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Frequency of Hepatopulmonary Syndrome and its Associated Factors in Decompensated Liver Cirrhosis

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ABSTRACT

Background: Pulmonary dysfunction including the hepatopulmonary syndrome is an important complication of cirrhosis and portal hypertension which affects the treatment and disease prognosis. Although HPS most commonly presents in patients with cirrhosis, it has also been reported among cases of chronic hepatitis with no cirrhosis or portal hypertension. In cirrhotic cases with HPS, survival was significantly decreased compared with cirrhotic cases without HPS.

Objective: The current study aimed to determine the frequency of hepatopulmonary syndrome and its associated factors in decompensated liver cirrhosis.

Methodology: A descriptive, cross-sectional study was conducted out at the Department of Medicine, Bahawal Victoria Hospital, Bahawalpur from May 30, 2021, to 29th November 2021. A total of 96 patients with decompensated liver cirrhosis, fulfilling the inclusion criteria were selected. Relevant history from each patient, and demographic characteristics i.e. age, gender and duration of disease were noted in each patient. After this, the child-pugh class was noted. The presence or absence of hepatopulmonary syndrome in each patient was noted. Statistical Package for Social Science was used. P-value ≤ 0.05 was considered as significant.

Results: The mean age of the study participants was 39.44 ± 9.91 years. Out of the 96 patients, 82.17% were male and 17.71% were females with a male-to-female ratio of 1.3:1. Hepatopulmonary syndrome was found in 48.96% of patients. There was no association of hepatopulmonary syndrome with age, gender, duration of disease, Child pugh class and alcoholism, only a statistically significant effect of smoking on hepatopulmonary syndrome was noted.

Conclusion: The Current study concluded that the frequency of hepatopulmonary syndrome (HPS) in decompensated liver cirrhosis patients is 48.96% and smoking has a strong significant association.

Keywords: Hepatopulmonary Syndrome; Cirrhosis; Child Pugh Class

Introduction

Chronic liver disease (CLD) is the end stage of liver disease occurring as a result of multiple risk factors. CLD usually leads to liver failure resulting in cirrhosis. It is included in the list of top ten causes of death in the western countries. Liver cirrhosis is a diffuse process, in which there is fibrosis, resulting in loss of normal anatomy of liver and development of abnormal nodules. Leaving behind the cause of liver cirrhosis, it has been stated that about 80% to 90% of the time liver lost its function before ensuring liver failure. Liver failure usually cause severe systemic infection and variceal bleeding. When there is coagulopathy, encephalopathy and increased ammonia concentration in blood then it is labelled as decompensated liver failure. The other complications include portal hypertension which leads to ascites, hepatosplenomegaly, variceal bleeding and caput medusa.

Hepatopulmonary syndrome (HPS) was first introduced by Kennedy and Knudson. HPS is the complication of liver cirrhosis, characterized by exertional dyspnea and development of porto-caval shunt., It is diagnosed clinically on the basis of a triad of chronic liver disease, pulmonary dysfunction with increasing gradient of alveolar-arterial oxygen and dilatation of pulmonary vasculature., Impaired pulmonary function in HPS is a known complication of liver cirrhosis while the portal hypertension affecting the treatment option and leads to poor prognosis. HPS is the most common complication of liver cirrhosis, besides that it also develops in the patients of chronic hepatitis who did not either developed cirrhosis or the portal hypertension. In the case of cirrhosis and HPS, the prognosis is poor in comparison to cirrhosis without HPS.

One of the research done at the Mayo Clinic reported that about 33-40% of the cases with HPS having life expectancy of 2.5 to 4 years. In majority of the cases who have normal liver function get worse after developing HPS. Very few of the studies have been done in Pakistan so the current study aimed to find out the frequency of hepatopulmonary syndrome and its associated factors in decompensated liver cirrhosis.

Objective

The current study aimed to find out the frequency of hepatopulmonary syndrome and its associated factors in decompensated liver cirrhosis.

Methodology

A descriptive, cross-sectional study was carried out at the department of medicine, Bahawal Victoria hospital, Bahawalpur from 30th May 2021 to 29th November 2021. Sample size of 96 cases had been calculated with 95% confidence level, 10% margin of error and taking expected frequency of hepatopulmonary syndrome in decompensated liver cirrhotic patients as 54.0%[9] by using OpenEpi calculator. Non-probability, consecutive sampling technique was used. The inclusion criteria was i) patients of decompensated liver cirrhosis of >6 months duration and of any child pugh class (A, B & C) ii) patients 20-60 years of age iii) any gender while the exclusion criteria was i) patients with h/o obstructive lung disease i.e. FEV_1 <50 (assessed on history and medical record) ii) known history of asthma iii) patients with history of chest trauma iv) patients not willing to be included in the study.

After approval from ethical review committee, total number of 96 patients of decompensated liver cirrhosis, fulfilling the inclusion criteria was selected. After taking informed written consent and relevant history from each patient, demographic characteristics i.e. age, gender and duration of disease were noted in each patient. After this, child pugh class was noted. Then presence or absence of hepatopulmonary syndrome in each patient was noted. All this data was recorded on a specially designed proforma,

Statistical analysis was performed using Statistical Package for Social Science (SPSS) version 20. Results were presented as mean and standard deviation for quantitative variables i.e. age and duration of disease. Frequency and percentage were calculated for qualitative variables like gender, child pugh class (A/B/C), smoking, alcoholism and presence of hepatopulmonary syndrome. Effect modifiers like age, gender, duration of disease, child pugh class (A/B/C), alcoholism and smoking were controlled through stratifications. Post-stratification chi square was applied to see their effects on frequency of hepatopulmonary syndrome and p value ≤ 0.05 was considered as significant.

Results

The mean age of the study participants was 39.44 ± 9.91 years. Majority of the patients (54.45%) was between 20 to 40 years of age. Out of the 96 patients, 82.17% were male and 17.71% were females with male to female ratio of 1.3:1. Mean duration of disease was 1.67 ± 0.72 years as mentioned in Table 1. Figure 1 presented the distribution of patients according to Child Pugh Class. Hepatopulmonary syndrome was found in 48.96% patients, whereas there was no hepatopulmonary syndrome in 51.04% patients as shown in figure 2.

When Stratification of Hepatopulmonary syndrome was done on age groups, it was found that there was no significant difference between different age groups while the stratification of Hepatopulmonary syndrome with

Table 1. Characteristics of study participants

Variable	Frequency (n=96)	Percentage (%)
Age (in years)		
20-40	52	54.45
41-60	44	45.83
Gender		
Male	79	82.17%
Female	17	17.71%
Duration of disease		
6 months- 1year	38	39.58%
≥ 1 year	58	60.42%
Smoking		
Yes	55	57.29%
No	41	42.71%
Alcoholism		
Yes	26	27.08%
No	70	72.92%

respect to gender also showed no significant difference between male and female. Stratification of Hepatopulmonary syndrome with respect to duration of disease and Child pugh class showed statistically no significant difference. Stratification of Hepatopulmonary syndrome with respect to smoking and alcoholism showed only statistically significant effect of smoking on hepatopulmonary syndrome as p-value was less than 0.05.

Discussion

Lung involvement is very common in the chronic liver disease, hepatopulmonary syndrome (HPS) and portopulmonary hypertension (POPH) are the most important complications, noted worldwide. Comparing these two, shows that the frequency of HPS is more than the POPH(). The frequency of HPS is 4-32% in adult population with liver failure () and about 9-20% among pediatric patients.[12,13] Current study found that the frequency of hepatopulmonary syndrome was 48.96% among the age range of 20-60 years. MA et alreported that prevalence of HPS is 54% among the patients of decompensated cirrhosis.[14]

Literature review revealed that the estimated frequency of HPS in patients of CLD is in between 4% to 47%, the frequency range is because of the difference in diagnostic criteria , methodology and the population included in the studies.[5] Younis et al conducted a study on 111 patients of liver cirrhosis. He used transthoracic contrast echocardiography, arterial blood gas testing and pulmonary function test for diagnosis and found that the frequency of HPS in cirrhotic patients was 24%.[15] Weinfurtner et al used the same diagnostic techniques and reported 26% frequency of HPS among the patients of liver cirrhosis.[16] Another study conducted in Egypt found that the frequency of HPS was 34% among the patients of CLD by using the same diagnostic test but by using intrapulmonary shunting through echocardiography the frequency of HPS was reduced to 20%.[14] The literature review manifested that the pulmonary microvessels get altered in the cases of liver cirrhosis.

Shafiq et al conducted a study, the results reported that the mean age with standard deviation of the study participants was 47.92±11.38 years, with male predominance (68.4%) and the male-female ratio was 2.1:1. Study results found hepatitis C (71.1%) as the most common cause of liver cirrhosis. The frequency of HPS in cirrhotic patients was 28.9%, among them 3.2%were having diagnosed triad of HPS while 15.8%were having subclinical HPS. Majority of patients were from class C of

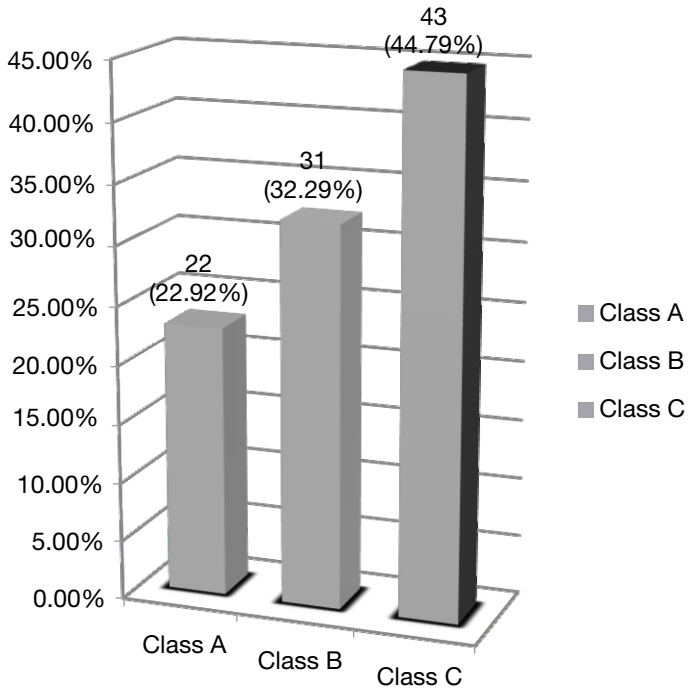

Figure 1. Distribution of patients according to Child Pugh Class (n=96)

Child-Pugh class.[17] Comparing current study, the mean age of the study participants was 39.44 ± 9.91 years. Out of the 96 patients, 82.17% were male. Majority of participants (53.49%) were from class c of Child Pugh Classification.

Studies reported that MELD (Model for End-Stage Liver Disease) score shows a strong significant association of HPS with the severity of CLD but is not having any association with the mortality due to CLD.[18] Literature review shows conflicted data regarding association of HPS with the severity of CLD.[19] Current study found no significant association between the disease duration and development of hepatopulmonary syndrome.

Conclusion

Current study concluded that the frequency of hepatopulmonary syndrome (HPS) in decompensated liver cirrhosis patients is 48.96% and the smoking has the strong significant association. So, we recommend that in every patient of chronic liver disease, hepatopulmonary syndrome should be taken into consideration and its early recognition and management should be done to reduce the morbidity and mortality rate.

Figure 2. Distribution of patients with Hepatopulmonary syndrome (n=96).

Table 2. Association of Hepatopulmonary syndrome with risk factors

Variables	Hepatopulmonary syndrome		P-value
	Present	Absent	
Age (years)			
20-40	25 (48.08%)	27 (51.92%)	0.851
41-60	22 (50.0%)	22 (50.0%)	
Gender			
Male	42 (53.16%)	37 (46.84%)	0.076
Female	05 (29.41%)	12 (70.59%)	
Duration of disease			
>6 months- 1 years	15 (39.47%)	23 (60.53%)	0.132
>1 year	32 (55.17%)	26 (44.83%)	
Child Pugh Class			
Class A	08 (36.36%)	14 (63.64%)	0.399
Class B	16 (51.61%)	15 (48.39%)	
Class C	23 (53.49%)	20 (46.51%)	
Smoking			
Yes	47 (85.45%)	08 (14.55%)	0.000
No	00 (0.0%)	41 (100.0%)	
Alcoholism			
Yes	15 (57.69%)	11 (42.31%)	0.297
No	32 (45.71%)	38 (54.29%)	

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