

## Original Article

# Nutritional Assessment Using Modified SGA Score and Its Correlation with Biochemical Profile Among Maintenance Hemodialysis Patients: A Cross Sectional Study at Multiple Hemodialysis Centers in Dhaka

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### Abstract:

Patients on maintenance hemodialysis are vulnerable to multitude of health-related issues, malnutrition being one of them. It is a key predictive factor for morbidity and mortality among patients on maintenance hemodialysis. The primary objective of the study was to assess the severity of malnutrition in patients undergoing maintenance hemodialysis, using modified subjective global assessment score and correlate it with biochemical parameters like blood hemoglobin, serum creatinine, serum albumin, serum pre-albumin, serum triglyceride and serum total cholesterol. Cross-sectional study from July 2016 to June 2017 was conducted at hemodialysis unit of SSMC & MH, BSMMU, BIRDEM hospital and NIKDU, Dhaka, among 80 maintenance hemodialysis patients. Adult patients over the age of 18 years and on regular ( $\geq 2$  sessions per week) hemodialysis for more than 3 months without any acute infection were enrolled. Nutritional status of the patients was evaluated using modified subjective global assessment score and compared with biochemical parameters for any correlation between them. Based on the modified SGA scores, of the 80 patients, 10% were well nourished and the rest were mildly malnourished, showing a high degree of malnutrition among respondents. There was strong positive correlation between modified subjective global assessment score and age. Modified SGA score also showed statistically significant negative correlation with serum creatinine, serum albumin and serum pre-albumin. Data obtained from this study confirm that modified subjective global assessment score can be used as a reliable index for identifying patients at risk for malnutrition and it correlates well with some of the biochemical profile.

**Key words:** Hemodialysis, Biochemical profile, Malnutrition.

### Introduction:

Malnutrition is one of the leading causes of mortality and morbidity among patients under maintenance hemodialysis<sup>1,2</sup>. Factors such as inadequate food intake, anorexia caused by uremic state, altered taste sensation, concurrent illness, emotional distress, impaired ability to procure, prepare or mechanically digest foods,

unpalatable prescribed diets, the catabolic response to superimposed illness, as well as the dialysis procedure itself by removing nutrients and promoting protein catabolism were found to be responsible for malnutrition<sup>3</sup>. Maintaining proper nutritional status can drastically improve outcome of the treatment leading to reduced duration and cost of treatment among patients under maintenance hemodialysis, as such patients are in constant need of nutritional support and are most vulnerable to malnutrition<sup>4-8</sup>. Although nutritional support has been proven to be a key factor in patient recovery, assessment for nutritional status is often ignored and overlooked in many dialysis centers<sup>9-12</sup>.

Multitude of scales have been developed to measure the nutritional status of the patients, but not all are easily assessable in hospital setup<sup>13-15</sup>. Although anthropometric parameters such as body mass index (BMI), skin fold thickness, mid arm circumference (MAC) and mid arm muscle circumference (MAMC) have been widely in use as metrics for nutritional status, their practicality in assessing severe protein energy malnutrition among hemodialysis patients have not been convincing, leading to the needs for developing newer and more assessable scales to measure malnutrition among hemodialysis patients<sup>16,17</sup>.

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Subjective global assessment (SGA) score is a well-validated screening tool recommended by the American Society for Parenteral and Enteral Nutrition (ASPEN) for nutritional screening determined by medical history on seven items and clinical findings on four items<sup>18-21</sup>. Using components of conventional SGA, in 1999, Kalantar-Zadeh et al presented a version of the SGA that was originally referred to as modified quantitative SGA<sup>1</sup>. This fully quantitative version of SGA used the 7 original SGA components and created a quantitative 5-point scale with 1 as normal and 5 as very severe malnutrition. The final score was the total sum of all 7 components. Total range was from 7 (normal) to 35 (severely malnourished). SGA is mostly examiner dependent, fully quantitative, performed in few minutes, reproducible and definitely determines the nutritional status of hemodialysis patients. SGA gives a global score of protein energy nutritional status. Disadvantages of this method include the fact that visceral protein levels are not included in the assessment; it is focused on nutrient intake and body composition<sup>19</sup>. It seems that modified SGA is superior to conventional SGA and more suitable to detect the changing trend of nutritional status<sup>22,23</sup>.

In Bangladesh, there is a high prevalence of malnutrition among patients with end stage renal disease (ESRD) and the calorie and protein intake of these patients are poor<sup>24</sup>. Modified subjective global assessment (SGA) is a simple and dynamic tool to assess malnutrition and its use among Bangladeshi maintenance hemodialysis patients has not been much explored. This study was carried out to assess the nutritional status of patients on maintenance hemodialysis using modified SGA score and to correlate it with biochemical profile of the patients.

**Materials and Methods:**

This was a cross-sectional study conducted from July 2016 to June 2017 at hemodialysis unit of SSMC & MH, BSMMU, BIRDEM hospital and NIKDU, Dhaka, among 80 maintenance hemodialysis patients. Adult patients over the age of 18 years and on regular (≥2 sessions per week) hemodialysis for more than 3 months without any acute infection were enrolled.

The SGA form had clinicians score 5 components of a medical history (i.e., weight change, dietary intake, gastrointestinal symptoms, functional capacity, metabolic demands in view of underlying disease state) and 2 components of a brief physical examination (signs of fat and muscle wasting, nutrition associated alterations in fluid balance). The patient was then assigned a rating of well nourished, moderately malnourished, or severely malnourished. In this study subjective global assessment was performed by using 7 point modified SGA scale.

Biochemical profile of the subjects was recorded. Serum albumin and prealbumin were measured by using fully automated chemistry analyzer Mindray-BS-230. Serum creatinine was determined by alkaline picrate method (Jaffe reaction). Serum total cholesterol and triglyceride were measured by enzymatic colorimetric methods in the laboratory. Adequacy of hemodialysis was measured by Kt/V using formula:

Kt/V: Calculated as follows<sup>25</sup>  
 $Kt/V \text{ urea} = 4 \times \{(\text{pre} - \text{post})/\text{pre}\} - 1.2$

Data was collected through face-to-face interview using a pre-tested data collection sheet. Before preceding the data collection, the detail of the study was explained to each eligible patient and written consent from the patient was obtained. The relevant socio-demographic data along with biochemical data of the patients were collected and recorded. Computer based statistical analysis were carried out with appropriate techniques and systems. Quantitative data were expressed as mean and standard deviation and qualitative data were expressed as frequency distribution and percentage. Statistical analysis was performed by using Statistical Packages for Social Sciences (SPSS version 22) for Windows.

**Results:**

A total of 80 patients, 53 males (66.3%) with the mean age of 51.87±16.51 years and 27 females (33.8 %) with the mean age of 52.30±12.19 years, with an overall mean age of 52.01±15.11 years undergoing maintenance hemodialysis were enrolled in the study. Majority (27.5%) of the respondents were from age group 61 to 70 years. The co-morbidities of study population were found to be diabetes in 33(41.3%) patients, glomerulonephritis in 6(7.5%) patients and hypertension in 3(3.8%) patients. Modified SGA was used for assessing the malnutrition in the study population. A score up to 7 was considered normal and 8-20 was considered mild malnutrition with score 21-34 as moderate malnutrition and score of 35 to be severe malnutrition.

**Table-I:** Nutritional status of the study population according to modified SGA score

Nutritional Status	No. of patients (N=80)				Total	Score	
	Male (n=53)		Female (n=27)				
	n	%	n	%	n	%	
Normal (<8)	6	7.5	2	2.5	8	10	7.0±0.0
Mild (8 - 20)	47	58.75	25	31.25	72	90	12.7±2.6

Based on the modified SGA scoring method, 10% patients were in normal nutritional status with a mean modified SGA score of 7.0 and 90% had mild malnutrition with mean modified SGA score of  $12.7 \pm 2.6$  (Table-I). The quantitative malnutrition scores were not significantly different between men and women suggesting that both men and women had equal tendency towards malnutrition. Although 25% of the well-nourished patients and 50% of the patients with mild malnutrition had other co-morbidities and this difference was found to be statistically not significant ( $p = 0.179$ ).

**Table-II:** Distribution of study population according to age and dialysis treatment adequacy in relation to modified SGA score

Parameters	Mean±SD		Pearson correlation with modified SGA score	
	Male (n=53)	Female (n=27)	r	p value
Age	51.87 ± 16.51	52.30 ± 12.19	0.237	0.035*
Kt/V	1.03 ± 0.54	0.9294 ± 0.26	-0.066	0.559

Modified SGA - modified subjective global assessment score; Kt/V - dialysis treatment adequacy; \*p value of  $\leq 0.05$  was considered statistically significant.

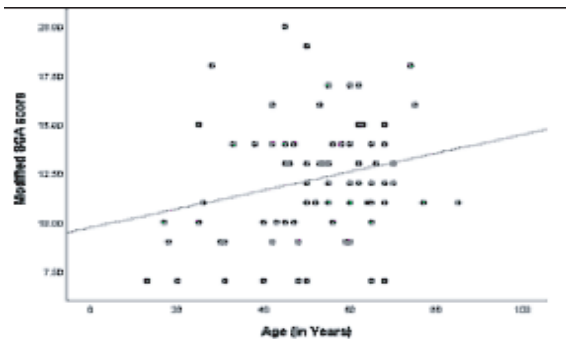
Mean Age for the respondents was found to have statistically significant positive correlation with modified SGA score ( $r = 0.237$ ;  $P = 0.035$ ) (Table-II & Fig 1a). Dialysis treatment adequacy showed negative but statistically not significant ( $r = -0.066$ ;  $P = 0.559$ ) correlation with modified SGA score.

**Table-III:** Distribution of study population according to biochemical profile in relation to modified SGA score

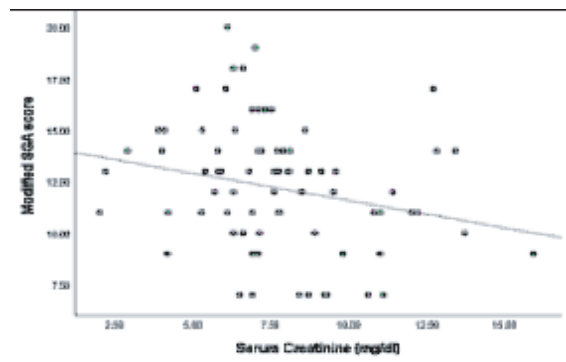
Parameters	Mean±SD		Pearson correlation with modified SGA score	
	Male (n=53)	Female (n=27)	r	p value
Hemoglobin (gm/dl)	8.62 ± 1.41	8.63 ± 1.48	0.018	0.872
Serum creatinine (mg/dl)	7.81 ± 2.85	7.33 ± 2.09	0.229	0.041*
Serum albumin (gm/dl)	3.71 ± 0.58	3.78 ± 0.56	0.347	0.002*
Serum pre albumin (mg/dl)	29.17 ± 11.84	25.25 ± 12.82	0.256	0.022*
Triglyceride (mg/dl)	151.94 ± 70.03	164.52 ± 104.50	0.011	0.919
Cholesterol (mg/dl)	147.94 ± 29.33	152.67 ± 52.89	0.029	0.796

Modified SGA - modified subjective global assessment score; \*p value of  $\leq 0.05$  was considered statistically significant.

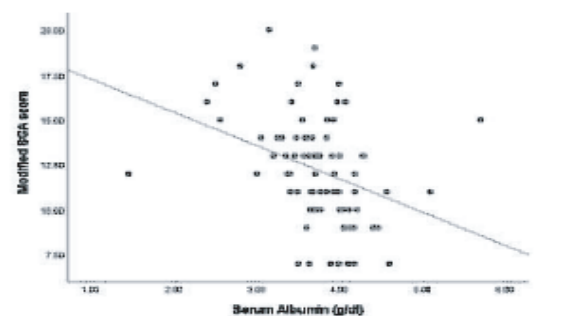
Mean blood hemoglobin for men was found to be  $8.62 \pm 1.41$  gm/dl and  $8.63 \pm 1.48$  gm/dl for women with a negative correlation ( $r = -0.018$ ;  $p = 0.872$ ) with modified SGA score (Table-III). Mean serum creatinine was  $7.81 \pm 2.85$  mg/dl for men and  $7.33 \pm 2.09$  mg/dl for women with a statistically significant negative correlation ( $r = -0.229$ ;  $p = 0.041$ ) with modified SGA score (Figure 1b). Mean serum albumin and serum pre-albumin also showed significant negative correlation with modified SGA score;  $r = -0.347$ ;  $p = 0.002$  and  $r = -0.256$ ;  $p = 0.022$  respectively (Figure 1c & 1d). Serum triglyceride and cholesterol were also measured and both were found to have weak positive correlation with modified SGA score;  $r = 0.011$ ;  $p = 0.919$  and  $r = 0.029$ ;  $p = 0.796$  respectively.



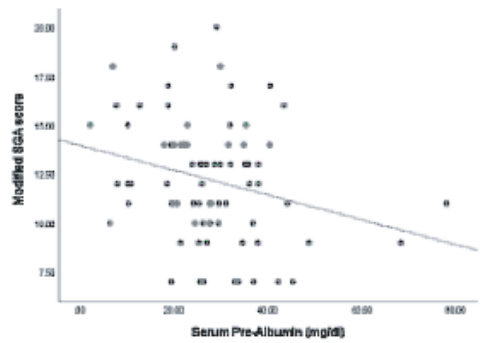
**Fig 1a:** Correlation between age and modified SGA score ( $r = 0.237$ ;  $p = 0.035$ )



**Fig 1b:** Correlation between serum creatinine and modified SGA score ( $r = -0.229$ ;  $p = 0.041$ )



**Fig 1c:** Correlation between serum albumin (g/dl) and modified SGA score ( $r = -0.347$ ;  $p = 0.002$ )



**Fig 1d:** Correlation between serum pre-albumin and modified SGA score ( $r = -0.256$ ;  $p = 0.022$ )

**Figure 1: Correlation of biochemical profile with modified SGA score**

Study population was grouped together into well-nourished and with mild malnutrition based on the modified SGA score and distributed by blood hemoglobin, serum creatinine, serum albumin, serum pre-albumin, serum triglyceride and serum total cholesterol (Table-IV). Differences between the mean values for these biochemical profiles were measured and compared between patients who were well-nourished and who were with mild malnutrition. No statistically significant difference between the mean values for well-nourished patients and patients with mild malnutrition were found.

**Table-IV:** Biochemical parameters among malnourished and well-nourished patients on the basis of modified SGA

Parameters	Nutritional status		p value
	Well-nourished (Modified SGA Score < 8) (n=8)	Malnourished (Modified SGA Score 8–20) (n=72)	
Hemoglobin (gm/dl)	7.95 ± 1.62	8.69 ± 1.39	0.161
Serum creatinine (mg/dl)	8.84 ± 1.60	7.52 ± 2.68	0.177
Serum albumin (gm/dl)	3.98 ± 0.34	3.71 ± 0.58	0.196
Serum pre-Albumin (mg/dl)	32.84 ± 8.74	27.29 ± 12.49	0.226
Triglyceride (mg/dl)	128.00 ± 34.56	159.32 ± 86.10	0.313
Cholesterol (mg/dl)	146.13 ± 23.97	149.92 ± 40.02	0.794

Independent sample t-test was done to measure the level of significance

**Discussion:**

Malnutrition is a frequent complication which affects quality of life and is associated with increased risk of mortality and morbidity in maintenance hemodialysis patients<sup>4,5</sup>. Compounding factors for malnutrition in hemodialysis patients are numerous. Nevertheless, the nutritional status of dialysis patients is frequently ignored. Most indicators, especially biochemical parameters like blood hemoglobin, serum creatinine, serum albumin, serum pre-albumin, serum triglyceride and total serum cholesterol are useful in identifying high risk patients with malnutrition. They do not necessarily correlate with changes in other parameters and can be influenced by non-nutritional factors.

This cross-sectional study was carried out with the aim to examine different approaches for the estimation of malnutrition among patients on maintenance hemodialysis. The purpose of assessing malnutrition is to identify patients at risk for complications and poor outcome. In this study, it was observed that main primary renal disease was diabetes mellitus (41.3%) which is consistent with prior study at India, where diabetes was found to be the most common disease among dialysis patients<sup>26</sup>. Diabetes patients are more malnourished because they have food restriction; majority patients of present study are diabetic, so prevalence of malnutrition is more in this study<sup>27</sup>.

A total of 80 MHD patients were present in this study. Most of the patients were above 50 years of age. Old age might also have contributed to the poor nutritional status of the majority of patients (90%), because in old age physical and financial ability declines which are essential for food arrangement<sup>28</sup>. SGA score is an easy and reliable tool that has been validated prospectively to determine nutritional status and predict the degree of "sickness"<sup>29</sup>. In this study the nutritional status was measured by modified SGA score. In present study, according to modified SGA, 10% patients were well nourished and 90% were mildly malnourished. This finding is nearly similar to findings in India<sup>30</sup>. Using modified SGA, malnutrition rate was 91% among 66 patients undergoing hemodialysis in that study. In present study it was also found that modified SGA score < 8 has significant lower rate of morbidity ( $p = 0.179$ ), suggesting modified SGA as a reliable prognostic indicator. Other studies have also shown that modified SGA not only determines the nutritional status, but also predicts the likelihood of complications in terms of sickness<sup>31-33</sup>.

In this study modified SGA score showed a positive correlation with age, serum triglyceride and serum total cholesterol, indicating that nutritional status of patients under maintenance hemodialysis decreases with

increased age, serum triglyceride and serum total cholesterol level. A study among Nepalese hemodialysis patients showed SGA score to have negative correlation with serum triglyceride and serum total cholesterol<sup>34</sup>, which could be contributed to the difference in sample size and the biological characteristics of the study population. Although there has been study supporting our findings that SGA score has a positive correlation with age<sup>1</sup>. Various other studies have also shown that nutritional status is correlated with age<sup>5,11,12</sup>.

Present study found negative correlation between modified SGA score and hemoglobin. Statistically significant negative correlation with modified SGA score was found for serum creatinine, serum albumin and serum pre-albumin, which is supported by findings from previous study conducted among hemodialysis patients<sup>30,37,38</sup>. Present study did not find any statistically significant difference for the mean values of hemoglobin, serum creatinine, serum albumin, serum pre-albumin, serum triglyceride and serum total cholesterol, which is also consistent with findings from previous study<sup>30</sup>.

This observational study was conducted to assess the malnutrition in maintenance hemodialysis patients using modified SGA score and to find the correlation of this method with biochemical profile. Modified SGA score showed significant correlation with serum creatinine, serum albumin and serum pre-albumin. Nutritional status estimation found that majority of the patients was mildly malnourished. Malnutrition proves to be an important complication in chronic renal failure.

### Conclusion:

Modified SGA score is a reliable tool for detecting malnutrition among patients on hemodialysis and has the potential to be used as a screening tool for screening. Biochemical tests like serum creatinine, albumin and pre-albumin also showed significant correlation with modified SGA score and can be used as an easy and low-cost method to quickly detect and predict malnutrition among patients. However more comparative and longitudinal studies are needed to confirm the validity of this nutrition scoring system among Bangladeshi population.

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