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Malnutrition and Associated Factors Among Patients With Cirrhosis at a Tertiary Care Center in Addis Ababa Ethiopia: An Ordinal Logistic Regression Analysis

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ABSTRACT

Background: Cirrhosis is an irreversible stage of liver damage that decreases the ability of the liver to store and metabolize nutrients. Malnutrition is a common problem in patients with cirrhosis and increases the risk of mortality.

Aims: This study aimed to assess malnutrition and associated factors among patients with cirrhosis at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

Methods: A cross-sectional study was conducted at Tikur Anbessa Specialized Hospital. All patients with cirrhosis who were admitted to the hospital from August to November were included. Royal Free Hospital Global Assessment tool (RFH-GA) was used to assess nutritional status. Data were entered in Epi-data software version 4.6.0.2 and analyzed with STATA version 17/MP. Ordinal logistic regression analysis was fitted to determine factors associated with nutritional status. Statistical significance was declared at p value < 0.05.

Results: The prevalence of moderate malnutrition and severe malnutrition were 36.67% and 14.29%, respectively. Patients with ascites were five times at a higher risk of being severely malnourished (AOR = 5.08; 95% CI = 2.66–9.67). The odds of severe malnutrition decrease by 0.35 times for patients without a history of previous hospitalization (AOR = 0.35; 95% CI = 0.18–0.68). The odds of being in the higher category of nutritional status (severe malnutrition) are 10 times higher for patients with hepatic encephalopathy (AOR = 10.43; 95% CI = 4.66–23.31). As the level of creatinine blood urea nitrogen (Cr-BUN) increases, the risk of malnutrition increases by 2.57 times (AOR = 2.57; 95% CI = 1.02–5.78).

Conclusion: Malnutrition is high among cirrhotic patients at Tikur Anbessa Specialized Hospital. Ascites, history of hospitalization, Cr-BUN, and hepatic encephalopathy are significant predictors of malnutrition.

Abbreviations: AOR, adjusted odds ratio; COR, crude odds ratio; Cr-BUN, creatinine blood urea nitrogen; RFH/GA, Royal Free Hospital Global Assessment.

1 | Introduction

Chronic liver disease (CLD) is one of the major causes of morbidity and mortality in the world. Globally, approximately 2 million people die each year due to CLD [1]. Cirrhosis is the end stage of CLD characterized as an irreversible stage of hepatic fibrosis [2, 3]. The prevalence of cirrhosis is increasing in sub-Saharan Africa; cirrhosis-related deaths doubled from 1980 to 2010 [4]. In Ethiopia, CLD is the seventh leading cause of death [5].

The liver plays a vital role in nutrition, but cirrhosis decreases the ability of the liver to store nutrients and metabolize nutrients [6]. Malnutrition is common in patients with cirrhosis [7]. It is estimated that 50%–90% of patients develop some form of malnutrition [8]. Various factors increase the risk of malnutrition in patients with cirrhosis, including inadequate intake, maldigestion, malabsorption, and altered metabolism [9].

Nutritional status is a predictor of morbidity and mortality in patients with cirrhosis. Malnutrition is associated with development portal hypertension, increased risk of infections, ascites, and hepatic encephalopathy [10, 11]. Complications of cirrhosis also contribute to the worsening of malnutrition [12].

Detection of malnutrition and its management can be lifesaving in patients with cirrhosis but assessing nutritional status in cirrhotic patients is challenging [13]. The Royal Free Hospital General Assessment tool (RFH-GA) is widely used to assess nutritional status among cirrhotic patients [14]. It combines measurements of body mass index (BMI), mid-arm muscle circumference (MMAC), and dietary intake [12]. It has been proved to be useful in assessing nutritional status and predicting clinical outcomes in patients with cirrhosis [15].

Little is known about the nutritional status of cirrhotic patients in Ethiopia. Therefore, this study aimed to assess malnutrition and associated factors among Cirrhotic patients at Tikur Anbessa Specialized Hospital (TASH), Addis Ababa, Ethiopia.

2 | Methods

2.1 | Study Design and Settings

A cross-sectional study was conducted at TASH, Ethiopia's main tertiary referral center located in the capital, Addis Ababa. TASH provides specialized and comprehensive medical care to patients from all over the country. The hospital has a gastroenterology unit under the Department of Internal Medicine that is responsible for caring for patients with gastrointestinal and hepatology problems. Data were collected from August to November 2021.

2.2 | Sample Size Determination and Sampling Procedure

All 210 patients with cirrhosis who were admitted to the gastrointestinal unit of TASH gastrointestinal unit during the study period were included in the study. Patients with hepatitis B and hepatitis C were on anti-viral treatments. Patients with hepatocellular carcinoma were excluded from the study.

2.3 | Variables of the Study

The outcome of this study was that nutritional status was classified as normal, mild and moderate malnutrition, and severe malnutrition. The independent variables included sociodemographic characteristics (age, sex, occupation, and marital status) and clinical characteristics (ascites, encephalopathy, etiology of cirrhosis, Gastrointestinal bleeding, history of previous hospitalization, creatinine blood urea nitrogen [Cr-BUN], and comorbidity).

2.4 | Data Collection and Quality Assurance

Three medical interns collected the data through face-to-face interviews. Two days of training were given to data collectors. Supervision was done by the investigators during data collection. The completeness of the questionnaire was checked onsite, and all appropriate measures were taken to ensure proper data entry.

For the assessment of nutritional status, the Royal Free Hospital Global Assessment tool (RFH-GA) was used. The RFH-GA is a global nutritional scheme that includes subjective and objective variables that measure recent dietary intake, measurements of MAMC, and BMI. It is validated for use in patients with cirrhosis [16].

BMI was calculated by using estimated dry weight, which was calculated by subtracting 5%, 10%, and 15% of the weight for patients with mild, moderate, and severe ascites, respectively. We measured anthropometric assessments to the nearest centimeter. Dietary intake was assessed subjectively by dietary recall. The patient recalls meals, snacks, and nutritional supplements; if intake met the estimated requirements, it was categorized as adequate. If the intake fell short of the estimated requirements but was greater than 500 kcal/day, it was classified as the inadequate group. If the intake was 500 kcal/day or less, it was classified as the negligible group [15].

Finally, patients are classified as well-nourished, mild and moderate malnutrition, and severe malnutrition based on the RFH-GA scheme.

2.5 | Data Processing and Analysis

Data were coded and entered into Epi Data 4.6.0.2 and analyzed by STATA software version 17 m/p. Descriptive statistics with frequency and percentage were used to characterize sociodemographic and clinical variables. A chi-squared test was performed to determine variables eligible for ordinal logistic regression analysis. Multivariable logistic regression was conducted, and variables with p value < 0.05 were considered statistically significant. Model fitness was checked with brant test (p value $= 0.102$) which indicates a good fit model.

2.6 | Ethics and Consent to Participate

The study was conducted after ethical clearance was obtained from the ethics committee of the Department of Internal Medicine, School of Medicine, Addis Ababa University. The objectives of the study were explained to the participants. Verbal and written consent were obtained from each participant.

3 | Results

Two hundred ten subjects were included in the study. The mean ± SD age of participants was 42.71 ± 12.41, and the minimum and the maximum ages were 20 and 65, respectively. The majority of participants were male (160, 76.19%), while 50 (23.81%) were female. Eighty percent of the participants were married (170, 80.95%), while 31 (14.76%) were single, and the rest 9 (4.28%) were divorced or widowed (Table 1).

3.1 | Clinical Characteristics

Ninety-five (45.24%) patients were previously hospitalized, while the remaining 115 (54.76%) were not hospitalized. Regarding the etiology of cirrhosis, hepatitis B virus (Hep B) was the cause of cirrhosis for 84 (40%) of the patients, hepatitis C virus (Hep C) accounted for 31 (14.76%) of the patients, while the remaining causes were alcohol-related and other 63 (30%), 32 (15.24%) respectively. The majority of the patients had decompensated cirrhosis (144, 68.57%), and the remaining 66 (31.43%) had compensated cirrhosis. Concerning the Child–Pugh classifications, 92 (43.81%) patients were in Class A, 96 (45.71%) were in Class B, and the remaining 22 (10.48%) were classified as Class C. Ascites were present among 101 (48.10%) of the patients and mild Hepatic encephalopathy was present on 58 (27.62%) of the patients (Table 2).

TABLE 1 | Summary of sociodemographic characteristics of cirrhotic patients at Tikur Anbessa Specialized Hospital, Addis Ababa Ethiopia.

Variables	Category	Frequency (%)
Age	18–33	56 (26.67)
	34–49	82 (39.05)
	50–65	72 (34.29)
Sex	Female	50 (23.81)
	Male	160 (76.19)
Marital status	Single	31 (14.76)
	Married	170 (80.95)
	Divorced and widowed	9 (4.28)
Occupation	Farmer	57 (27.14)
	Civil servant	82 (39.05)
	Private worker	46 (21.90)
	Other	25 (11.90)
Comorbidity	None	149 (70.95)
	Present	61 (29.05)

TABLE 2 | Summary of clinical characteristics of cirrhotic patients at Tikur Anbessa Comprehensive Specialized Hospital Addis Ababa Ethiopia.

Variable	Category	Frequency (%)
Etiology of Cirrhosis	Hepatitis B virus	84 (40)
	Hepatitis C virus	31 (14.76)
	Alcohol-related	63 (30)
	Other	32 (15.24)
Previously hospitalized	Yes	95 (45.24)
	No	115 (54.76)
Child–Pugh class	Class A	92 (43.81)
	Class B	96 (45.71)
	Class C	22 (10.48)
Nausea	Present	21 (10.00)
	Absent	189 (90.00)
Vomiting	Present	44 (20.95)
	Absent	166 (79.05)
Dysphagia	Present	11 (5.24)
	Absent	199 (94.76)
GI bleeding	Present	26 (12.38)
	Absent	184 (87.62)
Ascites	Present	101 (48.10)
	Absent	109 (51.90)
Hepatic encephalopathy	Present	58 (27.62)
	Absent	152 (72.38)
Easy satiety	Present	75 (35.71)
	Absent	135 (64.29)
Physical activity	Work as usual	104 (49.52)
	Suboptimal	55 (26.19)
	Ambulatory	51 (24.29)
Cr/BUN	Mean ± SD	0.83 ± 0.46
Serum albumin (gm/dL)	Mean ± SD	3.38 ± 1.6
BMI (kg/m^2)	< 18.5	65 (30.95)
	18.5–23.0	120 (57.14)
	≥ 23.0	25 (11.9)

Abbreviations: Cr/BUN, creatinine blood urea nitrogen; gm/dL, gram per deciliter.

3.2 | Nutritional Status and Anthropometric Measurement

According to the RFH-GA, nutritional status was categorized as normal, mild and moderate malnutrition, and severe malnutrition. In this study, 103 (49.05%) patients were normal, while 77 (36.67%) had mild and moderate malnutrition, and 30 (14.29%) patients had severe malnutrition.

3.3 | Factors Associated With Nutritional Status

Ordered logistic regression analysis with logit link function was used to determine the association between nutritional status and risk factors. A chi-square test was performed to determine variables eligible for ordinal logistic regression analysis. In multivariable logistic regression analysis, previous hospitalization, ascites, and degree of cirrhosis were significantly associated with nutritional status. The odds of being in the higher category of nutritional status (severe malnutrition) are 10 times higher for patients with hepatic encephalopathy (AOR = 10.43; 95% CI = 4.66–23.31). The odds of severe malnutrition are five times higher for patients with ascites (AOR = 5.08; 95% CI = 2.66–9.67). The odds of severe malnutrition decrease by 0.35 times for patients without a history of previous hospitalization (AOR = 0.35; 95% CI = 0.18–0.56). As the level of Cr-BUN increases, the odds of being severely malnourished increase by 2.5 times 2.57 (1.02–5.78). Patients with comorbidity have two times higher risk of malnutrition (AOR = 2.69; 95% CI = 1.19–6.05) (Table 3).

4 | Discussion

Malnutrition is one of the most common complications in cirrhotic patients. The RFH-GA scale is widely used to assess nutritional status among cirrhotic patients. It is a simple, non-invasive, and reliable tool [15]. This study aimed to assess the prevalence of malnutrition and associated factors among patients with cirrhosis at a tertiary care center in Ethiopia.

In the present study, moderate and severe malnutrition was 50.96% (40%–62%), which aligns with other studies conducted among the general patient population in the same hospital where 62% of the patients were malnourished [17]. Similar findings have also been reported from another study conducted among cancer patients where 58.2% of patients were malnourished [18]. The consistent findings could be explained by the similarities in sociodemograhic background.

The findings from this study were also consistent with other studies from India 59.5% [19], Ukraine 59.6% [20], and Mexico 56.3%, which were conducted among patients with cirrhosis [11]. However, the findings from study were lower as compared with in another study conducted in Nepal, which reported that 82% of patients with cirrhosis were malnourished

TABLE 3 | Factors associated with malnutrition Tikur Anbessa Specialized Hospital, Addis Ababa Ethiopia.

Variables	Categories	COR (95% CI)	AOR (95% CI)
Sex	Female	1	1
	Male	1.54 (0.81–2.90)	1.18 (0.55–2.52)
Age	18–33	1	1
	34–49	1.64 (0.85–3.18)	1.47 (0.56–3.85)
	50–65	1.45 (0.74–2.85)	0.99 (0.35–2.82)
Marital status	Ununioned	1	1
	Unioned	0.62 (0.32–1.19)	0.39 (0.15–1.02)
Previous hospitalization	Yes	1	1
	No	0.27 (0.16–0.47)	0.35 (0.18–0.68)**
Ascites	Absent	1	1
	Present	4.50 (2.58–7.84)	5.08 (2.66–9.67)***
Comorbidity	Absent	1	1
	Present	1.81 (1.00–3.25)	2.69 (1.19–6.05)**
Hepatic encephalopathy	Absent	1	1
	Present	16.14 (7.73–33.68)	10.43 (4.66–23.31)***
Cr-BUN	Mean ± SD (0.83 ± 0.46)	1.30 (0.73–2.33)	2.57 (1.02–5.78)*

Abbreviations: AOR, adjusted odds ratio; COR, crude odds ratio; CR-BUN, creatinine blood urea nitrogen.
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

[21]. The studies from Ukraine and Mexico have used the RFH-GA in the same way as the present study, which could be the reason for the similarities. The study from Nepal used a different tool for assessing malnutrition which could be the reason for the discrepancy.

In the present study, patients with ascites had an increased risk of malnutrition; similar findings have been reported in another study [11]. Ascites is one of the main complications of cirrhosis and it is associated with nausea, decreased appetite, and early satiety increasing the risk of malnutrition [22, 23]. Again, patients with encephalopathy had an increased risk of malnutrition. This is in line with other studies [24, 25]. Ascites and encephalopathy are the most common predictors of decompensated cirrhosis. Different reports have shown a higher prevalence of malnutrition in patients with decompensated cirrhosis as compared with patients with compensated cirrhosis. As cirrhosis progresses to a decompensated state, the liver's ability for nutrient metabolism deteriorates which explains the increase in malnutrition [26].

Patients with a history of previous hospitalization and patients with comorbidity had a higher risk of malnutrition; hospitalization is common in patients with cirrhosis, and patients are commonly hospitalized for cirrhotic complications like ascites, encephalopathy, and gastrointestinal. These complications increase the risk of malnutrition and might be the reason repeat hospitalization and risk of malnutrition are associated [27]. Patients with comorbidities were at higher risk of malnutrition, the presence of comorbidities puts an additional burden on the body especially the liver which adds to deficient nutrient metabolism and malnutrition [9].

Nutritional status was significantly associated with Cr-BUN. Similar findings were reported in other studies [28]. Renal dysfunction is one of the complications of liver cirrhosis and increased creatinine and uremia are indicators of decreased renal function and poor prognosis in patients with liver cirrhosis [29, 30]. Kidneys play a vital role in energy metabolism and decreased renal function increases the risk of abnormal energy metabolism and malnutrition [31].

5 | Conclusion

Malnutrition is high in patients with cirrhosis in TASH. Patients with ascites, hepatic encephalopathy, history of previous hospitalization, and higher Cr-BUN level and patients with comorbidity have a higher risk of severe malnutrition. Therefore, routine assessment and treatment of malnutrition should be considered in patients with cirrhosis.

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Ethics Statement

The study was conducted according to the principles stated in the Declaration of Helsinki. The study was approved by the institutional review board of Addis Ababa University. Informed verbal and written consent was taken from every participant.

Conflicts of Interest

The authors declare no conflicts of interest.

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