9949	0.0835

* **Statistically Significant**

We also analyzed the gender-based association of liver histology, ultra sound, and WHC markers in liver cir rhotic patients, as explained in Table 5. Liver histology, G0 was found in 11 patients, all the 11 patients were males. G1 of liver histology was found in 44 patients, among them, males were 39 (22.8%), and females were 5 (2.9%). G2 of liver histology was found in 81 patients,

among them, males were 58 (33.9%), and females were 23 (13.5%). G3 of liver histology was found in 35 patients, among them, males were 34 (19.9%), and females were 1 (0.6%).

Ultrasound was done for all 171 study patients, and gender-based analysis was done. Ultrasound-G1 was found in 126 patients, among them males were 110 (64.3%), and females were 16 (9.4%) with the statistical signifi cance of (Chi-square – 19.2059, p-value - 0.00 001). Ultrasound-G2 was found in 14 patients, among them males were 10 (5.8%), and females were 4 (2.3%). Ultrasound-G3 was found in 31 patients, among them males were 22 (12.9%), and females were 9 (5.3%) with the statistical significance of (Chi-square – 3.919, p-value - 0.0477) (Table 5).

West Haven Criteria (WHC) was done for all 171 study patients, and gender-based analysis was done. Hepatic encephalopathy-G0 was found in 115 patients, among them males were 97 (56.7%), and females were 18 (10.5%). WHC-G1 was found in 12 patients, among them males were 9 (5.3%), and females were 3 (1.7%). WHC-G2 was found in 32 patients, among them males were 27 (15.8%), and females were 5 (2.9%) with the statistical signifi cance of (Chi-square – 14.292, p-value - 0.0002). WHC-G3 was found in 12 patients, among them males 9 (5.3%), and females 3 (1.8%) with a statistical signifi cance of (Chi-square – 5.019, p-value - 0.019) (Table 5).

Table 5: Gender-based Association of Liver Histology, Ultrasound, and WHC Markers in Liver Cirrhotic Patients

Variables	Categories	Males (No = 142 (%)	Females (No =29 (%)	Chi-square	P value
Liver Histology (n=171)	G0 (n=11)	11 (6.4)	0 (00.0)	0.4259	0.5140
	G1 (n=44)	39(22.8)	5 (2.9)	0.1376	0.4168
	G2 (n=81)	58(33.9)	23 (13.5)	0.049	0.8235
	G3 (n=35)	34(19.9)	1 (0.6)	0.1376	0.4168
Ultrasound (n=171)	G1 (n=126)	110 (64.3)	16 (9.4)	19.2059	0.00001*
	G2 (n=14)	10 (5.8)	4 (2.3)	0.7001	0.2495
	G3 (n=31)	22 (12.9)	9 (5.3)	3.919	0.0477*
West Haven Criteria (WHC) identified Hepatic Encephalopathy (n=171)	G0 (n=115)	97 (56.7)	18 (10.5)	1.286	0.2155
	G1 (n=12)	9 (5.3)	3 (1.7)	1.3171	0.2511
	G2 (n=32)	27 (15.8)	5 (2.9)	14.292	0.0002*
	G3 (n=12)	9 (5.3)	3 (1.8)	5.019	0.019*

* **Statistically Significant**

Discussion

In cirrhotic patients, the importance of diagnostic tools is very important and requires a need and urgency for selection. Khalifa, A et al [43] describes that cirrhotic patients with gastrointestinal bleeding have anemia with an HB level of 8g/dl, our study found 167 patients showed the abnormal level of HB, and we also reported the gender-based distribution of abnormal level of HB in cirrhotic patents.

Rowley, M. W et al [44] reported 10.7% of their study patients were with thrombocytopenia, in our present study, we found 80 (46.8%) had lesser platelet diagnosed with thrombocytopenia. Ndabakuranye, J. P et al [45] report that the bilirubin levels can be estimated with a positive correlation (R-square > 0.95) and an accuracy of ±1.7

mg/dL, with higher reliability in cirrhotic bilirubin concentrations (> 4 mg/dL)-critical for high-risk patients, we in our present study reported 164 patients showed the abnormal level of bilirubin and we also reported gender-based distribution of abnormal level of bilirubin.

Bunchorntavakul, C et al [46] described that the protein gets stored up in a large amount in cirrhotic patients and makes them obese, and we in this study identified, 59 patients have shown abnormal protein levels. Esmaeil zadeh, A et al [47] reported a statistical significance of albumin in both controls and cirrhotic patients (3.99 ± 0.50 vs. 2.90 ± 0.55, P<0.0001), and we in our present study found 141 patients were with abnormal levels of albumin.

Akbar, A et al [48] explain in cirrhotic patients, Chylo thorax is a condition, in whom pleural effusion is found, and Chylothorax occurs in 1% of the patients, and also the author describes, Chylothorax is very distinct in identification and requires a very precise, and accurate diagnostic tool such as CXR. Our present study found chest X-RAY (CXR) identified 18 (10.5%) male patients who are aspirated with pleural effusion, where none of the female patients were found with pleural effusion with the statistical significance of (Chi-square – 2.873, p-value - 0.0471).

Duarte, N. T et al[49] narrated that in their study urea and nitric oxide were found in the saliva and blood of 38 cirrhotic patients, our study is compatible with their study. Xiong, J et al [50] describe that the importance of creatinine testing in cirrhotic patients diminishes as muscle wasting also increases the creatinine level, and we in our present study found 43 patients had abnormal values.

Goudsmit, B. F et al[51] reported gender-based distribution (males-31.9%, females- 35.5%) of abnormal levels of sodium in cirrhotic patients, we found in our study, 82.2% of males had abnormal levels of sodium, and 17.8% of females had abnormal levels of sodium. Labenz, C et al[52] revealed that out of 844 patients, around 220 patients showed abnormal levels of AST and ALT, in our study we found out of 171 cirrhotic patients, 144 patients showed elevated levels of AST, and out of 171 cirrhotic patients, 80 patients showed elevated levels of ALT.

In cirrhotic patients, Ascitic fluid analysis plays a vital role as a diagnostic tool, the protein in the Ascitic fluid analysis showed abnormal levels in 80.1% of males, and 18.25 of females with the statistical significance of (Chi-square – 5.418, p-value - 0.035).

Research by Mohammed, M et al [53], on peritonitis, shows that 9.2% of the patients had an abnormal level of protein in their cirrhotic patients, but not reported the gender-based distribution like us.

Ding, X et al [54] reported 334 pathogens were isolated in the Ascitic fluid analysis in their study, in our present study; we isolated 29 (17.0%) pathogens from male cirrhotic patients, and no pathogens were isolated from females with the statistical signifi cance of (Chi-square – 5.756, p-value - 0.0051).

Elloumi, H et al [55] describes that in 42.9% of patient hepatitis B, and C is the reason for cirrhosis. In our study, out of 171 patients, 14 cirrhotic patients were found with hepatitis B, and gender-based association showed the statistical significance of (Chi-square – 7.2622, p-value - 0.007), and 12 patients found with hepatitis C, and gender - based association showed the statistical signifi cance of (Chi-square – 19.01, p-value - 0.0001).

We also analyzed the gender-based association of predictive scoring markers in liver cirrhotic patients and found MELD, and CTP were the best predictive diag nostic markers in cirrhotic patients with the statistical significance of (Chi-square – 5.658, p-value - 0.032), and

(Chi-square – 3.9157, p-value - 0.0478) respectively. van Vugt, J. L. A et al [56] described that MELD is the best predictive diagnostic tool, and the addition of serum albumin made the test more accurate. Sebestyen, A et al[57] reported that MELD must be a predictive tool for any cardiac intervention in cirrhotic patients. El-Khateeb, E et al[58] reported that the CTP scoring supports understanding the clinical severity of liver diseases.

The other significant diagnostic tool for cirrhotic patients is an ultrasound in our study patients, the ultra sound-G1, and G2 showed the statistical signifi cance of (Chi-square – 19.2059, p-value - 0.00001), and (Chi-square – 3.919, p-value - 0.0477) res pectively. Lupsor - Platon, M et al [59] described that among the non-invasive diagnostic tool, ultra sound is a very useful tool in cirrhotic patients and also useful in identifying NAFLD, NASH, and HCC in cirrhotic patients.

West Haven Criteria (WHC) is one of the best diagnostic tools for cirrhotic patients, in our study we found WHC-G2, and WHC-G3 were statistically significant (Chi-square – 14.292, p-value - 0.0002), and (Chi-square – 5.019, p-value - 0.019) respectively. Khabibovna, Y. S et al [60] reported that the WHC is the unequivocal tool of diagnosis for cirrhotic patients.

Rao, A et al [61] described that the diagnostic and signifi cant therapeutic delays lead to treatment delay, leading the patients to a higher risk of mortality; hence impro vement in timely diagnosis is essential for appropriate and early interventions leading to a reduction of mor tality.

Diagnostic tools play a significant role in clinical practice, leading the clinicians towards the diagnosis of any diseases, and in our present study we also conclude that for cirrhotic patients, the accurate, best, precise, non-invasive diagnostic tools are ultrasound and WHC. The predictive tools are MELD, CTP, chest-X-ray, and acetic fluid analysis also very useful diagnostic tools for cirrhotic patients. Apart from these diagnostic tools, vaccination against hepatitis B, and C will also improve the quality of life in cirrhotic patients.

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