Why do we need to add objectivity to subjective nutrition assessment tools in hemodialysis patients?

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Abstract

Introduction: Malnutrition is very common in hemodialysis patients and is associated with increased morbidity and mortality. It is not clear whether subjective assessment can accurately identify status of malnutrition in dialysis patients. There is no single measure that can be utilized to provide a comprehensive evaluation of nutritional status.

Methods: Nutritional assessment was carried out using subjective and objective techniques on patients undergoing thrice a week hemodialysis. Subjective assessment was conducted using Subjective Global Assessment (SGA) and Dialysis Malnutrition Score (DMS). Objective assessment was done using handgrip strength and body composition analysis. Handgrip strength (HGS) analysis was performed using handgrip dynamometer (CAMRY, model EH101) while body composition analysis was performed using Body Composition Monitor (BCM) (Fresenius Medical Care). Sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) were assessed.

Result: Of the 91 screened patients, 81 completed the study. 81 patients of the total 91 patients, 46 were male. Their mean age was 54.8±12.7 years. Their mean albumin was 3.2±0.3 g/dl and BMI was 24.8±4.3 kg/m2. The prevalence of moderate and severe malnutrition was 69.1% and 17.2%. The sensitivity of both subjective as well as objective parameters was 86.4% while specificity of subjective parameters was 65.4% and that of objective parameters was 79%. The PPV of subjective parameters was 56.9% and that of objective parameters was 52.2%. The NPV of subjective parameters was 71.7% and that of objective parameters was 60.7%.

Conclusion: Objective techniques outperform subjective techniques due to higher specificity and lower NPV. Simple, easily available bedside tools like handheld dynamometer can prove to be a good nutrition assessment technique for hemodialysis patients in combination with SGA or DMS.

Keywords: nutrition assessment, objective, subjective, handgrip strength, malnutrition

Introduction

Protein energy malnutrition (PEM) is defined as a lack in supply of sufficient energy or protein to meet metabolic demands of body as a result of either an inadequate dietary protein intake or increased demands due to diseased condition or increased protein losses (1). While all these features are commonly seen in hemodialysis patients, the prevalence of PEM is high in hemodialysis patients. Malnutrition is a strong predictor of morbidity and mortality in hemodialysis (2) as well as peritoneal dialysis (3). In majority of patients, malnutrition is usually mild to moderate; however, in approximately 10% patients it is often severe (4).

Nutrition status at the beginning of renal replacement therapy significantly predicts dialysis outcomes. While it is extremely significant to assess the nutritional status at the initiation of dialysis followed by regular intervals, there is no single measure that can be utilized to provide a comprehensive evaluation of nutritional status (5). Currently, a combination of different methods like clinical parameters, laboratory parameters and technical parameters are used with each method having its own merits and demerits.

Of these parameters -few are subjective and are widely used while others are objective and not adequately used. Subjective parameters include scoring scales like Subjective Global Assessment (SGA) or Dialysis Malnutrition Score (DMS) which are simple, easily available, inexpensive tools and which can be performed bedside (5). Objective parameters include anthropometric measurements like skinfold thickness, laboratory parameters like serum albumin, pre-albumin, technical parameters like Dual X-ray Absorptiometry (DEXA), etc (6,7,8). As it is not clear which techniques can accurately assess the nutritional status, we hypothesized that objective parameters outperform subjective ones in case of chronic hemodialysis patients. The secondary aim was to propose easily performable bedside tools that can be routinely used to assess nutrition status.

Material and Methods

This study was a prospective, cross sectional study conducted in between October 2017 to May 2018. The inclusion criteria comprised of age above 18 years, patients undergoing chronic maintenance hemodialysis not less than twice a week and the ones willing to participate. The exclusion criteria comprised of history of hospitalization in previous 3 months for acute infection or history of hepatitis or malignancy and subjects with active infections like tuberculosis. Prior to enrollment patients willing to participate were given an informed consent form in language understandable by them.

Objective techniques: A brief medical history and anthropometric data were collected post hemodialysis. Serum albumin was assessed prior to hemodialysis on Vitros 250 machine. Body composition analysis was performed post hemodialysis on non-fistula arm. The machine used was body composition monitor by Fresenius Medical Care. It utilizes the

principle of bioelectrical impedance for analysis. Handgrip strength analysis was performed post hemodialysis using a digital handheld handgrip dynamometer (CAMRY, model EH101).

For nutrition assessment through objective techniques, both BCM and HGS were used.

Malnutrition was divided into 3 categories as shown in table 1.

Subjective techniques: SGA and DMS were performed after completion of objective assessment by a single trained Renal Dietician. 7-point SGA validated by Steiber et al was used for assessment. A modified quantitative SGA, also known as DMS which utilizes the 7 components of SGA and grading each component (from 1 to 5, therefore a possible total range of 7 to 35) was used too.

For comparing the results of subjective and objective techniques, malnutrition was categorized into 3 categories - normal, moderate and severe malnutrition. Normal nutrition was defined as serum albumin >3.5 g/dl, BMI>18. 5 kg/m2, SGA score A. Moderate malnutrition was defined as serum albumin <3.5 g/dl, BMI <18.5 kg/m2 and SGA score B. Severe malnutrition was defined as serum albumin <3.0 g/dl, BMI <17.5kg/m2 and SGA score C.

Statistical analysis: Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) software, version 22. Variables were reported as mean ± standard deviation (SD). For comparing the subjective and objective assessment techniques; sensitivity, specificity and Positive Predictive Value (PPV) and Negative Predictive Value (NPV) were assessed.

Results

Out of 94 screened patients, 6 were dropped due to ineligibility to perform body composition analysis (for example, due to presence of metal rod or plates in bones due to fractures, etc), 3 were dropped due to presence of arteriovenous fistula in both hands and 4 were excluded due to loss to follow up. In all, 81 patients completed the study. After enrollment, objective assessment was carried out which was followed by subjective assessment.

Baseline patient characteristics:

The mean age of patients was 54.8±12.7 years (Table 2). Of the total of 81 patients, 46 were males. Their mean Body Mass Index (BMI) was 24.8±4.3 kg/m2. The mean serum albumin was 3.2±0.3 g/dl and dialysis vintage was 2.9±2.4 years. All patients were on thrice a week maintenance hemodialysis. The etiology of kidney disease was diabetes in 29.9% patients, hypertension in 57.8%, chronic glomerulonephritis in 4.1%, chronic tubular interstitial disease in 2.3% and others in 5.9%. The average HGS was 18.9±7.7kg.

Sensitivity, specificity, positive predictive value and negative predictive value

According to the above definition of malnutrition; of total 81 patients, 11 (13.5%) patients were well nourished, 56 (69.1%) patients were moderately malnourished and 14 (17.2%) were severely malnourished (Table 3).

The sensitivity of both subjective as well as objective parameters was 86.4% while specificity of subjective parameters was 65.4% and that of objective parameters was 79%. The PPV of subjective parameters was 56.9% and that of objective parameters was 52.2%. The NPV of subjective parameters was 71.7% and that of objective parameters was 60.7%.

Discussion

Nutritional risk screening and nutrition assessment play a significant role in predicting dialysis outcomes as poor nutritional status is associated with frailty, muscle wasting and susceptibility to infections. This is associated with increased morbidity and mortality in chronic hemodialysis patients. There are several tools which are used to identify patients with nutritional risk, strategize interventions and periodically assess the degree of improvement in nutrition status (5). Due to lack of common consensus on the use of a single or a combination of screening tools as standard of care, different dialysis professionals use different tools according to their expertise, skills, etc.

In our study, we found that subjective assessment techniques were overestimating normal nutrition status. While the sensitivity of both techniques was similar, the specificity of subjective techniques was lower. Also, the negative predictive value of subjective parameters was higher as compared to objective parameters. In a study conducted by N Prasad et al in 2016, it was highlighted that although SGA remains a valid measure of nutrition status, there are several limitations in its individual parameters to be able to accurately assess nutrition status (3). Hence, they undertook a study to compare SGA with an alternative tool, Nutrition Risk Index (NRI) and found its sensitivity to be high but low specificity in peritoneal dialysis patients. This may be partially because NRI relies on objective parameters like dry weight and serum albumin. The NRI formulae itself provides objectivity in assessing the nutritional status.

Handgrip strength is a key parameter in assessment of malnutrition, sarcopenia or frailty (9,10). In two separate studies conducted by Viviane O et al and by Pierre D, it was reported that handgrip strength is an easy, bedside, reliable and useful tool for objective assessment of muscle strength in dialysis patients. In our study, we found handgrip strength to be a simple and reliable tool which does not require extra skills. Hence, we recommend its use at regular intervals in chronic hemodialysis patients to assess their nutritional status.

Conclusion

While subjective assessment techniques rely on the expertise and skills of the examiner and results may vary from one examiner to other, objective techniques are superior in terms of reliability. It is meaningful to add objectivity to subjective techniques and they should be considered at the initiation of hemodialysis and every six months as recommended by the National Kidney Foundation Kidney Disease/Dialysis

Outcomes and Quality Initiative (NKF/KDOQI) in its 2019 update.

Handgrip dynamometer is a relatively affordable, simple and reliable tool of nutrition assessment which can be utilized by all dialysis professionals. We strongly recommend the use of objective techniques for nutrition assessment while performing any clinical studies focusing on nutrition in hemodialysis patients.

Practical implications

For nutrition assessment, currently the most widely used parameters are laboratory parameters like serum albumin, pre-albumin, etc and anthropometric parameters like Body Mass Index (BMI) for routine clinical use. The use of subjective techniques like Subjective Global Assessment (SGA) is limited due to the lack of trained investigators and inter-researcher deviations. Hence, the use of simple, objective techniques that can be easily performed is required.

This study emphasizes the need for use of objective parameters like handgrip strength in nutrition assessment. Handheld dynamometer is a relatively affordable, simple and reliable tool of nutrition assessment which can be utilized by all dialysis professionals. We strongly recommend the use of objective techniques for nutrition assessment while performing any clinical studies focusing on nutrition in hemodialysis patients. Objective parameters may prove to be game changers in nutritional studies especially interventional studies.

Limitations of the study

Our study did not incorporate the use of malnutrition inflammation score (MIS) which includes subjective as well as objective parameters of nutrition assessment in hemodialysis patients. We recommend its use in future studies.

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Tables: Table1. Categories that define malnutrition through objective techniques

Nutritional Status	LTI (kg/m^2)	HGS (kg)
Well nourished	>10.7 for men, >6.7 for women	>26 kg for men, >18 kg for women
Moderately malnourished	9.0 - 10.7 for men, 5.0 - 6.7 for women	< 20 – 26 kg for men, < 12 - 18 kg for women
Severely malnourished	<9.0 for men, <5.0 for women	<20 kg for men, <12 kg for women

Table 2. Basic patient characteristics

Patient characteristics	**Value (N=81)**
Age	54.8±12.7 years
Gender	M: 46 F:35
Height	160.0±6.4 cm
Weight	63.9±13.5 kg
BMI	24.8±4.3 kg/m^2
Systolic Blood Pressure (SBP)	155±86 mm Hg
Diastolic Blood Pressure (DBP)	88±10.2 mm Hg
Dialysis vintage	2.9±2.4 years
Blood flow	250-300 ml/min
Dialysate flow	500 ml/min
Serum albumin	3.2±0.3 g/dl
Lean Tissue Mass (LTM)	23.5±7.0 kg
Lean Tissue Index (LTI)	9.5±3.2kg/ m^2
Handgrip strength (HGS)	18.9±7.7kg

Table 3. Comparison of prevalence of malnutrition through subjective and objective techniques

Nutritional status	Prevalence of malnutrition (%)	Prevalence by Subjective technique (%)	Prevalence by Objective technique (%)
Well-nourished	13.5	34.8	21.5
Moderately malnourished	69.1	58.3	63.7
Severely malnourished	17.2	6.8	14.8