



## Correlation of MIS with hsCRP, S. Prealbumin, TIBC, BMI among Patients on CAPD

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### Abstract

**Introduction:** Continuous ambulatory peritoneal dialysis (CAPD) is one of the therapeutic options at ESRD. The Malnutrition Inflammation Score (MIS) is an easy scoring system to assess the nutritional status and inflammatory condition of a patient. It includes 7 components of the subjective global assessment, body mass index, and serum albumin and transferrin concentrations. Aim of the study: To see the correlation of MIS with hs-CRP, S. Prealbumin, TIBC, and BMI among patients on CAPD. **Material & Methods:** This cross-sectional study was conducted at the Department of Nephrology of National Institute of Kidney Diseases and Urology. A total of 69 patients were included for the study during July 2018 to Jun 2019. Purposive sampling technique was used. Statistical analysis of the results was done by using computer based statistical software, SPSS (SPSS Inc, Chicago, IL, USA). Prior to the commencement of the study, the thesis protocol was approved by the ethical committee of NIKDU, Dhaka. **Results:** Out of 69 patients 39 were male (56.5%) and 30 were female (43.5%). Mean age of patients is  $58.3 \pm 13.7$  years. Mean BMI is ( $\text{kg}/\text{m}^2$ )  $26.1 \pm 4.0$ . Mean prealbumin was  $0.30 \pm 0.11$  ( $\text{ng}/\text{ml}$ ). Mean TIBC was  $165.8 \pm 59.5$ . Mean CRP was  $23.73 \pm 26.67$ . Mean Duration of dialysis is  $9.75 \pm 14.7$ . S-albumin, S-prealbumin, BMI & TIBC were significantly lower in patients with Malnutrition Inflammation Score  $>5$ . CRP was found higher in patients with MIS  $>5$ . **Conclusion:** According to the study findings, S. Prealbumin, BMI and TIBC were significantly lower in patients with higher Malnutrition Inflammation Score ( $>5$ ). CRP was significantly higher in patients with high MIS.

**Keywords:** CAPD, Peritoneal Dialysis, MIS, Prealbumin, TIBC, hs CRP.

## INTRODUCTION

Continuous ambulatory peritoneal dialysis (CAPD) is one of the therapeutic options at ESRD. Despite potential advantages, Peritoneal Dialysis is an underutilized modality in low and middle income countries. CAPD is the treatment used for approximately 11% of the world's dialysis population.<sup>[1]</sup> Bangladesh has a PD penetration of fewer than 2% of prevalent patients.<sup>[2]</sup> Because of its relative simplicity, patient freedom, lower cost and better preservation of RRF, CAPD utilization is gradually increasing in the developing countries.<sup>[1]</sup>

Patients treated with chronic peritoneal dialysis (PD) are often malnourished, as evidenced by low visceral protein levels, decreased anthropometric measurements and low scores of subjective global assessments.<sup>[3]</sup> There are several markers that can be measured to gauge the level of inflammatory burden, such as C-reactive protein (CRP). CRP level can rise rapidly and markedly in response to acute inflammatory stimulus from increased synthesis by hepatocytes to contribute to host defense and innate immune response.<sup>[4]</sup> Prealbumin has been shown to be a more sensitive index of the nutritional state, because of its shorter (2 vs 20 days for albumin) half-life. The limitation of prealbumin as a nutritional marker is the same of albumin, as it can also be decreased during inflammatory status, because it is a negative acute phase reactant.<sup>[5]</sup> The MIS was created using the seven components of the conventional SGA and combining them with three new elements: body mass index (BMI), serum albumin, and total iron-binding capacity (TIBC) to represent serum transferrin.<sup>[6]</sup> The MIS consists of four sections: nutritional history, physical examination, BMI, and laboratory values. Each of the 10 components has 4 levels of severity, from 0 (normal) to 3 (severely

malnourished). The sum of the 10 components varies between 0 and 30. A higher score reflects a more severe degree of malnutrition and inflammation. The history section in MIS includes the above-mentioned five components of SGA.<sup>[6]</sup> Malnutrition and its recognition has assumed increasing importance in management of dialysis patients.<sup>[7]</sup> Malnutrition has an important clinical implication because it is well-known that malnutrition is a powerful predictor of morbidity and mortality.<sup>[8,9]</sup> Several epidemiological studies have consistently shown strong association between clinical outcomes and measures of both malnutrition,<sup>[6,10]</sup> and inflammation,<sup>[11]</sup> in dialysis patients. Moreover, these two conditions tend to occur concurrently and coexist in individuals with end-stage renal disease and lead to adverse consequences such as death.<sup>[12]</sup> In Bangladesh periodic nutritional assessment of patients on CAPD is seldom carried out. Regular assessment of nutritional status and inflammatory condition may reduce mortality and morbidity and bring long-term better outcome. There are very few studies related to CAPD patients. This study has shown nutritional status of CAPD patients and inflammatory condition which can be assessed simply by using malnutrition inflammation score and correlation of MIS with hsCRP, S. Prealbumin, TIBC, BMI.

## MATERIALS & METHODS

This cross sectional study was conducted at the Department of Nephrology of National Institute of Kidney Diseases and Urology. A total of 69 patients were included for the study according to following inclusion and exclusion criteria during July 2018 to Jun 2019. Purposive sampling technique was used. Change in end dialysis dry weight was

measured after drainage of total effluent when the peritoneal cavity is empty then from previous records of body weight in last 3-6 months, weight change was calculated. Physical examination of decreased fatstores/loss of subcutaneous fat (bellow eye, BSF, TSF, chest) was performed by clinical examination and skinfold thickness measurement of BSF, TSF, Subscapular, Suprailiac, by trained nutritionist using Harpenden skin caliper. Mid-arm circumference was measured by using a flexible, non-stretchable, measuring tape. BMI was calculated using weight (in kilograms) / height (in meters)<sup>2</sup> formula. MIS includes S. albumin and S. TIBC both of which were related to inflammation and malnutrition. Statistical analysis of the results was done by using computer based statistical software, SPSS (SPSS Inc, Chicago, IL, USA). Prior to the commencement of the study, the thesis protocol was approved by the ethical committee of NIKDU, Dhaka.

**Inclusion Criteria:**

- Age group ≥ 18years.
- ESRD patients on CAPD for ≥ 1month.

**Exclusion Criteria:**

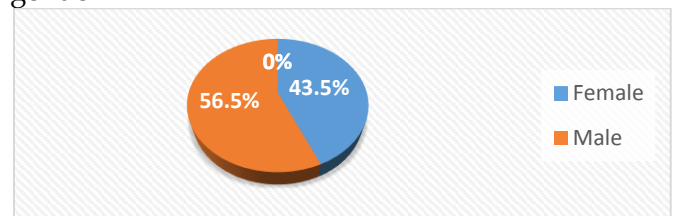
- Episodes of peritonitis in earlier 1month.
- Patient with cognitive impairment.
- Terminally ill patients.

**RESULTS**

Out of 69 patients 39 were male (56.5%) and 30 were female (43.5%) (Figure I). Mean age of patients is 58.3 ± 13.7 years. Mean BMI is (kg/m<sup>2</sup>) 26.1 ± 4.0. Mean Systolic BP is 140 ± 21 (mmHg). Mean Diastolic BP is 83 ± 11 (mmHg). Mean is MAC 25.94 ± 3.99. Mean Biceps skinfold thickness is 3.83 ± 2.62. Mean Triceps skin fold thickness is 9.74 ± 5.14. Mean

Duration of dialysis is 9.75 ± 14.7 (Table I). Mean Hb of Patients were 9.48 ± 1.77 (g/dl). Mean S Creatinine was 9.32 ± 3.94 (mg/dl). Mean CRP was 23.73 ± 26.67. Mean Albumin was 3.11 ± 0.60 (mg/dl). Mean prealbumin was 0.30 ± 0.11 (ng/ml). Mean TIBC was 165.8 ± 59.5 (Table II). S-albumin & S-prealbumin was significantly lower in patients with higher MIS- score (>5) (Table III). Mean age of patients is 58.3 ± 13.7 years. Mean BMI is 26.1 ± 4.0 (kg/m<sup>2</sup>). Mean MAC is 25.94 ± 3.99. Mean Bicep is 3.83 ± 2.62. Mean Triceps 9.74 ± 5.14. Mean Duration of dialysis is 9.75 ± 14.7 (Table IV). Out of 69 patients 49.3% were diabetic, 30.4% had GN, 15.2% had HTN & 2.9% had OU & 1.4% had PKD (Figure II). Table V shows BMI, albumin, prealbumin, TIBC has significant negative correlation with MIS and CRP has significant positive correlation to MIS.

**Figure I:** Distribution of the patients according to gender



**Table I:** Demographic profile of the patients (N=69)

Variables	Mean ± SD	Min - max
Age (year)	58.3 ± 13.7	19 - 89
BMI (kg/m <sup>2</sup> )	26.1 ± 4.0	14.4 - 35.0
Systolic BP (mmHg)	140 ± 21	100 - 180
Diastolic BP (mmHg)	83 ± 11	40 - 110
MAC	25.94 ± 3.99	11.00 - 32.00
Bicep	3.83 ± 2.62	1.10 - 12.70
Tricep	9.74 ± 5.14	1.50 - 25.20

Duration of dialysis	9.75 ± 14.7	0.5 - 88
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CRP	14.36 ± 11.66	26.33 ± 29.07	0.125
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**Table II:** Biochemical parameters of the patients (N=69)

Variables	Mean ± SD	Min - max
Hb (g/dl)	9.48 ± 1.77	6.00 - 14.30
S Creatinine (mg/dl)	9.32 ± 3.94	4.03 - 23.17
CRP	23.73 ± 26.67	0.79 - 142.00
TIBC	165.8 ± 59.5	24 - 298
Pre Albumin (mg/dl)	0.30 ± 0.11	0.04 - 0.54

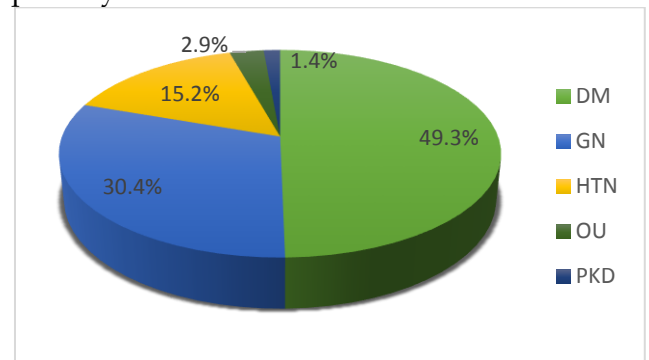
**Table III:** Demographic & Biochemical parameters among well-nourished & malnourished CAPD patients.

Variables	MIS score <5 (n=15) Mean ± SD	MIS score ≥5 (n=54) Mean ± SD	p-value
Age (year)	52.73 ± 14.48	59.85 ± 13.28	0.076
BMI (kg/m <sup>2</sup> )	27.79 ± 4.21	25.65 ± 3.87	0.067
Systolic BP (mmHg)	134.67 ± 15.06	141.51 ± 22.22	0.267
Diastolic BP (mmHg)	76.67 ± 13.97	84.81 ± 9.90	0.013
MAC	27.43 ± 2.40	25.53 ± 4.25	0.102
Bicep	3.92 ± 1.57	3.80 ± 2.86	0.877
Tricep	10.50 ± 3.26	9.53 ± 5.56	0.523
Duration of dialysis	10.73 ± 10.37	9.46 ± 15.82	0.771
Albumin	3.74 ± 0.41	2.94 ± 0.52	<0.001
Serum pre albumin (mg/dl)	0.39 ± 0.10	0.28 ± 0.10	0.001

**Table IV:** Comparison between demographic Profile of male & female

Variables	Total (N=69)	Male (n=39)	Female (n=30)	p-value
Age (year)	58.3 ± 13.7	61.10 ± 15.82	54.67 ± 9.59	0.053
BMI (kg/m <sup>2</sup> )	26.1 ± 4.0	25.73 ± 3.32	26.62 ± 4.79	0.366
Systolic BP (mmHg)	140 ± 21	140.00 ± 23.37	140.00 ± 17.81	1.000
Diastolic BP (mmHg)	83 ± 11	83.03 ± 11.60	83.00 ± 11.19	0.993
MAC	25.94 ± 3.99	25.85 ± 3.21	26.07 ± 4.88	0.822
Bicep	3.83 ± 2.62	3.21 ± 1.70	4.66 ± 3.36	0.002
Tricep	9.74 ± 5.14	9.11 ± 4.15	10.56 ± 6.18	0.248
Duration of dialysis	9.75 ± 14.7	9.21 ± 12.50	10.48 ± 17.48	0.731

**Figure II:** Distribution of the patients according to primary disease



**Table V:** Correlation of MIS score with BMI, Albumin, TIBC, Prealbumin, CRP and nPCR(N=69)

Variables	r value	p value
BMI	-0.487	<0.001
Albumin	-0.447	<0.001
TIBC	-0.600	<0.001
Prealbumin	-0.591	<0.001
CRP	0.322	<0.001

Pearson's correlation was done



## DISCUSSION

In this study, among 69 patients 56.5% were male & 43.5% were female. Which indicates, the male patients are predominately receiving CAPD. Singh et al,<sup>[13]</sup> also found male predominance. In that study, among 90 patients 51% was male and 49% was female. Mean age of patients in this study was 58.3 ± 13.7. In the study of Prasad et al,<sup>[14]</sup> mean age was 50.00±13.8 which is consistent with our study. Afsaretal,<sup>[15]</sup> study showed mean BMI of patients was 25.4 ± 4.8. Prasad et al,<sup>[14]</sup> study showed mean BMI of patients was 21.8 ± 5.2. Different variables were compared between nourished and malnourished patients like age, BMI, MAC, biceps skin fold thickness, triceps skin fold thickness, duration of dialysis, S. albumin, prealbumin, CRP, out of which albumin and prealbumin showed significant difference. All the variables were compared between male and female. Biceps skin fold thickness was also low in female patients.

In this study, BMI showed significant negative correlation with MIS which is consistent with Singh et al.<sup>[13]</sup> We found negative correlation with MIS & S. albumin. Singh et al and Afsar et al studies also showed similar negative correlation.<sup>[13,15]</sup> S. prealbumin, similar to albumin is the negative acute-phase protein that reflects presence of ongoing or resolving inflammatory condition that may influence the patient's nutritional stage and ultimately, mortality risk. In our study we found negative correlation between MIS and S. prealbumin. Afsar et al,<sup>[15]</sup> also showed similar result. S. TIBC showed significant negative correlation with MIS. Singh et al & Afsar et al studies also found significant negative correlation between TIBC and MIS.<sup>[13,15]</sup> CRP, which is an inflammatory marker showed significant positive correlation with MIS. Afsaret al,<sup>[15]</sup> also found the similar result but Singh et al,<sup>[13]</sup> found negative correlation. In this present

study, we explored the possible cut-off score of defining malnutrition with MIS. MIS score of <5 obtained for all patients indicated normal nutrition status whilst scores of ≥ 5 indicated presence of malnutrition. Singh et al,<sup>[13]</sup> also showed MIS cut- off score ≥5, which indicates presence of malnutrition in all patients. Singh, etal,<sup>[13]</sup> study showed primary cause of CKD was unknown in 41% of patients, followed by DM 33%, HTN 11%, others 14%. But in our study, primary disease was DM in 49.3% cases followed by GN 30.4%, HTN 15.9% and OU 2.9% cases. So there are more diabetic patients who developed CKD & ESRD and underwent to CAPD. Even percentage of GN is also higher as primary disease. Malnutrition inflammation score was higher among CAPD patients in our country. There was also significant negative correlation of albumin, prealbumin, BMI and TIBC with MIS. hsCRP had significant positive correlation with MIS. So MIS can be used as a useful tool to detect malnutrition and inflammatory condition among CAPD patients.

### Limitations of the study:

The sample size of participants was relatively small. The present study was conducted at a short period of time.

## CONCLUSION

According to the study findings, S. Prealbumin, BMI and TIBC were significantly lower in patients with higher Malnutrition Inflammation Score (>5). CRP was significantly higher in patients with high MIS. Further studies can be done over large number of CAPD patients. Home visit study should be carried out.

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