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Evaluation of the Nutritional Status of Chronic Haemodialysis Patients at Nouakchott National Hospital (Mauritania): Prevalence and Risk Factors for Undernutrition

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Abstract

Introduction: Protein-Energy Undernutrition (PEU) is common in chronic haemodialysis patients and is an important contributor to morbidity and mortality. However, limited data are available on the prevalence of PEU in the dialysis population of Africa. The objectives of this study were to evaluate the nutritional profile of chronic haemodialysis patients in Nouakchott (Mauritania) to determine the prevalence of undernutrition in this population and to identify predictive factors.

Patients and methods: This descriptive, analytical, cross-sectional study was conducted from 12 January to 8 September 2015, and involved patients on haemodialysis who regularly attended the haemodialysis unit (at least 3 months) of the Nouakchott Hospital Center. The Subjective Global Assessment (SGA) according to Detsky was used to assess the nutritional status of patients. We also collected epidemiological, dialytical, clinical and anthropometric data.

Results: Sixty-nine chronic haemodialysis patients were included. The mean age was 45.9 ± 14.08 years, and the sex ratio was 0.97. The mean duration of haemodialysis was 27 months and 20 days. Anorexia was found in 59.4% of cases, and the mean Body Mass Index (BMI) was 24.38 ± 3.74 kg/m2. The average Branchial Circumference (CB) was 22.91 ± 3.6 cm. Patients showed mean albumin and haemoglobin levels of 38.69 g/L (range 19.2-48.4 g/L) and 8.3 ± 0.9 g/dL, respectively, and biological inflammatory syndrome was found in 16.17% of patients. The prevalence of malnutrition was 36.2%, which was classified as moderate in 20.3% of cases and severe in 15.9% of cases. Malnutrition was found to be correlated with a low socioeconomic status, anorexia, poor dental status, low BMI, hypophosphatemia, hypocholesterolemia, high C-reactive protein CRP and hypoprotidaemia.

Conclusion: The prevention of undernutrition through dietary interventions must be at the heart of management for chronic haemodialysis patients.

Introduction

Protein-Energy Undernutrition (PEU) results from an imbalance between the contributions and requirements of the body, leading to involuntary tissue loss with deleterious functional consequences [1]. This complication is common among chronic haemodialysis patients. Despite advances in dialysis techniques, the prevalence of PEU in this population remains high. It is estimated that 20-50% of chronic haemodialysis patients suffer from PEU [2,3]. Despite regular dialysis, nutritional imbalances are often reported due to inflammation, infections, metabolic acidosis, gastro paresis in diabetic patients and oxidative stress related to uraemia and can also be influenced by the dialysis technique [1]. These factors may cause additional complications and represent sources of morbidity and mortality in dialysis patients.

Nutritional evaluation in chronic dialysis patients is especially challenging due to changes in hydration and protein and carbohydrate metabolism secondary to renal failure. Thus, comparison of certain parameters with the general population is not possible [4].

In Africa, limited data are available on PEU in the dialysis population, and no previous studies have been conducted in Mauritania. Thus, this study had the following objectives: to determine the prevalence of undernutrition in this population, to evaluate their nutritional profile, and to identify predictors of undernutrition.

Patients and Methods

This descriptive, analytical, cross-sectional study was conducted in the haemodialysis unit of the Nouakchott Hospital Center (Mauritania) from January 12 to September 8, 2015. Included were patients who had been on haemodialysis for more than 3months. The exclusion criteria were the refusal of patients to participate or severe infection or surgery in the past 30 days.

The collection of data was based on a standardised survey form which assessed different parameters including epidemiological, clinical and biological data.

To evaluate the socioeconomic level, we used the socioeconomic position index defined by Genoud in 2011 [5]. Patients were classified as having a low, medium or high socioeconomic level.

For the anthropometric evaluation, measurements were taken immediately after the dialysis session. They included the Body Mass Index (BMI) and muscle circumference, which was measured using

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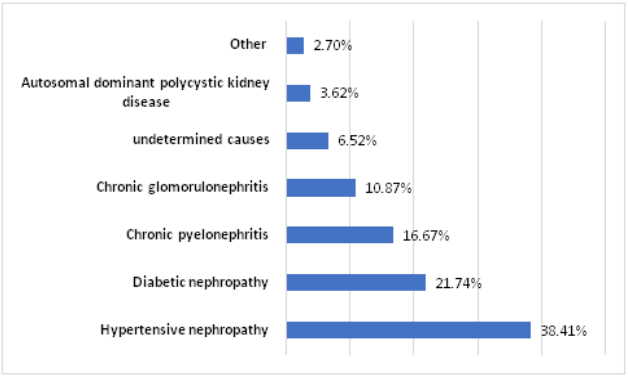

Figure 1: Distribution of patients according to different causal nephropathies.

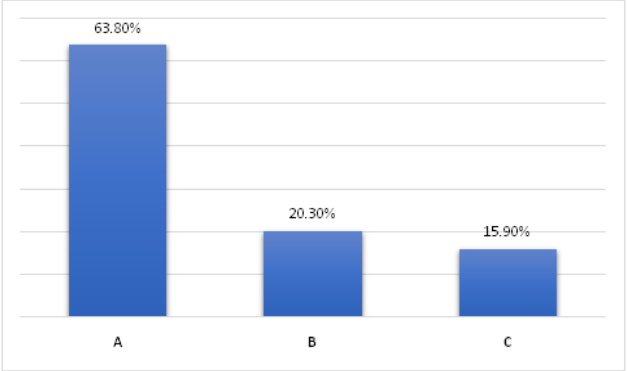

Figure 2: Classification of SGA.

a non-elastic tape measure. The Brachial Circumference (BC) was measured midway between the acromion and the olecranon on the opposite arm to the fistula. The Calf Circumference (CC) of the left leg was measured at the maximum perimeter while the leg was bent at a 90° angle.

The Subjective Global Assessment (SGA) according to Detsky was used to assess the nutritional status of patients [6]. This measure was used because the estimates were found to be very close to reality in our chronic haemodialysis patients.

The elements taken into account in this study were as follows: change in weight over the past 6 months (weight loss <5%, 6-10%, >10%) and change over the past 2 weeks; changes in dietary intake (no change, marked decrease, inability to eat); gastrointestinal disorders (anorexia, nausea, vomiting, diarrhea, etc.); degree of functional ability (from normal to bed rest); level of metabolic stress (absent, moderate, intense); loss of subcutaneous adipose tissue by the subjective clinical assessment of skin folds (quadricipital, tricipital, pre-thoracic); muscle wasting (quadriceps, deltoids); and the presence or absence of oedema of the ankles and/or as cites.

At the end of this evaluation, patients were grouped into three classes (class A, B or C) based on their nutritional status. Patients were classified as class A if they presented a normal nutritional status (absence or low presence of signs), with no physical signs of undernutrition, significant weight loss (weight loss of 5-10% with tendency to weight gain), food problems, functional discomfort or gastrointestinal symptoms that may lead to undernutrition. Class C indicated severe undernutrition (strong presence of signs), where the patient presented physical signs of undernutrition (significant loss of subcutaneous adipose tissue, significant muscle atrophy or oedema) associated with continuous weight loss of at least 10% or a decrease in food intake. Patients were classified as class B, indicating moderate undernutrition (intermediate state), if they presented weight loss of 5-10% without a tendency toward weight gain, associated with the slight loss of muscle or subcutaneous adipose tissue and a reduction in food intake.

Indeed, class B is the most ambiguous, and patients in this class could also present characteristics of the other categories. As a general rule, if classifications C and A were not clear, the patient was classified as category B.

The biological markers used were albumin, CRP, protidaemia, total cholesterolaemia, urea, creatinine, phosphataemia, haemoglobin and blood ionogram.

For statistical analysis, the collected data were captured and analysed with SPSS statistics software (version 20.0). The qualitative variables are presented as percentages and the quantitative variables are presented as the average and standard deviation or with the minimum and maximum values. The statistical analyses were performed with cross-tabulations. To compare the frequencies, the chi-square test, Fisher test or Student's t-test were used. The difference was statistically significant atp <0.05.

The local ethics committee approved the study.

Results

Descriptive results

Of the 128 chronic haemodialysis patients, 69 were included in the study, representing 54% of the total population. The mean age was 45.9 ± 14.08 years, with patients ranging from 16 to 75 years. There was a slight female predominance of 50.7% (35 patients) versus 49.3% of males (34 patients), with a sex ratio of 0.97. Regarding the socioeconomic level, it was high in 14.5% and low in 52.2% of patients. Hypertensive nephropathy was the first causal nephropathy followed by diabetic nephropathy (Figure 1). The average duration of dialysis was 27 months and 20 days, with a maximum of 156 months and a minimum of 3 months. The frequency of dialysis was twice per week in 47.8% of patients (33 patients) and three times per week in 52.2% (36 patients). The vascular approach was Arteriovenous Fistula (AVF) in 94.2% of patients and a temporary catheter in 5.8% of patients.

Anorexia was found in 41 patients (59.4%). Out of the 69 patients (39.1%), 27 ateless than three meals a day. A good dental condition was found in 82.6% of our patients (57 patients), with a poor condition found in 17.4% (12 patients).

The results of the nutritional status assessment according to Detsky's index is presented in (Figure 2). A normal nutritional status (Class A) was reported in 44 patients (63.8%), while a state of malnutrition (Classes B and C) was observed in 25 patients (36.2%).

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Table 1: Biological parameters of the study population.

Parameters	Categories	Number	Percentages	Means	Extreme values
CRP-adjusted albumin (g/l)	<25	1	1.4%	38,69	19.2 and 48.4
	[25-30]	8	11.5%		
	[30-35]	28	40.5%		
	[35-40]	21	30.4%		
	>40	11	16 %		
	Total	69	100%		
Bloodtotalcholesterol (g/l)	<1.5	21	30.4%	1,92	0.62 and 5
	1.5-2	14	20.2%		
	2-2.5	21	30.4%		
	2.5-3	11	15.9%		
	>3	2	2.8%		
	Total	69	100%		
Hemoglobin level (g/dl)	<10	58	84.05%	8,3	4.1 and 11.1
	≥10	11	15.9%		
	Total	69	100%		
Phosphataemia (mg/l)	<25	6	8.6%	44,9	23.4 and 91.6
	[25-45]	28	40.5%		
	>45	35	50.7%		
	Total	69	100%		
Protidemia (g/l)	<60	19	27.5%	63,85	34 and 78
	≥60	50	72.5%		
	Total	69	100%		
CRP (mg/l)	<6	57	82.6%	7,2	1 and 96
	≥6	12	17.4%		
	Total	69	100%		

Of these, 14 patients (20.3%) had moderate (Class B) and 11 patients (15.9%) had severe (Class C) malnutrition.

The average BMI was 24.38 ± 3.74 kg/m², with a maximum of 34.19 kg/m² and a minimum of 16.14 kg/m². Twenty-six percent of patients had a BMI less than 20 kg/m², and 15.9% had a BMI greater than or equal to 25 kg/m².

The average BC was 22.91 ± 3.6 cm, ranging from 16 to 31 cm. ABC greater than 22 cm was found in 50.7% of patients. The mean CC was 29.78 ± 4.3 cm, which ranged from 19 to 41 cm. A CC less than 31 cm was found in 40.6%.

The pre-dialytic biological data are presented in (Table 1).

Analytical results

In the bivariate analysis, nutritional status according to the Detsky Index was not significantly correlated with age (p = 0.172). Moderate and severe undernutrition was present in 32% of males and 40% of females, but this difference was not statistically significant (p = 0.792). There was no significant correlation between malnutrition and poor socioeconomic status (p = 0.026). The prevalence of undernutrition was 0% in patients with a high socioeconomic status, 34.8% among those with a moderate socioeconomic level and 47.2% among low socioeconomic patients. Undernutrition was correlated with the presence of anorexia (p = 0.006). A prevalence of undernutrition of 51.2% was found in anorexic patients compared to14.3% in non-anorexic patients. Undernutrition was correlated with a poor dental status (p<0.001). The prevalence of undernutrition among patients with a poor dental status was 75% compared to 28% in those with a good dental status. There was no significant difference between nutritional status and the dialysis seniority (p = 0.526).

Undernutrition was associated with a low BMI (p<0.001). Thus, undernutrition was found in all patients whose BMI was less than 18 kg/m². A good nutritional status was noted in all patients with a BMI greater than 30 kg/m². However, 16.7% of overweight patients (BMI of 25-30 kg/m²) were malnourished, and 77% of patients with a BMI between 18-20 kg/m² had a good nutritional status. A low BC (p<0.001) was correlated with undernutrition. All patients with a BC measuring <19 cm were malnourished. In contrast, 21% of malnourished patients had a BC between 23-25 cm and 6.7% had a BC greater than 25 cm.

The correlation between malnutrition and hypoalbuminaemia was statistically significant (p<0.001). Undernutrition was observed in all patients with albumin levels less than or equal to 25 g/L. It was also present in 87.5% of cases with albuminaemia between 25-30 g/L and in 50% of cases with albuminaemia between 30-35 g/L. Above 35 g/L, all patients had a good nutritional status. Undernutrition was also correlated with hypophosphataemia (p = 0.039). Malnutrition was found in 66.67% of patients with phosphataemia less than or equal to 45 mg/L compared to 32.8% for those with a phosphataemia greater than 45 mg/L. A state of malnutrition was found in 85% of patients with total cholesterol levels below 1.5 g/L, and a good nutritional status was observed in the majority of patients with cholesterol higher than 1.5 g/L. This difference was statistically significant (p<0.001). Undernutrition was correlated with elevated CRP (p = 0.001), and the prevalence of undernutrition in patients with CRP greater than or equal to 6mg was 82% compared to a prevalence of 26% among those with a CRP of less than 6mg. Hypoprotidaemia was significantly associated with malnutrition (p = 0.003). Undernutrition was found

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Table 2: Clinical and biological parameters associated with undernutrition according to the SGA.

Parameters	*P*
low socioeconomic status	*0,026*
Anorexia	*0,006*
Poor dental status	*<0,001*
Low BMI	*<0,001*
Low BC	*<0,001*
hypoalbuminaemia	*<0,001*
Hypophosphataemia	*0,039*
Low blood total cholesterol	*<0,001*
High CRP	*0,001*
Low Protidemia	*0,003*

in 79% of patients with protidaemia of less than 60 g/L compared to 18% of those with a protein level of 60 g/L or more.

The clinical and biological parameters associated with undernutrition in our study population, assessed by Detsky's SGA, are presented in (Table 2).

Discussion

In our study, the prevalence of global undernutrition according to the SGA was 36.2%. This undernutrition was classified as moderate in 20.3% and severe in 15.9% of patients. Our results are similar to those evaluated using the same method (Detsky's SGA) reported in the literature (Table 2). In Senegal, a country bordering Mauritania, the prevalence of malnutrition was reported to be 41.1% in 2013, divided into moderate undernutrition in 28.36% and severe in 12.76% [7]. In Morocco, a study by Es-Sebbani reported an undernutrition prevalence of 37% [8], with 22% of cases classified as moderate and 15% as severe. In 2007, a prevalence of 40.7% undernutrition was found in Iran, of which 35.1% was mild to moderate undernutrition and 5.6% was severe undernutrition [9]. A French multicentre study conducted by the Nutrition and Hemodialysis Research Group on 7123 patients treated in 110 haemodialysis centers found an overall prevalence of undernutrition of 20-36% at any age [10]. Other studies in the literature indicate a very high prevalence of malnutrition ranging from 31-75%, as evaluated by the SGA score [11].

The mean age of our patients was 45.9 ± 14.08 years, which is comparable to other studies conducted in Africa, such as that performed by Ondele in Senegal in 2013 on 141 haemodialysis patients whose average age was 47.84 ± 14.79 years [7], and a study by Es-Sebbani in Morocco with an average patient age of 48.4 ± 17.7 years [8]. In developed countries, the average age of haemodialysis patients is relatively high. In France, the average age was found to be 65.7 years [12].

Our study, like those performed in Senegal and Morocco [7,8], did not find a significant correlation between advanced age and undernutrition. In addition, a higher prevalence of 50% undernutrition, based on the SGA score, was found in patients aged over 60 years. This high prevalence of undernutrition in elderly subjects compared to other age groups has been reported in the literature, as the study conducted in Senegal reported a similar prevalence of 52.4% (evaluated by the MNA score). In addition, a correlation between age and undernutrition has been observed in other studies, such as one conducted in Brazil [13].

In our study, we found a significant correlation between malnutrition, based on the SGA score, and a low socioeconomic level, similar to a 2011 study conducted by Coimbra de Oliveira et al. in Brazil [13]. In contrast, studies by Ondele et al. in Senegal and Abu-Almakarem in Saudi Arabia did not observe this correlation [7,14]. These differences could be explained in part by the use of non-consensual methods to assess the standard of living of our patients.

The average duration of dialysis in our patients was very low compared to that found in Senegal, which was 86.5 months (7.3 years, range 5 to 168 months) [7], and that of Morocco, which was 76.12 months (6.3 years, range 11 to 199 months) [8].

Consistent with the study by Es-Sebbani in Morocco [8], we did not find a significant correlation between malnutrition, evaluated by the GAS, and the seniority in dialysis. However, a correlation was found by Ondelé in Senegal [7], as well as other authors [10,15].

The presence of anorexia and poor dental status were correlated with malnutrition (according to the Detsky index)of our haemodialysis patients, in accordance with studies by Ondelé in Senegal [7], Es-Sebbani in Morocco and by Kalantar Zadeh and Kopple in Philadelphia (USA) in 2004 [8,15].

The mean BMI of our patients was 24.38 ± 3.74 kg/m^2, which is similar to that reported in Senegal (24.11 ± 3.85 kg/m^2) [6], Morocco (23.13 ± 4.75 kg/m^2) and Saudi Arabia (24.8 ± 3.6 kg/m^2) [8,14]. For patients with a BMI less than 20 kg/m^2, the prevalence of undernutrition according to the GAS was 26%. In the literature, a BMI less than 20 kg/m^2 is consistently associated with an increased risk of mortality and is a powerful independent predictor of mortality risk in adult dialysis patients [15-18]. Several recent studies have confirmed the protective role of a high BMI in dialysis patients. For these patients, the threshold is 23 kg/m^2, below which a marked increase in mortality is clearly observed [19]. In the bivariate analysis, we found a significant correlation between SGA undernutrition and low BMI, similar to other studies [7,8,13,15-17].

In contrast to the study by Ondelé [7], CB was correlated with undernutrition in our study and in the Es-Sebbani study [8].

Albuminaemia less than 35 g/L was found in 54.4% of our patients. This rate is much higher than the rates found in Senegal (17.01%) [7], Morocco (10.4%) and in the multicentric French GRNH study (20%) [8,10]. This suggests that the majority of our patients had very low albumin compared to the recommended level. This may reflect a diet very low in protein, and probably occurs secondary to continuation of the low-protein diet in our chronic dialysis patients.

Hypophosphataemia less than 25 mg/L was found in 9% of our patients compared to 23.23% in Senegal and 8.8% in Morocco [7,8]. Undernutrition was significantly correlated with low phosphataemia, as found in many studies [7,8,10,13,14].

A biological inflammatory syndrome was found in 16.17% of cases, which is similar to the prevalence found by Ondelé in Senegal [7].

In dialysis patients, the prevalence of chronic inflammation with no identifiable infectious or neoplastic cause is important and represents a cause of undernutrition. Chronic inflammation is

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associated with various complications, including increased anaemia secondary to chronic kidney disease and impaired nutritional status [20].

In the bivariate analysis, we found a significant correlation between inflammatory syndrome and impaired nutritional status, as reported in many studies [7,21]

Conclusion

The prevalence of undernutrition in this population of chronic haemodialysis patients in Mauritania was found to be as high as that reported in other African studies. Undernutrition was correlated with a low socioeconomic status, anorexia, poor dental status, low BMI, low BC, hypoalbuminaemia, hypophosphoraemia, hypocholesterolaemia, high CRP and hypoprotidaemia. A better understanding of the underlying mechanism, as well as evaluation and early intervention from the beginning of haemodialysis, are important to help prevent undernutrition.

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