Handgrip Strength as an Important Bed Side Tool to Assess Malnutrition in Patient with Liver Disease

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Background: **Malnutrition is frequently present in patients with cirrhosis. Anthropometric measures such as body mass index (BMI), mid arm muscle circumference (MAMC), triceps skin fold thickness (TST) and subjective global assessment (SGA) have some limitations in assessment of malnutrition. This study aims to determine the prevalence of malnutrition in non-hospitalized cirrhotic and chronic hepatitis patients and to assess handgrip (HG) strength as a tool for identifying malnutrition.** ***Methods:*** **Consecutive patients of cirrhosis (*n* = 352), chronic hepatitis (*n* = 189) and healthy controls (*n* = 159) were enrolled. All patients underwent MAMC, TST, HG and SGA assessment. Malnutrition was diagnosed on basis of SGA score. Values of MAMC, TST and HG below the 5th percentile or less than 60% of healthy controls were considered as abnormal.** ***Results:*** **According to SGA (taken as standard) 24% patients with chronic hepatitis and 56% of patients with cirrhosis had malnutrition (*P* = 0.001). In patients with chronic hepatitis prevalence of malnutrition according to MAMC (12%), TST (31%) and HG (18%). In patients with cirrhosis prevalence of malnutrition according to MAMC (27%), TST (60%) and HG (42%). HG exercise strength had the highest area under curve 0.82 (95% confidence interval (CI) 0.78–0.86, *P* = 0.001) compared to MAMC 0.60 (95% CI 0.55–0.64, *P* = 0.001) and TST 0.65 (95% CI 0.61–0.69, *P* = 0.001) for assessing malnutrition. On comparison of HG, TST and MAMC, the sensitivity was 67%, 60% and 31%, respectively, Specificity was 95%, 71% and 89%, respectively, and diagnostic accuracy was 87%, 67% and 71%, respectively.** ***Conclusion:*** **HG strength is an excellent tool to assess at bed side the nutrition status in patients with cirrhosis and has the highest diagnostic accuracy compared to other anthropometric tests such as MAMC and TST. (J Clin Exp Hepatol 2017;7:16–22)**

Malnutrition is commonly present in patients with liver disease and its prevalence varies from 20% in compensated liver disease to more than 80% in those patients with decompensated liver disease.[1–4] Many factors contribute to malnutrition in these patients which include anorexia, early satiety, ascites, frequent hospitalization, pancreatic insufficiency, bacterial overgrowth and misconception about the dietary intake. Nutritional status is considered to be a predictor of morbidity and mortality in patients with advanced liver disease.[5,6] Malnutrition is a negative prognostic factor associated with life-threatening complications such as refractory ascites, spontaneous bacterial peritonitis, hepatorenal syndrome and variceal hemorrhage.[7] Malnutrition also has important implications in liver transplantation and it has been demonstrated that patients with a worse nutritional status before the transplant have increased postoperative complications and higher mortality rates.[8]

Assessing patient nutritional status by traditional anthropometric methods is difficult in patient with cirrhosis due to presence of ascites and pedal edema.[9,10] In practice, nutritional status in these patients has been assessed by combining anthropometry with history and physical examination, with a focus on nutritional aspects which we believe are clearly insufficient.

Subjective global assessment (SGA) is a proven nutritional assessment tool highly predictive of nutrition-associated complications.[11] Nutrition screening with SGA and anthropometric measurements are an important first step in the early identification of malnutrition and its management.[12,13] SGA is a bedside assessment tool used to collect information on dietary intake, weight change, and gastrointestinal symptoms. It includes examination for subcutaneous fat loss, muscle wasting, edema, and ascites. The SGA is commonly used to assess patients with liver disease because it is simple and cost-effective. We believe there is no clearly established standard to measure malnutrition in cirrhotic patients, but also believe the SGA is a better clinical assessment tool than using visceral proteins or anthropometry. In this study, the gold standard adopted was the SGA because there is evidence that clinical evaluation is better than anthropometric or biochemical assessment. SGA has been used as gold standard for assessment

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Abbreviations: BMI: body mass index; CTP: Child–Turcotte–Pugh; HG: handgrip; MAC: mid arm circumference; MAMC: mid arm muscle circumference; SGA: subjective global assessment; TST: triceps skin fold thickness
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of nutrition in various other studies in patients with cirrhosis.[14,15]

Number of tools are available as an aid for the nutritional assessment of the cirrhotic patient however, none are without limitations. Sarcopenia or loss of skeletal muscle mass is the major component of malnutrition and is a frequent complication in cirrhosis that adversely affects clinical outcomes. These include survival, quality of life, development of other complications and post liver transplantation survival. Radiological image analysis is currently utilized to diagnose sarcopenia in cirrhosis. Evaluation of muscle activity is considered a good nutritional index, and measuring non-dominant handgrip (HG) strength is a functional method to assess nutritional status.[16] Study by Alvares-da-Silva and Reverbel da Silveira[17] had shown that there was a high prevalence of malnutrition in cirrhotic outpatients, especially when assessed by HG, which was superior to SGA and prognostic nutritional index in this study. HG was the only technique that predicted a significant incidence of major complications (uncontrolled ascites, hepatic encephalopathy, spontaneous bacterial peritonitis, and hepatorenal syndrome) developed in 1 year in undernourished cirrhotic patients. There is paucity of data from Indian subcontinent on the assessment of nutritional status in cirrhosis. We assessed the nutritional status of patients with cirrhosis using anthropometric measurement such as body mass index (BMI), mid arm muscle circumference (MAMC), triceps skin fold thickness (TST), HG strength and SGA score in all patients.

MATERIALS AND METHODS

This was a prospective study of 700 adults who were assigned to one of three groups: group 1 consisted of healthy subjects (n = 159), group 2 consisted of patients who had chronic hepatitis and no cirrhosis (n = 189) and group 3 consisted of patients who had cirrhosis (n = 352). All patients were recruited from the Gastroenterology Outpatient Clinic. Cirrhosis was diagnosed on the basis of clinical, biochemical, radiological or liver biopsy findings suggestive of cirrhosis. Chronic hepatitis was diagnosed based on liver biopsy and fibroscan value which is more than 7 kPa and less than 11 kPa.[18] Patients were excluded if they had any associated co morbid illness like uncontrolled diabetes mellitus, acquired immunodeficiency syndrome, tuberculosis, chronic renal failure, muscle disease, and/or rheumatologic disease, hepatocellular carcinoma or any malignancy, hepatic encephalopathy at time of assessment of nutrition status and active drug abuse. Patients with joint disease and neuropathy were also excluded. Healthy subjects were taken from hospital staff and healthy volunteers of patients. All healthy subjects had normal ultra sound of abdomen, negative hepatitis B and C serology and normal liver and kidney functions tests. None of these subjects had history of significant alcohol intake and their fibroscan value was less than 5 kPa.

Nutritional assessment was done using anthropometrical and clinical methods, as well as biochemical and hematological laboratory examinations, which are available and can be routinely used for clinical practice in general hospitals in developing countries. BMI was defined as the body mass divided by the square of the body height, and was expressed in units of kg/m^2. In our study patient weight included ascites and/or pedal edema if he had any at the time of enrollment. SGA was done according to the proposition of Detsky et al.[19] A detailed history was recorded with appetite, caloric intake, change in body weight. Based on this evaluation, patients were classified into three groups: well, moderately malnourished and severely malnourished. The anthropometric evaluation was performed with the patient in the supine position according to the usual parameters: height, weight, TST, mid arm circumference (MAC) and MAMC measured on the right arm, using established methods. The triceps skin fold was calculated as the mean of three measurements using the Lange skin fold caliper midway between the acromion and tip of the olecranon. Arm circumference was evaluated at the right arm, at a midpoint equidistant from the acromion and olecranon, with the patient in the upright position and the arm flexed at 90°. The MAMC was calculated by the formula MAMC (cm) = MAC − [3.14 × TST (cm)].[15] The diagnosis of malnutrition was based on SGA score. Values of MAMC, TST and HG below the 5th percentile or less than 60% of healthy controls were considered as abnormal and patients were diagnosed to have malnutrition.[20]

HG was measured in the morning by dynamometry by the same examiner who performs the other anthropometry measurements. Subjects sat in front of the dynamometer, were instructed on its use, and became familiar with the apparatus by using the dominant hand. Then, with the non-dominant hand, subjects used the two shafts located in the lower part of the dynamometer. Three measurements were taken and the highest was considered.[17] The study was approved by the hospital ethics committee and informed consent was obtained from all subjects.

STATISTICAL METHODS

Values were presented as mean ± standard deviation, number of patients, or a percentage. The exact Fisher test or the chi-square test was used to compare the prevalence and the severity of malnutrition according to the severity and the etiology of the hepatic disease. Correlation between the variables was assessed using Spearman's rank correlation coefficient. The diagnostic performance of various anthropometric measurements was assessed by receiving operator characteristic curves taking SGA as the gold

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