Original article

Assessment of Malnutrition in Cirrhotic Patients

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Malnutrition is a common but frequently overlooked problem among patients with cirrhosis of liver. Malnourished cirrhotic patients have a higher rate of complications and an overall increased mortality. Identifying these patients is of great clinical importance. This study was carried out to assess nutritional status of cirrhotic patients to identify those who are malnourished and to see the relationship between severity of liver disease and malnutrition. 105 patients were selected by purposive type sampling. Nutritional status was assessed by 3 anthropometric assessment tools- body mass index (BMI), mid upper arm muscle circumference (MAMC) and triceps skin fold thickness (TST). Severity of liver disease was assessed by Child-Pugh (CP) score. Severe malnutrition was defined as MAMC and TST <5th percentile, calculated from standard tables, and as BMI <16. Among 105 patients 18, 49 and 38 were of Child-Pugh group (CP group) A, B and C respectively. Anthropometric assessment revealed that, when assessed by MAMC 63% of the study population were severely malnourished. Based on MAMC, severe malnutrition was present in 39%, 63% and 73% patients in CP group A, B and C, respectively (P<0.05). So, percentage of severely malnourished patient increased with the increase in severity of liver disease. Based on TST, 28%, 34% and 50% patients were severely malnourished in CP-A, CP-B and in CP-C (p>0.05) respectively which showed a trend similar to that by MAMC. Whereas, based on BMI, 0%, 8% and 2% patients were severely malnourished respectively (p>0.05). It showed a decrease in the percentage of severely malnourished patient in CP group C than in CP group B. In this study, nutritional assessment by TST and MAMC revealed that severe malnutrition was common in our study population and assessment by MAMC showed a statistically significant association of severity of liver disease with severe malnutrition.

Keywords: malnutrition; nutritional assessment; TST (triceps skinfold thickness); MAMC (mid arm muscle circumference); BMI; CP group (Child Pugh group)

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Introduction:

Malnutrition greatly affects the outcome of cirrhotic patients by determining both their quality of life and their survival. [1] Malnourished patients with chronic liver disease have a higher rate of complications such as recurrent and treatment-resistant ascites, encephalopathy, hepatorenal syndrome or infections and overall, an increased mortality. [2, 3] So, presence of malnutrition should alert clinicians to the same extent as the presence of other common complications of cirrhosis.

Identifying these cirrhotic patients who are malnourished is of great clinical importance because early intervention in replenishing the nutrient

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deficit can prolong life expectancy, ameliorate quality of life, diminish complications and prepare them for a more successful liver transplantation. [4, 5] Therefore, this study was planned to identify the presence of malnutrition among patients suffering from cirrhosis of liver and to assess relationship between severity of liver disease and malnutrition.

Multiple techniques have been proposed to detect malnutrition in patients with liver disease. Although there is no gold standard for the assessment of malnutrition in patients with liver disease, anthropometric measurements, such as arm muscle circumference and triceps skinfold, were utilized in large groups of cirrhotic patients and proved to be able to identify muscle and fat depletion. [1,6] The subjective global nutritional assessment (SGA), which is based both on physical signs of malnutrition and nutritional history, has also been utilized to evaluate the nutritional status in patients with chronic liver disease. [7, 8] In January 2006 the European Society for Clinical Nutrition and Metabolism (ESPEN) issued specific guidelines on enteral nutrition in liver disease which can be easily applied in both inpatients and outpatients. [9] The guidelines recommend the use of simple bedside methods such as the Subjective Global Assessment (SGA) or anthropometry to identify patients with malnutrition.

In this study, anthropometry, being a simple method that can be performed at bedside was chosen to identify cirrhotic patients with malnutrition. To the best of our knowledge no study to assess nutritional status of cirrhotic patients of cirrhosis has been carried out in Bangladesh.

Materials and Methods:

It was a cross sectional analytic type of study carried out in the department of Gastroenterology, Bangabandhu Sheikh Mujib Medical University from July 2021 and October 2013. 105 patients were selected purposive type sampling based on inclusion and exclusion criteria.

Inclusion criteria

Adults aged 18 years and above, admitted with cirrhosis of liver.

Exclusion criteria

1. Patients with hepatocellular carcinoma or other malignancy
2. Patients with severe, i.e. Grade 3 or 4, hepatic encephalopathy
3. Endocrine and metabolic disorders (uncontrolled DM, Hyperthyroidism)
4. Inflammatory bowel disease or other known inflammatory disease of intestine,
5. Known infectious disease other than hepatitis (e.g. tuberculosis)
6. Serious abdominal surgery (gastrectomy, small and or large intestinal resection)
7. Pregnancy

Methods

Complete history, physical examination was done in every patient at the entry of the study. Cirrhosis was diagnosed based on a combination of clinical features, blood profile and radiological imaging. Clinical features were those of portal hypertension, i.e. ascites and/or gastrointestinal varices. Blood profiles included were evidence of thrombocytopenia and/or coagulopathy. Radiological features, either with trans-abdominal ultrasound or computerized tomography, had to demonstrate a coarse/small shrunken liver with or without splenomegaly and intra-abdominal varices. Laboratory investigations also included routine laboratory tests (blood sugar, hemoglobin, kidney function tests) and liver function tests. These were done using the standard techniques and were done prior to inclusion in the study and also during the evaluation period.

Nutritional Assessment

Nutritional assessment was done by anthropometry. Upper limb anthropometry was used as lower limb measurements are influenced by edema in case of cirrhotics. A flexible tape was used to measure the mid- upper arm circumference (MUAC). Measurement was taken at the midpoint between the tip of acromian and olecranon process to the nearest centimeter in the right arm. Skin fold thickness at triceps or fat fold at triceps (TST) was determined using Lange skin fold caliper (beta technology, California, USA) in a standard manner. [10] The arm was hang freely and the skin fold was lifted parallel to its long axis. The mid-upper arm circumference was measured on the right arm at the level of the upper arm midpoint mark. Three measurements was taken for both TST and MUAC, with average values calculated and recorded. Mid arm muscle circumference (MAMC), an established measure of muscle protein mass, was calculated from MUAC and TST using a standard formula: MAMC = [MUAC – (3.14 X TST)]. Body mass index (BMI) was computed as body weight (kg)/ height (m2). Severe malnutrition was defined as MAMC and/or TSF below the 5th percentile for purposes of standardization with the literature

Table 1: Distribution of the cirrhotic patients among Child Pugh groups

Cirrhotic patient	Frequency	Percent
Group A	18	17.1
Group B	49	46.7
Group C	38	36.2
Total	**105**	**100.0**

Table 3: Nutritional status based on TST compared across Child Pugh groups (n=105)

CP Group	Nutritional status based on TST		P value**
	Severely malnourished	Not severely malnourished	
CP A	5	13	0.1
CP B	17	32	
CP C	19	19	

(* chi square test was used to test significance)

and for accurate comparisons with other cirrhotic populations. The percentiles of MAMC and TSF was calculated from standard tables based on age and sex. [11] According to BMI, patients with BMI <16.0 were considered severe malnourished.[12] All measurements were taken by the investigator, to avoid any inter-observer variation.

Calculation of Child Pugh score

Severity of liver disease was calculated according to the modified Child-Pugh scoring system using the standard protocol. [13]

Statistical analysis:

Data was collected using a preformed data sheet. All data were entered into Statistical Packages for the Social Sciences (SPSS 16) (Chicago, Illinois, USA) software for analysis. Continuous variables were expressed as means with standard deviation Patients with cirrhosis of liver were stratified according to Child-Pugh class. Crosstabs and Chi-Square test were used to compare non-numerical data between Child-Pugh class A, B and C.

Before starting this study, the research protocol was approved by the Ethical Review Committee of BSMMU, Dhaka.

Results:

The age range of cirrhosis patients was 18-75 years. The mean age was 43.65 ± 14.2 years. Among the study population 87 were male.

Most common presenting complaint was abdominal distension (75%). 54.3 % of the patients population were diagnosed as cases of cirrhosis of liver during the past 6 months. 21.9% were suffering from cirrhosis for > 6 months but < 1 year while 23.8% for more than 1 year. 11.4% had family history of liver disease. 21.9% were on treatment with antiviral medication.

On physical examination the most common finding was ascites (67%) followed by splenomegaly (59%). Anemia (51.4%), edema (30%), jaundice (26%), spider telangiectasia (16%), hepatomegaly (12.5%), clubbing (10%) were among other significant physical findings. Testicular atrophy and gynecomastia were present in 54% and 12% of the male population, respectively.

Chronic hepatitis B (CHB) was the most common cause of cirrhosis (67.3%) followed by chronic hepatitis C infection (11.4%). 3 persons suffered from Wilson disease, one person suffered from secondary biliary cirrhosis and one had combined CHB and CHC infection.

On endoscopic examination 30.5% had small and 61% had large esophageal varices. 8.5% had no varices while 3 patients had both esophageal and gastric varices. Portal hypertensive gastropathy was present in 70 patients (67.3%).

Most of the patients were in Child Pugh stage B (46.7%) (Table 1), followed by CP-group A and CP group C.

In the study population according to TST 40 patients (39%) were below 5th percentile (severely malnourished) for age and sex and according to MAMC 66 patients (63%) were below 5th percentile for age and sex. According to BMI 5% population was severely malnourished (figure 1).

Table 2: Anthropometric parameters in CP groups (n=105)

Anthropometric parameter	Child Pugh group			P value*
	CP A	CP B	CP C	
BMI	**19.7±2.7**	**20.5±3.4**	**21.9± 3.3**	**0.04**
TST (mm)	**8.3±3.1**	**8.0±5.7**	**7.8±4.3**	**0.1**
MAMC (mm)	**21.9±3.0**	**20.4±3.2**	**20.2±2.9**	**0.17**

(*ANOVA was used to see the relationship)

In both male and female patients with cirrhosis, mean values of anthropometric measurements for MAMC and TST demonstrated a progressive decline as the CP score increased. But BMI did not follow such pattern. In fact, BMI was highest in CP C patients (table 2).

Table 4: Nutritional status based on MAMC compared across Child Pugh groups (n=105)

CP Group	Nutritional status based on MAMC		P value**
	Severely Malnourished	Not severely malnourished	
CP A	7	11	0.04
CP B	31	18	
CP C	28	10	

(* chi square test was used to test significance)

Table 5: Nutritional status based on BMI compared across Child Pugh group

CP Group	Nutritional status based on BMI		P value**
	Malnourished	Not malnourished	
CP A	0	18	0.28
CP B	4	45	
CP C	1	37	

(* chi square test was used to test significance)

In patients with cirrhosis due to viral etiology 64.3% were severely malnourished and in those with cirrhosis due to non-viral etiology this figure was 59.1%. In patients with viral cirrhosis, chronic Hepatitis C induced cirrhosis group showed severe malnutrition in 75% while chronic Hepatitis B group showed severe malnutrition in 63%.

When compared across CP groups, severe malnutrition as determined by TST was more prevalent in CP C group (50%) when compared with CP-A (28%) and CP-B (34%) (figure 2).

When determined by MAMC, severe malnutrition was more prevalent in CP C group (73%) when compared with CP A (39%) and CP B (63%) (Figure 3). This relationship was found to be statistically significant when MAMC was used to assess malnutrition but not for TST. BMI assessed nutritional status showed no such relationship with Child Pugh scores. In CP A, CP B, CP C groups 0%, 8% and 2% respectively, were severely malnourished using BMI (Figure 4).

Discussion:

This study was conducted to assess nutritional status of hospitalized cirrhotic patients to identify those who are severely malnourished and the relationship of nutritional status with various stages of cirrhosis as determined by Child Pugh score. This is the first known study in Bangladesh to report on nutritional status of cirrhotic patients based on anthropometric measurement. We used anthropometric measurement to assess nutritional status, as this is a reliable indicator of nutritional status and European Society for Clinical Nutrition and Metabolism (ESPEN) guideline recommends the use of this simple bedside method to identify patients at high risk of undernutrition [9].

Our study demonstrated that severe malnutrition was present in 63% of our study population when assessed by MAMC and in 39% when assessed by TST. A recent study from Malaysia showed a similar picture where based on MAMC 50% and based on TST 30% of the study population were below 5th percentile. [14] In a study in Pakistan based on MAMC, 45.1% had moderate to severe malnutrition. [15]

In our study, CP-C group, MAMC, which mainly determines protein-energy malnutrition, showed severe malnutrition in 73% and TST, which mainly shows fat store depletions showed severe malnutrition in 50% of the study population. The level of malnutrition identified in this study appears to be higher when compared with published data from a hospital-based study of 315 patients from France (58.7% of Child-Pugh C cirrhotic patients with MAMC < 5th percentile) and Italy (34% of cirrhotics with MAMC < 5th percentile). [3, 16]

In our study, with the increase in severity of liver disease proportion of severely malnourished patients increased. Based on MAMC severe malnutrition was found in 39%, 63% and 73% in Child Pugh A, B, C respectively while according to TST 28%, 34% and 50% were malnourished in Child Pugh A, B and C respectively. Relationship between severity of liver disease and percentage of severely malnourished patients was found to be statistically significant ($p<0.05$) when MAMC was used to assess malnutrition but not for TST. Similar findings were observed by Alberino et at al., who found that based on MAMC the prevalence of severe malnutrition was higher in Child–Pugh class C (45.5%) than in Child–Pugh class A (12.5%) or class B (35.2%). [3] Fernandes et al., showed a similar relationship between nutritional status and severity of liver disease. [17]

In this study, we used BMI as one of the assessment tool of nutritional assessment as it is one of the most popular parameters. In the opinion of many authors, BMI should not be used in patients with

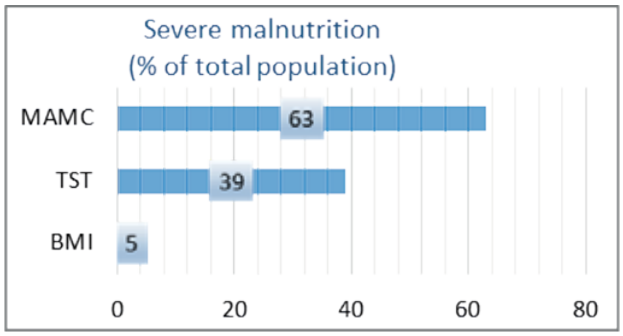

Figure 1: Severe malnutrition in cirrhotic patients by anthropometric assessment

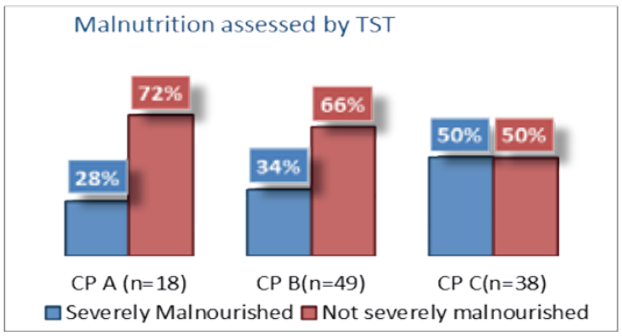

Figure 2. Comparison of malnutrition based on TST in CP groups

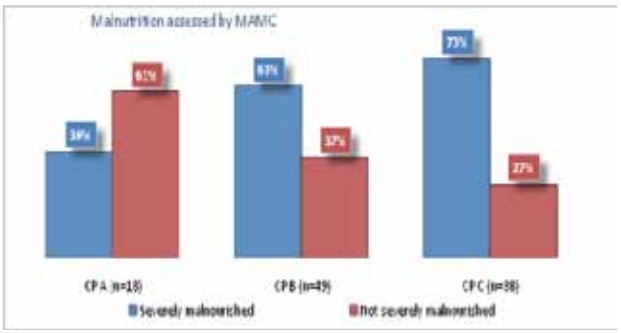

Figure 3. Comparison of malnutrition based on MAMC in CP groups

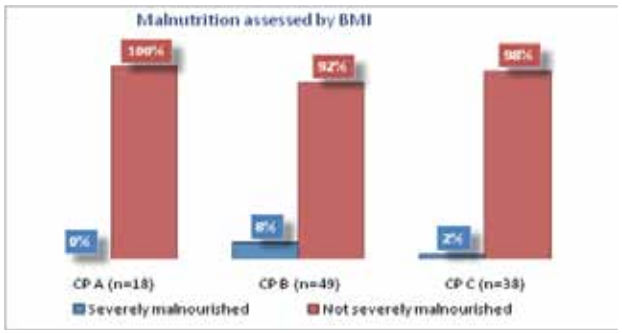

Figure 4. Comparison of malnutrition based on BMI in CP groups

liver cirrhosis because fluid retention and fluid displacement between the intra- and extracellular compartments, even in the absence of clinical signs of overhydratation, is the main reason for underestimation of malnutrition .[18, 19] Our study may supports this statement further. In this study 5% of the study population was found to be severely malnourished and in CP-C it was 2%.

In our study chronic hepatitis B was the most common cause of cirrhosis (66.7%) followed by chronic hepatitis C infection (11.4%). In 17.1% no cause was found (cryptogenic). This is in contrast to the causes found in USA where Hepatitis C is the most common cause (26%), followed by alcoholic liver disease (21%) and cryptogenic (18%). [20] We found no cases of alcoholic cirrhosis in our study. As in Bangladesh due to socio-religious barriers alcohol consumption is not common among the general people this finding may not be considered unexpected. Malnutrition develops in patients with cirrhosis irrespective of etiology of the disease.[21] Similarly, in our study there was no significant relationship of various etiologies with the severity of malnutrition. In cirrhosis due to viral etiology it was 64.3% and non-viral cirrhosis group it was 59.1%. Most of the data published on malnutrition among liver disease patients is on alcoholic liver disease with few studies on non-alcoholic liver disease. [22] Our study may represent as a study of malnutrition in non-alcoholic liver cirrhosis.

Limitations:

This study has several limitations. Reference values for nutrition assessment were obtained from international standards which might have overestimated the degree of malnutrition. As there is no gold standard for nutritional assessment, comparing anthropometric assessment with other nutritional assessment tool like SGA (Subjective global assessment) might have increased the strength of the study

Conclusion and Recommendation:

Malnutrition is being well understood and appreciated as an important factor in the management of cirrhotic patients. Identifying the patients who are approaching the state of malnutrition by simple and easily applied methods is necessary in order to provide nutritional support to those who need it the most. Anthropometric assessment, being easily done at bedside, may serve as an important tool in this process of identification. This study revealed that based on anthropometric assessment by TST and MAMC, severe malnutrition is common in our study population and the percentage of severely malnourished patients increases with increase

in the severity of liver disease. Further studies with a large number of patients and comparable control group to see the prevalence of severe malnutrition in our cirrhotic patients is important. A multicenter study to see the factors and causes of malnutrition in cirrhosis of liver patients may also be carried out. A national reference database of anthropometric measurements of the population needs to be developed to assess malnutrition with more accuracy.

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