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# TITLE: A malnutrition-inflammation score (MIS) is correlated with mortality in hemodialysis patients

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## INTRODUCTION AND OBJECTIVES:

Malnutrition-Inflammation Score (MIS) was proposed as a nutritional screening for patients undergoing hemodialysis and many studies have shown its association with morbidity and mortality.

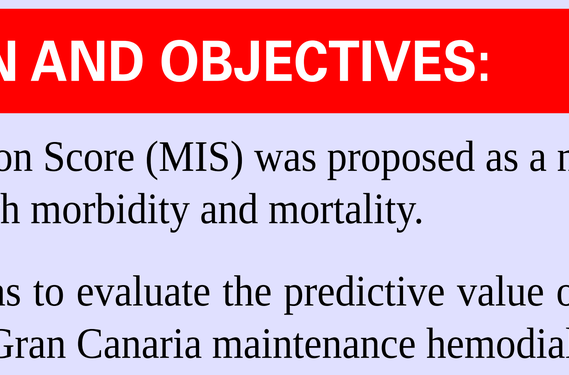
The aim of this study was to evaluate the predictive value of malnutrition-inflammation score (MIS) on short-term mortality and to identify the best cut-off point in the Gran Canaria maintenance hemodialysis (MHD) population.

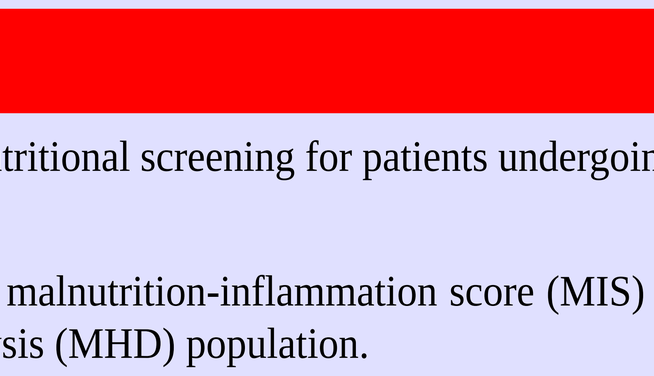
## METHODS:

A total of 221 patients from the peripheral hemodialysis center of Dr Negrín University Hospital of Las Palmas de Gran Canaria were included in this prospective study. Demographic and biochemical data were obtained as well as MIS score. A 30,76 (23,03-38,67) months follow-up was carried out with the study population to evaluate mortality as the primary outcome.

## RESULTS AND CONCLUSIONS:

| | |
|---|---|
| MIS < 5 | 74(32.7%) |
| MIS ≥ 5 | 152(67.3%) |



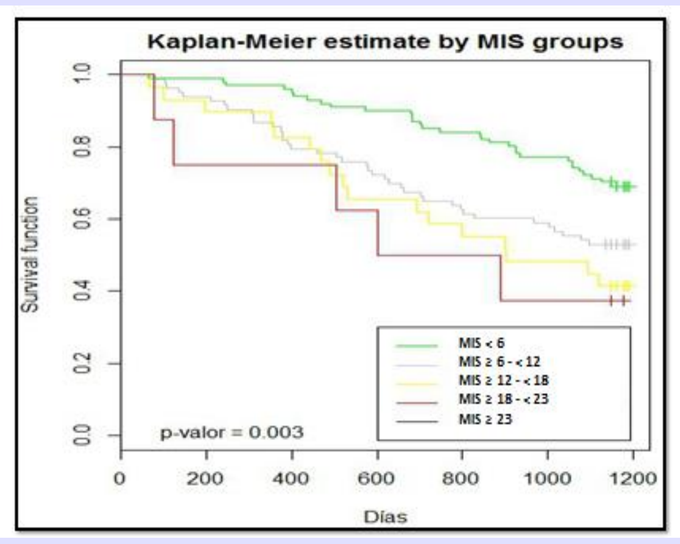




| Variable | B | EE | OR | IC(95%) | p |
|---|---|---|---|---|---|
| Lymphocytes | -0,07 | 0,02 | 0,93 | (0.894 - 0.972) | 0,001 |
| Charlson | 0,31 | 0,1 | 1,37 | (1.120 – 1.688) | 0,003 |
| Age | 0,07 | 0,02 | 1,38 | (1.043 – 1.113) | < 0,001 |
| MIS | 0,1 | 0,04 | 1,1 | (1.020 – 1.194) | 0,02 |

| Patients | MIS (Mean -SD) |
|---|---|
| Deceased (92) | **8,34 (4,56)** |
| Non-deceased(129) | 6,5 (4,26) |

| Patients | MIS < 5 | MIS ≥ 5 |
|---|---|---|
| Deceased (92) | 17 (18,5) | **75 (81,5)** |
| Non-deceased(129) | 55 (42,6) | 74 (57,4) |

| Variable | Deceased: (n=92) Mean (SD) ; Median (P25 - P50) | Non-deceased: (n=129) Mean (SD) ; Median (P25 - P50) | p-valor |
|---|---|---|---|
| Dry weight (1) | 1,16 (1,23) ; 1 (0 – 2) | 0,86 (1,11) ; 0 (0 - 2) | 0,06 |
| Dietary intake (2) | 0,51 (0,52) ; 0 (0,5 - 1) | 0,33 (0,49) ; 0 (0 - 1) | 0,01 |
| Gastrointestinal symptoms (3) | 0,61 (0,59) ; 1 (0 - 1) | 0,4 (0,52); 0 (0 - 1) | 0,01 |
| **Functional Capacity (4)** | **1,07 (0,92) ; 1 (0 - 1)** | **0,6 (0,82) ; 0 (0 - 1)** | **< 0,001** |
| Comorbidity (5) | 1,6 (0,58) ; 2 (1 – 2) | 1,41 (0,61) ; 1 (1 - 2) | 0,02 |
| Fat stores (6) | 0,73 (0,77) ; 1 (0 - 1) | 0,47 (0,74); 0 (0 - 1) | 0,01 |
| Nuscle wasting (7) | 0,75 (0,76) ; 1 (0 – 1) | 0,48 (0,71) ; 0 (0 - 1) | 0,01 |
| Body Mass Index (8) | 0,08 (0,31) ; 0 (0 – 0) | 0,12 (0,41) ; 0 (0 – 0) | 0,35 |
| Serum albumin (9) | 0,71 (0,72) ; 1 (0 – 1) | 0,46 (0,57) ; 0 (0 – 1) | 0,01 |
| Serum TIBC(Total Iron Binding Capacity (10) | 1,13 (0,87) ; 1 (0 – 2) | 1,37 (0,85) ; 1 (1 - 2) | 0,04 |




The MIS mean was 7.33 ± 4.57 and MIS value ≥ 5 was found in 67.3% of patients. The MIS was higher in deceased patients (8.34 ± 4.56) than in the non-deceased patients (6.5 ± 4.26) (p = 0.002).
In the ROC analysis, we found that the optimal cut-off value of MIS for predicting death was 5 with 81,5% sensitivity and 42,6 % specificity.
81.5% of the deceased patients had a MIS ≥ 5 compared to only 57.4% of the non-deceased patients (p <0.001).
Difference in means between deceased and non-deceased individuals was statistically significant in 8 of 10 MIS score components (p <0.05)
Special statistical significance presented the "functional capacity" MIS component. Patients with very little or no physical activity had a higher risk of death than the rest (p <0.001).
High MIS and Charlson index, advanced age and low lymphocytes were found to be predictors of mortality in the multivariate logistic regression analysis.
As the MIS increases, overall survival is lower according to the Kaplan Meier's statistical analysis (p = 0.003) (Figure 2).

**CONCLUSIONS:**

- ✓ Malnutrition is frequent in our population and physical dependence increases the risk of death.
- ✓ MIS was a practical, simple and independent predictor of mortality in hemodialysis patients, being 5 the best cut-off point to predict mortality.
- ✓ Additional risk factors associated with mortality were high Charlson Index, advanced age, MIS score as well as lymphopenia.

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