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NUTRITIONAL STATUS IN CIRRHOTIC PATIENTS WITH MINIMAL HEPATIC ENCEPHALOPATHY AND NON MINIMAL HEPATIC ENCEPHALOPATHY

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ABSTRACT

Nutrition has long been recognized as a prognostic and therapeutic determinant in patients with chronic liver disease. Malnutrition is a common manifestation in the patients with chronic liver disease. However, also there is scarcity of data regarding cause and effect relationship between MHE and poor nutritional status. This study aimed the role and effect of nutritional status in the development of MHE as well as the role and effect of MHE in determining the nutritional status of these patients. 460 patients with cirrhosis between 30-70 years were screened for the study and 168 patients found eligible on the basis of the inclusion & exclusion criteria. The diagnosis of Cirrhosis was based on clinical, biochemical, and ultrasonographic or liver histology. 50 subjects refused to participate during the study. The diagnosis of MHE among 119 patients was based on Neuropsychological assessment & Critical flicker frequency test and were divided into two groups-MHE & Non MHE. Nutritional status was assessed by using anthropometric measurements and 24 dietary recall for two days. The prevalence of MHE, as diagnosed by PHES or CFF test was detected in 79 out of 119 patients with cirrhosis without overt HE. The mean value of MUAC was found significantly lower in MHE group (23.47 ± 3.68) than Non MHE group (25.1 ± 3.48). Significant difference was found in food groups like cereals, pulses, fruits and fat intake between MHE group and Non MHE group. Consumption of macro nutrient like calories, carbohydrate, protein and fat was found to be lower in MHE group compared to Non MHE but significance difference was seen in protein and fat. Intake of micro nutrients like thiamine, niacin and free folic acid was found to be lower in MHE group than Non MHE. This difference was statistically significant. Only vitamin C intake was found to be significantly higher in MHE group. This study has shown that Nutritional status in cirrhotic patients with MHE was poor compared to those patients who are Non MHE.

Key Words: MHE (Minimal Hepatic Encephalopathy), PHES (Psychometric Hepatic Encephalopathy Score), CFF (Critical Flicker Frequency), MUAC (Mid Upper Arm Circumference).

INTRODUCTION

Minimal hepatic encephalopathy (MHE) is an important disorder that impairs patients daily functioning and health related quality of life (HRQOL) in patients with cirrhosis. MHE is a neurocognitive disorder that can only be elicited by specialized psychometric tests. It has a negative impact on a patient's health-related quality of life. MHE has also been associated with an increased rate in the development of overt hepatic encephalopathy (HE) and increased mortality; therefore, identification and treatment should not be delayed. Jennifer et al., in 2011 reported that MHE is a neurocognitive disorder that affects up to 80% of cirrhotic patients. MHE is associated with impaired health-related quality of life, predicts the development of overt HE and is associated with poor survival (Dhiman & Chawla 2009).

MHE is considered clinically relevant for at least 3 reasons. First, it impairs patients' daily functioning and HRQOL (Groeneweg *et.al* 1998; Marchesini *et.al* 2001; Schomerus *et al* 2001), and Second, it predicts the development of overt HE (Das *et.al* 2001; Romero-Gomez *et.al* 2001 & 2002; Saxena *et.al* 2002). Finally, it is associated with a poor prognosis reported by Amodio *et al.,* in 1999 and Romero-Gomz *et al.,* in 2004. Thus, MHE may warrant attempts at treatment.

Protein-energy malnutrition (PEM) has often been observed in patients with liver cirrhosis (Lautz *et al.,* 1992; Moriwaki, 2002). Previous studies in western patients have documented malnutrition rates from 20% in compensated liver cirrhosis up to 60% in decompensated liver cirrhosis (Coltorti *et al.,* 1991). Causes for malnutrition in liver cirrhosis are known to include a reduction in oral intake

(for various causes), increased protein catabolism and insufficient synthesis, and malabsorption/ maldigestion associated with portal hypertension (Lautz *et.al.,* 1992; Coltorti *et.al.,* 1991; Sobhonslidsuk *et al.,* 2001).

Nutrition has long been recognized as a prognostic and therapeutic determinant in patients with Chronic Liver Disease (CLD). It has been seen that severe protein calorie malnutrition can seriously undermine the capacity for liver regeneration and functional restoration. Although many biochemical and hormonal abnormalities occur in such patients, disturbances of carbohydrate, protein and lipid metabolism are most relevant and responsive to nutritional supplementation. Malnutrition is a common manifestation in the patients with CLD. Impairment in nutritional status is common among cirrhotics, with a point prevalence of 10-100 % (Marchesini *et.al.,* 2001). However it is not clear that poor nutritional status may act as a prognostic determinant in the development of MHE. There is paucity of data regarding the role and effect of nutritional status in the development of MHE as well as the role and effect of MHE in determining the nutritional status of these patients.

Although a lot of research has been done on association between nutrition and CLD, patients with MHE have not been studied so extensively. There is limited data regarding cause and effect relationship between MHE and poor nutritional status. Therefore, the present study was planned to assess the effect of nutrition on MHE.

OBJECTIVE

The objectives of the study were assessment of the nutritional status in cirrhotic patients with MHE and Non MHE and to compare the nutritional status of cirrhotic patients with MHE and without MHE.

MATERIALS AND METHODS

The study was carried out at the Department of Gastroenterology, Sawai Man Singh Medical College and Hospital, Jaipur, Rajasthan (a tertiary level health care centre). All CLD patients who visited from August1, 2009, to July 31, 2010 aged between 30-70 years were screened for the study. Purposive sampling was used. The diagnosis of cirrhosis was based on clinical, biochemical, and ultrasonographic or liver histology, if available. Patients were selected on the basis of the inclusion & exclusion criteria. The diagnosis of MHE was based on neuropsychological assessment & critical flicker frequency test (CFF –done by Hepatonorm Analyzer; score < 39 MHz). On the basis of this, the subjects were divided into two groups: MHE & Non MHE. Nutritional status was evaluated by anthropometric measurement, 3 days 24 hours dietary recall and biochemical investigations among both the groups.

GENERAL CLINICAL AND LABORATORY ASSESSMENT

All patients were subjected to detailed history taking and physical examination. Laboratory assessment was carried out. Severity of liver disease was calculated according to the Child-Pugh score with grades A (mild) to C (severe) indicating degree of hepatic reserve and function. Etiology of cirrhosis was evaluated.

NEUROLOGICAL ASSESSMENT

Clinical examination included a thorough general physical examination, taking vitals and a systemic examination including complete neurological and mental state examination using the Mini Mental State Examination to exclude the presence of any illness that could have caused or affected neurological status or quality of life.

DIAGNOSIS OF MHE

All patients underwent a series of psychometric tests, which include number connection tests (NCT A, NCT B), if literate and figure connection tests (FCT A, FCT B), if illiterate. Three performance subtests of the Wechsler Adult Intelligence Scale — Digit Symbol Test (DST), Picture Completion Test (PCT), and Block Design Test (BDT) (Ferenci *et al.,* 2002; Dhiman 1995) along with the critical flicker frequency measurement (CFF) were also conducted. The diagnosis of MHE was made if any two of the NP tests were impaired beyond 2 standard deviations (s.d.) of known control values. This diagnostic criterion conforms to the consensus statements of Ferenci *et al.,* in 2002. These tests were performed over a period of 35 – 40 min.

NUTRITIONAL ASSESSMENT (NA)

Nutritional assessment was based on the following: anthropometry -Body Mass Index (BMI), Mid Upper Arm Circumference (MUAC), Triceps Skin fold Thickness (TST), Mid Arm Muscle Area (MAMA), 24 hours dietary recall for 3 days, SGA and MUST. All measurements were taken by the same single investigator, to avoid any inter-observer variation.

ANTHROPOMETRY

Body Mass Index (BMI) of all patients was calculated. Values for ideal weight were calculated from the Life Insurance Corporation of India by Sharma (1999). Upper limb anthropometry was used for nutritional assessment because of two reasons, firstly the simplest measure of malnutrition i.e. body weight and consequently BMI was likely to be affected by the presence of ascites and secondly, lower limb measurements would also be influenced by water retention/edema. Although BMI is a crude measure of nutritional status, it was used as a

baseline comparison between cirrhotic patients with MHE & without MHE.

Subjective global assessment: Subjective global assessment (SGA) is a simple evaluation tool that allows physicians to incorporate clinical findings and subjective patient history into a nutritional assessment (Detsky *et al.,* 1987). Based on history taking and physical examination, nutritional ratings of patients are obtained as follows: well-nourished-A, moderately malnourished-B and severely malnourished-C. The SGA has been shown to be a valid and useful clinical nutritional assessment tool for patients of various medical conditions (Makhija *et.al.*, 2008).

MALNUTRITION UNIVERSAL SCREENING TOOL

The malnutrition universal screening tool (MUST) is designed to detect protein-energy malnutrition as well as those individuals at risk of developing malnutrition by using three independent criteria: current weight status, unintentional weight loss and acute disease effect. The patient's current body weight is determined by calculating the BMI (Kg/m^2). Weight loss (over the past 3-6 months) is determined by looking at the individual's medical record. An acute disease factor is then included if the patient is currently affected by a pathophysiological condition and there has been no nutritional intake for more than 5 days. A total score is calculated placing the patients in a low, medium, high-risk category for malnutrition. A major advantage of this tool is its applicability to adults of all age across all health care settings. Additionally, this method provides the user with management guidelines once an overall risk score has been determined. Studies have shown that MUST is quick and easy to use, and has good concurrent validity with most other nutrition assessment tools tested (Stratton *et.al.*, 2004).

24 hour dietary recall for 3 days: 3 days 24 hours dietary recall was taken. In this recall method of oral questionnaire diet survey, a set of 'standardized cups', suited to local conditions were used. The following steps were involved:

1. The house wife or the member of the household who invariably cooks & serves food to the family members were asked about the types of food preparations made at breakfast, lunch, afternoon tea time & dinner.
2. An account of the raw ingredients used for each of the preparations was obtained.
3. Information on the total cooked amount of each preparation was noted in terms of standardized cup.
4. The intake of each food item (preparation) by the specific individual in the family was assessed by using the cups.

Assessment of individual patient's oral intake during hospitalization was determined by the dietary recall method done every three days for two weeks and an average intake was calculated and recorded. The objective was to determine the adequacy of total nutrients intake in term of calories, carbohydrates, fat, protein, calcium, iron, sodium, potassium, thiamine, riboflavin, niacin, free folic acid and vitamin C per patient with minimum reporting bias. Nutrient intake was calculated by Nutritive value of Indian foods (ICMR, 2010).

STATISTICAL ANALYSIS AND DATA MANAGEMENT

Data processing was performed by using Microsoft excel 2007 & SPSS version 10.0 (SPSS, Chicago,IL) in this study. Mean and standard deviations were calculated. Statistical analysis was done using Student's *t* test (unpaired) and Chi-squared test. Correlations between different tests were calculated by Spearman's rank-order correlation coefficient.

RESULTS AND DISCUSSION

A total of 460 patients with liver cirrhosis were screened during the study period. Out of these, 169 (37.8%) patients met the eligibility criteria, whereas 291 (63.2%) patients were excluded. The reasons for exclusion were a history of overt Hepatic Encephalopathy (126); History of recent (6 weeks) alcohol intake(63); History of recent (6 weeks) gastrointestinal bleeding (18); History of recent (6 reasons for exclusion were a history of overt Hepatic Encephalopathy (126); History of recent (6 weeks) use of any nutritional supplementation (13) & drugs affecting psychometric performances like benzodiazepines, antiepileptic, or psychotropic drugs (10); History of shunt surgery or transjugular intrahepatic portosystemic shunt for portal hypertension (4); Electrolyte imbalance (8); Renal impairment (11); Hepatocellular carcinoma (3); Severe medical problems such as congestive heart failure, pulmonary disease, or neurological or psychiatric disorder that could influence quality-of-life measurement and Inability to perform Neuropsychological tests and unable not having enough comprehension to fill quality of life questionnaire (35).

CLINICAL CHARACTERISTICS

The mean age of the study group was 45.49 years. Data on education (Table-1) revealed that in the total study group 21% were illiterate, 56.3% had ≤ 12 years of formal education, 18.5% had achieved their graduation and about 4.2% had completed their post graduation or higher degree. Thus most patients were not very well educated. Most patients belonged to lower middle class and upper lower class in both MHE and Non MHE group.

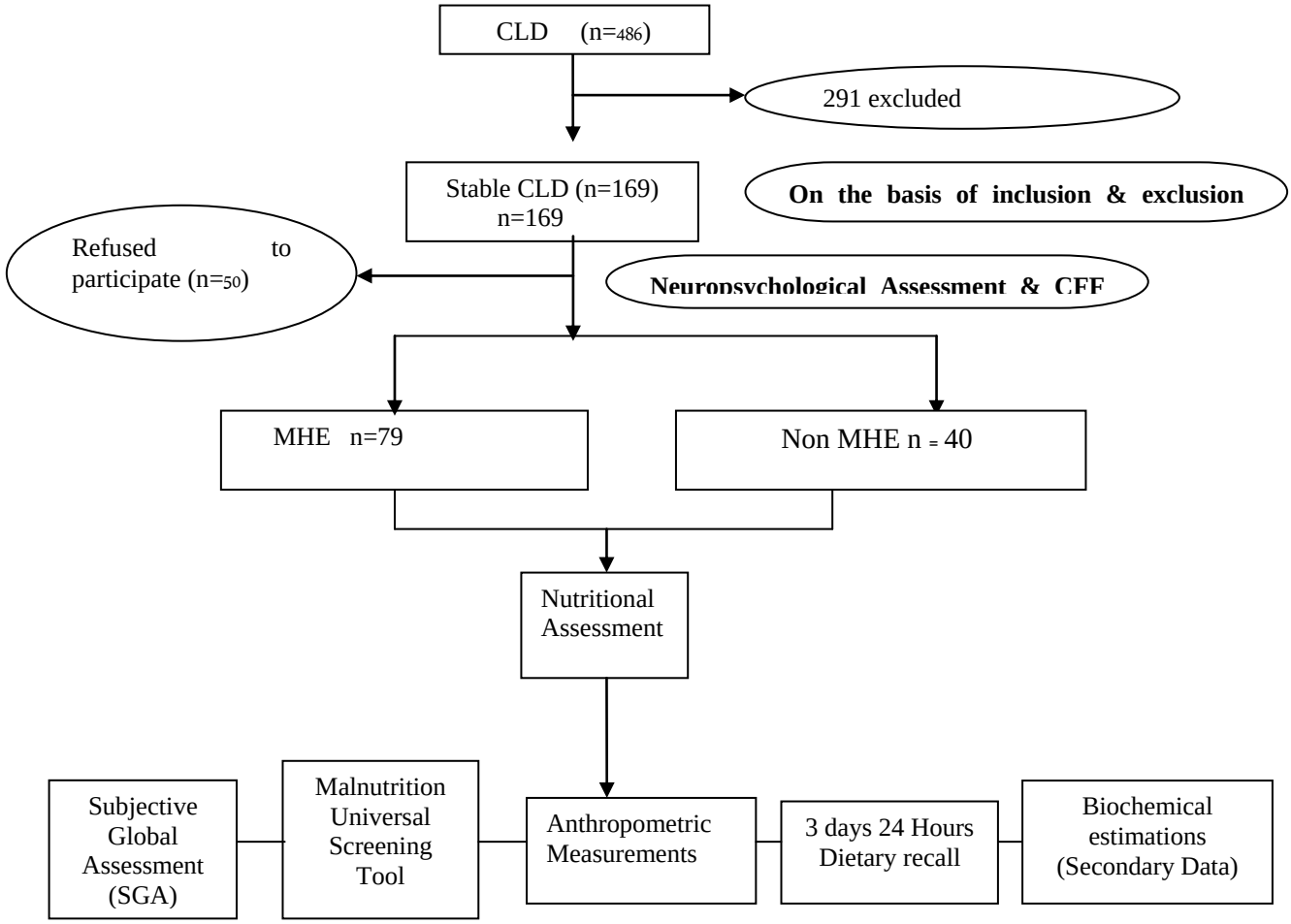

Figure 1 STUDY DESIGN

DEMOGRAPHIC CHARACTERISTICS

Table 1: Demographic characteristics of the patients

Characteristics	Total cirrhotic patients (n=119)	MHE (n=79)	Non-MHE (n=40)
Demographic characteristics			
Age	45.49+11.95	47.11+11.79	42.27+11.75
Male:Female	101:18	69:10	32:8
Rural:Urban	59:60	41:38	18:22
Education			
Illiterate	25(21%)	18 (22.78%)	7 (17.5%)
School education	67(56.3%)	44 (55.70%)	23 (57.5%)
Graduate	22 (18.49%)	14 (17.72%)	8 (20%)
Post Graduate	5 (4.2%)	3 (3.80%)	2 (5%)
Socio-Economic Status			
Upper Class	7 (5.88%)	4 (5.06%)	3 (7.5%)
Upper Middle Class	26 (21.85%)	20 (25.32%)	6 (15%)
Lower Middle Class	46 (38.66%)	28 (35.44%)	18 (45%)
Upper Lower Class	39 (32.77%)	26 (32.91%)	13 (32.5%)
Lower Class	1 (0%)	1 (1.27%)	0
Footnote: Figures in parentheses denote %			

Table 2: The baseline clinical characteristics of the MHE and Non MHE patients

Clinical Characteristics	Total (n=119)	MHE (n=79)	Non MHE (n=40)
Severity of disease			
CTP Class A	23 (19.33%)	7 (30.44%)	16 (69.56%)
CTP Class B	62 (52.10%)	44 (71%)	18 (29%)
CTP Class C	34 (28.57%)	28 (82.35%)	6 (17.65%)
Etiology			
Alcohol	50 (42.02%)	34 (68%)	16 (32%)
HBV	42 (35.29%)	27 (64.29%)	15 (35.71%)
HCV	16 (13.44%)	13 (81.25%)	3 (18.75%)
Other	11 (9.24%)	5 (45.46%)	6 (54.54%)
Clinical sign			
Jaundice	54 (45.38%)	39 (72.22%)	15 (27.8%)
Ascites and odema	73 (61.34%)	52 (71.23%)	21 (28.76%)

FOOTNOTE: FIGURES IN PARENTHSES DENOTE %

Total 169 stable CLD patients met the eligibility criteria, out of these 50 patients refused to participate in the study. Severity of liver disease was calculated according to the Child-Pugh score with grade A (mild) to C (severe) indicating degree of hepatic reverse and function (Albers et al., 1989). In the study group (119 subjects) 23 subjects (19.33%) were in Child Pugh Class A, 62 subjects (52%) were in Class B and 34 subjects (28.57%) were in Class C. Their mean age was 45.49±11.95years. The most common reasons for admission was tense ascites, jaundice, infection, diarrhea, abdominal discomfort and other. The etiology of cirrhosis was owing to alcohol consumption (n=50; 42%), chronic hepatitis B (n=42; 35.3%), chronic hepatitis C (n=16; 13.44%) and other (n=11; 9.24%) as seen in Table 2.

In the study group, 66.39% patients were found to have MHE, 36.97% (44/119) based on positive PHES results alone, 44.54% (53/119) based on positive CFF test results alone and 15.12% (18/119) based on a positive results for both tests. In the present study, 34 subjects were in Class C, out of these 28 (82.35%) patients were from MHE. 44/62 (71%) patients with MHE were in Class B and only few patients 7/23 (30.44%) with MHE were from Class A. Etiology of cirrhosis was considered more in MHE group as seen in Table-2. Jaundice and ascites was found to be more prevalent in MHE group. The severity of CLD as indicated by CTP class was also more prevalent in the MHE group.

NUTRITIONAL ASSESSMENT

Table 3: Anthropometric Assessment of the MHE and Non MHE patients

Anthropometry	MHE (n=79)	Non MHE (n=40)	T-value
BMI	20.51 ± 2.85	20.85 ± 2.51	-0.651
MUAC	23.47 ± 3.68	25.1 ± 3.48	-2.364*
TST	7.24 ± 3.22	8.25 ± 3.70	-1.470
MAMA	3657.84 ± 1138.22	4083.6 ±1202	-1.858

*Significant at the 0.05 level, data expressed as mean ± SD

ANTHROPOMETRIC ASSESSMENT

Patient's nutritional status was evaluated by the following anthropometric measurements: Body Mass Index (BMI), Mid Upper Arm Circumference (MUAC), Triceps Skin-fold Thickness (TST), and Mid Arm Muscle Area (MAMA). There was no big difference in the average BMI between MHE and Non MHE group but the mean value of MUAC was found to be significantly lower in MHE group than Non MHE group. The average TST and MAMA was also found to be lower in MHE group than Non MHE but this difference was not statistically significant (Table-3).

DIETARY ASSESSMENT: 24 HOURS DIETARY RECALL FOR 3 DAYS

Table 4: Average Food Group Intake of the MHE and Non MHE patients

Food groups	MHE (n=79)	Non MHE (n=40)	T-value
Cereals & Grains	138.70 ± 73.74	173.58 ± 77.86	-2.392**
Pulses & Legumes	18.58 ± 13.71	24.22 ± 17.04	-1.953*
Green Leafy Vegetables	10.76 ± 25.85	16.25 ± 30.77	-1.026
Roots & Tuber	29.75 ± 29.71	41.25 ± 42.19	-1.724
Other Vegetable	61.84 ± 44.24	76.87 ± 49.48	-1.683
Fruits & Juices	152.21 ± 189.69	64.75 ± 119.52	2.658**
Meat & Poultry	1.46 ± 5.73	0 ± 0	1.604
Milk & Milk Products	311.89 ± 230.27	318.41 ± 166.26	-.159
Fats & Edible Oil	26.69 ± 13.51	32.37 ± 14.47	-2.116*
Sugars	15.06 ± 11.79	15.56 ± 8.29	-.239

*Significant at the 0.05 level, **Significant at the 0.01 level. (Data expressed as mean ± SD)

DAILY CONSUMPTION OF FOOD GROUP

As seen in Table-4, the mean intake of various food groups among both the groups was insufficient. This may be due to poor appetite and insufficient dietary intake of the patients. Total Consumption of cereals, pulses and fat was found to be lower in MHE group compared to Non MHE group. This difference was statistically significant. Fruits intake was significantly higher in MHE group than Non MHE group. Daily consumption of food group in MHE and Non MHE patients were compared are highlighted Table-4.

Table 5: Average Nutrients Intake of the MHE and Non MHE patients

Nutrients intake	MHE (n=79)	Non MHE (n=40)	T-value
Calories (Kcal)	1158.41 ± 520.65	1302.4 ± 438.09	-1.500
Carbohydrate (gm)	154.05 ± 73.7	172 ± 61.04	-1.325
Protein (gm)	30.97 ± 14.85	37.36 ± 13.37	-2.288*
Fat (gm)	39.54 ± 17.71	46.08 ± 14.56	-2.014*
Calcium (mg)	505.29 ± 309.26	546.86 ± 236	-.747
Iron (mg)	9.71 ± 4.27	11.25 ± 4.26	-1.856
Sodium (mg)	254.46 ± 202.23	323.72 ± 171.78	-1.771
Potassium (mg)	1217.06 ± 566.53	1342.52 ± 470.78	-1.205
Thiamine (mg)	0.92 ± 0.38	1.15 ± 0.38	-3.018**
Riboflavin (mg)	0.83 ± 0.46	0.97 ± 0.36	-1.791
Niacin (mg)	6.73 ± 3.07	8.60 ± 3.1	-3.127**
Free Folic Acid (ug)	38.04 ± 25.47	50.24 ± 26.2	-2.445*
Vitamin C (mg)	70.66 ± 79.92	32.20 ± 37.75	2.880**

*Significant at the 0.05 level, **Significant at the 0.01 level. (Data expressed as mean ± SD)

DAILY CONSUMPTION OF NUTRIENT INTAKE

The mean intake of nutrients was inadequate in both the groups. This may be due to lower intake of food groups. Consumption of macro nutrient like calories, carbohydrate, protein and fat was found to be lower in MHE group compared to Non MHE but significant difference was seen in only protein and fat intake. Consumption of micro nutrients like thiamine, niacin and free folic acid was found to be lower in MHE group than Non MHE. This difference was statistically significant. Only vitamin C intake was found to be significantly higher in MHE group because fruits intake was higher in MHE group compared to Non MHE group (Table-5).

NUTRITIONAL SCREENING TOOLS

Table 6: Nutritional Assessment of the MHE and Non MHE patients using two Screening Tools

Nutritional screening tool	Total (n=119)	MHE (n=79)	Non MHE (40)
	MUST		
MUST-0	25 (21%)	11 (13.92%)	14 (35%)
MUST-1	39 (32.77%)	27 (34.18%)	12 (30%)
MUST-2 or more	55 (46.22%)	41 (51.9%)	14 (35%)
P-value		0.025	
	SGA		
Grade A/1	18 (15.12%)	9 (11.39%)	9 (22.5%)
Grade B/2	57 (47.9%)	36 (45.57%)	21 (52.5%)
Grade C/3	44 (36.97%)	34 (43.04%)	10 (25%)
P-value		0.057	

FOOTNOTE: FIGURES IN PARENTHESES DENOTE %

MUST

41 (52%) patients had more high risk of malnutrition (MUST-2), 27 (34.2%) patients had medium risk of malnutrition (MUST-1) and only 11 (13.92%) patients were at low risk of malnutrition (MUST-0), i.e. 68 (86%) patients had some level of at the risk of malnutrition based on MUST scale in MHE group. In case of Non MHE, 35% patients were at the low risk of malnutrition (MUST-0) as well as 35% patients were high risk of malnutrition (MUST-2). 12 (30%) patients had medium risk of malnutrition (MUST-1).

In the study group most of the patients were in MUST-2 (Table-6). In the present study, 55 CLD patients were in MUST-2, out of these 41(74.54%) patients were belonged to MHE group. 39 CLD patients were in MUST-1, out of these 27 (69.23%) patients were also belonged to MHE group and 11 (44 %) patients with MHE, out of 25 patients had a low risk of malnutrition (MUST-0).

SGA

Prevalence of severe malnutrition (SGA-C) was higher in MHE group 34 (43%) as compared to Non MHE group 10 (25%). 36 (45.6%) patients had mild-moderate malnutrition (SGA-B) and only 9 (11.4%) patients were well nourished (SGA-A) in MHE group. In case of Non

MHE group 21 (52.5%) patients had mild-moderate malnutrition and 9 (22.5%) patients were well nourished.

According to the SGA scale, most of the patients were in SGA grade B and out of 57 subjects, 36 (63.16%) patients had SGA grade B in MHE group. In the study, 44 (37%) patients with CLD had SCA grade C, out of these 34 (77.27%) patients were from MHE.

DISCUSSION

The present study of nutritional assessment in cirrhotic patients with MHE had some limitations. The study was conducted in Govt. Hospital so most of the patients were from lower middle class and upper lower class (table-1). A significant proportion of patients with ascites did not have dry weight measurements done, which could have influenced BMI calculation, therefore MAMA, MUAC and TST were also used. MHE is fairly common in patients with CLD. The prevalence of MHE in our patient population with cirrhosis who did not have any past history of OHE was 66.39%. This study provides useful data regarding nutritional status of CLD patients with MHE. Anthropometric measurement like mid upper arm circumference (MUAC) was found to be significantly lower in MHE group than Non MHE group (Table-3). BMI measurements in less malnourished cirrhotic patients were not different from the general population, mainly due to the fact that ascites and peripheral edema contributed significantly to body weight in cirrhotic patients, and true lean body mass was not taken into account (Campillo *et.al.,* 2006).

CTP class has been identified as a risk factor for malnutrition among these patients and most of the patients with MHE were in CTP class C. The prevalence of MHE was reported to be higher in patients with cirrhosis with CTP class B and C, advanced age, alcoholic etiology, a previous episode of overt HE and portosystemic shunts (Ortiz *et.al.,* 2005). None of the patients in this study had a previous episode of overt HE or had undergone portosystemic shunt surgery. Alcohol consumption and hepatitis B were the most common etiology among the CLD patients and more in MHE group therefore it may be possible that etiology or CTP class affected the prevalence of MHE.

A lower intake of food groups (cereals, pulses, green leafy vegetables, roots and tuber, other vegetables, milk and milk products, and sugar) was found to be associated with poor nutrients intake and an increased risk for poor nutritional status in MHE group. Cereals, pulses and fat intake were found to be significantly lower in MHE group compared to Non MHE. The consumption of nutrients intake like protein, fat, thiamine, niacin and free folic acid was also found to be lower in MHE group and was statistically significant. Only one micro nutrient intake (vitamin C) was found to be higher in MHE group this may be due to higher consumption of fruits intake because patients avoided the normal diet due to mal absorption, mal digestion and poor appetite.

Two tools were used for the nutritional screening of CLD patients to diagnose grade of malnutrition in both the group MHE and Non MHE. The patients in MHE group were found to have poor score of MUST and SGA there by indicating higher prevalence of malnutrition than the Non MHE group. The poor dietary intakes as seen previously could be the reason for malnutrition.

This study further supported the utility of the nutritional assessment like anthropometry; dietary intake and nutritional screening tool like MUST and SGA are known to be better predictor of malnutrition in cirrhotic patients with MHE and without MHE.

CONCLUSION

To summarize, malnutrition was common in cirrhotic patients, together with an inadequate dietary and nutrient intake except vitamin C. Prevalence of malnutrition was found to be higher in MHE group; therefore nutritional intervention needs to be provided to avoid the risk of malnutrition and to prevent CLD patients to proceed towards overt MHE. As soon as a CLD patient is diagnosed, identification of malnutrition by nutritional assessment and MHE by the neuropsychological tests should not be delayed. MHE patients need more nutritional care than Non MHE patients. This study has shown that Nutritional status in cirrhotic patients with MHE was poor compared to those patients who are Non MHE. Therefore in the CLD patients, diagnosis of MHE is important and necessary to prevent conversion to covert/ overt HE. The role of dietician in identification of malnutrition and providing timely nutritional intervention is very vital to improve the survival and prognosis of MHE patients.

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