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Nutritional Assessment in Cirrhotic patients using Mini Nutritional Assessment Performa: A cross-Sectional study

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Abstract

Introduction: Liver cirrhosis is a condition often associated with malnutrition, which is caused by reduced nutrient intake and impaired hepatic metabolism. To assess nutritional status of patients with liver cirrhosis the Mini Nutritional Assessment (MNA) score is widely used.

Objective: The purpose of the current study was to determine nutritional status of liver cirrhosis patients using the MNA score and explore the correlation between malnutrition and complications related to this condition.

Methodology:This descriptive study was conducted on 330 liver cirrhosis patients at the Department of Gastroenterology, HMC Peshawar, between October 2022 and April 2023. Data on demographic characteristics, liver cirrhosis-related variables (such as ascites, portosystemic encephalopathy. and causes of liver cirrhosis), and MNA scores were collected using pre-designed questionnaires.

Results: Among the participants, 80.6% were classified as malnourished based on the MNA score. The mean age was 54.73 years, mean BMI was 22.41. The MNA scores categorized patients into malnourished, at risk of malnutrition, and normal nutritional status groups. Notably, 43.6% of the patients were malnourished, 37% were at risk of malnutrition, and 19.4% were well nourished. Significant associations were found between malnutrition and certain factors. Increased frequency of malnutrition was found in patients with hepatitis b virus infection. Moderate to gross ascites, variceal bleeding, and higher grades of hepatic encephalopathy were also significantly associated with malnutrition. Nonetheless, no association was observed between malnutrition and gender or body mass index (BMI).

Conclusion: Malnutrition is highly prevalent among liver cirrhosis patients, with older age, HBV etiology, moderate to gross ascites, variceal bleeding, and higher grades of Portosystemic Encephalopathy (PSE) being significant factors associated with malnutrition.

Keywords: Liver Cirrhosis, MNA. Malnutrition, Assessment, Ascites, Portosystemic Encephalopathy

Introduction

Cirrhosis is the end result of most chronic liver diseases, which leads to portal hypertension and end-stage liver disease (Schuppan *et al*., 2008) [27]. It is caused by many factors e.g. chronic hepatitis (HCV is the most common cause in developed countries), alcohol consumption, and many metabolic disorders (Sharma *et al*., 2022) [29]. Chronic liver disease (CLD) accounts for approximately 2 million deaths annually worldwide (Kim *et al*., 2021) [19].

Malnourishment is commonly found in patients with liver cirrhosis due to factors such as decreased nutrient intake or impaired liver metabolism of nutrients, decreased absorption of nutrients from intestine, and increases as the severity of liver disease

progresses. It affects 65-90% of patients with decompensated cirrhosis (Henkel *et al*., 2006) [7] (Tsiaousi *et al*., 2008) [34]. Malnutrition increases mortality and aggravated disease course of liver diseases. Disease related malnourished patients have a high rate of hepatic encephalopathy, infection, variceal bleeding, and refractory ascites (Ney *et al*., 2020) [19]. Moreover, malnutrition is an independent predictor of death. Early screening, assessment, and treatment of malnutrition plays a vital role in preventing complications and potentially enhancing disease outcomes, as highlighted by the European Association for the Study of the Liver in 2019 (Merli *et al*., 1996 and Sam *et al*., 2009) [16, 23].

There are four commonly employed screening tools for assessing the risk of malnutrition in patients. These include the Subjective Global Assessment (SGA) recommended by the American Society for Parental and Enteral Nutrition (ASPEN), the Malnutrition Universal Screening Tool (MUST) recommended by the British Association for Paternal and Enteral Nutrition (BAPEN), the Nutrition Risk Screening-2002 (NRS-2002) recommended by the European Society for Parental and Enteral Nutrition (ESPEN), and the Mini Nutritional Assessment (MNA) also recommended by ESPEN (Cristina *et al*., 2010). Multiple studies reported that Mini Nutritional Assessment (MNA) has undergone extensive validity and reliability testing in cirrhotic patients and in elderly non-cirrhotic population Yasutake *et al*., 2018 [38], Pengsorn *et al*., 2018 [20], Bauer *et al*., 2002 [1]. The MNA is a simple, non-invasive, cost effective, reliable tool to use and may be calculated by non-dietetic professionals after minimal training (Jane *et al*., 2005). Moreover, other nutritional assessment tool used in cirrhotic patient are anthropometric measurements; weight in kg. Dry weight, Height, Body Mass index (BMI), Mid arm circumference (MAC), Triceps skin fold thickness (TSF), mid-arm muscle circumference (MAMC), mid-arm muscle area (MAMA), calf circumference (CC) and hand grip strength test (HGS) (Shin *et al*., 2021) [31]. To evaluate fat-free mass, mid-arm circumference and mid-arm muscle area are used as nutritional assessment tools (Madden *et al*., 2016) [13]. Hand grip strength calculated with the help of dynamo-meter was a helpful tool in assessment of nutrition in cirrhotic patients (Miwa *et al*., 2022) [14].

Materials and Methods

Study Location and design:

Cross-Sectional Study was conducted at Hayatabad Medical Complex, Peshawar from 1" October 2022 to 30th April 2023. The Sampling technique was non- probability consecutive.

Sample size: A total of 330 cirrhotic patients were studied to assess their nutritional status.

Inclusion Criteria: All patients aged equal or greater than 18 years, who have confirmed diagnosis of liver cirrhosis were recruited into the study irrespective of their gender, ethnicity and etiology.

Data collection:

Socio-Demographic Data: It included name, age, gender and diagnosis of the patients.

MNA SCORE: The MNA is a comprehensive assessment tool consisting of 18 questions that cover four areas of evaluation: anthropometric measurements, general health, dietary intake, and subjective assessment. The complete MNA assessment includes two parts: a screening part with six questions and an assessment part with 12 questions. It typically takes around 15 minutes to complete.

Screening Part: Part 1 of the MNA aims to identify potential issues such as psychological stress, acute illness, recent changes in eating habits or weight, mobility or neuropsychological problems, and changes in BMI over the past three months. The screening part yields a maximum score of 14. A score of 12 to 14 indicates normal nutritional status and no further assessment is required. A score of 11 or lower suggests possible malnutrition, and the interviewer proceeds to part 2 for further evaluation.

Assessment Part:

In the second part of the MNA, various additional factors are assessed, such as the use of multiple medications (polypharmacy), the presence of pressure ulcers, the frequency of full meals consumed daily, the method of feeding, living arrangements, and specific details about food and fluid intake. The patient provides information regarding their nutritional and health status, while the healthcare practitioner collects anthropometric data by measuring mid-arm and mid-calf circumferences.

Interpretation of MNA scores: It ranges from 0 to 30, and it is categorized into three groups:

a. Normal nutritional status (score 24-30),
b. At risk of malnutrition (score 17-23.5),
c. Malnourished (score less than 17).

By interpreting the scores, you can identify individuals who require nutritional intervention or monitoring.

BMI: It is calculated by dividing a person's weight in kilograms by the square of their height in metres. The categories for BMI are as follows:

1. Underweight: BMI below 18.5
II. Normal weight: BMI between 18.5 and 24.9
III. Overweight: BMI between 25.0 and 29.9
IV. Obese: >30

Cause of Liver Cirrhosis: It was assessed using Immunochromatographic Test (ICT). Sec blood was taken from the patient and a sample was sent for ICT of Hepatitis B and Hepatitis C surface antigen.

Statistical Analysis:

For the statistical analysis the SPSS 23 program for Windows was used Descriptive statistics, such as frequencies, were used to summarise the qualitative data collected in the study. The Chi- square test was employed to compare the qualitative data. Significant variables were subjected to logistic regression analysis. A significance level of less than 0.05, with a confidence interval of 95%, was considered statistically significant. The findings were presented in tabular form.

Results

Table 1 shows descriptive statistics of age, BMI, and MNA statistics. The mean age of the sample is 54.73 years old, with a standard deviation of 11.793. The range of ages in the sample is 59 years, with the youngest participant being 22 and the oldest being 81. The mean BMI in the sample is 22.4121, with a standard deviation of 2.76103. The range of BMIs in the sample is 17.04, with the lowest BMI being 14.96 and the highest being 32.00. The mean MNA score in the sample is 19.030, with a standard deviation of 4.4287.

The range of MNA scores in the sample is 17.0, with the lowest score being 10.5 and the highest score being 27.5.

Table 1: Descriptive Statistics of Age, BMI and MNA (n=330)

Variables	Age	Body mass Index (BMI)	MNA
Mean	54.73	22.4121	19.030
SD	11.793	2.76103	4.4287
Range	59	17.04	17.0
Minimum	22	14.96	10.5
Maximum	81	32.00	27.5

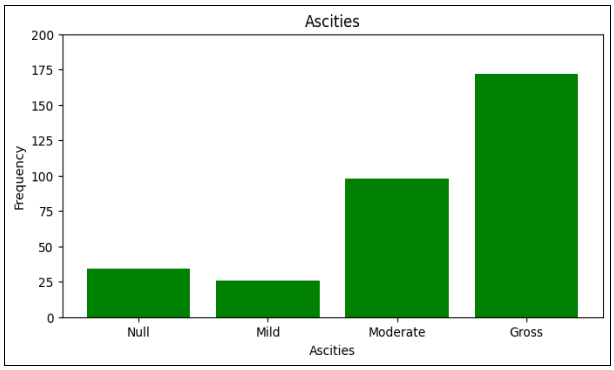

Fig 1: Frequency of ascites among cirrhotic patients

The frequency bar chart of Ascites demonstrated that out of 330 cirrhotic patients, 34(10.3%) had no ascites, 26(7.87%) had mild ascites, 98(29.69%) had moderate ascites, and 172(52.12%) had gross ascites.

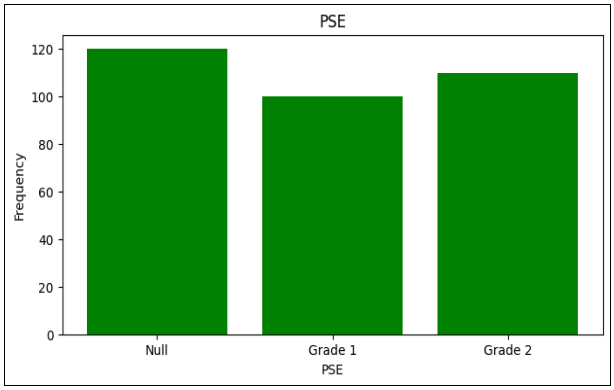

Fig 2: Frequency of portosystemic Encephalopathy (PSE)

The frequency bar chart of PSE shows that out of 330 cirrhotic patients, 126(38 18%) had no Portosystemic Encephalopathy (PSE), 96(29.09%) had gradel Portosystemic Encephalopathy (PSE), and 108(32.72%) had grade 2 Portosystemic Encephalopathy (PSE).

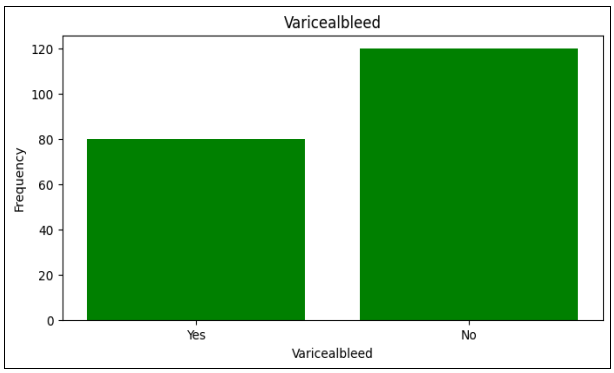

Fig 3: Frequency of variceal bleed

Fig 3 shows the frequency of variceal bleed among cirrhotic patients (n-330), 118(35%) had variceal bleed and 212(64.24%) had no variceal bleed.

Malnutrition status

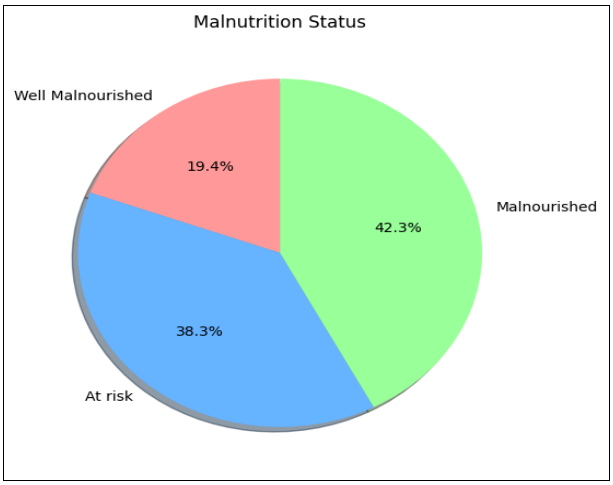

Fig 4: Malnutrition Status by MNA score

The pie chart of malnutrition status by MNA score shows that there were n-144 (43.6%) patients included in malnourished category, n-122 (37%) were in At Risk of malnourished category and n-64(19.4%) were well nourished.

Table 2: Comparison of Malnutrition with Variables

Variables	Categories	malnutrition Yes. No		Total	P Value
Age	18-40 yrs	58.8% (n=20)	41.2%(n=14)	34	0.001
	40-60 yrs	80.6%(n=150)	19.4%(n=36)	186	0.001
	More than 60 yrs	87.3%((n=96)	12.7%(n=14)	110	0.001
Gender	Male	80.9%(n=136)	19.1%(n=32)	168	.871
	Female	80.2%%(n=130)	19.8%(n=32)	162	.871
Cause of liver Cirrhosis	HCV	73.2%(n=120)	26.8%(n=44)	164	.002
	HBV	90.2%(n=92)	9.8%(n=10)	102	
	0thers	84.4%(n=54)	15.6%(n=10)	64	
Body Mass Index (BMI)	Under-weight	77.8%(n=14)	22.2%(n=4)	18	.778
	Healthy	81.4%(n=210)	18.6%(n=48)	258	
	Over weight	78.3%(n=36)	21.7%(n=10)	46	
	Obese	66.7%(n=4)	33.3%(n=2)	6	
Ascites	Nill ascites	17.6%(n=6)	824%(n=28)	34	<.0001
	Mild ascites	46.2%^(n=12)	53.8”%(n=14)	26	
	Moderate	77.6%(n=76)	22.4%(n=22)	98	
	Gross	100%?(n=172)	0%(n=0)	172	
Variceal bleed	Yes	93.2%(n=110)	6.8%(=n=8)	118	<000.1
	No	73.6%(n=156)	26.4%(n=56)	212	
Portosystemic Encephalopathy (PSE)	Nill	55.6%(n=70)	44.4%(n=56)	126	<000.1
	Grade 1	95.8%(n=92)	42%(n=4)	96	
	Grade 2	96.3%(n=104)	3.7%(n=4)	108	

Table 2 shows that the percentage of patients with malnutrition is significantly higher in older age groups (40-60 years and more than 60 years) compared to the younger age group (18-40 yean with a p-value of 0.001. No significant difference in the percentage of malnutrition between male and female patients. Patients with hepatitis B virus (HBV) have a significantly higher percentage of

malnutrition compared to those with hepatitis C virus (HCV) or other causes, with a p-value of 0.002. No significant difference in the percentage of malnutrition among patients with different BMI categories. Patients with moderate or gross ascites have a significantly higher percentage of malnutrition compared to those with nil or mild ascites, with a p-value of <0.0001. Patients who have experienced variceal bleeding have a significantly higher percentage of malnutrition compared to those who have not experienced variceal bleeding, with a p-value of <0.0001. Patients with higher grades of Portosystemic Encephalopathy (PSE) have a significantly higher percentage of malnutrition compared to those with no or lower grades of hepatic encephalopathy, with a p- value of <0.0001.

According to Table 3. Ascites and PSE are both significant predictors of malnutrition, with negative coefficients indicating that as these variables increase, the likelihood of malnutrition decreases. The odds ratios (ORs) for Ascites and PSE are 0.221 and 0.338, respectively. This means that for every one-unit increase in Ascites, the odds of malnutrition decrease by a factor of 0.221 (or 77.3% decrease), and for every one-unit increase in PSE, the odds of malnutrition decrease by a factor of 0.338 (or 66.2% decrease). Cause of Liver cirrhosis, Variceal bleed, and Age in categories are not significant predictors of malnutrition at the predetermined alpha level. The odds ratios (ORs) for these variables are all greater than 1, indicating that as these variables increase, the odds of malnutrition also increase, but not significantly.

In conclusion, the logistic regression analysis suggests that Ascites and PSE are significant predictors of malnutrition, while Cause of LC, Variceal bleed, and Age in categories are not significant predictors.

Table 3: Logistic Regression Analysis of Significant Variables

Variables	S.E.	Sig.	Odds ratio	95% C.I for EXP(B) Lower	Upper
Ascites	.383	.000	.221	.104	.468
PSE	.347	.002	.338	.171	.666
Cause of I.C	.275	.712	.904	.527	1.549
Variceal bleed	.526	.150	.469	.167	1.314
Age in Categories	.323	.121	.606	.322	1.142

Discussion

Prompt and timely nutritional diagnosis, as well as early intervention to address malnutrition, play a crucial role in improving the prognosis of cirrhotic patients awaiting transplantation. By implementing these measures, the mortality rate among these patients can be reduced. The first and crucial step in identifying individuals who may be at risk of malnutrition is to perform a thorough nutrition assessment, employing appropriate tools to assess their dietary intake and body composition. Subsequently, appropriate nutrition interventions can be implemented to address their specific nutritional needs. (Sakpota *et al*., 2022).

In the present study the mean age of the patient was 54.73±11.93. This is identical to reports of different studies by Sakpota *et al*., 2022, Sherpa *et al*., 2022, Viera *et al*, 2019. While (Naqvi *et al*. 2013) [18] reported a mean age of less than 50 years which is different from our study.

The mean BMI was 22.41±14.96. (Khalil *et al*., 2015) [9] reported BMI of around 26-27 in her study. (Naqvi *et al*., 2013) [18] reported a BMI of 20.05±3.07.

Overall 80.6% patients were malnourished by MNA score assessment. Khalil *et al*., (2015) [9] reported 86% patients who were malnourished in her study. Naqvi *et al*., (2013) [18] reported 90.54% of overall malnourished patients in his series of studies

In this study most of the patients with malnutrition were of older age ie more than 40 years of age. Same findings are reported by Khalil *et al*., 2015 [9], Cahil *et al*., 1996 [3], and Vanderplas *et al*., 2003.

According to our study no significant difference in gender group was noted although the major population were of male gender in malnutrition category. These findings are in line with reports of (Cahil *et al*, 1996) [3] and (Vanderplas *et al*., 2003) and opposite to findings of (Khalil *et al*., 2015) [9] which reported female preponderance.

According to our study HBV was found as a major cause of liver cirrhosis. (Khalil *et al*., 2015) [9] and (Sharif *et al*., 2005) [28] reported HCV as the main cause of liver cirrhosis in their study population.

According to our study Patients with moderate or gross ascites have a significantly higher percentage of malnutrition compared to those with nil or mild ascites, with a p-value of <0.001.

These findings are similar to reports of Khalil *et al*., 2015 [9] and Sharif *et al*., 2005 [28] which reported ascites as a risk factor for developing malnutrition în liver cirrhosis patients.

According to our study Patients who have experienced variceal bleeding have a significantly higher percentage of malnutrition compared to those who have not experienced variceal bleeding. with a p-value of <0.0001. This in line with reports of (Saunder *et al*., 2010) [26] which reported both variceal bleed and malnutrition has positive correlation and it leads to increase in mortality in patients.

According to our study patients with higher grades of hepatic encephalopathy have a significantly higher percentage of malnutrition compared to those with no or lower grades of hepatic encephalopathy, with a p-value of <0.0001. Same findings are reported by (Saunder *et al*., 2010) [26].

When logistic regression analysis was performed on significant variables, Ascites and PSE came out to be the significant risk factor for developing malnutrition in patients of liver cirrhosis. These findings are also reported by Moctezuma *et al*., 2013, Romeiro *et al*., 2015, and Saunder *et al*., 2010 [26].

Conclusion

Malnutrition is highly prevalent among liver cirrhosis patients, with older age, HBV etiology. moderate to gross ascites, variceal bleeding, and higher grades of hepatic encephalopathy being significant factors associated with malnutrition. These results underscore the significance of evaluating and addressing the nutritional needs of individuals with cirrhosis as a means to enhance outcomes and minimise complications.

Recommendations

To prevent malnutrition and complications associated with liver cirrhosis, it is crucial for all cirrhotic patients to receive

nutrition support, follow nutritional guidelines, and receive advice from a dietitian regarding their dietary regimen. By implementing these measures, the clinical outcomes of patients can be improved. Furthermore, the findings of this study can be applied to a diverse range of samples and geographical regions, enhancing its generalizability and applicability.

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