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Frequency Of Malnutrition In Chronic Liver Disease Patients

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Abstract: ***Objective:*** To quantify the frequency of malnutrition in chronic liver disease patients. ***Methodology***: The current study involved and sample 378 participants, i.e. chronic liver disease (CLD) patients. Data were obtained using a structured proforma and included patient demographics, clinical findings, anthropometric assessments, i.e. body mass index and mid-upper arm circumference, and relevant lab investigations. It applied Chi-square tests, regression and one-way ANOVA tests for identifying the relationship between malnutrition and relevant variables. ***Results:*** The findings show that malnutrition exists in such patients up to 14%. However, their smoking status has indirect relationship with malnutrition ($p = 0.003$) as compared to direct associations between recurrent ascites and malnutrition ($p = 0.043$). Other variables did not significantly predict malnutrition status.***Conclusion:*** The study highlights that in patients with chronic liver disease, malnutrition is more related to modifiable clinical factors, especially smoking and ascites, rather than demographic or socioeconomic statuses. These findings emphasise the need for a proactive nutritional assessment and management as part of routine CLD care to prevent underdiagnosis and late-stage complications.

Keywords: Chronic liver disease, Malnutrition, Ascites, Smoking, Nutritional assessment, Pakistan.

INTRODUCTION

Malnutrition is defined as "an insufficient intake or assimilation of nutrients essential for development and prevention of disease" [1]. It is one of the common and serious complications of chronic liver disease (CLD)/cirrhosis, a disease that significantly contributes to increased morbidity, poor quality of life, and mortality. CLD is the 11th leading cause of mortality and 15th cause of morbidity that accounts for 2.2% of deaths and 1.5% of disability affected life years (DALYs) globally in the year 2016 [2]. It is a progressive illness where the liver's parenchymal structure and function, such as synthesis of clotting factors, proteins, detoxification, etc., deteriorate over a prolonged period, typically over six (6) months, leading to fibrosis and cirrhosis [3]. Nutritional status in these patients deteriorates progressively with advancing liver dysfunction, particularly in those with cirrhosis. Even though this is the case, malnutrition is still not properly identified or treated in regular liver disease care.

Studies have evaluated the causes and prevalence of malnutrition in CLD, showing a variety of results. Shin et al. defined the causes of malnutrition in CLD, as an occurrence of inadequate eating, changes in body, nutrient malabsorption, and inflammation [4]. Thus, these factors can cause muscle loss and impaired body functions, leading to worsened health outcomes [4]. While another revealed that in Pakistan, 80% or more CLD patients are falling under slightly or moderately malnourished, which corresponded to longer disease duration [5]. This shows that it is a public health issue, as South Asia has one of the highest rates of viral hepatitis, one of the causes of CLD as well as it has insufficient nutrition care.

Similarly, international studies like Traub et al. presented a prevalence of 90% [6]. It co-exists with other serious illnesses, i.e. ascites, hepatic encephalopathy and loss of muscle mass; all of which can worsen disease and/or prognosis. Thus, this research evidence is dispersed and limited in guiding a proper nutritional plan for deficiency, which linked it to poor healthcare outcomes, infections and readmission rates.

As studied the pathogenesis of CLD associated malnutrition is complicated. Studies confirmed that such diseases cause a failure of hepatic protein synthesis, hormonal dysregulation, and severe metabolic disruption [7]. It also disrupts other mechanisms, including portal hypertension, which affects early satiety, declining oral intake and gastrointestinal congestion, and catabolic reactions, prolonging inflammation, increased cytokine activity, and dietary restrictions (salt restrictions and diuretics). It affects the proper absorption of nutrient.

There are important signs, which shows how it impacts nutrition, for instance, the loss of appetite, change of taste and sickness. They are linked to a declining quality of life (QoL) and malnutrition in CLD patients, more aggressive with cirrhotic ones [8]. Such findings show the importance and requirement for strategies to enhance malnutrition in such patients in a better manner. Thereby, it examines the depth, rather than just physical signs.

Evidence – based literature also assesses the impact of providing proper diet to these patients, which can eventually help preventing muscle and health loss, increasing the chances of serious illnesses and mortality [9, 10]. Corresponding to these findings, there is a strong routine nutritional evaluation recommendation for CLD patients as a standard of care. Thus, it has been found as an independent link with Model for End-Stage Liver Disease (MELD) and Child-Pugh scores, impacting the eligibility of transplantation.

Effective nutritional support can improve treatment outcomes, but its implementation remains inconsistent. Shergill et al. argue that nutritional intervention is rarely prioritised in the management of liver disease, even after having solid guidelines from hepatology societies [10]. They stress the utility of enteral nutrition and branched-chain amino acid supplementation in reversing sarcopenia and enhancing nitrogen balance in CLDs. However, in many healthcare centres, especially in resource-constrained settings like Pakistan, nutrition support services are fragmented or lacking altogether.

Espina et al. offer a comprehensive framework for the evaluation and management of nutritional consequences in CLDs, which advocates early screening using validated tools, such as the Royal Free Hospital Global Assessment and Subjective Global Assessment (SGA) [11]. They recommend routine monitoring of dietary intake, muscle mass via mid-arm circumferences or imaging, and serum proteins. Moreover, they advocate individualised nutrition plans adapted to disease stage and patient tolerance.

In Pakistan, the nutritional burden is mounted by high background rates of undernutrition and food insecurity. Hepatitis B and C remain endemic, with a large proportion of patients presenting late with decompensated disease. However, there is a need for systematic nutritional status in this population using modern criteria. Most use outdated or limited anthropometric tools, with little correlation to biochemical markers or clinical outcomes. Thus, there is a clear gap in current literature and practice.

This study aims to address this gap by measuring the

frequency of malnutrition in patients with CLD at a tertiary care centre in Karachi, using BMI, mid-arm circumference, and serum albumin levels. It further seeks to explore associations between malnutrition and sociodemographic variables, aetiologies, and duration. By generating local evidence using objective markers, it supports early nutritional interventions and enhanced multidisciplinary care pathways for CLD patients in Pakistan.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Department of Medicine, Abbasi Shaheed Hospital, Karachi. Ethical approval was obtained from the Institutional Review Board of Karachi Medical and Dental College. after obtaining approval from the Research Evaluation Unit (REU), College of Physicians and Surgeons Pakistan (CPSP), over a period of six (6) months after approval from 1st April 2025 to 30th September 2025. This study aimed to determine the prevalence of malnutrition in patients with CLD and its association with various demographic and clinical factors, for instance, BMI, age, gender, socioeconomic aspects, etc. A total of 378 patients were included in the study. The sample size was calculated using Raosoft software, keeping the estimated prevalence of chronic liver disease at 44.1%, a 95% confidence level (Cl), and a 5% margin of error [4]. A non-probability consecutive sampling technique was employed to recruit participants [12]. It included ≥18 years- ≤60 years, both sexes, and a confirmed liver disease for at least 6 months. It excluded patients with BMI <18 before liver disease, muscular dystrophy, malabsorption syndrome, malignancy, and/or refusal to give informed consent.

For analysing the collected data, the software, SPSS version 16 was used. Continuous variables (including age, weight, height, BMI, serum albumin, serum ammonia, and duration of liver disease) were assessed using the descriptive statistics, i.e. mean and standard deviations. Categorical variables, including gender, marital status, comorbidities, education level, socioeconomic status, aetiology, and clinical complications, were reported as frequencies and percentages. Stratification was done for effect modifiers such as age, gender, diabetes, hypertension, smoking, physical inactivity, marital status, education, and socioeconomic status. Post-stratification Chi-test was applied for determining the associations between categorical variables and malnutrition status, with a p-value of ≤ 0.05 considered statistically significant. Continuous variables were compared using one-way ANOVA. The study adhered to ethical guidelines throughout, and data confidentiality was ensured.

RESULTS

Baseline Characteristics

A total of 378 participants were included. The mean age was 39.00 ± 11.92 years, and 51.3% were male. The average BMI was 26.99 ± 7.84 kg/m2, and mean serum albumin was 3.05 ± 0.86 g/dL. Further baseline characteristics of the study population are shown in Table 1.

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Table 1 Descriptive Statistics of Continuous Variables (n = 378)

Variable	Minimum	Maximum	Mean ± SD
Age (years)	18	60	39.00 ± 11.92
Body Mass Index (kg/m^2)	12.0	50.0	26.99 ± 7.84
Serum Albumin (g/dL)	1.50	4.50	3.05 ± 0.86
Mid-Arm Circumference	18.0	34.9	26.19 ± 4.78

(cm)			
Height (cm)	140.0	185.0	163.08 ± 13.23
Weight (kg)	40.0	100.0	70.43 ± 13.23
Duration of Liver Disease (months)	6	120	63.80 ± 33.32
Liver Size on Ultrasound (cm)	10.0	20.0	14.79 ± 2.94
Serum Ammonia (µmol/L)	20.50	150.0	84.14 ± 36.49

Table 7 presents the frequency of categorical variables, such as gender, marital status, aetiologies, occupation, comorbidities (diabetes mellitus and hypertension), smoking status, physical inactivity, educational status, socioeconomic status, recurrent ascites, OGD done, treatment offered, presence of varices, and hepatic encephalopathy [full table placed in Appendix; Table 6].

Most participants were male as mentioned and unmarried (53.4%). Among the aetiologies, hepatitis B was the most common cause of liver disease (25.9%), followed closely by alcohol-related liver disease (24.3%) and hepatitis C (22.8%). Further, the prevalence of diabetes mellitus and hypertension, as comorbidities among patients, was 20.1% and 29.4% respectively. These stats represented a classic case of chronic liver disease, presenting in outpatient clinic frequently.

Notably, 63.0% of patients reported physical inactivity. While this may appear paradoxical among labourers (16.9%) and drivers (the largest occupational group; 17.7%), the classification reflects either reduced work capacity due to illness and/or underreported daily activities. Among the participants, housewives were found to be in great number, i.e. 14.6% reinforced the predominance of a sedentary lifestyle. In contrast, the educational status showed an even distribution, 23.8% were illiterate, 26.2% were primary literate, 26.7% were secondary literate and 23.3% had higher education. However, the study, being conducted in a low-resource setup, refers to the holders of diploma, for example, electrician, plumber, etc.

Socioeconomic classification was limited to lower class, i.e. 26.7% were earning around 5,001 to 10,000 PKR, and 24.1% around 15,001 to 20,000 PKR. In addition to this demographic insight, 41.0% patients presented with recurrent ascites, while OGD was performed in 51.3%. hepatic encephalopathy was also reported in 15.9% of the sample.

Chi-square tests revealed that smoking status ($p = 0.001$) and recurrent ascites ($p = 0.073$) were significantly associated with malnutrition status. OGD showed a borderline significance ($p = 0.066$), whereas all other variables, including sex, diabetes mellitus, education and socioeconomic status, were not significantly associated. Results are presented in Table 2.

Table 2 Chi-Square Association Between Malnutrition and Categorical Variables

Variable	Categories	p-value (Pearson Chi-square)	Interpretation
Sex	Male/Female	0.514	Not significant
Marital Status	Married/Unmarried	0.275	Not significant
Cause of Liver Disease	Alcohol/ HepB/ HepC/ Others	0.749	Not significant
Diabetes Mellitus	Yes/No	0.326	Not significant
Hypertension	Yes/No	0.640	Not significant

Smoking Status	Yes/No	0.001	Significant
Physical Inactivity	Yes/No	0.674	Not significant
Educational Status	Illiterate/ Primary/ Secondary/ Higher	0.346	Not significant
Socioeconomic Status	5 groups	0.855	Not significant
Recurrent Ascites	Yes/No	0.043	Significant
OGD Done	Yes/No	0.066	Borderline
Presence of Varices	Yes/No	0.367	Not significant
Hepatic Encephalopathy	Yes/No	0.567	Not significant
Treatment Offered	Yes/No	0.817	Not significant

A multivariate binary logistic regression was conducted to identify independent predictors of malnutrition in CLD patients. The Omnibus test of model coefficients was not statistically significant ($\chi^2 = 24.665$, $p = 0.262$), with Nagelkerke $R^2 = 0.114$, indicating a modest explanatory power. The classification accuracy was 85.7% as illustrated in Table 3.

Table 3 Binary Logistic Regression Model Summary

Test	Statistic	p-value
Omnibus Test of Model Coefficients	$\chi^2 = 24.665$, df = 21	0.262; not significant
-2 Log Likelihood	281.777	-
Cox & Snell R^2	0.063	-
Nagelkerke R^2	0.114	-
Overall Classification Accuracy	85.7%	

Among individual predictors, smoking status was significantly correlated with lower odds of malnutrition (OR = 0.368, p = 0.003). Other variables such as recurrent ascites (p = 0.073) and OGD (p = 0.109) showed trends but did not reach statistical significance as presented in Table 4.

Table 3 Logistic Regression – Odds Ratios and Confidence Intervals

Predictor	Odds Ratio (OR)	95% CI	p-value
Smoking Status (Yes)	0.368	0.195-0.696	0.003
Recurrent Ascites (Yes)	1.879	0.948-3.725	0.073
OGD Done (Yes)	1.666	0.892-3.112	0.109
Marital Status (Married)	0.783	0.410-1.495	0.458
Diabetes Mellitus (Yes)	1.304	0.566-3.004	0.535
Hypertension (Yes)	0.786	0.408-1.514	0.477
Physical Inactivity (Yes)	1.268	0.683-2.354	0.471
Hepatic Encephalopathy (Yes)	1.157	0.466-2.872	0.751
Presence of Varices (Yes)	0.795	0.432-1.462	0.465
Treatment Offered (Yes)	1.098	0.589-2.046	0.767
Educational status, socioeconomic status, and cause of liver disease	-	-	P > 0.05 for all categories

*Educational status, socioeconomic status, and cause of liver disease were not found to be significant across all categories (p > 0.05)

One-way ANOVA was performed to compare duration of liver disease across different BMI and serum albumin categories. No statistically significant differences were observed in either comparison [full table placed in Appendix; Table 7 and 5].

Table 4 One-Way ANOVA Results (part ii)

Variable Compared	F-value	p-value
Duration of liver disease v BMI	0.869	0.833

Duration of liver disease v Serum Albumin	1.107	0.246

Overall, these findings suggest that malnutrition among patients with chronic liver disease was not significantly affect by demographic or socioeconomic variables. Instead, modifiable clinical factors, [1] smoking status and [2] recurrent ascites, appeared to have a more substantial impact. Thus, this finding reveals a significant integration of targeted clinical assessments in the nutritional management of CLD patients.

Table 5 Frequencies of Categorical Variables (n = 378)

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	194	51.3
	Female	184	48.7
Marital Status	Married	176	46.6
	Unmarried	202	53.4
Occupation	Driver	67	17.7
	Housewife	55	14.6
	Laborer	64	16.9
	Shopkeeper	42	11.1
	Student	55	14.6
	Teacher	45	11.9
	Unemployed	50	13.2
Cause of Liver Disease	Alcohol	92	24.3
	Hep B	98	25.9
	Hep C	86	22.8
	Others	102	27.0
Diabetes Mellitus	Yes	76	20.1
	No	302	79.9
Hypertension	Yes	111	29.4
	No	267	70.6
Smoking Status	Yes	85	22.5
	No	293	77.5
Physical Inactivity	Yes	238	63.0
	No	140	37.0
Educational Status	Illiterate	90	23.8
	Primary	99	26.2
	Secondary	101	26.7
	Higher	88	23.3
Socioeconomic Status	Lower Income	87	23.0
	Lower Middle	97	25.7
	Middle Income	78	20.6
	Upper Middle	91	24.1
	Upper Income	25	6.6
Recurrent Ascites	Yes	155	41.0
	No	223	59.0
OGD Done	Yes	194	51.3
	No	184	48.7
Presence of Varices	Yes	178	47.1
	No	200	52.9
Hepatic Encephalopathy	Yes	60	15.9
	No	318	84.1
Treatment Offered	Yes	191	50.5
	No	187	49.5

Table 6 One-Way ANOVA (part i)

Variable compared	Sum of squares	df	Mean square	F-value	p-value
Duration of liver disease versus BMI					
Between groups	214,081.46	206	1039.23	0.869	0.833

Within groups	203,592.05	171	1196.45		
Total	418,673.51	377			
Duration of liver disease versus serum albumin					
Between groups	244,768.98	211	1160.04	1.107	0.246
Within groups	173,904.53	166	1047.62		
Total	418,672.51	377			

DISCUSSION

Malnutrition has affected a number of individuals, from healthy individuals to chronic liver diseased patients. They, in recent studies, range from 20% in early-stage disease to more than 70% in decompensated cirrhosis [14, 15]. Therefore, in this study, the prevalence of malnutrition was observed to be 14% among CLD patients, determined by using mid-arm circumference thresholds (<23cm in males and <22cm in females). Essentially as European data, it suggests prevalence to be closer to 20 to 35% in outpatient cirrhotic individuals [16], compared to Pakistani data, reporting up to 28%, using National Nutrition Survey Report 2021, SGA and body composition analyses [1].

This discrepancy may reflect the demographic composition and predominantly compensated disease stage in the current sample. Furthermore, reliance on MAC as a single anthropometric indicator, while pragmatic, may underestimate sarcopenia or micronutrient deficiencies, particularly in overweight or oedematous patients [17]. This supports growing consensus that malnutrition in CLD is frequently underdiagnosed when conventional metrics are applied in isolation [17].

One of the more counterintuitive observations was the apparent protective association between smoking and malnutrition [18]. While smoking is widely recognized as a risk factor for appetite suppression and metabolic dysfunction [19], its inverse relation here may reflect behavioural and/or survival biases. Smokers in this dataset may present a relatively preserved functional group, or possibly, those who engage in compensatory behaviours, such as frequent snacking, not recorded by standard clinical indices. Similar trends have been reported in outpatient liver clinics in Southeast Asia, where smokers paradoxically demonstrated higher caloric intake, but lower micronutrient sufficiency [20].

Reviewing the emergence of recurrent ascites, it is a more related factor of malnutrition than any other studied factors like BMI, age, socioeconomic status [21]. Its relationship probably results from several interrelated factors that include decreased stomach emptying, early satiety, increased losses of protein into ascitic fluid, and electrolyte imbalances due to diuretics; all of which reduces hunger greatly. Some literature has extensively reported these effects, and the current findings highlight how necessary it is to use nutritional surveillance into treatment of CLD. As a consequence, nutritional collapse due to ascites and advanced disease can be prevented [22].

It is interesting to observe that regression models did not a show significant relationship between malnutrition and socioeconomic classes statistically. Thereby, it is evident that malnutrition rates do not vary by income brackets as it does by ascites. However, another possible rationale for this can be that the discriminatory power of income data decreases when all patients are financially constrained, highlighting a structural limitation in the healthcare system of Pakistan.

The overall results of logistic regression models reveal poor predictive accuracy with modest explanatory power, indicated by Nagelkerke R2 values. Prior literature supports the notion that malnutrition in CLD should be assessed using combined instruments from both biochemical and functional point of views, which include SGA and GLIM guidelines, instead of relying on single factors to predict it.

Further, the lack of statistically significant variations in albumin or BMI over time in CLD may suggest an early nutritional decline followed by stabilization, or may again highlight the inadequacy of traditional markers, such as BMI, MAC, etc. through one-way ANOVA. For example, in fluid-retaining conditions, cirrhosis, weight-based measures often underestimate the severity of sarcopenia or micronutrient deficiency. Future studies should consider integrating dynamometry, muscle ultrasound, and/or bioimpedance analysis to yield better functional consequences of malnutrition.

Perhaps the most urgent implication is the need to embed nutritional assessment into the management and routine hepatology practice. Global guidelines from EASL and AASLD now advocate for universal nutritional screening in CLD patients, yet implementation in low-and middle-income countries remains sporadic. This study has an emphasising factor for such initiative, which advocates for such measures, i.e. proactive screening for patients with compensated disease and chronic disorders, in low-resource or developing countries.

CONCLUSION

Malnutrition and CLD symptoms have clear associations, as strong positive relationship was found between malnutrition and (1) smoking status (2) recurrent ascites in CLD patients. Yet, they were not the sole predictor of malnutrition, the rates of physical inactivity and low socioeconomic status have somewhat impacted it also. Thus, the study highlights the need for assessment tools, like SGA in low-resource settings.

Ethical Approval
Ethical approval was obtained from the Institutional Review Board.

Patients' Consent
All participants have consented for their participation.

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