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Prevalance and Clinical Profile of Pulmonary Hypertension in Chronic Liver Disease: A Tertiary Care Hospital-Based Study

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Abstract

***Introduction:** Chronic liver disorders (CLDs) have significantly increased global mortality. With 1.6 billion affected by conditions like alcoholic liver disease (ALD), hepatitis B and C, and non-alcoholic fatty liver disease (NAFLD), complications such as cirrhosis, hepatopulmonary syndrome (HPS), and portopulmonary hypertension (PoPH) are prevalent. This study investigates the prevalence and clinical profile of pulmonary hypertension (PH) in patients with CLD.*

***Objectives:** This study aims to evaluate the clinical profile and prevalence of pulmonary hypertension in patients with CLD and assess its correlation with the severity of liver disease.*

***Methods:** This cross-sectional study involved 150 patients with CLD with PH, from January 2023 to June 2024. Patients aged >14 years with CLD and PH were included, excluding those with malignancies, recent surgeries, or other causes of PH.*

***Results:** The mean patient age was 45.55 ± 9.8 years, predominantly male (79.3%), with most from lower socio-economic backgrounds (65.3%). Alcohol use was prevalent (78.7%), and 32.0% tested positive for HBsAg. Ascites varied in severity, and 20.0% of patients had PH (6.7% mild, 13.3% moderate). A significant correlation was found between Child-Pugh scores and PH prevalence (p <0.001).*

***Conclusion:** Pulmonary hypertension is observed in 20.0% of patients with CLD, with severity correlating strongly with liver disease severity. Trans-thoracic echocardiography is non-invasive diagnostic tool for PH in patients with CLD. Alcohol remains a major preventable cause of CLD. Further research is needed to confirm these findings and explore management strategies.*

***Key words:** Chronic liver disease; pulmonary hypertension; alcoholic liver disease; hepatopulmonary syndrome; portopulmonary hypertension; Child-Pugh score; trans-thoracic echocardiography.*

Introduction:

Chronic liver disorders (CLDs) are a significant public health concern due to their rising global morbidity and mortality. From 1980 to 2013, global mortality from CLDs increased by 46%, with most deaths occurring in LMICs (low- and middle-income countries), predominantly in Asia as well as Africa, where vital event reporting systems are inadequate[1]. This underreporting may obscure the true burden of CLDs, necessitating improved methods to assess their impact on health systems. In 2017, 1.6 billion people suffered from CLDs, primarily caused by HCV (hepatitis C virus), ALD (alcoholic liver disease), NAFLD (non-alcoholic fatty liver disease), and HBV (hepatitis B virus). Cirrhosis contributed to 132 million deaths globally, with a significant increase from 1990. In East and Southeast Asia, cirrhosis incidence is notably high, with a 13% increase in prevalence since 2000.

Pulmonary hypertension (PH), a severe condition affecting the cardiovascular system, has become better understood over the past 25 years, yet remains challenging to study due to its varied causes and treatment approaches. Specialised PH clinics are recommended to enhance patient outcomes and research. Portopulmonary hypertension (PoPH), as well as hepatopulmonary syndrome (HPS), are serious issues in patients with CLD, impacting functional status and survival. HPS is characterised by pulmonary vasodilation and hypoxaemia, while PoPH develops right heart failure through rising pulmonary vascular resistance[2].

Despite the advances in understanding PH and its link to CLD, complications like ascites and hepatic encephalopathy remain prevalent. Identifying and managing pulmonary arterial hypertension (PAH) in patients with CLD is crucial, and The purpose of this study is to determine the prevalence along with clinical characteristics of PH in this population.

Aim and Objectives

To estimate the prevalence of pulmonary hypertension and compare its clinical profile in patients with chronic liver disease in a tertiary care hospital.

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Methods

This hospital-based cross-sectional investigation had been performed with 150 patients diagnosed with chronic liver disease with pulmonary hypertension who attended the outpatient and inpatient department of the Medicine Department, over 18 months from January 2023 to June 2024, after obtaining consent from the patients.

Inclusion Criteria

Age >14 years with patients of chronic liver disease with pulmonary hypertension. Chronic liver disease is diagnosed in patients using both clinical evaluation and radiological criteria.

Exclusion Criteria

Patients of chronic liver disease with associated malignancy other than hepatocellular carcinoma, Budd-chiari syndrome, recent abdominal surgery (within 3 months.), abdominal trauma, patients having pulmonary artery hypertension due to any other cause.

All patient data was preceded and entered in an Excel sheet and examined utilizing SPSS (Statistical Package for Social Sciences) version 23.0 for the Windows. The arithmetic mean ± standard deviation was employed to display quantitative data. Qualitative data was presented as frequencies (percentages). For variables, parametric and non-parametric tests were applied as required. The two groups' category variables were compared employing the chi-square test. Student t test or else ANOVA (Analysis of variance) was used to assess group variation over time. P-values less than 0.05 had been regarded as statistically significant.

Table I: Distribution of the studied patients based on variables.

Variable		Number of patients (n=150)	Percentage
Alcoholic	Yes	118	78.7
	No	32	21.3
HCV	Positive	0	0.0
	Negative	150	100.0
HBsAg	Positive	48	32.0
	Negative	102	68.0

Table II: Child-Pugh score of patients.

Child-Pugh Score	Number of patients (n=150)	Percentage
Grade A	39	26.0
Grade B	39	26.0
Grade C	72	48.0

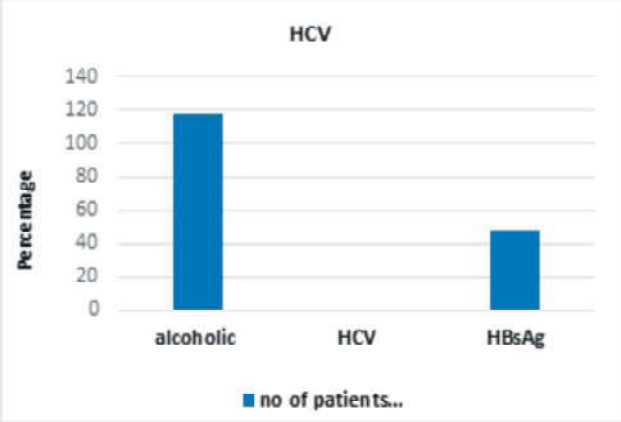

Fig. 1: *Distribution of the studied patients based on variables.*

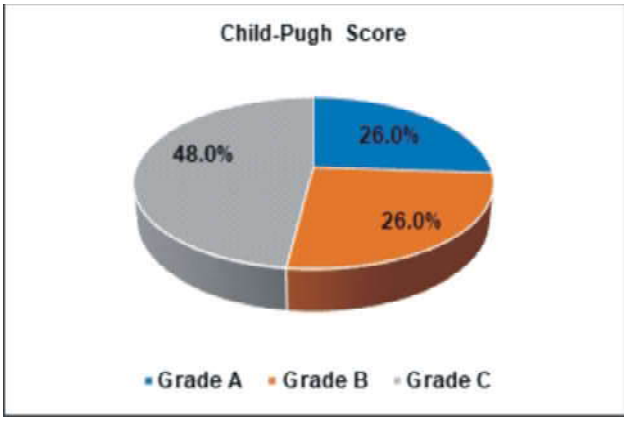

Fig. 2: *Child-Pugh Score of patients.*

Table III: Pulmonary hypertension prevalance in patients with chronic liver disease.

Pulmonary hypertension (Echo Findings)		Number of patients (n = 150)	Percentage
No		120	80.0
Yes	Mild	10	6.7
	Moderate	20	13.3

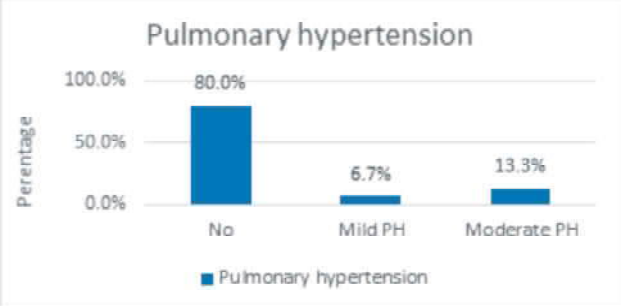

Fig. 3: *Pulmonary hypertension.*

Table IV: Compare the clinical profile of pulmonary hypertension with chronic liver disease

Pulmonary hypertension (Echo Findings)	Child-Pugh Score			p-value
	Grade A (n=39)	Grade B (n=39)	Grade C (n=72)	
No	39 (100.0%)	27 (69.2%)	54 (75.0%)	**<0.001**
Mild	0 (0.0%)	2 (5.1%)	8 (11.1%)	
Moderate	0 (0.0%)	10 (25.6%)	10 (13.9%)	

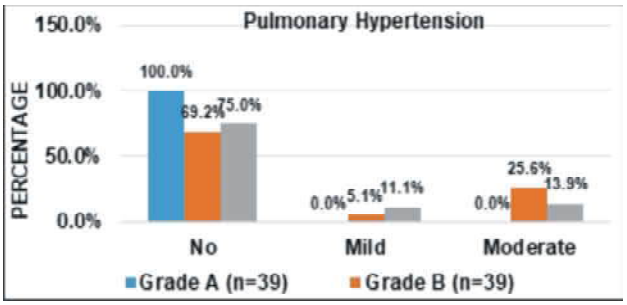

Fig. 4: *Clinical profile comparison of pulmonary hypertension with chronic liver disease.*

Results

- The study analysed 150 patients, revealing that maximum had been aged 41 - 50 years (40.7%), having mean age of 45.55 ± 9.8 years. Most patients were male (79.3%).
- Socio-economically, most patients were from the lower class (40.0%), followed by upper lower (25.3%), lower middle (17.3%), and upper middle (17.3%) classes, with no patients in the upper class.
- The majority lived in rural areas (75.3%).
- Alcohol use was prevalent in 78.7% of patients, while HCV was absent and 32.0% tested positive for HBsAg. (Table I) (Fig. 1).
- 46.0% of cases had mild ascites, 39.3% had moderate ascites, 13.3% had severe ascites, and 1.3% had no ascites at all.
- According to the Child-Pugh score, 26.0% of patients were in Grade A and Grade B, while 48.0% were in Grade C (Table II) (Fig. 2).
- USG findings indicated splenomegaly in 86.6% of cases, and altered liver echotexture in all patients.
- Portal vein diameter averaged 13.17 ± 17 mm. 64.0% of cases with upper GI endoscopy had Grade 1 oesophageal varices, 31.3% had Grade 2, as well as 4.7% had Grade 3.
- Pulmonary hypertension was present in 20.0% of patients, with 6.7% having mild and 13.3% moderate PH (Table III) (Fig. 3).
- The prevalence of pulmonary hypertension was substantially correlated with rising Child-Pugh scores; a p-value of less than 0.001 indicated statistical significance (Table IV) (Fig. 4).

Discussion

In our study, 78.7% were alcoholics and there were no HCV-positive cases whereas HbsAg-positive were in 32.0% of cases. Also, mild ascites were in 46.0% followed by moderate in 39.4%, absent in 13.3% and severe in 1.3%. Our findings were supported by Khadka *et al* reporting that Ascites were present in 4 (10.53%) cases, and coagulopathy in 2 (5.26%) cases[4]. Enenche *et al* reported that 40.0% of cases had ascites[5]. Rekha and Sushmitha reported that many patients had a history of chronic alcohol usage[6].

In our study, patients are distributed on the basis of child-pugh score and it had been found that Grade A and Grade B cases had been 39.0% each whereas Grade C was in the majority of cases with 48.0%. Also, it was found that splenomegaly was positive in 130 (86.6%) of the studied cases and altered liver echotexture was in all the cases. The mean portal vein was 13.17 ± 17 mm. Our findings were in concordance with outcomes of Lamba *et al* who made reporte that class B child-pugh score was in majority of the cases (54.5%) followed by A and C with 22.7% each[3]. Likewise, Gurghean AV and Tudor IA reported that utilizing the child-pugh functional classification, the degree of hepatic cirrhosis was evaluated[7].

In this study, upper GI endoscopy shows that oesophageal varices (grade 1) were in 64.0% followed by large oesophageal varices (grade 2) in 31.3% and small oesophageal varices (grade 3) in 4.7%. Chaudhary *et al*[1] have investigated the results in the upper gastrointestinal tract of individuals who have portal hypertension and liver cirrhosis. 51 (57.3%) of the patients in their research, oesophageal varies, had upper gastrointestinal haemorrhage, which is a significant cause[8].

In our study, pulmonary hypertension was seen in 30 cases out of 150 cases (20.0%) out of those positive cases 6.7% had mild PH and 13.3% had moderate PH. The association between pulmonary hypertension and child-pugh score shows that if the child-pugh score increases (indicating more severe liver disease), the likelihood of having pulmonary hypertension also increases. This is particularly evident in the transition from Grade A to Grades B and C, with many patients in Grades B and C experiencing mild-to-moderate PH. The p-value of <0.001 confirms that these differences

are statistically significant. Our findings were in concordance with outcomes of Lamba *et al* who made reporte that three of the19 patients with CPS Grade C had moderate-severe PAH, and fourteen of the patients had mild PAH. Compared to child classes B and A, it was shown that child class C had higher rates of pulmonary arterial hypertension[3]. In comparison to prior research, the strong and clinically correlated relationship between CPS and PAH was discovered Punekar *et al* discovered class A comprised 43.0% of cases, class B included 45.0%, and class C included 12% of cases based on the CPS for the severity of cirrhosis. The length of chronic liver illness increases the frequency of heart problems[9].

Gurghean AV and Tudor IA in their study concluded that Twenty per cent of the patients suffering from portal hypertension – that is, 27 from a total of 116 – developed pulmonary hypertension[7].

According to Enenche *et al* of the subjects, 64 (30.5%) had pulmonary hypertension. Ten (4.8%) of the 64 (30.5%) patients with pulmonary hypertension had moderate pulmonary hypertension, and 54 (25.75%) had mild pulmonary hypertension. Severe pulmonary hypertension was not present in any subject[5].

Duration of chronic liver illness increases the frequency of heart problems. In Lamba *et al* study, among the instances of PAH, pericardial effusion was observed to occur in just 3% of cases and diastolic dysfunction in about 42.0% of cases, which is greater than the research conducted by Punekar and Thakur[94] where the incidences of pericardial effusion (22.0%), systolic dysfunction (6.0%), diastolic dysfunction (32.0%), and pulmonary arterial hypertension (6.0%) were recorded[3,9]. Balde discovered that among individuals with liver cirrhosis, there was no meaningful relation between CPS and echocardiographic alterations[10]. The results aligned with the research conducted by Ghayumi where he observed that 40.0% of patients had diastolic dysfunction, 32.7% had pulmonary artery hypertension, 47.3% had left ventricular hypertrophy, and 3.6% had pericardial effusion. This might be a result of the reduced sample size we used[11].

Conclusion

According to the study's findings, pulmonary hypertension is rather common among patients with CLD. There was a 20.0% prevalence. A straight forward and non-invasive method for identifying pulmonary hypertension In patients with CLD is trans-thoracic echocardiography. In the Uttar Pradesh area, alcohol addiction is the most frequent cause of CLD (preventable cause). Further research is needed to validate the strong correlation between the severity of underlying liver illness and the prevalence of pulmonary hypertension.

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