Correlation Between Anthropometrics Measurements, Prealbumin Level and Transferin Serum with *Child-pugh* Classification in Evaluating Nutritional Status of Liver Cirrhosis Patient

Yovita H, Ali Djumhana, SA Abdurachman, Juke Roslia Saketi

ABSTRACT

Aim: *to evaluate nutritional status by using anthropometrics and biochemistry examination and to determine the correlation between albumin, prealbumin and transferin serum level with anthropometrics measures in liver cirrhosis patient according to Child-Pugh classification.*

Methods: *study was conducted on 30 patients with liver cirrhosis Child-Pugh A, B and C. There were 8 patient of Child-Pugh A, 18 Child-Pugh B and 4 Child-Pugh C. Every patient underwent anthropometrics and biochemistry examination including ideal body weight (IBW), body mass index (BMI), triceps skin-fold thickness (TSF), mid-arm circumference (MAC), mid-arm muscle circumference (MAMC), albumin, prealbumin and transferin serum. We used statistical analysis Spearman and Pearson correlation test.*

Results: *by IBW and BMI measurement, most of liver cirrhosis patients indicated normal results. By MAMC measurement, there was no liver cirrhosis patient with good nutritional status. Most of them have slight and moderate malnutrition. There was no significant correlation between anthropometrics measurement with Child-Pugh score, with $p>0.01$. And also, there was no significant relationship between albumin, prealbumin and serum transferin with anthropometrics measures, but there was significant correlation between prealbumin and transferin level with Child-Pugh score, with $p<0.01$.*

Conclusion: *the conclusion of this study is prealbumin and transferin level may be used to evaluate nutritional status of liver cirrhosis patient, and on the contrary with anthropometrics measures. There was no correlation between anthropometrics measures with albumin, prealbumin and transferin level.*

Keywords: *Nutritional status, Liver cirrhosis*

Gastroenterohepatology Division, Department of Internal Medicine School of Medicine University of Padjadjaran/ Dr. Hasan Sadikin Hospital, Bandung

INTRODUCTION

Liver cirrhosis is a chronic liver disease which is manifested by inflammation process, necrosis of liver cell, and the addition of collagen tissues diffusely so that the liver cell is unable to run its function.[1] This severe liver damage will cause metabolism disorder of macro- and micronutrients, resulting in malnutrition.[2,3] Nutritional deficiency of the patient with liver disease aggravate the liver disorder, increase morbidity and worsen prognosis. [3-5]

The prognosis indicator that is widely used for the liver cirrhosis patient is the *Child* classification including evaluation of nutritional status, presence of ascites, encephalopathy, bilirubin and albumin levels.[1] It is different from the classification according to *Child modification (Child-Pugh)*, which has no evaluation of nutritional status but the prothrombin time test is added.[6] The albumin serum level is one of severity markers in liver disease. [7,8]

Evaluation of nutritional status in liver cirrhosis patient is aimed to know the patient's risk factor, to know the effects of this disease development on nutritional status and to monitor therapeutic recovery and for nutritional intervention. [4,6] Until now, there is no consensus that has been agreed to evaluate the nutritional status of patient with chronic liver disease.[9]

Prealbumin is a major marker, related to *Protein Energy Malnutrition (PEM)* and accurately indicates response in nutritional therapy.[10] Transferrin also has high sensitivity and it may be used to recognize nutritional status disorder. [11,12]

The usage of albumin serum as nutritional parameter of liver disease patient is still controversial. Albumin synthesis usually normal and may only decrease on last stage of disease or severe liver failure. [13,14]

Table 1. Protein Energy Malnutrition Stadium [11,12,17-19]

Examination	Normal	Slight Malnutrition	Moderate Malnutrition	Severe Malnutrition
BMI	18,5 – 25,0	17,0 – 18,4	16,0 – 16,9	< 16,0
TSF	100% standard	- 90% standard	60 – 90% standard	< 60% standard
MAC	100% standard	80 – 90% standard	60 – 80% standard	< 60% standard
MAMC	100% standard	- 90% standard	60 – 90% standar	< 60% standard
Albumin	3,5 – 4,5g/dl	2,8 – 3,4 g/dl	2,1 – 2,7 g/dl	< 2,1 g/dl
Transferin	250-300mg/dl	150 – 200 mg/dl	100 – 15 mg/dl	< 100 mg/dl
Prealbumin	15,7-29,6mg/dl	10 – 15 mg/dl	5 – 10 mg/dl	< 5 mg/dl

According to Cabre et al (1990), the albumin serum is related to mid-arm muscle circumference (MAMC).[14] And also, according to O'Keefe (1980), there is significant correlation between triceps skin-fold thickness (TSF) and hypoalbuminemia.[15]

The aim of this study is to evaluate the nutritional status of liver cirrhosis patient by using anthropometrics and biochemistry examination, i.e. ideal body weight (IBW), body mass index (BMI), triceps skin-fold thickness (TSF), mid-arm circumference (MAC), mid-arm muscle circumference (MAMC) and albumin, prealbumin and transferin serum. And also, to determine correlation between albumin, prealbumin and transferin level with anthropometrics measures in liver cirrhosis patient according to *Child-Pugh* classification.

METHODS

This study is an observational epidemiology study with selective prevalent design.[1] Study was conducted in the outpatient clinic of the Division of Gastroenterohepatology, Department of Medicine, Dr Hasan Sadikin Hospital, Bandung, on July to October 2002.

Our subjects were liver cirrhosis patients who sought treatment at the outpatient clinic in the Division of Gastroenterohepatology. Sampling was taken by order (*sampling from consecutive admissions*) from liver cirrhosis patients meeting inclusion and exclusion criteria.

Inclusion criteria for this study were outpatient with liver cirrhosis without any complication, age more than 14 years old, and willing to participate in this study. Exclusion criteria were liver cirrhosis patient with complication or other coincidence disease, i.e. upper gastrointestinal bleeding, liver encephalopathy, spontaneous bacterial peritonitis, hepatorenal syndrome and sepsis (need hospitalization care) for example bronchopneumonia, sepsis. The sample measure was determined non-statistically, because of cost consideration; it was done in 30 patients with liver cirrhosis disease.

The severity of protein energy was categorized into slight, moderate and severe stadium based on BMI, TSF, MAC and MMAC examination and albumin, prealbumin and transferin serum measurement, as seen on table 1.

In order to know the correlation between anthropometrics measures and biochemistry evaluation with *Child-Pugh* classification, Spearman correlation test was used. We used the Pearson correlation test to know determine the correlation between albumin, prealbumin and transferin levels with anthropometrics measures.[20] Every statistical calculation was done by using SPSS 10.0 (SPSS, Inc, Chicago, Illinois) software. P value < 0.05 is assumed as significant statistically.

RESULTS

The Patients' General Characteristics

The patients' age which meet inclusion and exclusion criteria was between 33-68 years old. The patient's general characteristic in keeping with variables being studied may be seen in table 2.

It appeared that for anthropometrics measures, patient's IBW range was 37.5-70.3 kg and BMI range was 14.9-28.5 with mean IBW 21.8. TSF, MAC and MAMC range were 3.0-36.0 mm, 190.0-300.0 mm and 140.3-230.8 mm respectively.

Evaluation of Nutritional Status by Anthropometrics

In figure 1, we could see that most liver cirrhosis patients indicate normal IBW, BMI and TSF. Liver cirrhosis patient with *Child-Pugh* B, 13 of 18 patients had normal IBW, 14 of 18 patients had normal BMI and 9 or 18 patients had normal TSF, while for the patient with *Child-Pugh* C, 3 of 4 patients had normal IBW, 1 of 4 patients had normal TSF and all of them had normal BMI.

Evaluation of Nutritional Status by Anthropometrics

On figure 1 we could see that most of the liver cirrhosis patients had normal IBW, BMI and TSF. Liver cirrhosis patient with *Child-Pugh* B, 13 of 18 patients

Table 2. General Characteristic of Liver Cirrhosis Patient According to The Studied Variable

Variable	Min	Max	Mean	Standard Deviation (SD)	Median
Age (years)	33,0	68,0	55,5	8,9	37,5
Measures Anthropometrics:					
- IBW	37,5	70,3	56,4	7,5	57,5
- BMI	14,9	28,5	21,8	3,2	22,2
- TSF (mm)	3,0	36,0	13,6	7,8	12,5
- MAC (mm)	190,0	300,0	243,8	28,9	240,0
- MAMC (mm)	140,3	230,8	201,2	22,0	202,7
Biochemistry value:					
- Albumin (g/dl)	2,1	4,4	3,1	0,5	3,1
- Prealbumin (g/l)	0,0	0,2	0,1	0,0	0,1
- Transferin (g/l)	0,9	2,9	1,8	0,6	1,6

P.S. IBW: ideal body weight, BMI: body mass index, TSF: triceps skin-fold thickness, MAC: mid-arm circumferencde, MAMC : mid-arm muscle circumference

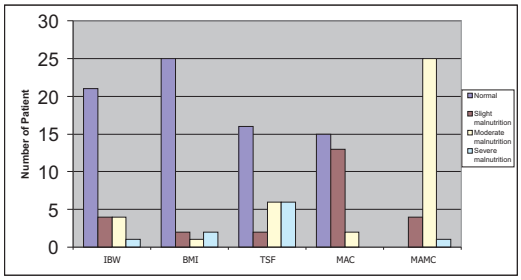

Figure 1. The Amount of Liver Cirrhosis Patient *Child-pugh* A, B and C Who Had Normal Nutritional Status, Slight, Moderate, and Severe Malnutrition by Anthropometrics

had normal IBW, 14 of 18 patients had normal BMI and 9 or 18 patients had normal TSF, while for the patient with *Child-Pugh* C, 3 of 4 patients had normal IBW, 1 of 4 patients had normal TSF and all of them had normal BMI.

The study result indicated that there was no significant correlation between anthropometrics measures (IBW, BMI, TSF, MAC and MAMC) and *Child-Pugh* score with $p > 0.01$ (table 3).

Table 3. Correlation Between Anthropometrics Measures and Child-pugh Score

Anthropometrics Measures	Spearman Correlation	Child-pugh Score
IBW	Correlation Coefficient	- 0.091
	Significant	0.631
BMI	Correlation Coefficient	0.050
	Significant	0.794
TSF	Correlation Coefficient	- 0.061
	Significant	0.748
MAC	Correlation Coefficient	- 0.113
	Significant	0.554
MAMC	Correlation Coefficient	- 0.137
	Significant	0.469

P.S. IBW: ideal body weight; BMI : body mass index; *TSF : triceps skin-fold thickness, MAC : mid-arm circumference; MAMC : mid-arm muscle circumference*

Evaluation of nutritional status by biochemistry measurement.

It appeared that by biochemistry measurement, in general patients have slight and moderate malnutrition. 7 of 30 patients indicated normal nutritional status by albumin examination while by prealbumin examination there was 1 patient and transferin were 5 patients. (figure 2).

The study result found correlation between albumin, prealbumin and transferin serum with *Child-Pugh* score by p value < 0.01 (table 4).

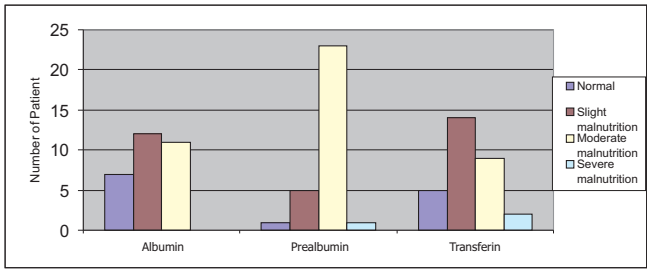

Figure 2. The Amount of Liver Cirrhosis Patient Child-pugh A, B and C Who Had Normal Nutritional Status, Slight, Moderate and Severe Malnutrition Based on Protein Transport Measurement

Table 4. Correlation Between Albumin, Prealbumin and Transferin Serum Level with The Score in Keeping with Child-pugh Classification

Protein transport measurement	Spearman correlation	Child-pugh score
Albumin	Correlation Coefficient	- 0.658
	Significant	0.000
Prealbumin	Correlation Coefficient	- 0.564
	Significant	0.001
Transferin	Correlation Coefficient	- 0.650
	Significant	0.000

Correlation Between Albumin, Prealbumin and Transferin Serum Level with Anthropometrics Measures (IBW, BMI, TSF, MAC and MAMC)

There was no correlation between albumin, prealbumin and transferin serum with IBW, BMI, TSF, MAC and MAMC by p value > 0.05 (table 5).

Tabel 5. Correlation Between Albumin, Prealbumin and Transferin Serum Level with Anthropometrics Measures

Anthropometrics measures	Albumin	Prealbumin	Transferin
IBW : - Pearson correlation	0.154	- 0.078	0.072
- Significant	0.416	0.681	0.706
BMI: - Pearson correlation	- 0.192	- 0.262	0.110
- Significant	0.308	0.161	0.562
TSF: - Pearson correlation	- 0.098	- 0.066	0.113
- Significant	0.605	0.729	0.553
MAC: - Pearson correlation	- 0.006	- 0.118	0.179
- Significant	0.977	0.534	0.345
MAMC: - Pearson correlation	0.102	- 0.082	0.109
- Significant	0.592	0.667	0.565

P.S. IBW: ideal body weight, BMI: body mass index , *TSF: triceps skin-fold thickness, MAC: mid-arm circumference, MAMC: mid-arm muscle circumference*

DISCUSSION

The patient's age in this study was appropriate to the mean age of liver cirrhosis patient in general, ranging from 30-60 years old with peak age of 40-49 years old.[21] Patients of this study consist of 18 males and 12 females, with male to female ratio 1.5 : 1. This ratio was similar to liver cirrhosis incidence that frequently found in big city hospitals in Indonesia. Male patient was more than female with ratio ranging from 1.5 – 2.1.

Ideal body weight, even it was affected by body height, it can not be used as determiner of nutritional status of liver cirrhosis patient as considered by total amount of liver cirrhosis patient of *Child-Pugh* A, B and C. Likewise BMI, which its measurement is affected by height and body weight. Decreased body weight may be used as simple way to identify malnutrition condition, but this indicator is not reliable if there was any edema that caused by hypoalbuminemi.[22] In liver cirrhosis, edema and ascites are frequently found, so we rarely could determine the real body weight measurement.

Evaluation of *TSF* will be inaccurate result if there is fluid retention. This result was not appropriate to the patient's condition, which 60% of them are liver cirrhosis patient of *Child-Pugh* B (there has been lower capacity of liver function reserve) and generally they had low nutritional status (moderate malnutrition). In malnutrition condition, TSF will decrease in about 60% patients. This condition indicates that TSF cannot be used for determining the nutritional status. Measurement of this body lipid reserve will provide better evaluation if it is done at more than one sites[2]. In this study, it was done only in one site.

We could see that in liver cirrhosis of *Child-Pugh* B and C, most of them indicated normal IBW and BMI. Liver cirrhosis patient with *Child-Pugh* B, 13 of 18 patients had normal IBW, 14 of 18 patients had normal BMI. While for the patient with *Child-Pugh* C, 3 of 4 patients had normal IBW, 1 of 4 patients had normal TSF and all of them had normal BMI. These facts indicate that IBW and BMI cannot be used to evaluate the nutritional status of liver cirrhosis patient of *Child-Pugh* B and C.

Evaluation of nutritional status by anthropometrics in liver cirrhosis patient obviously cannot be used to determine malnutrition condition. From the study result, we could see that by anthropometrics examination, the malnutrition severity in liver cirrhosis patient *Child-Pugh* A, B and C is not equal to capacity level of liver function reserve.

There was no significant correlation between anthropometrics measures and the score, with p value >0.01. Even it was not significant but there was negative tendency between IBW, TSF, MAC and MAMC with the score based on *Child-Pugh* classification. These facts indicate that the higher *Child-Pugh* score, IBW, TSF, MAC and MAMC are much lower. They were different from BMI, which had positive correlation tendency.

There was negative correlation between albumin, prealbumin and transferin serum with the score based on *Child-Pugh* classification. These visceral protein is synthesized in liver cells, so when there is any capacity decrease of liver function reserve, their synthesize will also decrease.

Analysis result using *Pearson* correlation obviously indicated that there was no correlation between albumin, prealbumin and transferin serum level with IBW, BMI, TSF, MAC and MAMC with p value >0.05. Even this correlation was not significant statistically, but there was positive tendency between transferin serum levels with anthropometrics measurement. These indicate that the higher level of transferin serum, then IBW, BMI, TSF, MAC and MAMC tend to increase. Likewise, there was positive tendency of correlation between albumin serum level with IBW and MAMC.

CONCLUSION

There was no correlation between anthropometrics measures with *Child-Pugh* score, so that anthropometrics measures cannot be used as parameter

to evaluate nutritional status of liver cirrhosis patient.

There was positive correlation between prealbumin, transferin serum levels with *Child-Pugh* score, then the prealbumin and transferin serum level may be used as parameter to evaluate nutritional status of liver cirrhosis patient.

There was no correlation between albumin, prealbumin and transferin serum level with anthropometrics measures in liver cirrhosis patient based on *Child-Pugh.*

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