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# **A Prospective observational study on management and prevalence of comorbid condition in hepatic patients and assessment of severity using MELD score**

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## **Abstract**

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### **Background:**

Hepatic diseases are the primary concern of global health that usually comprises complex situations resulting from comorbid conditions that polarize the liver disease in terms of progression, management, and outcome. For this, the current work looks with interest at the prevalence of certain associated comorbidities and their management in hepatic patients, as well as at how the MELD score can affect the overall control of disease severity.

### **Methods:**

A prospective observational study was conducted on 300 hepatic patients, analyzing demographic characteristics, comorbidities, drug usage patterns, and MELD scores. Statistical associations were assessed between age, gender, and MELD scores to identify factors influencing disease severity.

### **Results:**

This study population was mainly males, (88%), with a high prevalence of smoking, 76%, and alcohol use, 7.33%. Type 2 Diabetes Mellitus was the most common comorbidity at 16.61%, followed by Acute Kidney Injury at 15.59%, and Alcohol Use Disorder at 15.25%. The overall number of drugs prescribed to manage the aforementioned conditions was 450, of which the most commonly prescribed were antibiotics, 21.11%, antidiabetic agents, 18%, and diuretics, 12.66%. Most of the patients (42%) were found at the MELD range 20-29, which had very high liver dysfunction. When MELD scores with the age groups and the association calculated, it exhibited a significant positive association ( $p < 0.05$ ), yet the association that existed between the age and the MELD scores was weak negative ( $r = -0.1258, p < 0.05$ ). And the gender could not show the significant association among the MELD scores.

### Conclusion:

This study draws attention to the complex clinical profile of patients with liver diseases, emphasizing a high burden of comorbid conditions and advanced disease severity indicated by MELD scores. It points out that early diagnosis, lifestyle modifications, and evidence-based management strategies may help improve outcomes in patients with liver diseases and reduce the burden of hepatic diseases and their complications.

**Keywords:** Hepatic diseases, comorbid conditions, MELD score, liver dysfunction.

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## Introduction

Hepatic diseases comprise many diseases with dysfunction of the liver. Such diseases have a tendency to vary from quite mild to very severe conditions that cause much morbidity and mortality in the entire world. Viral infections, alcohol use, metabolic disorders, and autoimmune conditions some of the reasons which bring about such diseases. Chronic conditions representing the most severe end of the spectrum of organ failure include cirrhosis and hepatocellular carcinoma. In recent years, a growing burden of liver diseases has been associated with increasing incidence in lifestyle-associated disorders like obesity, Type 2 Diabetes Mellitus (T2DM), and alcohol use disorder. It is critical to understand the prevalence and management of comorbid conditions in hepatic patients in order to improve clinical outcomes and reduce healthcare costs.<sup>[1,2,3]</sup>

Another challenging task while treating patients suffering from liver disorders is comorbid conditions. Comorbid conditions include T2DM, hypertension, chronic kidney disease, and acute kidney injury. They greatly add up to the difficulty in the treatment of hepatic patients as well as complicate their clinical course, adding danger and increased chances of morbidity and mortality. For example, alcohol use disorder continues to be one of the main causes of the progression of liver disease and often coexists with other complications such as malnutrition and hepatic encephalopathy. The increasing prevalence of metabolic syndrome and its components also complicated the management of liver diseases in the past decades.<sup>[4,5,6]</sup>

Often the severity of the liver disease can be measured in terms of a Model for End-Stage

Liver Disease (MELD) score based on serum levels of bilirubin, creatinine, and INR, providing an objective means of measuring these factors. In practice, this score has come to be accepted widely for making decisions regarding listing for liver transplantations; it is valuable for predicting a patient's mortality risk in liver disease. Higher MELD scores indicate a more severe disease and a greater risk of poor outcomes, which makes it a critical parameter in both clinical and research settings. It is possible that the correlation between demographic factors like age and gender with MELD scores could provide valuable insights into the progression of the disease and its determinants.<sup>[7,8]</sup>

Pharmacological management is an integral part of the management of both liver diseases and their attendant comorbidities. Antibiotics are prescribed for infections, antidiabetic drugs for metabolic disorders, and diuretics for treating ascites and portal hypertension. The choice of the medications must take into account the altered drug pharmacokinetics and pharmacodynamics in patients with liver disease due to a reduced ability of the liver to metabolize and clear drugs. Thus, a delicate and individualistic approach to drug therapy is considered to reduce harmful drug reactions as well as for better therapeutic achievement.

The objective of this study was to find the prevalence and management pattern of comorbid conditions in patients suffering from liver and assess the disease severity with a MELD score. A comprehensive analysis will be carried out in demographics, comorbidity, medication usage pattern, and MELD score as a measure for the clinical burden and the management-related challenges that result from liver disorders. The findings will contribute to developing evidence-

based strategies for improving patient care, reducing complications, and enhancing the quality of life in this vulnerable population. In addition, the study points out the importance of early diagnosis, lifestyle interventions, and guideline-based treatment to handle the growing burden of hepatic diseases effectively.<sup>[9,10]</sup>

### **Aim**

To study the management and prevalence of comorbid conditions in hepatic patients and assessment of severity using meld score in a tertiary care hospital

### **Primary objectives:**

- To analyse the management of co-morbid conditions in hepatic patients.
- To assess the severity of the hepatic patient using the MELD score.
- To assess the prevalence of comorbid conditions in hepatic patients.

### **Secondary objectives:**

- To assess the pattern of drug use for comorbid conditions in hepatic patients.
- To identify the risk factors and complications of hepatic disease with its co-morbidities.

### **Methodology**

**Study Site:** The study was conducted at Karnataka medical College and research institute, Hubballi.

**Study Duration:** The study is conducted over a period of 6 months.

**Study Design:** Prospective Observational Study

**Sample Size:** A total of 300 cases were collected

### **Study method :**

A data collection form for collecting patient information is designed. The prescriptions of the patient who is treated during the course of the study are audited prospectively using a specifically designed form to record the required information. The demographic details, disease information, a detailed history about clinical symptoms and treatment regimen, and comorbid conditions are collected from the patient's records and through patient interviews. The prevalence of comorbid conditions is assessed by collecting the data obtained from patient case files. Management of comorbid conditions is evaluated by referring to patient case files. Severity is evaluated by calculating the meld score.

### **Study Criteria**

#### **Inclusion Criteria:**

1. Hepatic Patients with or without comorbidities admitted to tertiary care hospital
2. Patients above 18 years of either sex.
3. Patients who are willing to participate.

#### **Exclusion Criteria:**

1. Pregnant/lactating women.
2. Paediatric patients.
3. Patients who were not willing to participate in the study.

### **Statistical Analysis**

Statistical analysis involved descriptive statistics, with frequencies, percentages etc and results are represented in tables.

## Results

### 1. Subject Characteristics

Subject Characteristics		No Of Patients	Percentage
Gender	Male	264	88%
	Female	36	12%
Age	20-30	19	6.33%
	31-40	87	29.00%
	41-50	93	31.00%
	51-60	63	21.00%
	61-70	21	7.00%
	71-80	17	5.67%
Social Habits	Smoking	228	76.00%
	Alcohol	22	7.33%

The study had 300 hepatic patients, in whom males were dominant (88%, n=264), and females accounted for only 12% (n=36). Most patients fell within the age range of 41-50 years, constituting 31% (n=93). The age range of 31-40 years constituted 29% (n=87) of the population. Patients within the age ranges of 20-30 years and over 70

years comprised the least percentage, 6.33% (n=19) and 5.67% (n=17) respectively. As far as social habits were concerned, the patients who were smokers accounted for 76% (n=228) while those who reported alcohol use constituted 7.33% (n=22).

### 2. Prevalence of Co Morbidities for Hepatic Disease

Comorbidities	No Of Patients	Prevalence
AUD (Alcoholic use disease)	45	15.25%
Pancreatitis	14	4.74%
HTN (Hypertension)	39	13.22%
Shock	3	1.01%
AKI (Acute Kidney Injury)	46	15.59%
Seizures	9	3.05%
T2DM (Type -2 Diabetes Mellitus)	49	16.61%
CVD (Cardiovascular disease)	6	2.03%
CKD (Chronic Kidney Disease)	9	3.05%
UTI (Urinary Tract Infection)	13	4.40%
Cellulitis	8	2.71%
Hepatitis	7	2.37%
TB (Tuberculosis)	11	3.72%
Pneumonia	9	3.05%
Sepsis	4	1.35%
Sepsis With Septic Shock	15	5.08%
COPD (Chronic Obstructive Pulmonary Disease)	5	1.69%
CVA (Cerebrovascular accident)	3	1.01%

Among the 300 patients, around 175 patients (88%) were diagnosed with comorbidities while 125 (12%) were diagnosed without comorbidities. The most common comorbidity identified was Type 2 Diabetes Mellitus (T2DM), occurring in 16.61% (n = 49) of the patients. The second most common was Acute Kidney Injury (AKI) which reached 15.59% (n = 46), closely followed by

Alcohol Use Disorder at 15.25% (n = 45). Other commonly found comorbidities included hypertension, 13.22% (n = 39), UTI, 4.4% (n = 13), and TB, 3.72% (n = 11). Other conditions that included CKD, pneumonia, and sepsis were less frequent among the sample population, each representing 3-4%.

### 3. Distribution Based On Final Diagnosis

Final Diagnosis	No Of Patients	Percentage
Decompensated Cirrhosis	102	40.66%
Chronic Liver Disease	54	18.0%
Decompensated Liver Disease	46	15.33%
Chronic Parenchymal Liver Disease	27	9.0%
Non Alcoholic Cirrhosis	2	0.66%
Non Alcoholic Liver Disease	1	0.33%
Non Alcoholic Fatty Liver Disease	2	0.66%
Cryptogenic Liver Disease	1	0.33%
Auto Immune Cirrhosis	1	0.33%
Compensated Cirrhosis	12	4.0%
Compensated Liver Disease	2	0.66%
Alcoholic Cirrhosis	11	3.66%
Alcoholic Liver Disease	19	6.33%

Decompensated cirrhosis remained the most prevalent final diagnosis for 40.66% (n=102) of patients. Chronic liver disease was identified in 18% (n=54) of patients and decompensated liver disease in 15.33% (n=46). There were less prevalent diagnoses of cryptogenic liver disease,

NAFLD, and autoimmune cirrhosis, where each condition affected fewer than 1% of the patients. The presence of alcoholic cirrhosis (3.66%, n=11) and alcoholic liver disease (6.33%, n=19) indicated the huge burden of liver conditions associated with alcohol.

### 4. Distribution according to Different Classes of Drugs

Class Of Drugs	No Of Drugs Prescribed	Total Number Of Drugs	Percentage
Anticonvulsant Agents	Lorazepam( 19) Diazepam( 6) Phenytoin(5) Levipill(11) Sodium Valproate(1)	42	9.33%
Antibiotic	Pipzo(17) Ceftriaxone(31) Meropenam(9) Metronidazole(18) Azithromycin(4) Levofloxacin(9) Imipenam(1) Linezolid(4) Ciprofloxacin(1)	95	21.11%

Anti Diabetic Agents	Plain Insulin (30) H Mixtard (27) Metformin (14) Glipizide (1) Glimepiride (6) Linagliptine (1) Sitagliptin (1) Vidagliptin(1)	81	18.0%
Bronchodilators	Deriphylline (3) Budesonide (4) Salbutamol (4)	11	2.44%
Corticosteroids	Dexamethasone(11) Hydrocortisone(3)	4	0.88%
Diuretics	Furosemide (23) Aldactone (23) Lasilactone (8) Spironolactone (1) Hydrochlorothiazide (1)	57	12.66%
Antihypertensive Agents	Propranolol (10) Amlodipine (31) Enalapril (3) Clonidine (1) Amikacin (1) Temisartan (4) Metoprolol (2) Labetalol (3)	55	12.22%
Antiviral Agents	Endacavir (4) Lamivudine(1) Tenofovir(2)	7	1.55%
Anti Anginal Agents	Aspirin (7) Atorvastatin (4) Carvedilol (1) Amiodarone (1) Clopidogrel (1)	14	3.11%
Anti Tubercular Agents	Ethambutal (8) Isoniazid (2) Rifampicin (1)	7	1.55%
Supplements	Thiamine (30) Albumin (17) Pancreatin (5) Lupizyme (4)	56	12.44%
Others	Noradrenaline (11) Dobutamine (4) Sodium Bicarbonate(2)	17	3.77%

A total of 175 individuals with comorbid illnesses were administered 450 medications from different classes. Antibiotics accounted for 21.11% (n=95) of all prescriptions, making them the most commonly prescribed medicine class. Second

most often prescribed were anti-diabetic medications (18.0%; n = 81), which were followed by diuretics (12.66%; n = 57) and supplements (12.44%; n = 56). Anticonvulsants made up 9.33% (n=42) of the medications

administered, whereas dobutamine and noradrenaline made up 3.77% (n=17). In 3.11% (n=14) of cases, anti-anginal medications were utilized, while 2.44% (n=11) of patients received a prescription for bronchodilators. The least prescribed medications were corticosteroids

(0.88%; n = 4), followed by antiviral and antitubercular medications (1.55%; n = 7). This distribution emphasizes the use of anti-diabetic drugs and antibiotics to treat comorbidities in individuals with liver disease.

**5. Distribution according Comorbid Conditions and Drugs used.**

Comorbidities	Drugs	Frequency	Percentage
T2DM (Type -2 Diabetes Mellitus)	Plain Insulin	30	37.03
	Human Mixtard	27	33.33
	Metformin	14	17.28
	Sitagliptin	1	1.23
	Vidagliptin	1	1.23
	Glipizide	1	1.23
	Linagliptin	1	1.23
	Glimiperide	6	7.40
AKI (Acute Kidney Injury)	Aldactone	23	34.81
	Furosemide	21	31.81
	Lasilactone	7	10.60
	Albumin	14	21.21
	Sodium Bicarbonate	1	1.51
AUD (Alcoholic use disease)	Thiamine	30	51.72
	Diazepam	6	10.34
	Lorazepam	15	25.86
	Levipill	7	12.06
HTN (Hypertension)	Amlodipine	28	52.83
	Spirolactone	1	1.88
	Enalapril	3	5.66
	Arkamine	1	1.88
	Propranalol	10	18.86
	Telmisartan	4	7.54
	Hydrochloro Thiazide	2	3.77
	Labetalol	3	5.66
	Metoprolol	1	1.88
Pancreatitis	Metronidazole	6	28.6
	Pancreatin	5	23.8
	Ceftriaxone	5	23.8
	Lupizyme	4	19.04
	Imipenam	1	4.76
Septic Shock	Metronidazole	3	12.5
	Dobutamine	2	8.33
	Meropenam	2	8.33
	Ceftriaxone	5	20.83
	Noradrenaline	5	20.83
	Pipzo	7	29.16



UTI (Urinary Tract Infection)	Meropenam	6	31.57
	Ceftriaxone	6	31.57
	Feropenam	1	5.26
	Metronidazole	4	21.05
	Pipzo	1	5.26
	Levofloxacin	1	5.26
TB (Tuberculosis)	Ethambutol	8	33.33
	Levofloxacin	7	29.16
	Isoniazid	2	8.33
	Rifampicin	1	4.16
	Ceftriaxone	6	25.0
Pneumonia	Pipzo	3	23.07
	Meropenam	1	7.69
	Ceftriaxone	5	38.46
	Azithromycin	4	30.76
Seizures	Lorazepam	4	28.6
	Levipill	4	28.6
	Phenytoin	5	35.7
	Sodium Valporate	1	7.1
CKD (Chronic Kidney Disease)	Atrovastatin	1	7.7
	Furosemide	5	38.46
	Lasilactone	1	7.7
	Clinidipine	1	7.7
	Metaprolol	1	7.7
	Sodium Bicarbonate	1	7.7
	Albumin	3	23.16
Cellulitis	Metronidazole	3	23.07
	Linizolid	4	30.07
	Ciprofloxacin	1	7.69
	Ceftriaxone	2	15.38
	Levofloxacin	1	7.69
	Pipzo	2	15.38
Hepatitis	Endacavir	4	57.14
	Tenofovir	2	28.6
	Lamivudine	1	14.3
CVD (Cardiovascular disease)	Aspirin	5	50.0
	Atrovastatin	2	20.0
	Carvedilol	1	10.0
	Amiodarone	1	10.0
	Clopidogrel	1	10.0
COPD (Chronic Obstructive Pulmonary Disease)	Deriphylline	3	20.00
	Budecort	4	26.66
	Asthalin	4	26.66
	Dexamethasone	1	6.66
	Hydrocortisone	3	20.00
Sepsis	Metronidazole	2	28.57
	Pipzo	3	42.85
	Ceftriaxone	2	28.57



Shock	Noradrenaline	2	33.33
	Aspirin	1	16.66
	Dobutamine	2	33.33
	Ceftriaxone	1	16.6
CVA (Cerebrovascular Accident)	Atrovastatin	1	33.33
	Nor Adrenaline	1	33.33
	Aspirin	1	33.33

The study highlighted several comorbid conditions of the patients with liver disease and the drugs administered to treat them. For DM, insulin was the most common drug used (37.03%), followed by Human Mixtard (33.33%). For AKI, aldactone (34.81%) and furosemide (31.81%) were the most commonly used drugs. Thiamine (51.72%) and lorazepam (25.86%) were the most commonly used drugs for the treatment of AUD. For HTN, the most prescribed drugs were amlodipine at 52.83% and propranolol at

18.86%. In pancreatitis, the drugs metronidazole at 28.6% and pancreatin at 23.8% were used. Pipzo at 29.16% and noradrenaline at 20.83% were the most commonly prescribed drugs in septic shock. Other comorbid conditions included TB, UTI, pneumonia, and CKD, and drugs used to treat them included ethambutol, ceftriaxone, and furosemide. This distribution highlights the targeted drug therapy used to manage specific comorbidities in hepatic patients.

**6. Distribution of patients based on management of comorbid conditions according to guidelines**

Falls Under Guidelines	Does Not Falls Under Guidelines	
	Empirical	Unknown
107	54	14

The management of comorbid illnesses in hepatic patients was assessed in accordance with standard treatment guidelines issued by the Ministry of Health and Family Welfare, Government of India. Of the 175 patients with comorbid diseases, 107

received treatment that meets with standards, whereas 68 did not; of these, 54 received empirical therapy, and 14 had an unidentified cause.

**7. Distribution based on MELD Score**

MELD Score	No Of Patients	Percentage
>10	17	5.67
10-19	101	33.67
20-29	126	42.00
30-39	42	14.00
<40	14	4.67
TOTAL	300	100.00

The majority of the patients, 42% (n=126), had MELD scores between 20 and 29, meaning advanced liver disease, according to the score distribution. Only 14% (n=42) of the patients received scores between 30 and 39, while 33.67% (n=101) received scores between 10 and 19. The smallest groupings were scores >40 and <10,

making up 4.67% (n=14) and 5.67% (n=17), respectively. Age groups and MELD scores appeared to be statistically significantly correlated (p=0.001), with younger patients having higher MELD values, which indicate higher levels of liver dysfunction.

**8. Association between age groups and MELD score**

Age groups	<10	%	10-19	%	20-29	%	30-38	%	>=40	%	Total
20-30yrs	3	15.79	4	21.05	11	57.89	1	5.26	0	0.00	19
31-40yrs	0	0.00	25	28.74	41	47.13	15	17.24	6	6.90	87
41-50yrs	3	3.23	30	32.26	45	48.39	13	13.98	2	2.15	93
51-60yrs	4	6.35	28	44.44	19	30.16	9	14.29	3	4.76	63
61-70yrs	3	14.29	9	42.86	7	33.33	2	9.52	0	0.00	21
71-80yrs	4	23.53	5	29.41	3	17.65	2	11.76	3	17.65	17
Total	17	5.67	101	33.67	126	42.00	42	14.00	14	4.67	300

Chi-square=45.8120, p=0.0010\*

\*p<0.05 indicates significant correlation

On comparing the age groups with MELD scores among these 300 patients, a statistically significant positive correlation was found in this study as well (p<0.05). Generally speaking, younger patients show higher MELD scores when

compared to that of older ages, especially a higher score being seen in 20-30 years of age. This seems linearly related as the age of groups increases, thus the disease.

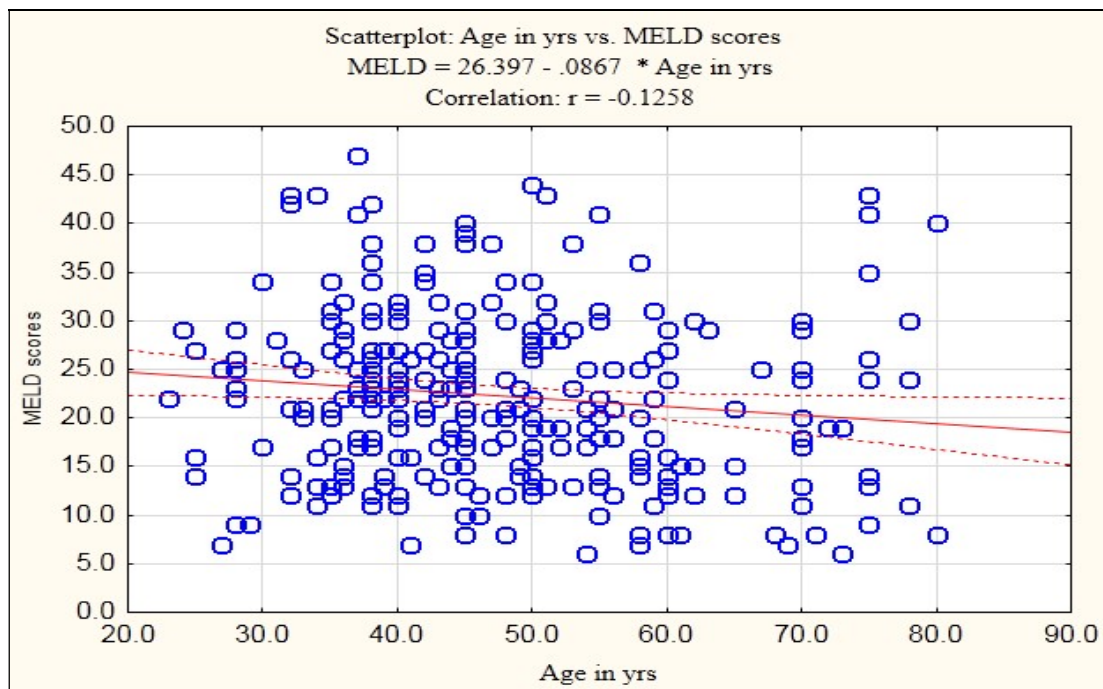
**9. Correlation between age with MELD scores by Karl Pearson’s correlation coefficient**

Variable	Correlation between MELD scores with		
	r-value	t-value	p-value
Age in yrs	-0.1258	-2.1894	0.0293*

\*p<0.05 indicates significant correlation

With a significant p-value (<0.05) and an r-value of -0.1258 the research showed a slight negative connection between age and MELD scores. This

implies that although MELD scores marginally decline with age, there is a statistically significant but weak association.



**Figure: 1 :Scatter diagram of correlation between age with MELD scores**

## 10. Association between gender and MELD score

Gender	<10	%	10-19	%	20-29	%	30-38	%	>=40	%	Total
Male	16	6.06	89	33.71	112	42.42	37	14.02	10	3.79	264
Female	1	2.78	12	33.33	14	38.89	5	13.89	4	11.11	36
Total	17	5.67	101	33.67	126	42.00	42	14.00	14	4.67	300

Chi-square=4.3390, p=0.3620

The study discovered no significant correlation between MELD scores and gender among the 300 patients. Male and female scores were distributed similarly, suggesting that gender had no bearing on the severity of liver disease as determined by MELD scores.

## 11. Distribution Based On Complications

Hepatic disease complications, including portal hypertension, hepatic encephalopathy, hepatic coagulopathy, anemia, ascites, pleural effusion, and bacterial peritonitis, were discovered in 257 of the 300 patients. There were no issues with the other forty-three

Complications	No of patients	Percentage
Present	257	85.7%
Absent	43	14.3%

## Discussion

The research presented the demographic and clinical profile of 300 patients with liver diseases, with male preponderance, at 88%, consistent with the established risk factors such as alcohol and tobacco usage, which is predominant in the studied population. Most patients fall within the 41-50 years age range, 31%, suggesting that liver disease typically presents in the middle-aged as a result of the accumulation effect of risk factors over time. The high prevalence of smoking (76%) emphasizes the role of smoking as a major contributor to hepatic diseases and calls for public health interventions aimed at reducing this modifiable risk factor.

The comorbid conditions were generally distributed as follows: Type 2 Diabetes Mellitus at 16.61%, Acute Kidney Injury at 15.59%, and Alcohol Use Disorder at 15.25%. These comorbidities complicate the clinical management but may affect the rate of disease progression. Usage of drugs remained individualized according to the need for specific therapy, with the highest prescribed being antibiotics at 21.11%, antidiabetic agents at 18%, and diuretics at 12.66%. A high proportion of supplement use, at 12.44%, suggests a strong need for nutritional support in managing complications and improving outcomes.

The analysis of MELD scores showed that 42% of the patients fall in the 20-29 range, suggesting advanced liver dysfunction. A high positive association is found between age groups and MELD scores, with a higher disease severity in younger patients. However, a very weak negative correlation between age and MELD scores suggests a slight decrease in severity of liver diseases with increasing ages, possibly related to differences in disease progression and survival rates. No association at all was reported between gender and MELD scores, which probably reflects the aspect that liver diseases are more dictated by clinical factors and lifestyle characteristics than gender-related factors. Such findings underscore early detection, tailor-made management strategies, and lifestyle interventions for an effective solution to the burden of hepatic diseases.

## Conclusion

In this prospective observational study on the prevalence and management of comorbid conditions in hepatic patients and assessment of severity using MELD scores, key insights were obtained regarding the clinical burden of liver disease. From this study, it was revealed that the burden of the disease was greater in males (88%) and in middle-aged people, while smoking (76%) and alcohol use (7.33%) were also among the contributory factors in this context. The most common conditions were Type 2 Diabetes Mellitus (16.61%), Acute Kidney Injury (15.59%), and Alcohol Use Disorder (15.25%) and, thus pose a great aggravation to diseases' management strategies. This underscores comprehensive care strategies focused on both hepatic conditions and any comorbidities.

The MELD score analysis revealed that most patients (42%) fell into the 20-29 range, indicating advanced liver dysfunction, especially in younger age groups. Although a weak negative correlation was observed between age and MELD scores, gender did not significantly influence disease severity. Antibiotics, antidiabetic agents,

and diuretics were among the most frequently prescribed drugs, reflecting the complexity of managing hepatic diseases alongside comorbidities.

Overall, early diagnosis, modification of risk factors, and guideline-based treatment are of paramount importance in preventing disease progression, improving patient outcomes, and reducing the burden of hepatic diseases and their complications.

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