THE PREDICTIVE VALUE OF MALNUTRITION - INFLAMMATION SCORE ON 1 YEAR MORTALITY IN MAINTENANCE HEMODIALYSIS PATIENTS

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Objectives:

Malnutrition-inflammation score (MIS) is a comprehensive and quantitative system to assess malnutrition-inflammation complex syndrome (MICS), and a strong correlation between MIS and morbidity-mortality in maintenance hemodialysis (MHD) patients had been demonstrated. However, studies have been reported with conflicting results about the best cut-off value of MIS to categorize patients into high-risk or low-risk groups. The aim of this study was to evaluate the predictive value of MIS on short term (1 year) mortality and to identify the best cut-off point in the Turkish MHD population.

Methods:

A total of 100 patients on MHD were included in this prospective study. Patients with a history of hospitalization, major surgery, obvious infections, and inflammatory disease within the preceding 3 months and patients with nephrotic-range proteinuria, end stage liver disease, metastatic malignancies, and malabsorption syndromes were excluded from the study. All patients had received conventional HD thrice a week with standard bicarbonate and 140 mEq/L sodium containing dialysate bath using low-flux biocompatible HD membranes. Demographic, anthropometric (dry weight, body mass index, triceps skinfold thickness) and biochemical data were obtained from all patients. Malnutrition inflammation score and inflammatory markers including hs-CRP (mg/L), TNF-α (pg/mL) were recorded at the initiation of the study to determine nutrition and inflammation status. The study population was followed up as a 12-month prospective cohort to evaluate mortality as the primary outcome.

Table 1. Baseline characteristics of all patients and groups.

	All patients (n= 100)	Survived (n= 93)	Deceased (n= 7)	P
Demographics				
Age (y)	53 (28)	50 (25)	70 (20)	**0.001**
Sex (male/female)	52/48	47/46	5/2	0.439
Duration on HD (months)	53.5 (87)	60 (89)	19 (66)	0.150
Dry weight (kg)	58.5 (18)	58.6 (19)	57 (14)	0.985
Body mass index (kg/m²)	23.0 (6)	23 (6)	23.3 (4)	0.778
Delivered dose of dialysis				
spKt/V	1.57 (0.4)	1.60 (0.4)	1.35 (0.6)	**0.002**
Anthropometry				
Triceps skinfold thickness (mm)	13 (8)	14 (9)	9 (4)	**0.021**
Laboratory				
Predialysis urea (mg/dL)	135 (41)	135 (97)	125 (115)	0,643
Predialysis creatinine (mg/dL)	8.7 (3.0)	8.7 (3.1)	9.5 (2.7)	0.623
Hemoglobin (g/dl)	10.5 (1.9)	10.3 (1.9)	11 (1.6)	0.634
Uric acid (mmol/L)	6.0 (1.6)	6 (1.5)	6.6 (1.9)	0.663
Sodium (mmol/l)	139 (4)	139 (4)	138 (5)	0.295
Potassium (meq/L)	5.0 (1.1)	5.1 (1.2)	5 (0.6)	0.693
Calcium (mg/dL)	8.6 (1.0)	8.6 (1)	8.6 (1.2)	0.892
Phosphorus (mg/dL)	5.4 (2.0)	5.5 (2)	4.2 (2)	0.086
CaxP	48.2 (19)	48.5 (19)	33 (27)	0.116
intact PTH (pg/ml)	363.5 (453)	381 (482)	255 (70)	0.941
Total cholesterol (mmol/L)	172.5 (58)	174 (60)	161 (51)	0.352
LDL (mmol/L)	100 (49)	100 (51)	95 (41)	0.661
Triglyceride (mmol/L)	135 (99)	135 (97)	125 (115)	0.506
Bicarbonate (meq/L)	22.3 (3.0)	22.2 (3.1)	23.2 (4.1)	0.414
Nutrition				
Albumin (g/L)	3.9 (0.4)	3.9 (0.4)	3.9 (0.4)	0.830
Prealbumin (mg/dL)	27.7 (9)	27.9 (8)	25.5 (13)	0.592
TIBC (g/L)	206 (52)	207 (54)	203 (31)	0.728
MIS	6 (4)	5 (3)	10 (4)	**0.013**
Inflammation				
Hs-CRP (mg/L)	8.0 (17.2)	7.1 (17)	17 (22.1)	0.852
TNF-alpha (pg/mL)	21 (9)	21 (9)	22 (5)	0.917
Ferritin (ng/mL)	613 (562)	624 (580)	442 (526)	0.230

Data were presented as median (IQR); HD: Hemodialysis, ESRD: End stage renal disease, LDL: Low density lipoprotein, PTH: Parathormone. TIBC: Total iron binding capacity, Hs-CRP: Highly sensitive C reactive protein, TNF-alpha: tumor necrosis factor-alpha, MIS: Malnutrition inflammation score.

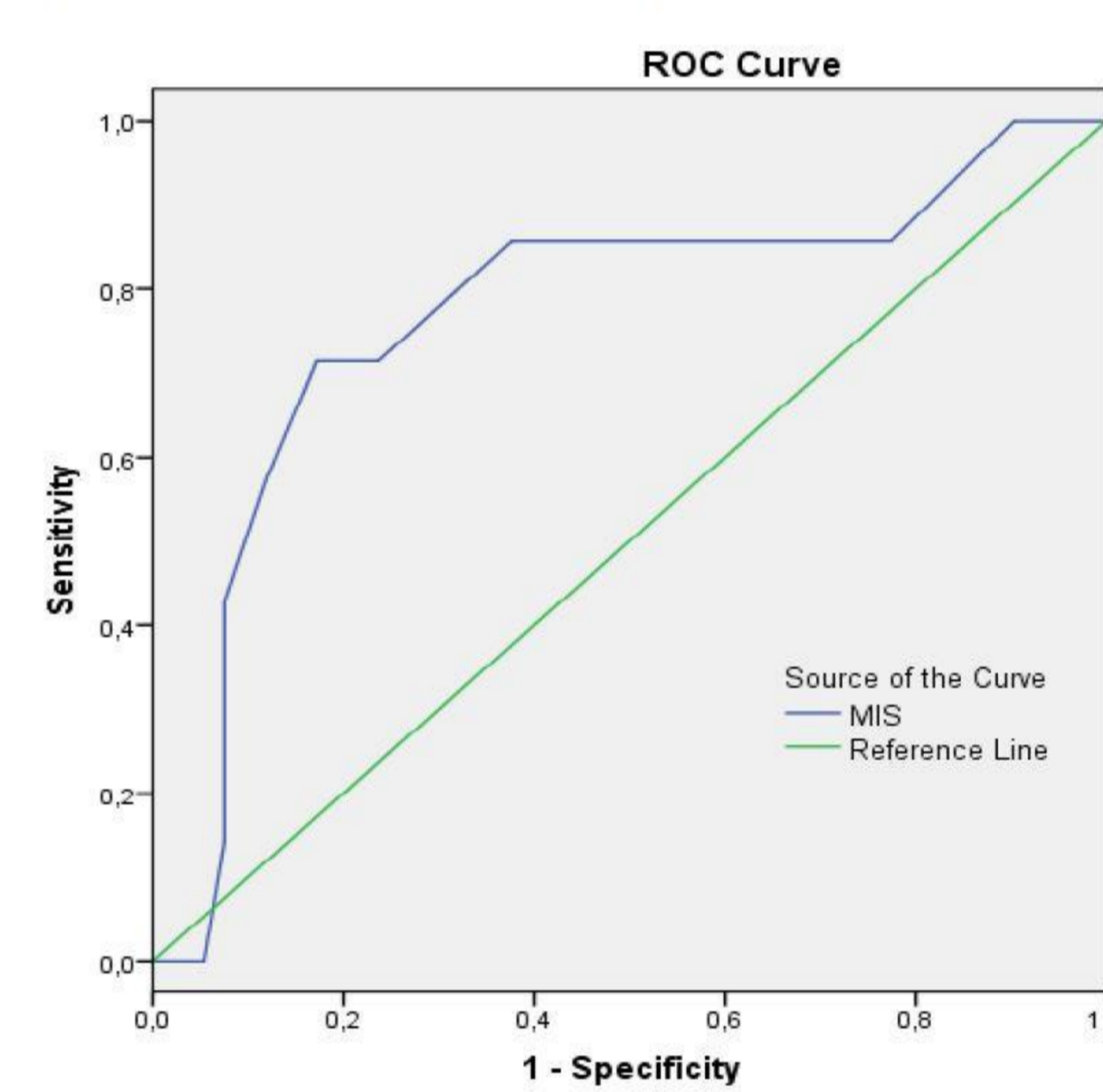**Figure 1.** ROC analysis of the relationship between MIS and mortality.

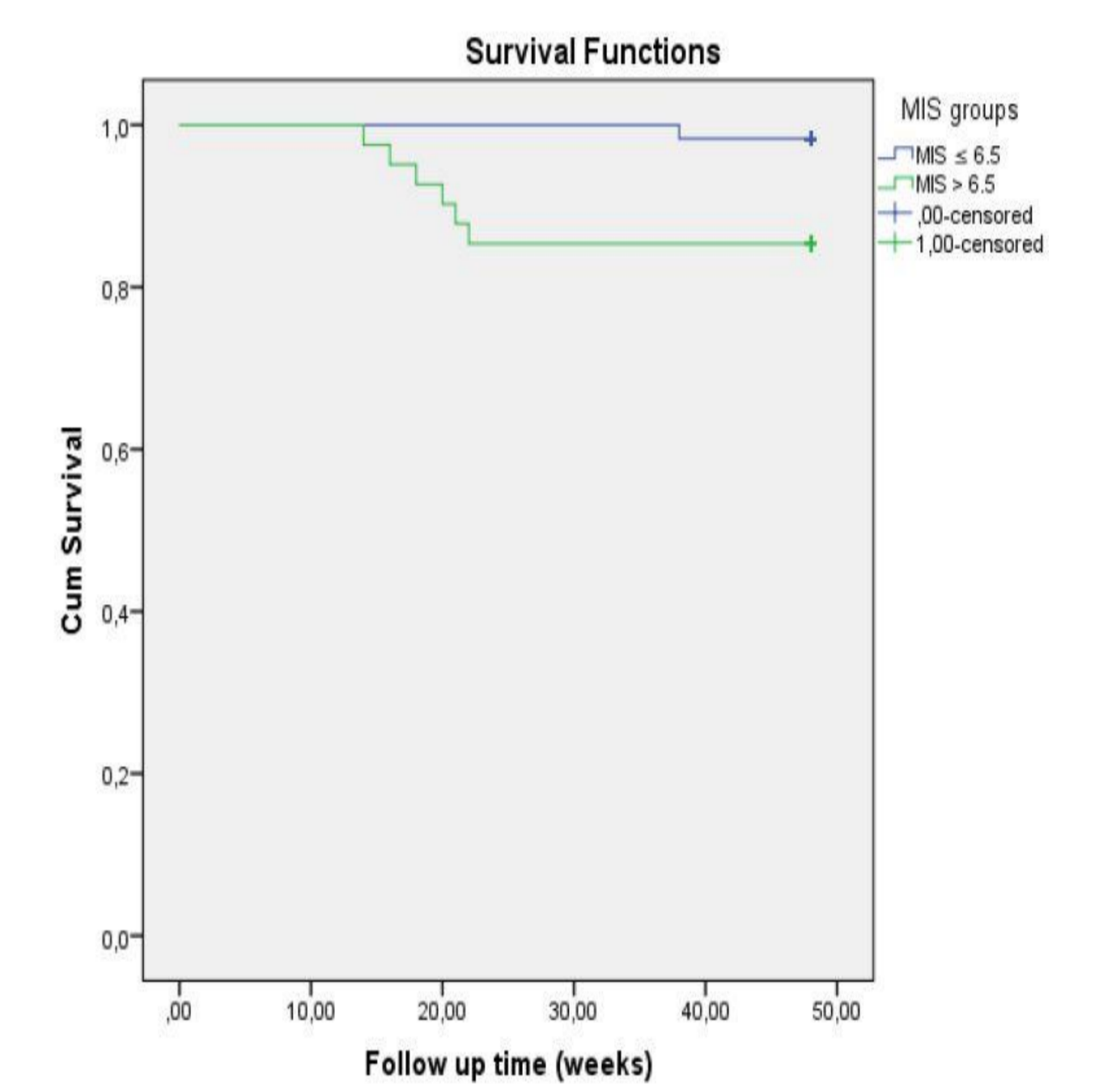**Figure 2.** Patient survival at 1 year according to MIS.

Table 2. Multivariate logistic regression analysis of the factors that were found to predict mortality.

Predictors of mortality	P	ODDS	%95 Conidence Interval	
			Lower	Upper
Age (years)	0.024	1.217	1.027	1.443
spKt/V	0.012	0.004	0.000	0.289
MIS	0.021	1.709	1.083	2.687

MIS: Malnutrition inflammation score.

Table 3. Survival analysis at 1 year according to the MIS cut-off value.

MIS score	n	Exitus (n)	Survival Time (weeks)		% 95 Confidence Interval		P (Log Rank)
			Estimate	Std. Error	Lower	Upper	
MIS ≤ 6.5	59	1	47.8	0.168	47.5	48.1	
MIS > 6.5	41	6	43.6	1.637	40.4	46.8	**0.012**
Overall	100	7	46.1	0.708	44.7	47.5	

MIS: Malnutrition inflammation score.

Results:

Median age and HD vintage of 100 patients (M/F: 52/48) were 53 (28) years and 53.5 (87) months, respectively. Seven patients died in the 12-month observational period. Compared to survived patients, deceased patients had significantly older age (years) (50 (25) vs. 70 (20), p: 0.001, respectively), lower spKt/V (1.60 (0.4) vs. 1.35 (0.6), respectively), lower triceps skinfold thickness (mm) (14 (9) vs. 9 (4), p: 0.021, respectively) and higher MIS (5 (3) vs. 10 (4), p: 0.013, respectively). In the ROC analysis, we found that the optimal cut-off value of MIS for predicting death was 6.5 (p: 0.017). The sensitivity and specificity were 85.7% and 62.4%. Positive and negative likelihood ratios were 2.279 and 0.229 while diagnostic Odds ratio was 10.190. Advanced age (p: 0.024), low spKt/V (p: 0.012) and high MIS (p: 0.021) were found predictors of mortality in multivariate logistic regression analysis. One year mortality rate was significantly higher in MIS > 6.5 group compared to the MIS ≤ 6.5 group (14,3% (6/41) vs. 1.6% (1/59), respectively). Compared to MIS ≤ 6.5 group, 1 year survival time of the patients with MIS > 6.5 were found significantly lower (47.8±0.16 weeks vs. 43.6±1.63 weeks, respectively, p: 0.012).

Conclusions:

Our study showed that MIS is a robust and independent predictor of short term (1 year) mortality in maintenance hemodialysis patients. Patients with MIS > 6.5 had a significant risk. Additional risk factors associated with short-term mortality besides MICS were advanced age and low spKt/V.

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Dialysis. Protein-energy wasting, inflammation and oxidative stress.

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