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Correlation Between Anthropometric Parameters And Biochemical Markers Of Cardiovascular Risk In Chronic Renal Patients On Hemodialysis

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ABSTRACT

Objective: To correlate anthropometric parameters and biochemical markers of cardiovascular risk in chronic renal patients undergoing hemodialysis. **Methods:** Cross-sectional observational study, carried out at the Instituto de Medicina Integral Professor Fernando Figueira - Imip (Recife-PE), from July to October 2018. Anthropometric parameters were analyzed: The anthropometric measurements used were waist circumference (WC) and waist-height ratio (WHT), sociodemographic data (sex and base disease) and biochemical parameters (HDL, LDL, Total Cholesterol, Triglycerides, Vitamin D, phosphorus, calcium, potassium and parathyroid hormone). **Results:** Fifty-nine patients with CKD were evaluated in a regular HD program. and males (54.2%). The majority of the population had an undetermined disease (44.1%). Regarding anthropometry, it was observed that there was a predominance in the change in waist circumference (57.6%) and waist/height ratio (59.3%). Regarding the biochemical profile, through pearson's correlation, it was observed that there was a significant positive association of WC and WHT with phosphorus ($p^*=0.305$ and 0.329). In the correlation of WC and WHT with vitamin D, it was seen that as these anthropometric indices increase, vitamin D decreases, making this correlation significant ($p^*=-0.435$ and -0.368). **Conclusion:** It can be concluded that most patients presented inadequate nutritional status, as well as decreased serum vitamin D levels and changes in serum phosphorus levels. These changes may result in increased risk for cardiovascular events in this population.

Keywords: Chronic Renal Failure, Nutritional Status, Nutritional Assessment, Cardiovascular Diseases.

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INTRODUCTION

Chronic kidney disease (CKD) occurs slowly and insidiously, resulting from the irreversible reduction of the amount and function of nephrons, the main functional unit of the kidneys. It is characterized by the injury of the renal parenchyma (with normal renal function) and/or by the renal functional decrease present for a period equal to or greater than three months.^{1,2}

In Brazil, studies have shown that its incidence is 8% per year.³ Hemodialysis being the most frequent treatment among these patients, with an average of 93.2% between 2010 and 2017. CKD has been described as one of the main determinants of cardiovascular disease (CVD) risk, which is the leading cause of mortality in renal replacement therapy (RRT) patients, resulting in a prevalence of 126,583,000 patients.⁴

Among the RRT options, hemodialysis stands out as the most frequent method, managing its activities through diffusion and ultrafiltration to remove accumulated toxins from the body, controlling blood pressure and helping the body maintain the balance of chemical substances such as sodium, potassium and chlorides, with an average of 3 sessions per week, lasting 3 to 4 hours.²

Due to the disease itself and treatment, several biochemical changes occur in these patients, highlighting the changes in lipid profile that can lead to dyslipidemia and the accumulation of atherogenic particles that result in increased triglycerides (hypertriglyceridemia), elevation of low density lipoprotein (LDL) cholesterol, accumulation of apolipoprotein B (Apo B), increased concentrations of lipoprotein (a) and low levels of high density lipoprotein (HDL).⁵

In addition to changes in lipid metabolism, The presence of hyperphosphataemia, hyperkalemia and vitamin D deficiency is also observed in renal patients cardiovascular and nutritional. Current studies have shown that waist circumference (WC) and waist height ratio

(WHR) are good indicators for assessing cardiovascular risks, besides being better predictors than BMI, due to the relationship between waist circumference and central obesity.⁶

Biochemical parameters when associated with anthropometrics are fundamental to intervene early in the appearance of alterations that may affect cardiovascular and nutritional risk factors. Current studies have shown that waist circumference (WC) and waist height ratio (WHR) are good indicators for assessing cardiovascular risks, besides being better predictors than BMI, due to the relationship between waist circumference and central obesity.⁶

Due to the changes that occur in this population, the aim of the present study is to correlate anthropometric parameters and biochemical markers of cardiovascular risk in chronic renal patients undergoing hemodialysis.

METHODS

The study was cross-sectional observational, carried out at the Instituto de Medicina Integral Professor Fernando Figueira - Imip (Recife-PE), from July to October 2018. The patients included were those over the age of 19 years, submitted to the regular hemodialysis program for more than 3 months. Those who were unable to be evaluated anthropometrically or who did not have the capacity to understand were excluded from the study.

The anthropometric measurements used were waist circumference (WC) and waist-to-height ratio (WHR), with cut-off points for WC of (≥ 94 cm for men) and (≥ 80 cm for women), recommended by the World Health Organization (1995) of for ECR the cutoff point was (≥ 0.52 for men) and (≥ 0.53 for women), according to haun's study, Pitanga and Lessa (2009)⁷. Height was measured in meters, with the participant standing upright, arms extended along the body, with feet united and barefoot and in the center of the BALMAK® brand stadiometer, coupled to the scale.

To obtain WC, an inelastic measuring tape was used, and the abdominal region was relaxed and absent from clothing, as a patient in an upright position. The measurement was performed at the midpoint between the last rib and the iliac crest. Height was used to calculate THE.

To evaluate the serum profile of the selected patients, biochemical tests of HDL, LDL, Total Cholesterol, Triglycerides, Vitamin D, phosphorus, calcium, potassium and parathyroid hormone were determined.

For analysis of the collected data, the Microsoft Excel program was used and the analyses were performed with the aid of the SPSS 13.0 program. The Kolmogorov Smirnov test was used to evaluate the normality distribution of the continuous variables, those that presented normal distribution were described in the form of means and standard deviation, those with non-normal distribution, in the form of median and interquartile range. In the statistical inference tests, the proportions were compared by Pearson's chi-square and/or Fisher's exact chi-square test.

RESULTS

Fifty-nine patients with CKD were evaluated in a regular HD program and males (54.2%). Most of the population had an undetermined underlying disease (44.1%), followed by systemic arterial hypertension (10.2%). Regarding anthropometric parameters it was observed that there was a higher prevalence of changes in waist circumference (57.6%) and waist/height ratio (59.3%), as shown in Table 1.

DISCUSSION

It is known that WC and WHR are potentially better indicators for assessing the risk of CVD in individuals, regardless of BMI.⁸ In this study, it was demonstrated that individuals presented inadequate nutritional status, according to the anthropometric parameters WHR and CC. According to Elsayed et al (2008)⁹ the measurement of WHT is associated with increased risks of cardiovascular events for a period of up to ten years. Compared to WC, WHR may better reflect central obesity in different body types, since it also takes into account the height of individuals. When used concomitantly, they more reliably reflect the cardiometabolic risk present in these individuals.

According to the inadequate nutritional status of individuals, according to the anthropometric parameters used, it can be perceived that excess weight and/or visceral obesity is becoming common in chronic renal patients. In a study of 3,344 patients with CKD, Wang et al (2019)¹⁰ observed that more than 80% of patients with CKD were overweight or obese. It is known that adipose tissue is known to be an active endocrine organ and to produce adipokines, such as leptin and adiponectin, which may be involved in the pathogenesis of CKD. Excess adiposity can cause activation of the sympathetic and renin-angiotensin systems, as well as lipid deposition, ultrafiltration and increased sodium resorption in the kidneys. This forms a feedback cycle in which the decline in obesity-induced renal function accelerates the progression of hypertension, further aggravating impaired renal function.¹¹

Table 1. Characterization of the sample regarding the nutritional profile of patients undergoing hemodialysis at the Instituto de Medicina Integral Prof. Fernando Figueira, Recife, 2018.

Variables	N	%
WC		
Inadequate	34	57,6%
Adequate	25	42,4%
WHR		
Inadequate	35	59,3%
Adequate	24	40,7%

Table 2. Correlation between anthropometric parameters/index and biochemical markers of cardiovascular risk in chronic renal patients on hemodialysis, Institute of Integral Medicine, Recife, 2018.

	Waist circumference		Waist-height ratio	
	ρ^*	P	ρ^*	P
Calcium	-0,114	0,390	-0,138	0,299
Phosphorus	0,305	0,019	0,329	0,011
Potassium	0,138	0,296	0,157	0,235
Parathormone	-0,139	0,299	-0,152	0,256
Vitamin D	-0,435	0,001	-0,368	0,004
Total cholesterol	0,083	0,532	0,114	0,390
LDL	0,012	0,934	0,010	0,945
HDL	0,005	0,989	-0,005	0,970
Triglyceride	0,164	0,214	0,215	0,101
Glucose	0,208	0,114	0,202	0,124

* Pearson correlation.

Regarding the biochemical profile, it was demonstrated that the highest serum phosphorus was associated with increased WC and WHT. It is known that conventional hemodialysis alone is insufficient for phosphorus control due to the kinetics of dialysis phosphorus removal. Additionally, excess weight can result in a dialysis inefficiency, characterized by impaired blood flow that can cause greater hemodynamic instability, deficiency of flow through vascular access to hemodialysis, and shorter dialysis time than prescribed, influencing the kinetics of urea that results in less efficient dialysis.¹²

When the correlation of WC and WHT with vitamin D was observed, it was observed that as these anthropometric indices increase, vitamin D decreases. These findings are explained for Jean et al (2017)¹³, which explain that that the progressive vitamin D deficiency worsens in stage 3 for stage 5D, as well as the presence of high body adiposity, and may justify the inversely proportional correlation between anthropometric markers that assess visceral fat with the decrease in serum vitamin D levels. Additionally, Gois et al (2018)¹⁴ in their literature review, demonstrate that patients with CKD, especially in HD, probably have less exposure to sunlight. In addition to knowing that uremia, a metabolic alteration characteristic of CKD, is related to the decrease in serum vitamin D levels.

CONCLUSION

It can be concluded that most patients presented inadequate nutritional status, as well as decreased serum vitamin D levels and changes in serum phosphorus levels. These changes may result in increased risk for cardiovascular events in this population, emphasizing the importance of proper monitoring and use of different anthropometric, clinical and biochemical parameters, with the objective of assisting in the clinical practice of health professionals.

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