Malnutrition-Inflammation Score Associated with Atherosclerosis, Inflammation and Short-Term Outcome in Hemodialysis Patients

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Background: *Malnutrition-Inflammation Score (MIS) has been proposed as a new quantitative system for assessment of malnutrition and inflammation, which are common important risk factors for increased morbidity and mortality in maintenance hemodialysis (MHD) patients.*
Objective: *To determine the MIS and related it to the presence of atherosclerosis, and the morbidity and mortality rate.*
Material and Method: *The inflammatory and nutritional status in 100 MHD patients was evaluated by serum high-sensitivity C-reactive protein (hs-CRP), Subjective Global Assessment (SGA), and MIS. Atherosclerosis was defined by a history of cardiovascular disease or presence of carotid plaque by B-mode ultrasonography. Twelve-month prospective hospitalization and mortality rates were recorded.*
Results: *The MIS score was significantly higher in patients with atherosclerosis (5.5 $\pm$ 2.3 vs. 3.0 $\pm$ 1.7, p = 0.003) and modestly correlated with serum ferritin level (r = 0.304, p = 0.03), but did not correlated with hs-CRP. The SGA was not associated with hs-CRP level and atherosclerosis. Over a 12-month follow-up period, 4 patients died and 28 were hospitalized at least once. Compared to the survivor group, MIS in the deceased group was significantly higher (8.0 $\pm$ 1.4 vs. 5.1 $\pm$ 2.3, p = 0.01) while SGA, hs-CRP and other biochemical markers were not significantly different. The Receiver Operating Characteristics Curves for the prediction of 1-year mortality from the MIS score identified the optimal cut-off value of 7.5 with sensitivity of 75% and specificity of 88%. There was no association between MIS or SGA and hospitalization.*
Conclusion: *MIS is a useful tool for the assessment of malnutrition and inflammatory status. It is superior to the conventional SGA as a predictor of short-term outcome in MHD patients.*

Keywords: *Malnutrition-Inflammation Score, Subjective Global Assessment, Atherosclerosis, Morbidity and Mortality rate, Nutritional status*

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Although there have been many recent advances in dialysis technologies and new knowledge in dialysis patient care, the morbidity and mortality rate of maintenance hemodialysis (MHD) patients remains unacceptably high[1-3]. Cardiovascular disease (CVD) is the most common cause of death that accounting for more than 50% of all deaths, followed by infection (approximately 15%)[1,2]. Several risk factors for this high mortality rate have been identified including advanced age, hypertension, cardiovascular disease, diabetes mellitus (DM), abnormal lipid metabolism, anemia, hyperhomocysteinemia, abnormal calcium/phosphate metabolism, and malnutrition. Recently, oxidative stress and inflammation have been well-established as important non-traditional risk factors that associated with

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the high cardiovascular morbidity and mortality rate. Malnutrition, inflammation and atherosclerosis are common findings in MHD patients and have been referred together as 'malnutrition-inflammation-atherosclerosis' (MIA syndrome) to denote the important contribution of malnutrition and inflammation to atherosclerotic cardiovascular diseases[4-8] and high mortality rate[7,9-16]. There are several subjective methods for assessment of nutritional status in dialysis patient including biochemical markers (such as serum albumin, prealbumin, and retinol binding protein), anthropometric measurement, protein catabolic rate, body composition analysis, and continuous decline in dry weight. However, biochemical markers (such as serum albumin) and anthropometric methods, whose value in epidemiological research is well-established, have some limitations when applied to the diagnosis of malnutrition in individual patients. Conventional Subjective Global Assessment (SGA), a semiquantitative scoring system based on history and physical examination, is the most common method using in clinical practice to assess nutritional status. It is a simple and reliable tool, and has been validated in dialysis patients. Recently, Malnutrition-Inflammation Score (MIS) has been proposed as a new quantitative system for assessment of malnutrition and inflammation in MHD patients that showed significant strong correlations with prospective hospitalization and mortality[17]. The objective of the present study was to evaluate malnutrition and inflammation in Thai MHD patients by using MIS and relating it to inflammatory marker, the presence of atherosclerosis, and the morbidity and mortality rate.

Material and Method

Patients

Patients undergoing maintenance hemodialysis at Siriraj Hospital for at least 3 months and aged 18 years or older were enrolled in the study. Exclusion criteria were patients who had malignancy or severe infection or vascular access at both arms that precluded the anthropometric measurement. One hundred patients (42 men, 58 women) agreed to enroll in the study. The study was approved by the institutional Ethic Review Board, and written informed consent was obtained from all participants.

Data collection

Baseline characteristics data such as age, sex, body weight, height, smoking status, underlying diseases, vintage, hemodialysis times and hours per week, adequacy of hemodialysis (Kt/V), normalized protein catabolic rate (n-PCR), changes of dry weight in last 3-6 months, appetite, gastrointestinal symptoms, and physical activity were recorded. Clinical data of underlying renal condition, presence of CVD and other comorbid conditions were obtained by chart review. Physical examination was performed to verify the evidences of CVD. Atherosclerosis of carotid arteries was evaluated by using B-mode ultrasonography. Prehemodialysis laboratory parameters were measured for complete blood count, blood urea nitrogen (BUN), creatinine, fasting blood sugar, electrolyte, lipid profile (cholesterol, triglyceride, HDL, LDL-c), calcium (Ca), phosphorus (P), intact-parathyroid hormone (i-PTH), total iron binding capacity (TIBC), albumin, and ferritin. Serum high sensitivity C-reactive protein (hs-CRP) was measured as an indicator of an inflammatory state (normal value < 3 mg/L). Nutritional status was evaluated by using Subjective Global Assessment (SGA) and Malnutrition Inflammation Score (MIS) scoring chart.

Duration of follow-up was 12 months since January 2006-December 2006. Hospitalization and mortality rate during the 12-month period after the completion of these measurements were obtained on all 100 MHD patients. Hospitalization was defined as any hospital admission that included at least one overnight stay in the hospital. Hospital admission for a variety of disorders such as cardiovascular complications or infectious was included.

Subjective Global Assessment (SGA)

The SGA is recommended by NKF K/DOQI as an instrument for assessing the nutritional status of dialysis patients (Fig. 1)[18]. It is a semiquantitative scoring system based on history and physical examination. The history consists of five components: weight loss during the preceding 6 months, gastrointestinal symptoms, food intake, functional capacity, and comorbidities. Each of these features is scored separately as A, B, or C, reflecting well-nourished to severely malnourished categories. The physical examination consists of 2 components: loss of subcutaneous fat and muscle wasting. These two components are classified in terms of the three major SGA scores: A, well nourished; B, mild to moderate malnutrition; and C, severe malnutrition.

Malnutrition-Inflammation Score (MIS)

MIS scoring sheet (Fig. 2)[17] consists of four sections (patient's related medical history, physical examination, body mass index (BMI), and laboratory pa-

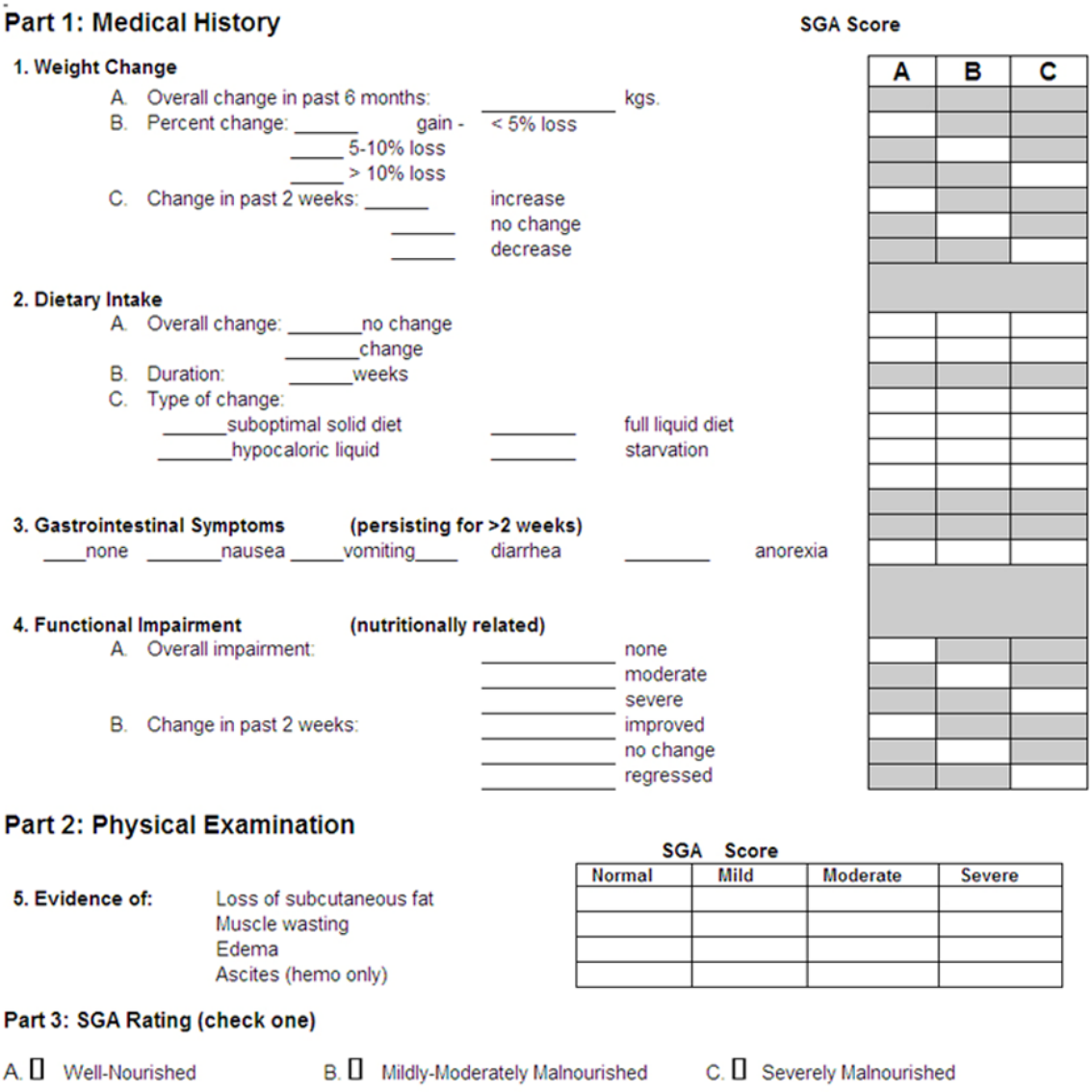

Fig. 1 Subjective Global Assessment Scoring Sheet

rameters) and 10 components. Patient's medical history consists of five components: dry weight changes, dietary intake, gastrointestinal symptoms, functional capacity, and co-morbidity, including number of years on dialysis. Major comorbid conditions (MCC) include congestive heart failure class III or IV, full blown AIDS, severe coronary artery disease, moderate to severe COPD, major neurological sequlae, and metastatic malignancies or status post recent chemotherapy. Physical examination consists of two components, which aims to detect decreased fat store or loss of subcutaneous fat and signs of muscle wasting. Laboratory parameters are serum albumin and serum total iron binding capacity (TIBC). Each of 10 MIS components is classified among four levels of severity, from 0 (normal) to 3 (severely abnormal). The sum of all 10 MIS components ranges from 0 (normal) to 30 (severely malnourished); a higher score reflects a more severe degree of malnutrition and inflammation.

Carotid ultrasound

The carotid artery was scanned bilaterally on longitudinal and transverse planes by radiologist using B-mode ultrasonography (iU22, Phillips, Bothell,

MALNUTRITION INFLAMMATION SCORE (M.I.S.)			
(A) Patients' related medical history:			
1- Change in end dialysis dry weight (overall change in past 3-6 months):			
0	1	2	3
No decrease in dry weight or weight loss <0.5 kg	Minor weight loss (≥0.5 kg but <1 kg)	Weight loss more than one kg but <5%	Weight loss >5%
2- Dietary intake:			
0	1	2	3
Good appetite and no deterioration of the dietary intake pattern	Somewhat sub-optimal solid diet intake	Moderate overall decrease to full liquid diet	Hypo-caloric liquid to starvation
3- Gastrointestinal (GI) symptoms:			
0	1	2	3
No symptoms with good appetite	Mild symptoms, poor appetite or nauseated occasionally	Occasional vomiting or moderate GI symptoms	Frequent diarrhea or vomiting or severe anorexia
4- Functional capacity (nutritionally related functional impairment):			
0	1	2	3
Normal to improved functional capacity, feeling fine	Occasional difficulty with baseline ambulation, or feeling tired frequently	Difficulty with otherwise independent activities (e.g. going to bathroom)	Bed/chair-ridden, or little to no physical activity
5- Co-morbidity including number of years on Dialysis:			
0	1	2	3
On dialysis less than one year and healthy otherwise	Dialyzed for 1-4 years, or mild co-morbidity (excluding MCC*)	Dialyzed >4 years, or moderate co-morbidity (including one MCC*)	Any severe, multiple co-morbidity (2 or more MCC*)
(B) Physical Exam (according to SGA criteria):			
6- Decreased fat stores or loss of subcutaneous fat (below eyes, triceps, biceps, chest):			
0	1	2	3
Normal (no change)	mild	moderate	Severe
7- Signs of muscle wasting (temple, clavicle, scapula, ribs, quadriceps, knee, interosseous):			
0	1	2	3
Normal (no change)	mild	moderate	Severe
(C) Body mass index:			
8- Body mass index: BMI = Wt(kg) / Ht^2(m)			
0	1	2	3
BMI≥20 kg/m^2	BMI: 18-19.99 kg/m^2	BMI: 16-17.99 kg/m^2	BMI<16 kg/m^2
(D) Laboratory Parameters:			
9- Serum albumin:			
0	1	2	3
Albumin≥ 4.0 g/dL	Albumin: 3.5-3.9 g/dL	Albumin: 3.0-3.4 g/dL	Albumin: <3.0 g/dL
10- Serum TIBC (total Iron Binding Capacity): ♣			
0	1	2	3
TIBC≥ 250 mg/dL	TIBC: 200-249 mg/dL	TIBC: 150-199 mg/dL	TIBC: <150 mg/dL
Total Score = sum of above 10 components (0-30):			

Fig. 2 Malnutrition Inflammation Scoring

WA, 98041, USA). The three points of the carotid artery, proximal common carotid artery, carotid bulb and internal carotid artery were scanned. Carotid plaque is recognized and categorized to four grades. Grade 0 is plaque free patients, grade 1 is the fatty plaque, grade 2 is soft plaque that has hypo-echogenic density under the fatty plaque, and grade 3 is hard plaque that contains calcification within the plaque.

Atherosclerosis definition

Atherosclerosis was defined as one or both of the following criteria: 1) history of CVD (cerebrovascular disease, coronary artery disease, or peripheral arterial disease) documented by interview and chart review, and evidence presented on physical examination 2) carotid ultrasound showed plaque (at least grade 1) in the carotid artery. Subclinical atherosclerosis was defined as presence of carotid plaque (at least grade 1) without history and clinical evidence of CVD.

Statistical analysis

Data are presented as mean ± SEM. The Pearson's correlation coefficient (*r*) was used to determine the correlation between continuous variables.

However, for non-normally distributed variables, data are presented as median and ranges and correlations were performed with the Spearman rank test. A comparison between the two groups was performed using Student's t-test (two tailed) for normally distributed variables, whereas the Mann-Whitney's U test was used for non-normal distributed variables. Chi-square or Fisher's exact test was used for the categorical data. To analyze the sensitivity and specificity of the MIS score for the prediction of atherosclerosis and death, Receiver Operating Characteristics Curves (ROC curves) were generated, including area under the curve (AUC) and their 95% confidence intervals (CI). A p-value of 0.05 or less was considered statistically significant.

Results

The clinical characteristic and laboratory data of 100 MHD patients are listed in Table 1. Mean ages was 52.1±14.9 years, and dialysis vintage was 82 months (range, 3 to 291 months). Twenty percent of the study population was smokers or exsmokers. The major etiologies of end-stage renal disease are chronic glomerulonephritis (25.7%), uncertain cause (25.7%), diabetes (16.2%), hypertension (14.3%), chronic tubule-interstitial nephritis (9.5%) and adult polycystic kidney disease (3.8%). Ages and dialysis vintage in male patients were not significantly different from female patients. Dry weight and intact-PTH were significantly higher in males, whereas Kt/V and serum ferritin level were significantly higher in females. Other clinical and laboratory parameters were not significantly different. According to SGA, normal nourished status was found in 55% of patients and mild to moderate malnourish status was 45%. Mean MIS score was 5.25 ± 2.29. The MIS score in male patients was not significantly different from female patients.

Associations between MIS and inflammation status or atherosclerosis

Serum hs-CRP commonly used in clinical practice to evaluate inflammation status was higher than normal value (normal < 3 mg/L) in 53% of MHD patients with median value of 3 mg/L (range 0.2-46 mg/L). The MIS score was not correlated with hs-CRP level (r = 0.08, p 0.44), but positively correlated with serum ferritin level (r = 0.304, p = 0.03), and negatively correlated with hemoglobin level (r = -0.29, p = 0.004). Compared with non-atherosclerosis group, serum hs-CRP level in atherosclerosis group tended to be higher (3.2 (0.2-46) vs. 1.2 (0.3-6.6) mg/L, p = 0.09). There was no significant association between SGA and hs-CRP level or serum ferritin level.

Eighty-five of 100 MHD patients were diag-

Table 1. Clinical characteristic of 100 MHD patients

	All patients	Male	Female	p
No of patients	100	42	58	
Age (years)	52.1 ± 14.9	51.6 ± 16.4	52.3 ± 13.9	0.81
DM	12%	14.3%	10.3%	0.55
Dry weight (kg)	54.6 ± 10.7	58.3 ± 10.2	52 ± 10.4	0.003
BMI(Kg/m^2)	21.5 ± 3.8	21.1 ± 3.3	21.9 ± 4.1	0.29
Vintage (dialysis months)	82 (3-291)	86 (3-255)	80 (5-291)	0.99
Hemodialysis hours/wk	9.3 ± 1.9	9.2 ± 1.9	9.3 ± 2.0	0.9
Kt/V	2.14 ± 0.50	1.93 ± 0.40	2.3 ± 0.46	<0.001
nPCR (gm/kg/day)	1.14 ± 0.41	1.13 ± 0.28	1.14 ± 0.48	0.87
Hemoglobin (g/dl)	9.3 ± 1.7	9.6 ± 1.6	9.1 ± 1.7	0.16
Serum				
Ca X P product $[mg/dl]^2$	48 ± 17	51 ± 17	46 ± 17	0.15
i-PTH (pg/ml)	275 (4-4,484)	419 (13-2,212)	239 (4-4,484)	0.03
Cholesterol (mg/dl)	170 ± 38	164 ± 43	174 ± 34	0.22
Triglyceride (mg/dl)	120 ± 78	111 ± 78	127 ± 78	0.31
Albumin (g/dl)	3.75 ± 0.33	3.78 ± 0.25	3.7 ± 0.37	0.40.
Ferritin (ng/ml)	463(15-3518)	321 (15-2581)	546 (20-3518)	0.01
hs-CRP (mg/L)	3 (0.2-46)	3 (0.3-38.5)	3 (0.2-46)	0.75
MIS	5.25 ± 2.29	4.74 +1.94	5.62 +2.46	0.11

nosed as having atherosclerosis. Of the 85 patients, 23 patients had established atherosclerosis confirmed by chart review and physical examination, and 62 patients had subclinical atheroslcerosis (diagnosed by the presence of carotid plaque). In the atherosclerosis group, mean age and dialysis vintage were significantly more than the non-atherosclerosis group (54.4 ± 14.1 vs. 31.6 ± 11.6 years ($p < 0.001$); 84 (3-291) vs. 41 (23-87) months ($p = 0.03$), respectively). Compared with non-atherosclerosis group, MIS scoring in atherosclerosis group was significantly higher (5.46 ± 2.26 vs. 3.0 ± 1.69, $p = 0.003$). There was no significant association between SGA or other variables and atherosclerosis (Table 2).

Associations between MIS with hospitalization and mortality rates

Over 12-month prospective follow-up period, 28 patients were admitted to the hospital at least once with mean duration of hospitalization of 16.2 ± 19.6 days. The causes of hospitalization were cardiovascular disease (24%, mean duration of hospitalization 8.3 ± 7.3 days), infection (31%, mean duration of hospitalization 15.9 ± 15.9 days), and other causes (45%, mean duration of hospitalization 15.2 ± 17.0 days). There was no significant association between MIS or SGA and the hospitalization rates.

During the 12-month period, 4 patients died due to cardiovascular disease (1 patient), infectious causes (2 patients), and other causes (1 patient). Mean age of deceased patients was significantly more than of the surviving patients (66.5 ± 6.3 vs. 51.5 ± 14.9 years, $p = 0.047$). MIS score in deceased group was significantly higher than survivor group (8.0 ± 1.41 vs. 5.14 ± 2.25, $p = 0.013$). All patients in deceased group had MIS score more than or equal 6. There was no significant association between SGA or other variables and mortality rates (Table 3).

The area under the ROC curves for the MIS score as predictive tools for atherosclerosis and death were 0.82 (95% CI; 0.66-0.97, $p = 0.03$) and 0.86 (95% CI; 0.72-0.99, $p = 0.015$), respectively. The best cut-off value of the MIS score for prediction of atherosclerosis and 1-year mortality were 3.5 and 7.5, with sensitivity of 82% and 75%, and specificity of 75% and 88%, respectively.

Discussion

High prevalence of malnutrition (45%), inflammation (53%) and atherosclerosis (85%) in MHD patients was observed in the present study. These finding is concordances with previous studies that have

Table 2. Clinical characteristics of 100 MHD patients with atherosclerosis and without atherosclerosis

	All patients	Non-atherosclerosis (n = 15)	Atherosclerosis (n = 85)	p-value
Age (years)	52.1 ± 14.9	31.6 ± 11.6	54.4 ± 14.1	<0.001
BMI (kg/m^2)	21.5 ± 3.8	20.2 ± 2.5	21.7 ± 3.9	0.28
Vintage (months)	82(3-291)	41 (23-87)	84 (3-291)	0.03
Hemodialysis hours/wk	9.3 ± 1.9	8.8 ± 1.5	9.3 ± 2.0	0.41
Kt/V	2.14 ± 0.50	2.16 ± 0.48	2.14 ± 0.47	0.36
Hemoglobin (g/dl)	9.3 ± 1.7	9.6 ± 1.7	9.3 ± 1.7	0.67
Serum				
Ca X P product(mg/dl)^2	48 ± 17	48 ± 19	49 ± 17	0.99
i-PTH (pg/ml)	275 (4-4,484)	203 (48-772)	275 (4-4484)	0.82
Cholesterol (mg/dl)	170 ± 38	190 ± 43	169 ± 38	0.13
Triglyceride (mg/dl)	120 ± 78	98.9 ± 42.3	123.3 ± 82.8	0.41
Ferritin (ng/ml)	463 (15-3518)	265 (51-3518)	508 (15-3,432)	0.18
Albumin (g/dl)	3.75 ± 0.33	3.78 ± 0.21	3.74 ± 0.33	0.77
n-PCR (gm/kg/day)	1.13 ± 0.4	1.25 ± 0.3	1.12 ± 0.42	0.19
hs-CRP (mg/L)	3 (0.2-46)	1.2 (0.3-6.6)	3.2 (0.2-46)	0.09
MIS	5.25 ± 2.29	3.0 ± 1.69	5.46 ± 2.26	0.003
SGA				
Normal nourish	55%	85.8%	51.7%	0.12
Mild to moderate malnourish	45%	14.2%	49.3%	

Table 3. Patients' characteristics in survivor and deceased groups

	Survivor (n = 96)	Deceased (n = 4)	p-value
Age (years)	51.5 ± 14.9	66.5 ± 6.3	0.047
BMI (kg/m^2)	21.6 ± 3.9	20.0 ± 2.1	0.412
Vintage (months)	82(3-256)	177 (63-291)	0.91
Hemodialysis hours/wk	9.3 ± 2.0	8.5 ± 1.0	0.422
Kt/V	2.13 ± 0.45	2.25 ± 0.85	0.190
Hemoglobin (g/dl)	9.3 ± 1.7	9.4 ± 0.4	0.701
Serum			
Ca X P product (mg/dl)^2	48 ± 17	40 ± 16	0.348
i-PTH (pg/ml)	272 (4-4,484)	419 (352-486)	0.70
Cholesterol (mg/dl)	170 ± 38	165 ± 51	0.822
Triglyceride (mg/dl)	118.9 ± 76.4	144.3 ± 128.2	0.528
Ferritin (ng/ml)	456 (15-3,518)	1,580 (1,019-2,141)	0.86
Albumin (g/dl)	3.75 ± 0.33	3.73 ± 0.17	0.893
n-PCR (gm/kg/day)	1.12 ± 0.41	1.29 ± 0.14	0.760
hs-CRP (mg/L)	3 (0.2-46)	5.1 (1.3-8.9)	0.08
MIS	5.14 ± 2.25	8.0 ± 1.41	0.013

been shown that inflammatory processes are common in dialysis patient as reflected by increased inflammatory marker in approximately 30% to 60% of dialysis patients[17-21]. Previous study showed that inflammation is more common in malnourished dialysis patients[8], and the nutritional status and inflammatory response are independent predictors of hospitalization in MHD patients[22]. It has been shown that overall mortality rate was significantly higher in dialysis patients with elevated hs-CRP[23,24].

Inflammation may blunt the responsiveness of anemia to recombinant human erythropoietin in MHD patients. It has been shown that refractory anemia appears to be more common in patients who also have protein energy malnutrition and/or inflammation. Prolonged and persistent inflammation may lead to adverse consequences such as decline in appetite, increased catabolic rate, muscle and fat wasting, endothelial damage, erythropoietin-hyporesponsive anemia and atherosclerosis[22]. In the present study, we found that MIS was positively correlated with inflammatory markers (serum ferritin), and negatively correlated with hemoglobin level. The MIS score was also associated with atherosclerosis, and 1-year mortality, but not hospitalization. We could not find any association between SGA or biochemical markers and atherosclerosis, hospitalization rate, or mortality rate. However, hs-CRP level in deceased patients tends to be higher than in surviving patients.

Although the SGA is an easy and reliable tool that has been validated prospectively to determine nutritional status and predict the dialysis outcomes[25], it is a semiquantitative scale which consists of only three nutritional levels that do not have clear-cut definitions in most components, and the final assessment is based solely on the subjective impression of the evaluator. MIS is a scoring system to which three new items were added to the SGA (BMI, TIBC and serum albumin level), and scored in an incremental fashion (as integer numbers between 0 to 3) and thus provided a fully quantitative system[17]. A previous study have shown that BMI has a predictive value for dialysis mortality[26]. Serum TIBC correlates significantly with nutritional state in dialysis patients. It reflects serum transferring concentration which changes with iron loading, inflammation, and gastrointestinal diseases. Albumin, which is a negative acute-phase reactant, is an important marker of nutrition in the dialysis population. Since the MIS includes the nutritional status and inflammatory marker, which are strong predictors of cardiovascular events[17,27]. Therefore, MIS appears to be superior to conventional SGA as well as to individual laboratory values, as a predictor of dialysis outcome and an indicator of the malnutrition inflammation complex syndrome[17].

The present study confirms clinical benefit of MIS in Thai MHD patients, and is similar to the previous studies that have shown the benefit of MIS as a predictor of death in MHD and peritoneal dialysis patients[22,24,28,29]. In the present study we found that the best cut-off value of the MIS score for prediction of one-year mortality was 7.5 with sensitivity of 75% and

specificity of 88%. It is superior to the conventional SGA in short-term prediction of mortality. However, the present study has some limitations such as small population size, short follow-up period, small diabetic population (only 12 %). In comparison to other studies, the low mortality rate at one year (4%) in the present study may be attributed to relatively the low ages of the patients, small sample size of diabetic patients, short duration of follow-up, and the exclusion of some patients who have very severe atherosclerosis (*e.g.* bilateral vascular accesses and some cases of cerebrovascular disease) that precluded anthropometric measurement.

In conclusion, high prevalence of malnutrition, inflammation and atherosclerosis was observed in MHD patients. The MIS appear to be a useful quantitative system for assessment of malnutrition and inflammatory status, and could be a predictor of short-term outcome.

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Malnutrition-inflammation score สัมพันธ์กับภาวะหลอดเลือดแดงแข็งและอัตราการเสียชีวิตในผู้ป่วยไตวายเรื้อรังที่ได้รับการรักษาโดยการฟอกเลือด

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ภูมิหลัง: *Malnutrition-inflammation score (MIS) เป็นวิธีการใหม่ที่ใช้ในการประเมินภาวะทุพโภชนาการ และภาวะการอักเสบซึ่งเป็นปัจจัยเสี่ยงสำคัญที่เป็นเหตุเสียชีวิตในผู้ป่วยไตวายเรื้อรังที่ได้รับการฟอกเลือด*

วัตถุประสงค์: *ใช้ MIS ในการประเมินผู้ป่วยฟอกเลือด และดูความสัมพันธ์ระหว่าง MIS กับภาวะหลอดเลือดแดงแข็ง อัตราการนอนโรงพยาบาลและอัตราการเสียชีวิต*

วิธีการวิจัย: *ผู้ป่วยไตวายเรื้อรังที่ได้รับการฟอกเลือด 100 ราย ได้รับการประเมินภาวะอักเสบ และภาวะทุพโภชนาการโดยตรวจระดับ high-sensitivity C-reactive protein (hs-CRP), ใช้แบบประเมิน subjective global assessment (SGA) และ MIS การวินิจฉัยภาวะหลอดเลือดแดงแข็งอาศัยประวัติและการตรวจร่างกายหรือตรวจพบ carotid plaque จากอัลตราซาวด์ ผู้ป่วยทุกรายได้รับการตรวจเลือดต่างๆซึ่งปัจจัยเสี่ยงของหลอดเลือดแดงแข็ง ติดตามอัตราการนอนโรงพยาบาลและอัตราการเสียชีวิตของผู้ป่วย 12 เดือน*

ผลการศึกษา: *ผู้ป่วยที่มีภาวะหลอดเลือดแดงแข็งมีค่าเฉลี่ยของ MIS สูงกว่าผู้ป่วยที่ไม่มีภาวะหลอดเลือดแดงแข็ง (5.5 ± 2.3 กับ 3.0 ± 1.7, $p = 0.003$) ค่า MIS สัมพันธ์กับระดับ ferritin ($r = 0.304$, $p = 0.03$) แต่ไม่สัมพันธ์กับระดับ hs-CRP SGA ไม่สัมพันธ์กับภาวะเส้นเลือดแดงแข็งและระดับ hs-CRP ในช่วงติดตาม 12 เดือนมีผู้ป่วยเสียชีวิตทั้งหมด 4 ราย, นอนโรงพยาบาลอย่างน้อย 1 ครั้ง 28 ราย เมื่อเปรียบเทียบกับผู้ป่วยที่รอดชีวิตค่าเฉลี่ย MIS ในผู้ป่วยที่เสียชีวิตสูงกว่า (8.0 ± 1.4 กับ 5.1 ± 2.3, $p = 0.01$) ในขณะที่ SGA, ระดับ hs-CRP และผลเลือดอื่นๆไม่แตกต่างกัน จาก ROC curve พบว่าค่า MIS ที่ 7.5 พบความไวร้อยละ 75 และความจำเพาะร้อยละ 88 ในการพยากรณ์การเสียชีวิตที่ 1 ปี ไม่พบความสัมพันธ์อย่างมีนัยสำคัญระหว่าง MIS หรือ SGA กับอัตราการนอนโรงพยาบาล*

สรุป: *MIS เป็นวิธีที่ใช้ได้ดีในการประเมินภาวะทุพโภชนาการและการอักเสบ สัมพันธ์กับภาวะหลอดเลือดแดงแข็งและสามารถทำนายอัตราการเสียชีวิตในผู้ป่วยไตวายเรื้อรังที่ได้รับการฟอกเลือดได้ดีกว่า SGA*