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Assessing the Nutritional Status of Hemodialysis Patients in a Sub-Saharan Country

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Abstract

Objective: Identifying which of the three scores (MNA, SGA and ISRNM) would better assess the nutritional status of chronic hemodialysis patients in Benin

Patients and Methods: We conducted a cross-sectional, descriptive and analytical study. It was carried out over a three-month period, from 1st July to 31st September 2015. The study participants included patients who have been on hemodialysis for at least the past 6 months, non-admitted in the past 4 weeks and having given their consent to participate in the study. All patients were subject to anthropometric parameters and checkups in order to apply the three nutritional scores: Mini Nutritional Assessment (MNA); Suggestive Global Assessment (SGA); International Society of Renal Nutrition and Metabolism (ISRNM criteria). Statistical analysis was performed through EpiData Ver 3.1.

Outcomes: 149 patients were selected including 38.93% of women and 61.07% of men. Age ranged from 19 to 79 years with 48 ± 12.88 as mean age. The prevalence of overall malnutrition was respectively 42.75%; 36.24% and 14.09% based on MNA, SGA and ISRNM scores. There was poor protein intake in 85.19% of cases, body mass index (BMI) was below 23 kg/m^2 in 68.46% of cases, hypoalbuminemia and pre-dialysis hypocreatininemia were recorded in respectively 29.53% and 52.38% of cases.

Conclusion: SGA score seems to be a more objective score as it uses both history and clinical data. BMI and protein intake when considered distinctly, have a better predictive value of our patients nutritional status.

Keywords: Malnutrition; Hemodialysis patients; Prevalence; Nutritional score

Introduction

Chronic kidney disease is a public health issue [1]. In Africa, its prevalence and incidence among the population at large are unknown; existing data relate to IRC in hospital setting. Decline in glomerular filtration rate (GFR) underlies gradual deterioration of nutritional status [2]. Patients in end-stage chronic kidney disease require renal replacement therapy which is not only extensive but also expensive: Dialysis or kidney transplant [3].

Poor nutritional status among hemodialysis patients is a basic predictor of shorter survival time [4]. In scientific journals, prevalence of malnutrition among these patients varies from 18 to 75% depending on screening methods [5,6]. Malnutrition should be prevented because it largely contributes to the high rates of morbidity and mortality recorded among these patients. With regard to dialysis, annual mortality is estimated at 10-15% in the absence of malnutrition while this rate rises to 30% among malnourished patients [7]. It is very important to assess the nutritional status of patients on dialysis, in view of preventing protein-energy malnutrition and provide adequate treatment to malnourished patients [8,9].

In Benin, hemodialysis is the only renal replacement therapy provided to adults at end-stage chronic kidney disease. Benin Government covers 100% of the cost involved in care and support (dialysis sessions and drugs). Hemodialysis patients of CNHU-HKM, Cotonou have no nutritional follow-up, furthermore, the dialysis unit cannot boast of a dietician-nutritionist. The purpose of this study was to assess the nutritional status of chronic hemodialysis patients in CNHU-HKM, Cotonou and identify the ideal scores and/or parameters for better screening.

Patients and Methods

It was a cross-sectional, descriptive and analytical study carried out over a three-month period, from 1st July to 31st September 2015 in the dialysis unit of HKM teaching hospital in Cotonou. Non-probability sampling method was used. It consisted in comprehensive census of patients on hemodialysis during the study period. This study

performed within the framework of academic work, was conducted in strict compliance with good clinical practices (GCP). Patients gave their free and informed consent in writing. Confidentiality was strictly maintained during data collection. Information collected within the framework of this study was anonymously processed. Inclusion criteria were as follows: 18 years and above, be on hemodialysis for at least the past six months and non-admitted in the past four weeks. We excluded patients unable to respond to the questions, and those who did not provide answers to greater part of the questions. Patients were interviewed during dialysis sessions.

Demographic and clinical variables namely age, sex, duration of dialysis session, seniority in dialysis, digestive symptoms and anthropometric parameters were collected. Body mass index expressed in kg/m^2 was calculated: body weight expressed in kg divided by height squared expressed in m^2. Immediately after the dialysis session, anthropometric parameters were measured. Paraclinical variables namely albuminemia bromocresol green, C-reactive protein, pre and post dialysis uremia and pre-dialysis serum creatinine were all determined. Generation of protein nitrogen (nPNA), formerly termed protein catabolism rate (PCR), was calculated to assess protein intake. The calculation of nPNA in g/kg/24 h satisfied the following equation from Garred et al. [10] 126: nPCR=[0.0504 (1-0.162R) (1- R +Δ Poids/0.58 Poids Sec)] x UréeAv/(1-0,0003 x tHD)+0.17 in which R represented the ratio between urea concentrations at the end and the beginning of the dialysis session R=UréeAp/UréeAv; weight is expressed in kg, urea concentrations expressed in mmol/l and dialysis session duration (tHD) expressed in hour.

Three nutritional scores used in several scientific studies were assessed namely: Subjective Global Assessment (SGA), Mini Nutritional Assessment (MNA) and the score of International Society of Renal Nutrition and Metabolism (ISRNM). MNA score [11] includes: anthropometric assessment, overall assessment, dietary indicators and subjective assessment. The nutritional status was qualified as satisfactory only when the score was ≥ 24. There is a risk of malnutrition when the score was between 17 and 23.5. The nutritional status was termed as poor when the score was below 17. SGA score [12] helps to classify the patients in three distinct categories: A (Good nutrition); B (Moderate malnutrition) or C (Severe malnutrition). The patients on dialysis were classified in one of these categories after a subjective estimate based on two criteria: medical history and physical examination. SGA grid was used to assign a score (A, B or C) to each parameter of the medical history or physical examination. The patient on dialysis was said to be in good nutritional status when score A was dominant globally, moderate to slight malnutrition when score B was predominant and severe malnutrition when score C was predominant. According to ISRNM [13] criteria, a patient on dialysis was said to be malnourished when at least three of the four following criteria were present: serum albumin <38 g/l; BMI <23 kg/m^2; pre-dialysis serum creatinine value <665 µmol/l; protein intake (nPNA) <0.80 g/kg/day for over two months (nPNA was calculated four times: in June, July, August and September).

Paper mapping data collected were then entered in the form of database using EpiData version 3.1 and the analysis was made through Stata version 11. We made comparison of ratios and sought associations between variables using Pearson Chi^2 test with 5% as significance threshold.

Outcomes

During the study period, there were 208 chronic hemodialysis patients. One hundred and forty-nine hemodialysis patients met the inclusion criteria, i.e. 71.63% of the study population. We recorded 38.93% of women against 61.07% of men with 1.57 as sex ratio. Age ranged from 19 to 79 years with 48 ± 12.88 as mean age. Sixty-one percent (61%) of our patients on dialysis were aged below 50 years. Only 12.75% of the population was out of school and 71.81% has at least secondary school level. Our patients have been on hemodialysis for an average period of 75.9 ± 59.7, with extremes ranging from 6 to 228 months. During the study period, we recorded that half of these patients have been on dialysis for less than 5 years (60 months). Anorexia was moderate in 28.86% of cases and 71.14% of patients on dialysis experienced no anorexia. Mid upper arm circumference was normal in 57.72% of cases and calf circumference in 81.88% of cases. CRP was negative in 71.23% of cases (Table 1).

Parameters	Normal	Abnormal
Clinical characteristics		
Dietary survey	No anorexia 71.14%	Moderate anorexia 28.86%
BMI (kg/m²)	31.54% (≥ 23)	29.54% ([20; 23]), 38.92% (< 20)
Mid upper arm circumference (cm)	57.72% (>22)	42.28% (≤ 22)
Calf circumference (cm)	81.88% (≥31)	18.12% (< 31)
Biological parameters		
Serum albumin (g/L)	70.47% (≥38)	29.53% (< 38)
CRP (mg/L)	71.23% (≤6)	28.77% (> 6)
Other		
NPNA (g/kg/l)	12.75% (] 1; 1.4])	28.19% (<0.8), 57.05% ([0.8; 1]), 8.72% (>1.2), 2.01% (>1.4)

Table 1: Clinical-biological characteristics.

Based on MNA score, the nutritional status was normal among 57.05% of patients on dialysis. 31.54% of patient on dialysis were exposed to risk of malnutrition and 11.41% had poor nutritional status. Overall malnutrition was estimated at 42.75%.

Based on SGA score, nutritional status was normal among 63.76% of patients on dialysis. There was moderate malnutrition among 36.24% of patients on dialysis. No case of severe malnutrition was observed.

Based on ISRNM criteria (low albumin level, BMI ≤ 23kg/m^2, poor protein intake and pre-dialysis hypocreatininemia), only 21 out of 149 patient on dialysis presented simultaneously at least three of the four criteria. The prevalence of protein-energy malnutrition according to this score was 14.09% (Figure 1).

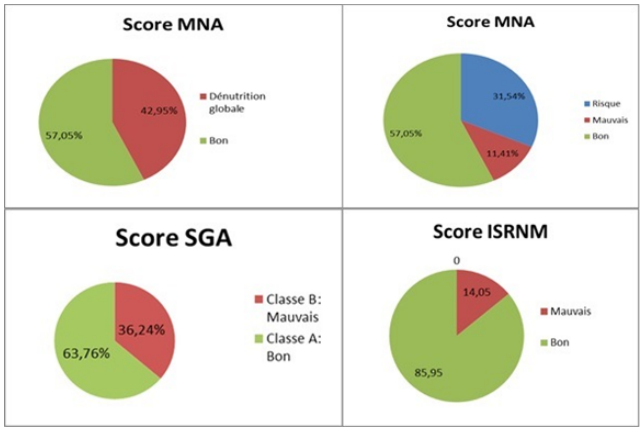

Figure 1: Prevalence of protein-energy malnutrition based on the three nutritional scores. Score MNA-MNA score, Dénutrition globale-Overall malnutrition, Bon-Good, Risque-Risk, Mauvais-Poor, Bon-Good, Score SGA-SGA score, Classe B Mauvais-Category B Poor, Classe A Bon-Category A Good, Score ISRNM-ISRNM score.

Nutritional status according to nPNA: poor protein intake in 85.24% of cases with 57.05% (0.8 ≥ nPNA<1) of risk of malnutrition and 28.19% (nPNA<0.8) of malnutrition (Figure 2).

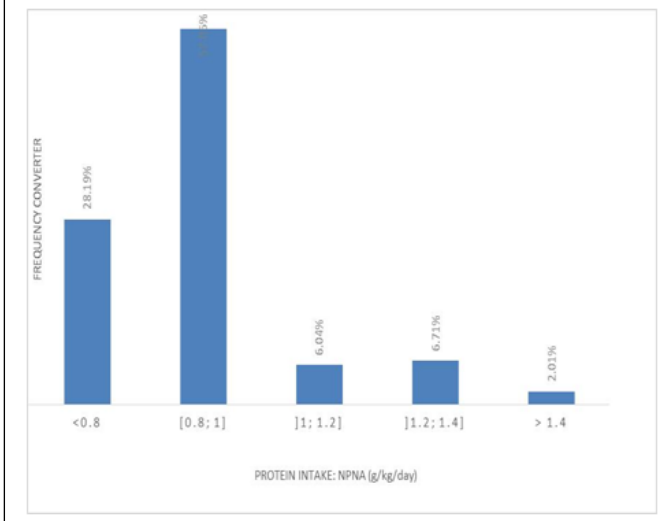

Figure 2: Distribution of dialysis patients based on protein intake.

Nutritional status according to albuminemia: there was 29.53% hypoalbuminemia cases. Nutritional status according to BMI: there was 31.54% normal Body Mass Index cases (BMI ≥23 kg/m^2). We recorded 29.54% (20 ≤ BMI<23 kg/m^2) of risk of malnutrition and 38.92% (BMI<20 kg/m^2) of the study population was malnourished (Figure 3).

BMI is the only parameter which was significantly associated with the screening of malnutrition through the three nutritional scores used (Table 2). We did not observe any statistically significant relation between seniority in hemodialysis and the onset of malnutrition among our hemodialysis patients (p= 0.490).

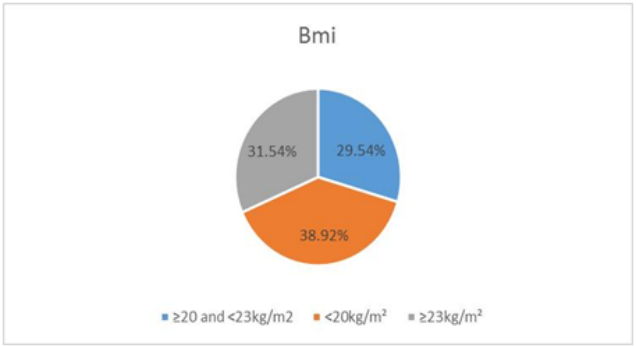

Figure 3: Distribution of dialysis patients based on BMI.

Parameters	MNA	SGA	ISRNM
	P-value	P-value	P-value
Age	0.212	0.344	0.289
Seniority in dialysis	0.363	0.172	0.133
Dialysis duration/week	0.193	0.426	0.041
Anorexia	0	0	0.303
Mid upper arm circumference	0	0	0.162
Calf circumference	0	0	0.102
BMI	0	0.013	0.007
Serum albumin	0.243	0.041	0
nPNA	0.822	0.096	0

Table 2: Variables significantly associated with nutritional scores in bivariate analysis.

Discussion

Protein-energy malnutrition is a common concern of patients on dialysis, and it increases morbidity and mortality among this population. Despite this reality, no particular attention is given to the nutritional status of patients on dialysis [14]. This study is meant to assess the nutritional status of hemodialysis patients in Benin, through several assessment methods. Notwithstanding the small size of the sample, we have been able to make the following discussion through the study outcomes.

The demographic characteristics (sex, age) reported in our study were comparable with studies conducted by Ondele et al in 2013 in Senegal [15], Halle et al. in 2014 in Cameroon [16] and by Liman et al. in 2015 in Nigeria [17]. Sixty-one percent (61%) of our patients on dialysis were aged below 50 years; therefore they were part of the working population. This observation highlights the need to pay particular attention to this category of labor force by mobilizing all means available to decrease morbidity and mortality.

We did not observe any consistency between the three nutritional scores and the two clinical scores (MNA and SGA). However, Ondele et al. observed consistency between MNA and SGA scores in their study in Senegal [15]. This difference could be attributable to variation in demographic and culture characteristics which are specific to each country and ethnic group. Based on SGA score, the prevalence of malnutrition among our hemodialysis patients was higher than that of De Oliveira et al. in 2007 (19.5%) in Brazil [18]; Saran et al. in 2008 (32%) in Saudi Arabia [19]; and Hall et al. (28.3%) in Cameroon [16]. However, it was less than records found in China by Chen et al. (68%) [20]; in Senegal by Ondele et al. (41%) [18]; and in Nigeria by Liman et al. (54.8%) [17]. This variation from one country to another could be explained not only by the reasons already mentioned above, but also the traditional eating habits specific to each country. In Benin, we mostly have high-calorie and low-protein diets. Based on ISRNM criteria, this prevalence is lower than the estimates recorded in Brazil in 2013 (20%) [21], 2.6 times lower than estimates found in Spain in 2013 (37%) [22], and five times lower than the incidence recorded among Afro-Caribbeans in France in 2011 (69.9%) [23]. The lower prevalence in our study could not obviously be justified without a longitudinal study in the other dialysis units within our country, to analyze this score variation within our population. Especially, in view of the fact that the prevalence based on ISRNM was the lowest of the three scores. When we consider the protein intake (nPNA), 28.19% of our patients on dialysis were malnourished (<0.8 g/kg/day) and 57% exposed to risk of malnutrition (0.8-1.0 g/kg/hr). This observation is similar to that of Afshar et al. in 2007 in Iran where 33.33% were malnourished and 46.30% at risk of malnutrition [24]. But this prevalence was significantly higher than records found by Ondele et al. in 2013 in Senegal, where the prevalence of malnourished hemodialysis patients at risk of malnutrition was 12.7% [15]. On the one hand, this difference could be attributable to poor nutritional follow-up of our patients on dialysis, and on the other hand the sources of protein and traditional eating habits specific to each country.

The low albumin level reported by our study is close to that of Hall et al. in 2012 (31.6%) in Cameroon [16] and Foucan et al. in 2011(31.5%) in France [23]. However, this proportion is higher than records found by Ondele et al. in 2013 (17%) in Senegal; Flavia et al. in 2013 (18%) in Brazil [21]; Liman et al. in 2015 (24.2%) in Nigeria. It is lower than estimates recorded by Gracia-Iguacel et al. in 2013 (49.6%) in Spain [22].

Out of all ISRNM criteria, BMI emerges as the leading predictive factor of malnutrition among our patients on dialysis, followed by protein intake. BMI was the only factor significantly associated with the three nutritional scores in bivariate analysis. Our findings suggest that when considered distinctly, these elements could have better predictive value of malnutrition among our dialysis patients than ISRNM. Gracia-Iguacel et al. [22] made the same observation. The limitations of this study are: cross-sectional method, small sample size, absence of pre albumin test, poor assessment of fat mass and lean body mass through DEXA and impedance measurement.

It will be difficult to perform periodic assessment of the hemodialysis patients' nutritional status according to the ISRNM criteria because albuminemia requires a huge budget. MNA and/or SGA nutritional scores associated with BMI and protein intake (nPNA) can allow to reasonably monitoring the nutritional status of hemodialysis patients, given the limited financial resources.

Conclusion

Protein-energy malnutrition is common among hemodialysis patients in Cotonou. Its prevalence varies between 14 and 42.95% depending on the measurement tool used in the absence of nutritional follow-up. In a sub-Saharan developing country with limited resources such as Benin, MNA and SGA nutritional scores together with BMI and nPNA could help to follow the nutritional status of our hemodialysis patient. However this study was cross-sectional and could not be generalized, hence the need for a longitudinal study to determine which of the parameters would better assess the nutritional status of our dialysis patients with limited resources in Cotonou.

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