Applicability of subjective global assessment and malnutrition inflammation score in the assessment of nutritional status on chronic kidney disease

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Abstract

Up to now, there is no single method that provides complete and unambiguous assessment of the nutritional status in chronic kidney disease (CKD). Therefore, it has been recommended the use of many nutritional markers. The subjective global assessment (SGA) contains questions regarding the clinical history and physical examination. Subsequently, other versions of the SGA were developed. The malnutrition inflammation score (MIS) was also developed from the original version of the SGA and consists of 70% of the items common to SGA in addition to objective questions. Since many modifications were proposed in the original form of SGA, the use of these questionnaires in CKD patients has increased substantially in clinical practice. Therefore, this paper aims to review the applicability of the SGA and MIS when applied to assess the nutritional status of CKD patients.

Keywords: dialysis; malnutrition; nutrition assessment; renal insufficiency, chronic.

Introduction

The prevalence of chronic kidney disease (CKD) in Brazil and around the world has alarmingly increased in recent decades.[1,2] In Brazil, there is no data describing the CKD prevalence magnitude. However, if the American reality, estimated in 10% of the population, were to be employed in our country, we could estimate a prevalence of 15 million individuals with kidney disease.[3]

Although dialysis techniques have advanced continuously, we note that mortality rates in CKD patients remain high, reaching 20% in the U.S. during the first two years of hemodialysis (HD).[4] Protein-energy deficit (PED) is a leading cause of morbidity and mortality in patients with CKD. This finding is typified by an inverse association between mortality rates and nutritional status markers.[5,6] Furthermore, it is known that PED is a common nutritional disorder in CKD, ranging from 30% to 74% in papers which used the subjective global assessment (SGA) for its diagnosis.[7-10] PED etiology is multifactorial, including inadequate food intake, increased protein catabolism and decreased protein synthesis.[11]

Considering the high prevalence of PED and its close association with morbidity and mortality, nutritional diagnosis in this group requires special attention, especially in regards to the criteria or method used for that purpose. Since we still lack a single method to reliably diagnose the nutritional status of CKD patients, it has been recommended the use of multiple markers, which may be objective and/or subjective.[12,13]

Among subjective nutritional markers, combined methods for nutritional status assessment have gained prominence. These methods are based on a combination of subjective and objective elements of nutritional status, which provide a set of information about nutritional deficit condition and its level. In the context of CKD, SGA and the malnutrition inflammation score (MIS) stand out among the combined methods employed in clinical practice and in studies. Therefore, this paper aims to review the use of SGA and MIS, focusing on their ability to differentiate between well-nourished patients from those with PED to diagnose the degree of PED (mild, moderate or severe) and evaluate their ability to predict clinical outcomes.

Subjective global assessment and malnutrition inflammation score

Subjective global assessment (SGA)

The SGA comprises a method involving subjective and objective aspects of nutritional status, including components of the medical history and physical examination. It is a simple and inexpensive tool that can be applied by previously trained healthcare professionals.[14] SGA was originally developed by Detsky *et al*. in 1984,[15] aiming to assess the nutritional status of surgical patients into (A) well-nourished; (B) moderate PED; and (C) severe PED. Since it yielded good sensitivity and specificity in predicting postoperative infections in this population, SGA was reformatted to be used for specific groups in order to increase its reproducibility and predictive value.[14] Since then, its application has increased in several population groups,[16-18] including those with CKD.[14]

The first SGA validation for individuals in HD and peritoneal dialysis (PD) happened in 1993, by Enia *et al.*[19] In that study, the authors reported that PED patients diagnosed by SGA had lower serum albumin levels, lower body fat percentage, lower arm muscle circumference and lower protein intake. Subsequently, a multicentric study in PD, conducted in the U.S. and Canada - CANUSA (1996) modified the original SGA and proposed a new model with a 7-point scale. The authors reported that the expanded scale provided greater association with mortality, and a one-point decrease was associated with a 25% increase in mortality.[20] This version was subsequently validated by Steiber *et al.*[10] in HD patients.

SGA-7p is recommended by the American guide of approaches in nephrology, National Kidney Foundation/Dialysis Outcome Quality Initiative[12] and by the European Best Practice Guidelines on Nutrition (EBPG)[13] as a valid method to identify patients with PED. This version features a structure that is similar to the original one.

Other modifications of the original SGA have been proposed, varying as to the score scale,[21,22] components and mode of assessment.[6,23]

Malnutrition inflammation score

Also stemming from the original SGA, Kalantar-Zadeh *et al.*[24] proposed a new combined method called Malnutrition Inflammation Score (MIS). The MIS has a total of 10 components, 70% of the items assessed are common to the SGA and the remaining 30% are additional components (serum albumin, iron binding capacity (TIBIC) and body mass index (BMI)). In the original MIS paper, increased scores (closer to 30) were associated with poorer nutritional status and higher hospitalizations and mortality rates.[24]

Subjective global assessment and malnutrition inflammation score for PED diagnosis capacity

An important theme when referring to combined methods for assessing nutritional status is whether they are able to properly diagnose PED. To do so, we must assess whether these methods have good sensitivity (true positive) and specificity (false positive) for this purpose. When there is a gold standard method to assess nutritional status, sensitivity and specificity are evaluated by finding the cutoff point or value with the best ability to predict the outcome i.e. PED.

Since there is no gold standard for assessing nutritional status in CKD patients, CKD and nutrition guidelines recommend the use of a combination of methods to minimize errors with nutritional diagnosis. These can be anthropometry, bioelectrical impedance analysis, serum albumin, food intake, and others.[12,13]

Thus, most of the studies evaluating the accuracy of combined methods of assessing nutritional status did so through concurrent validation, i.e., from the comparison between subjective and objective methods to evaluate patient nutritional status.[7,10,21,24-34] These studies show that patients classified as well nourished by SGA and MIS had significantly higher titers of nutritional markers when compared to those classified as malnourished. The nutritional markers evaluated in these studies were BMI, fat percentage, skinfolds, waist circumference, phase angle, body cell mass and serum albumin. Thus, combined methods for assessing nutritional status are able to differentiate the well-nourished patients from those with PED.

However, the ability to diagnose the SGA and MIS degrees of PED (mild, moderate or severe) is not clear. Studies which assessed the concurrent validation by comparing the degrees of PED by SGA with anthropometric and laboratory variables showed divergent results. While some studies found that SGA was able to differentiate the degree of

PED,[10,30,35] others did not find differences between the groups.[27,33] The study by Cooper *et al.*,[27] which included patients on PD and HD evaluated SGA sensitivity and specificity in diagnosing PED and its degree (mild to moderate or severe) using the body nitrogen content assessed by the *in vitro* neutron activation analysis as the standard method. In this study, the SGA showed good sensitivity (true positive) to find patients with PED, but low specificity (false positive) to assess its degre.[27]

The lack of consensus among studies regarding SGA's ability to classify the degree of PED may be due to differences in study methodology, both in regards to diversity of parameters and normal ranges used to classify nutritional status and make the concurrent validation. Regarding MIS, although some studies proposed values to classify the nutritional status,[34,36] the lack of pre-established cutoff points hampers the test's ability to measure the degree of PED. In a study including patients on HD, which divided the sample into MIS score quartiles, the authors noted that the objective markers of nutritional status differed only between the 1st and 4th quartiles.[31] This result suggests a reduced MIS ability to differentiate the degree of PED. However; further studies on this topic are needed to confirm these findings.

With regards to the SGA models, the one with the higher accuracy in diagnosing PED is yet to be found. To our knowledge, only one study has been carried out for this purpose. Campbell *et al*.[35] evaluated the agreement of PED diagnosed by body cell mass (BCM) (count of total body potassium) with that obtained by the SGA in its original form, patient-generated subjective global assessment (PG-SGA) and SGA-7p. Among these models, the SGA in its original form had better agreement with the BCM. However, further studies should be carried out so as to define which model offers greater accuracy in PED diagnosis.

The intra -and interobserver variability is another important consideration when applying combined methods. With this objective, Visser *et al.*[37] and Steiber *et al.*[10] evaluated the intra - and interobserver variability in the SGA group of evaluators who received training. In both studies, we noticed a good intraobserver agreement and moderate interobserver agreement. These findings stress the importance of careful and regular training to use these methods and prioritize, whenever possible, the same examiner in monitoring the nutritional status.

Subjective global assessment and malnutrition inflammation score capacity in predicting outcome

The association between morbidity and mortality and PED evaluated by SGA and MIS has been described in several studies in CKD patients. Studies including patients with stage 5 CKD (non-dialysis-dependent)[22] and in HD[26,38] showed that the SGA score indicative of PED was a predictor of mortality, even after adjustment for covariates such as gender, age, c-reactive protein and cardiovascular disease (CVD).[22,26,38] In line with these findings, Mutsert *et al.*,[39] studying a cohort of patients in HD and PD, showed that for each point reduction in the SGA score, the relative risk of death increased significantly. Moreover, severe PED increased the risk of mortality five times when compared to the group classified as well-nourished. In another study including PD patients, the association between mortality and PED diagnosed by SGA was not maintained after adjustment for diabetes and CVD.[9] Despite the less favorable outcome reported in the latter paper, these data suggest that the PED - indicative SGA has good mortality-predictive power, a result also shown for hospitalization in HD patients.[26,38]

Regarding MIS, its ability to predict the mortality outcome was also demonstrated in studies including patients in HD[24,31,36] and kidney transplant.[40] In particular, the study by Ho *et al.*,[36] which included HD patients followed for up to 12 months for mortality events, deserves attention for showing that the likelihood of death in patients with values above the MIS score of 5 was 80% and above 8, it was 100%.

Thus, these results demonstrate, that the association between poor nutritional status and increased morbidity and mortality is present regardless of the model and/or combined method employed. Therefore, SGA and MIS have good predictive ability as far as outcomes are concerned.

Summary and conclusions

The use of combined methods to assess the nutritional status of patients with CKD has gained attention for its advantages such as generating a global assessment of nutritional status using reduced number of devices for its completion. Based on the studies presented, it can be concluded that these methods are able to differentiate the well-nourished patients from those with PED and that they have good power in predicting

worse mortality outcomes. Therefore, these methods constitute a valid alternative, very much applicable for the diagnosis of PED. However, some peculiarities must be considered. With respect to SAG, different models have been proposed, and one cannot state which model provides more precision for the diagnosis of PED. Second, the cutoff points proposed for classifying nutritional status deserve careful attention for not accurately representing the degree of PED. Therefore, it is important to employ other objective methods for nutritional status assessment to supplement the information provided by the combined methods. Third, we highlight the importance of early and careful training of examiners, seeking to reduce intra -and interobserver variability.

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