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Original research article

A study to assess the prevalence of pulmonary complications in patients of chronic liver disease

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Abstract

Background: Patients with cirrhosis and portal hypertension have been associated with pulmonary complications e.g.; dyspnoea, haemoptysis, cor pulmonale etc. These can be a spectrum of major pulmonary complications affecting CLD found in various studies (incidence - 40% in patients planned for Liver Transplant).

Aim of the study: To find the Prevalence and Clinical spectrum of pulmonary complications in CLD patients.

Material and Methods: Observational cross-sectional, prospective study with purposive sampling (100 samples) in Medicine Department, M.L.B. Medical College, Jhansi from Dec 2020-October 2022.

Results: Maximum patients were below 55 years of age (57%) with Alcohol as the commonest aetiology (58%) and personal history (78%). HPS (33%) is the commonest pulmonary complication followed by HH (30%), PH (18%) and POPH (9%) CLD with Child-Pugh Class C had maximum complications (59%), followed by Class B (26%) and Class A (15%). $SP0_2/Pa0_2$ categorized HPS into Mild-HPS (42.4%), Moderate-HPS (18.2%), Severe-HPS (30.3%) & Very Severe-HPS (9.1%). ECG/TTE categorized PH/POPH into High-grade (59.3%), Intermediate-grade (22.2%) and Mild-grade pulmonary-hypertension (18.5%).

Conclusion: The major pulmonary complications of CLD includes HPS, HH, PH and POPH. Pulse oximetry is a simple and non-invasive method used for detecting and grading HPS severity. Imaging studies viz; CXR/HRCT-Thorax/ECG/Trans-Thoracic-Echocardiography facilitate in identifying Hepatic-Hydrothorax, Pulmonary-Hypertension and Portopulmonary-Hypertension which complicates CLD. Since this is a Hospital-based study with purposive-sampling, therefore further studies need to be carried out to corroborate or defy the study results.

Keywords: Hepatopulmonary syndrome, portopulmonary hypertension, hepatic hydrothorax, chronic liver disease, pulmonary complications in CLD

Introduction

Chronic liver disease in clinical setting is a liver disease characterized by gradual destruction and regeneration of the liver parenchyma, leading to fibrosis and cirrhosis [1]. Cirrhosis is a condition that is defined histopathologically as development of fibrosis to the point that there is architectural distortion with formation of regenerative nodules. This results in decrease in hepatocellular mass, and thus function, and an alteration of blood flow [2, 3, 4].

Chronic Hepatitis B, Chronic Hepatitis C, Metabolic-associated Fatty Liver Disease, and Alcoholic Liver Disease are the leading global causes of CLD. MAFLD, a new term changed from non-alcoholic fatty liver disease in 2020 (Xian YX *et al*., 2021) [5]. Globally, 1.5 billion persons had CLD in 2017, most commonly due to MAFLD (60%), HBV (29%), HCV (9%) and ALD (2%). According to the WHO (2017) data, liver disease deaths in India reached 2.95% of total deaths, accounting for one-fifth (18.3%) of all cirrhosis deaths globally.

CLD can cause portal hypertension, therefore blood can bypass the liver and the toxic chemicals which were supposed to be detoxified inside the liver also bypasses it. As a result, the blood vessels of the lung are exposed to such toxins causing damage to small arteries of the lungs, complicating and hence manifesting pulmonary changes occurring in the patients of the chronic liver disease [1, 2, 3, 4].

The relationship between chronic liver disease, respiratory symptoms and hypoxia is well-established. Various pulmonary consequences unique to chronic liver illness have been identified: hepatopulmonary syndrome (HPS), hepatic hydrothorax (HH), portopulmonary hypertension (POPH) and Pulmonary Hypertension (PH).

Hepatopulmonary syndrome is one of the most common complications of CLD accounting to 5-30%

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(Bommena S *et al*., 2014) [6]. Hepatic Hydrothorax is seen in 5-10% of CLD in absence of cardiopulmonary diseases (Machiacao *et al*., 2014) [6]. Pulmonary hypertension has been observed in 2-16% of patients with CLD with portal hypertension (Gurghean AV *et al*., 2017) [7], (Rajat Jain *et al*., 2019) [8].

Portopulmonary hypertension is present in 5-10% of patients evaluated for Liver transplantation (Rajat Jain *et al*., 2019) [8], (Bommena *et al*., 2014) [6]. There is relative paucity in the knowledge about the data of pulmonary complications in the patients of CLD. The aim of this study is to estimate the prevalence of pulmonary complications in the patients of CLD and enhance the knowledge on the same.

Aims and Objectives

- To Estimate the Prevalence of the Pulmonary Complications in the Patients of Chronic Liver Disease.
- To Study the Clinical Profile & Spectrum of the Pulmonary Complications in the Patients of Chronic Liver Disease.

Materials and Methods

Observational cross-sectional prospective study with purposive sampling (Sample size of 100 samples) in Medicine Department, MLB Medical College & Hospital from December 2020 to October 2022.

Diagnosed by: Clinical examination, Blood investigations, SpO_2, USG abdomen, Chest skiagram, HRCT Thorax, Electrocardiogram, Trans-Thoracic Echocardiography (using HITACHI-ALOKA-Alpha6-PCPNDT/JHAN/04MAY22/146440 installed in premises of Medicine Department, MLBMCH).

Inclusion criteria

- Known case of Chronic Liver Disease.
- Chronic Hepatitis (Alcoholic, Viral, Metabolic Associated).
- Age >18 Years.
- Willing to Give Consent for Study.

Exclusion criteria

- Age <18 Years.
- Congenital Heart Diseases.
- Left Ventricular Diseases.
- Valvular Heart Diseases.
- HIV Infected Patients.
- Pulmonary Tuberculosis.
- Cardiomyopathies.

Results

Table 1: Table showing Major Pulmonary Complications among CLD Patients

Complications	Number of patients (N=100)	Percentage (%)
HPS	33	33
HH	30	30
PH	18	18
POPH	9	9
No major complications	10	10
TOTAL	100	100

During the study performed, the study concluded of majority of the patients were having Hepatopulmonary syndrome being the most common major complication affecting CLD patients (33%) which were followed by Hepatic Hydrothorax (30%), Pulmonary Hypertension (18%) and Portopulmonary Hypertension being the least common complication (9%) of Chronic Liver Disease patients.

Table 2: Graphical illustrations of Pulmonary complications with Child-Pugh Score in the study participants

Complications	Class A	Class B	Class C	Total	Percentage (%)
HPS	03	13	17	33	33
HH	02	06	22	30	30
PH	00	06	12	18	18
POPH	00	01	08	09	09
No major complications	10	00	00	00	00
Total	15	26	59	100	100

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In our study, the results showed maximum number of study participants were within Child Pugh Class C (59%, n=59) followed by child Pugh Class B (26%, n=26) and Child Pugh Class A (15%, n=15).
Furthermore, out of all HPS complications the maximum number of study participants were included in Child Class C (51%, n=17/33), following Child Class B (40%, n=13/33) and only 9% (n=3/33) were included under Child Class A.
During the study of Hepatic Hydrothorax patients, majority were included in Child Class C (73%, n=22/30) following it Class B (30%, n=6/30) and rest under Class A (7%, n=2/30).
During the study of Pulmonary Hypertension among patients, majority were included in Child Class C (67%, n=12/18) following it Class B (33%, n=6/18) and none of the study participants were included under Class A (00%, n=00).
During the study of Portopulmonary hypertension among patients, majority were included in Child Class C (89%, n=8/9) following it Class B (11%, n=1/9) and no study participants were included under Class A (00%, n=00).
Also, the study concluded that the participants with having no major complications were categorised under Child Class A (100%, n=10/10).
In the study, on the basis of SpO_2 and PaO_2, the results concluded that majority of the participants were categorised under Mild Hepatopulmonary syndrome (43%, n=14/33), followed by Severe HPS (30%, n=10/33), then Moderate HPS (18%, n=6/33) and the rest under Very severe HPS (9%, n=3/33).
In our study, while evaluating Hepatic hydrothorax on radiological basis, majority of the participants were having Right Sided pleural effusion (70%, n=21/30) followed by Bilateral Pleural effusion (23%, n=7/30) and Left sided pleural effusion being the least common finding (7%, n=2/30).
While studying Pulmonary and portopulmonary hypertension, all of them were found to have MPAP >25 mmHg (mean pulmonary artery pressure) (100%, n=27), hence extrapolating the study of the echocardiographic finding we found majority participants were having Peak TRV >3.4m/s (Peak Tricuspid regurgitation velocity) (59%, n=16/27), following it were Peak TRV >2.8m/s and <3.4m/s (22%, n=6/27) and Peak TRV <2.8m/s (19%, n=5/27).
On further evaluating for the severity of pulmonary/portopulmonary hypertension, further detailed echocardiographic findings were used as per diagnostic criteria and PA diameter, and RV/LV basal diameter ratio were used for categorising the participants of pulmonary hypertension for the same, which revealed out of 22% patients, 15% (n=4/27) were recategorised under severe pulmonary hypertension and 7% (n=2/27) under Mild pulmonary hypertension.
Henceforth concluding the echocardiographic study for pulmonary/portopulmonary hypertension, 59% (n=16/27) were classified under severe pulmonary hypertension, followed by 26% (n=7/27) under Mild Pulmonary hypertension, then 15% (n=4/27) under Moderate pulmonary hypertension.

Discussion

Cirrhosis can occur at any age and often causes prolonged morbidity. In our study, 67% (n=67) of CLD patients were <55 years of age and 33% (n=33) were >55 years of age, (see Figure 1). Similar results were found in the study conducted by Cheermala S *et al*., 2021 [9].
The study conducted by our team included 76% of the male study participants and the rest participants were female (24%), (see Figure 2).
The occupation of the study participants in our study were Labourer by occupation (24%), followed by Housewife (23%), Shopkeeper (12%), Business (11%), Daily wage workers (10%), Driver (10%), Student (5%), Farmer (4%) and the minimum participants were having Teacher (1%) as profession, (see Figure 3).
The results indicate that cirrhosis was common in young adults who were admitted and studied. In our study, majority of study participants were from Lower socio-economic class (28%) and Upper-lower (32%) class.
The study showed alcohol related cirrhosis (58%) as most common aetiology of cirrhosis followed by Metabolic associated Fatty Liver Disease (17%), Hepatitis B infection (11%) and Hepatitis C infection (4%), (see Figure 4). Cheermala S *et al*., (2021) [9] and Osna NA *et al*., (2017) [10] found similar results during their study.
The study found alcohol consumption as the most common personal history (78%), followed by Tobacco chewing (70%), Smoking (29%) and a significant percentage of the study participants were having no history of any addiction (17%), (see Figure 5).
Our study showed a positive correlation between the presence of major pulmonary complications and the severity of liver disease assessed by the Child-Pugh score and showed that the severity of major pulmonary complications worsened with the severity of liver disease assessed by Child Pugh class-Class A (5%), class B (30%) and class C (55%), (see Figure 6). These findings agree with those done by Soulaidopoulos S *et al*., (2020) [11], Helmy AM *et al*., (2014) [12].
In the present study Pulmonary Hypertension and POPH was diagnosed in 18% and 9% of patients respectively. This study showed a 9% prevalence of POPH in liver cirrhosis which is in the range of most

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studies which showed a prevalence between 2% and 10% as shown by Gurghean AV *et al*., (2017) [7], Rajat Jain *et al*., (2019) [8].

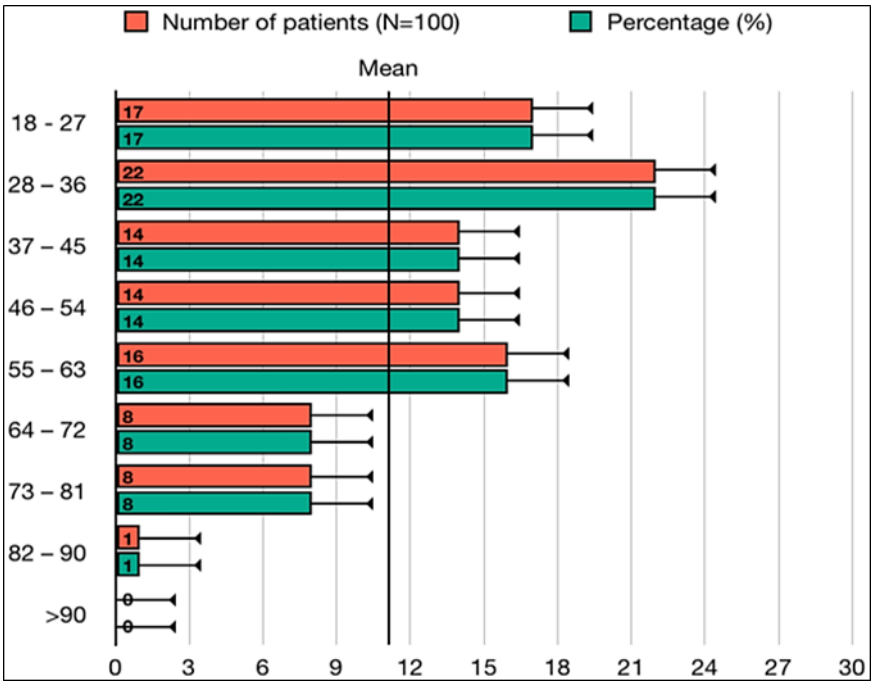

Fig 1: Distribution of study participants in terms of Age

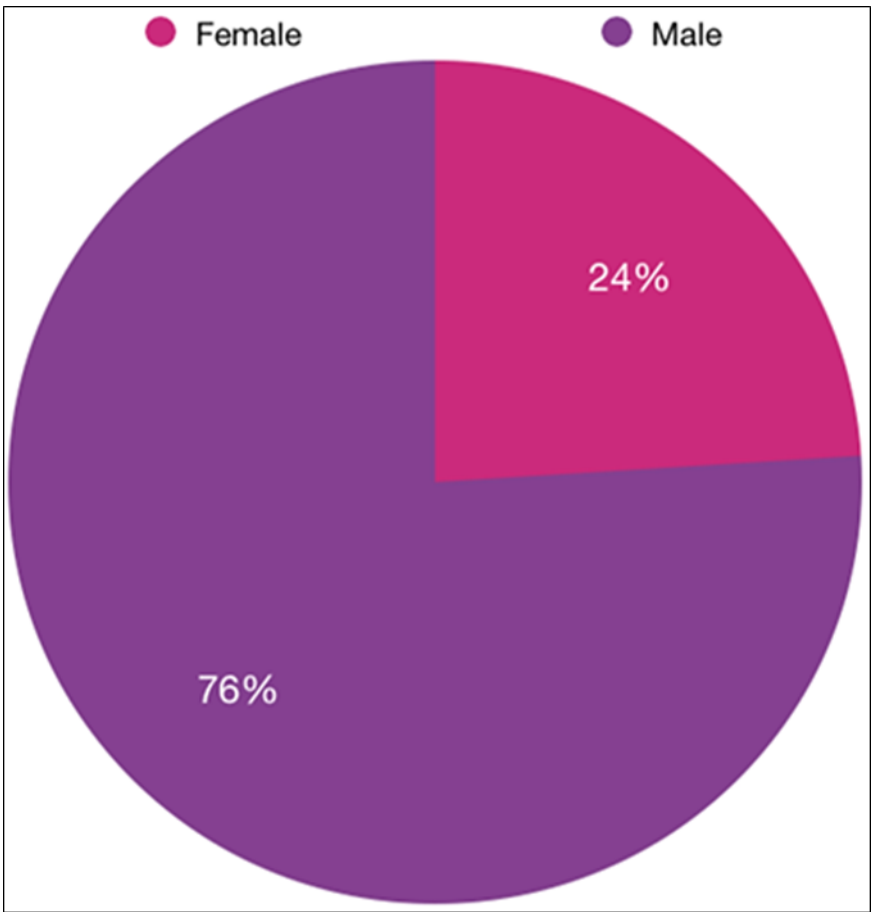

Fig 2: Distribution of CLD patients in terms of gender

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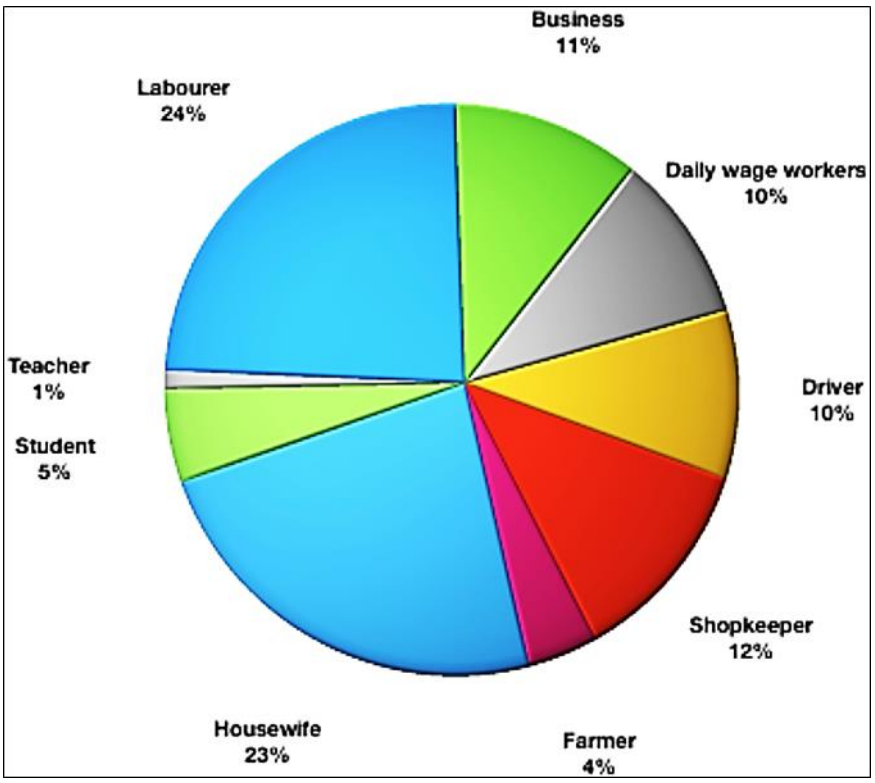

Fig 3: Graphical representation of occupation of study participants

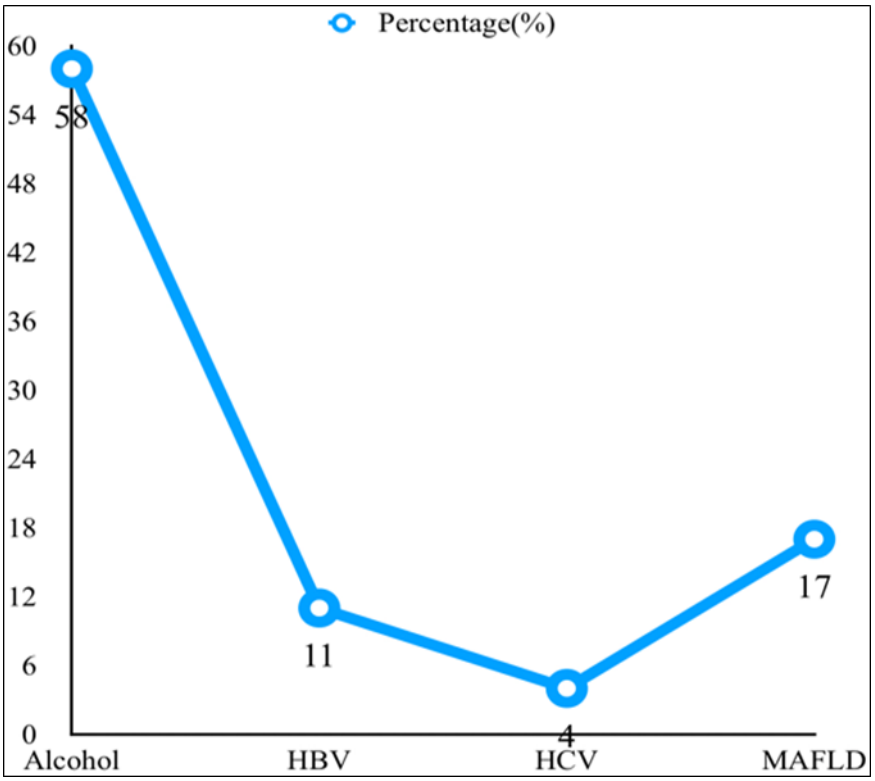

Fig 4: Graphical representation of aetiology wise distribution in patients

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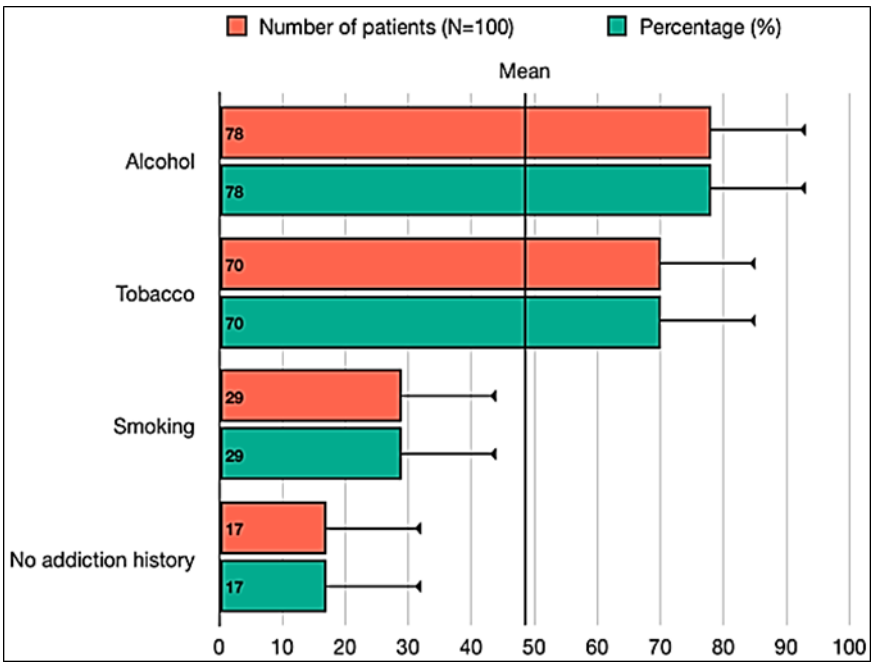

Fig 5: Graphical representation of personal history of patients

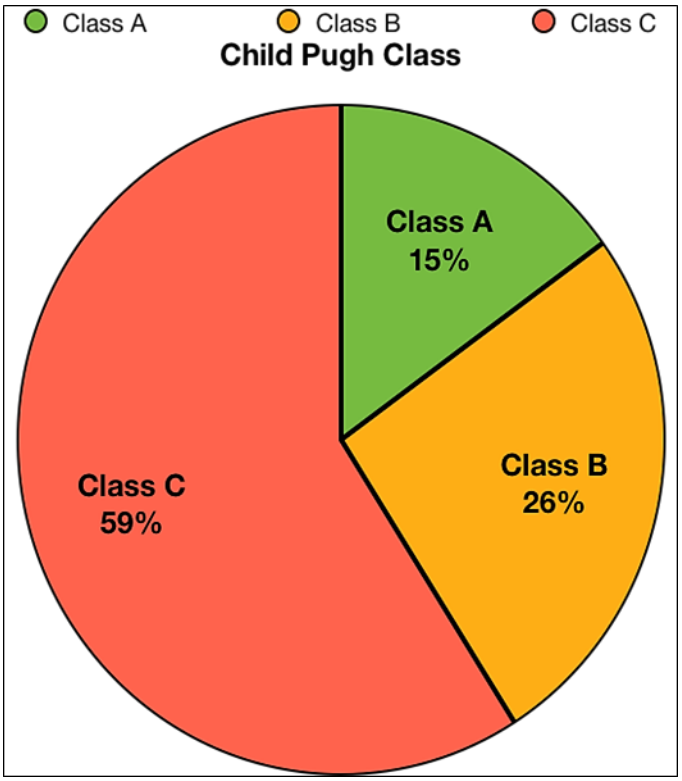

Fig 6: Graphical illustrations of Child-Pugh Score in the study participants

Limitations of the study

The study performed was a single-centered study.

Conclusion

- The major pulmonary complications of CLD includes Hepatopulmonary Syndrome, Hepatic Hydrothorax, Pulmonary Hypertension and Portopulmonary Hypertension.
- Pulse oximetry is a simple and non-invasive method used for detecting and grading the severity of Hepatopulmonary Syndrome.
- Imaging studies viz; Chest skiagram, HRCT Thorax, ECG, Trans Thoracic Echocardiography facilitate identifying Hepatic Hydrothorax, Pulmonary Hypertension and Portopulmonary Hypertension which complicates the CLD.
- Patients of CLD with Child Pugh class B or C are more prone for major pulmonary complications.

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Although patients under Child Pugh class A developed comparatively less pulmonary complications.

- Since this is a Single-centered Hospital-based study with taking purposive sampling into account, therefore further studies need to be carried-out to corroborate or defy the study results.

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References

1. "NHS Choices". Cirrhosis; c2015 Oct.
2. Harrison's Principles of Internal Medicine 21e; c2022.
3. Sherlock's Diseases of the Liver and Biliary System 13e; c2019.
4. Sleisenger and Fortran's Gastrointestinal and Liver Disease 11e; c2020.
5. Ying-Xin Xian, Jian-Ping Weng, Fen Xu, Li-Shao Guo Chin-MAFLD vs. NAFLD: shared features and potential changes in epidemiology, pathophysiology, diagnosis, and pharmacotherapy. -Med J (Engl). 2021 Jan;134(1):8-19. PMCID: PMC7862804-https://pubmed.ncbi.nlm.nih.gov/33323806/
6. Shoma Bommena, Richard D Gerkin, Sumit Agarwal, Sarah Raevens, Marilyn K Glasberg, Michael B Fallon-Diagnosis of Hepatopulmonary Syndrome in a Large Integrated Health System-Clinical Gastroenterology and Hepatology. 2021 Nov;19(11):2370-2378-https://pubmed.ncbi.nlm.nih.gov/33007510/
7. Adriana V Gurghean, Ioana A Tudor. Pulmonary hypertension in patients with hepatic cirrhosis and portal hypertension. An echographic study-Clujul Med. 2017 April;90(2):161-165. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5433567/
8. Rajat Jain, Zaki Siddiqui, Gauri Narayani, Swati Azad, Sanya Jain. To study the incidence of pulmonary hypertension in Patients of chronic liver disease. Global Journal for Research Analysis. 2019;8(9):87-89. https://www.worldwidejournals.com/global-journal-for-research-analysis-GJRA/article/to-study-the-incidence-of-pulmonary-hypertension-in-patients-of-chronic-liver-disease/MTI2MjA=/?is=1&b1=153&k=39
9. Shantan Cheermala, Maya Balakrishnan-Global Epidemiology of Chronic Liver Disease; c2021 June. https://aasldpubs.onlinelibrary.wiley.com/doi/10.1002/cld.1061
10. Natalia A Osna, Terrence M Donohue, Kusum K Kharband. Alcoholic Liver Disease: Pathogenesis and management-PMC5513682; c2017. www.ncbi.nlm.nih.gov/pmc/articles/PMC5513682
11. Stergios Soulaipodoulos, Loannis Goulis, Evangelos Cholongitas-Pulmonary manifestations of chronic liver disease: a comprehensive review-PMC7196609; c2020 March. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7196609/
12. Amr M Helmy, Mohamed F Awadallah. Study of pulmonary dysfunctions in liver cirrhosis; c2014 May. https://cyberleninka.org/article/n/1276602.pdf