

Prevalence of Metabolic Syndrome and Associated Factors among Hemodialysis Patients Monitored at the National Teaching Hospital, Hubert Koutoucou Maga in 2015

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Abstract

Introduction: Metabolic syndrome is one of the main risk factors of cardiovascular disease among hemodialysis patients. **Objective:** The main objective of this study was to determine the prevalence and factors associated with metabolic syndrome among hemodialysis patients in Cotonou in 2015. **Patients and methods:** It was a cross-sectional, descriptive and analytical study conducted from 05th October to 02nd November 2015 at the National Teaching Hospital, Hubert Koutoucou Maga of Cotonou. All patients aged 18 years and above, regularly under hemodialysis for the past 3 months and who gave their informed consent were included in the study. Those excluded were: currently hospitalized hemodialysis patients, hemodialysis patients hospitalized in the last three months, hemodialysis patients whose general condition deteriorated or unable to answer the questionnaire. Metabolic syndrome was defined according to the International Diabetes Federation's criteria. Factors associated with metabolic syndrome were sought using logistic regression in univariate analysis. Confidence intervals were calculated at 95% and alpha significance threshold at 5%. **Outcomes:** In total 165 patients were included in the study. Male predominance was observed, with 1.27 sex-ratios. Average age was 49.3 ± 12.9 years with extremes ranging from 18 to 78 years. Metabolic syndrome is observed among 46 patients undergoing hemodialysis or 27.9% prevalence rate. Factors associated with the metabolic syndrome in univariate analysis were: gender ($p < 0.001$), age ($p = 0.007$), body mass index ($p = 0.029$) and prior diabetes history ($p = 0.011$). **Conclusion:** Metabolic syndrome is common among hemodialysis patients. Early screening and fighting against associated

risk factors are very important.

Keywords

Benin, Associated Factors, Hemodialysis Patients, Prevalence, Metabolic Syndrome

1. Introduction

Chronic kidney disease is a real public health problem [1]. Hemodialysis patients are faced with the risk of cardiovascular diseases which are the first cause of mortality among this population. Cardiovascular diseases' index varies from 25% to 60% among patients with chronic renal disease [2]. These cardiovascular diseases claim 44% of deaths among hemodialysis patients [3]. The risk of hemodialysis patients' death is 5 to 20 times higher compared to the general population [4].

Metabolic syndrome is an entity that brings together in the same individual, several metabolic abnormalities which predispose him to cardiovascular risks. Metabolic syndrome is itself one of the main risk factors for cardiovascular diseases [5].

The prevalence of metabolic syndrome among the general population is 13.3% in China in 2006 [6], 22% in the United States in 2012 [5]. Jalalzadeh observed among hemodialysis patients in Iran in 2011, 28.7% prevalence; Pérez in Spain in 2014, 29% and Maoujoud in Morocco recorded in 2011, 44% [7] [8] [9]. This prevalence within hemodialysis population may reach 70% [10]. Metabolic syndrome triples the risk of developing cardiovascular disease [9] [11], and increases two-fold mortality among hemodialysis patients [12].

In Benin, the prevalence of the metabolic syndrome among chronic hemodialysis patients is unknown. The factors associated with metabolic syndrome among these patients have not yet been identified. This justifies the interest in this study on the metabolic syndrome among hemodialysis patients at the National Teaching Hospital Hubert Koutoukou Maga (CNHU-HKM) of Cotonou.

2. Objectives

2.1. General Objective

- Study metabolic syndrome among hemodialysis patients monitored in CNHU-HKM.

2.2. Specific Objectives

- Determine metabolic syndrome prevalence among patients undergoing hemodialysis.
- Identify factors associated with metabolic syndrome among hemodialysis patients.

3. Patients and Methods

It was a cross-sectional, descriptive and analytical study conducted from 05th October to

02nd November 2015 at the Nephrology-Hemodialysis University Clinic of The National Teaching Hospital, Hubert Koutoukou Maga of Cotonou.

This National University Teaching Hospital is the referral hospital for the whole country. Nephrology-Hemodialysis University Clinic received 60 - 80 new patients per year, which are then distributed mostly in other public or private dialysis centers of the country.

Patients included in the study were at least 18 years old, under hemodialysis for at least the past three months and who gave their informed consent. The following were excluded from the study: currently hospitalized hemodialysis patients, hemodialysis patients hospitalized in the last three months, hemodialysis patients unable to answer the questionnaire.

Metabolic syndrome was defined according to International Diabetes Federation (IDF) which includes the following components [13]:

- Waist size or abdominal circumference is above or equal to 94 cm among men and above or equal to 80 cm among women,
- Blood pressure is above or equal to 130/85 mmHg or specific treatment of hypertension,
- Fasting plasma glucose above or equal to 1, 1 g/L or specific treatment,
- Fasting triglyceridemia above or equal to 1, 50 g/L or specific treatment,
- HDL cholesterol levels below 0.40 g/l among men or below 0.50 g/L among women or specific treatment.

Metabolic syndrome occurs with a patient if his/her waist size is high and associated with at least two other criteria [13].

The waist circumference was measured at the end of hemodialysis session, in sitting position, with a measuring tape, placed in the middle of the distance between the iliac crest and the lower costal margin, on the narrowest abdominal section.

Other variables sought were socio-demographic data (age, gender, profession, marital status); medical history (diabetes, hypertension); lifestyle (alcohol abuse, and level of physical activity), dialysis parameters (usual number of hours of dialysis per session, frequency of dialysis per week, type of arterio-venous fistula or catheter, duration under hemodialysis, percentage of urea reduction) and biological data.

Patients practicing less than 30 minutes of physical activity per day were considered as inactive. Otherwise, they were considered active. Anemia is defined by a rate of hemoglobin below 10 g/dl according kidney Disease Improving Global Outcome (KDIGO) guideline [14]. Urea reduction percentage (URP) was calculated on the ratio of the difference between blood urea nitrogen before dialysis and the one after dialysis on blood urea nitrogen before dialysis multiplied by 100. The URP is considered as normal when it is above or equal to 60%. With regard to biological data, blood sampling was made for each patient at the beginning of one of the he-modialysis sessions in the morning.

Associated factors were sought by using logistic regression in univariate analysis. Data entry and analysis were performed using Epi Data 3.1. P-value below 0.05 was considered significant.

4. Results

4.1. General Characteristics of the Population

The study population comprised 165 hemodialysis patients. Male predominance was noted with 1.27 sex-ratio. Average age was 49.3 ± 12.9 years with extremes ranging from 18 to 78 years. Hypertension (HTA) was observed among 103 patients (62.4%). Arterio-venous fistula (AVF) was the privileged vascular access, and it was observed among 140 patients (84.8%). Average BMI of patients was 22.5 ± 6.8 kg/m² with extremes ranging from 14.5 to 62.14 kg/m². **Table 1** shows the general characteristics of hemodialysis patients.

4.2. Metabolic Syndrome Prevalence

Metabolic syndrome was observed among 46 hemodialysis patients or 27.9% prevalence. The average waist size of patients was 87.7 ± 12.4 cm with extremes ranging from 64 to 130 cm. Average systolic blood pressures was 147 ± 25.73 mmHg with extremes ranging from 81 to 234 mmHg and average diastolic blood pressure was 76.03 ± 19.06 mmHg with extremes ranging from 10 to 111 mmHg. Average HDL rate was 0.47 ± 0.14 g/L with extremes ranging from 0.10 to 0.87 g/l. Average triglyceridemia was 1.17 ± 0.75 g/L with extremes ranging from 0.30 to 5.92 g/L. Average glycemia was 0.97 ± 0.35 g/L with extremes ranging from 0.6 to 2.60 g/l. The most frequently metabolic syndrome criteria observed were blood pressure above or equal to 130/85 mm Hg (66.67%), followed by HDL hypocholesterolemia (45.5%). **Table 2** shows metabolic syndrome prevalence and metabolic syndrome criteria among hemodialysis patients.

4.3. Factors Associated with Metabolic Syndrome

Factors associated with metabolic syndrome in univariate analysis were gender ($p < 0.001$), age ($p = 0.007$), body mass index ($p = 0.029$), and diabetes history ($p = 0.011$). **Table 3** shows factors associated with metabolic syndrome among hemodialysis patients in univariate analysis.

5. Discussion

5.1. Metabolic Syndrome Prevalence

In this study, the definition of metabolic syndrome is based on IDF criterion, which is a reliable definition of metabolic syndrome. It is the most used and practical in the sense that the excess abdominal fat estimated through waist size is considered as a vital criterion [13].

Metabolic syndrome prevalence among hemodialysis patients was 27.9% in Spain and Russia while similar results were reported by Perez and Radojica [8] [15]. In their studies, metabolic syndrome prevalence was respectively 29% and 29.8% in hemodialysis patients [8] [15]. Alfonso *et al.* and Bonet *et al.* used NCEP-ATP III (National Cholesterol Education Program Adult Treatment Panel III) criteria and still recorded among hemodialysis patient a prevalence close to that of our study, respectively 25%

Table 1. General characteristics of hemodialysis patients monitored at CNHU-HKM in 2015.

	Number (N = 165)	Percentage (%)
Gender		
Female	72	43.6
Male	93	56.4
Age		
<40 years	42	25.5
≥40 years	123	74.5
Level of Education		
Illiterate	24	14.5
Literate	141	85.5
Level of physical activity		
Inactive	139	84.3
Active	26	15.8
History		
HTA	103	62.4
Diabetes	30	18.2
Dialysis parameters		
Number of session per week		
2	146	88.5
3	19	11.5
Duration of each session		
4 h	71	43.0
>4 h	94	57.0
Vascular access		
AVF*	140	84.8
Catheter	25	15.2
URP**		
<60%	42	25.5
≥60%	123	74.5
Duration under dialysis		
<60 months	46	27.9
≥60 months	119	72.1
Body Mass Index		
< 18	32	19.4
[18 - 25]	102	61.8
[25 - 30]	21	12.7
≥30	10	06.1

*Arterio-venous fistula, **Percentage of urea reduction.

Table 2. Prevalence and characteristics of metabolic syndrome components among hemodialysis patients monitored at CNHU-HKM in 2015.

	Number (N = 165)	Percentage (%)
Metabolic Syndrome		
Yes	46	27.9
No	119	72.1
Metabolic syndrome criteria		
Waist size		
High	74	44.8
Normal	91	55.2
Blood pressure (mmHg)		
<130/85	55	33.3
≥130/85	110	66.7
Glucose (g/L)		
Normal	106	64.3
Abnormal	59	35.7
HDL hypocholesterolemia		
Yes	75	45.5
No	90	54.5
Hypertriglyceridemia		
Yes	42	25.5
No	123	74.5

Table 3. Factors associated with metabolic syndrome among hemodialysis patients monitored at CNHU-HKM in 2015 (univariate analysis).

	Metabolic syndrome N (%)	No metabolic syndrome N (%)	RC [95% CI]	P
Gender				<0.001
Male	15 (16.1)	78 (83.9)	1	
Female	31 (43.1)	41 (56.9)	2.66 [1.56 - 4.55]	
Age				0.007
<40 years	5 (11.9)	37 (88.1)	1	
≥40 years	41 (33.3)	82 (66.7)	5 [1.43 - 11.11]	
Body Mass Index				0.029
<25 kg/m ²	28 (20.9)	106 (79.1)	1	
≥25 kg/m ²	18 (58)	13 (42)	2.5 [1.11 - 5]	
Diabetes history				0.011
No	32 (23.7)	103 (76.3)	1	
Yes	14 (46.7)	16 (53.3)	2.8 [1.2 - 6.3]	

and 34.3% [11] [16]. In UCAR study, metabolic syndrome prevalence based on IDF criteria was 36% [17]. Higher metabolic syndrome prevalence among hemodialysis patients 52% was reported by Chang *et al.* [5]. In that study metabolic syndrome was defined based on NCEP-ATP III criteria. Similarly, in Nakagawa, Kubrusly, Maoujoud and Tu's studies, metabolic syndrome prevalence was much higher with respectively 38.3%, 42.6%, 44%, and 63.1% [9] [12] [18] [19]. This disparity could be explained by differences between sample size, race, dietary habits, culture and defining criteria of metabolic syndrome. Furthermore, these different studies took place respectively in Japan, Brazil, Morocco, Taiwan and their respective sample size was 133, 115, 25, 377 patients. Vogt *et al.* observed among the general population varied metabolic syndrome 51%, 66.3%, and 75.3% respectively following the criteria of NCEP ATP III, IDF and harmonized criteria [20].

The most frequent metabolic syndrome criteria observed were high blood pressure followed by HDL hypocholesterolemia. Bonet *et al.* reported similar results with high blood pressure among 65% of hemodialysis patients and HDL hypocholesterolemia among 52.7% patients [11].

5.2. Factors Associated with Metabolic Syndrome

Gender was associated with metabolic syndrome, and female subjects were 2.6 times more exposed to the risk of developing metabolic syndrome (RC [95% CI] = 2.66 [1.56-4.55]; $p < 0.001$). This same association was reported by Chen ($p < 0.0001$) who used as criteria for metabolic syndrome definition, NCEP-ATPIII [21].

In our study, age is associated with metabolic syndrome among hemodialysis patients and patients aged above 40 years were 5 times more exposed to the risk of developing metabolic syndrome (RC [95% CI] = 5 [1.43 - 11,11]; $p = 0.007$). Age is also associated with metabolic syndrome in the studies of Radojica ($p = 0.001$), Kubrusly ($p = 0.004$) and Chen ($p < 0.0001$) [15] [12] [21].

Diabetes history is associated with metabolic syndrome (RC [95% CI] = 2.8 [1.2 - 6.3]; $p = 0.011$). It is similar in the studies of Jalalzadeh ($p < 0.001$) and Radojica ($p = 0.04$) [7] [15]. However, in Gorsane's study, diabetes was not associated with metabolic syndrome [10].

Body mass index (BMI) is associated with metabolic syndrome among hemodialysis patients, and patients with BMI ≥ 25 kg/m² were 2.5 times more exposed to the risk of developing metabolic syndrome (RC [95% CI] = 2.5 [1.11 - 5]; $p = 0.029$). This association was observed in the studies of Jalalzadeh ($p < 0.001$), Radojica ($p = 0.001$) and Chen ($p < 0.0001$) [7] [15] [21]. In contrast, in Maoujoud's study carried out in Morocco, BMI is not associated with metabolic syndrome ($p = 0.098$) [9].

6. Conclusion

Metabolic syndrome is common among hemodialysis patients. Early screening and fighting against the risk factors are necessary. It is important to introduce a dietician in these hemodialysis patients' support team in order to prevent cardiovascular complica-

tions.

Declaration of Conflict of Interest

The authors declare not to have any conflict of interest in connection with this article.

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