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Pruritus in hemodialysis patients: association with phosphorus intake and serum calcium level

Prurido no paciente em hemodiálise: associação com ingestão de fósforo e nível sérico de cálcio

Prurito en el paciente en hemodiálisis: asociación con ingestión de fósforo y nivel sérico de calcio

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ABSTRACT

Objective: To analyze the association between the occurrence of pruritus and adherence to the prescribed diet, biochemical indicators of renal function and the quality of hemodialysis in chronic renal patients.

Method: A cross-sectional study performed at a dialysis clinic in the Northeast of Brazil, with 200 patients undergoing hemodialysis in the first half of 2015.To analyze the data, inferential statistics were used, using Chi-Square and Fisher's Exact tests; and Mann Whitney U test.

Results: The pruritus was present in 51% of the sample, being associated statistically with phosphorus consumption (P = 0.024) and elevation of serum calcium (P = 0.009).

Conclusion: Pruritus in chronic renal patients undergoing hemodialysis is influenced by adequate nonadherence to the prescribed diet, in addition to the elevation of biochemical indicators of renal function.

Keywords: Pruritus. Renal dialysis. Renal insufficiency, chronic. Quality of life. Nursing.

RESUMO

Objetivo: Analisar a associação entre a ocorrência do prurido e a adesão à dieta prescrita, indicadores bioquímicos da função renal e a qualidade da hemodiálise, em pacientes renais crônicos.

Método: Estudo transversal, realizado em uma clínica de diálise no Nordeste do Brasil, com 200 pacientes submetidos à hemodiálise, no primeiro semestre de 2015. Para análise dos dados fez-se uso da estatística inferencial, através dos testes de Qui-Quadrado e Exato de Fisher; e teste de U de Mann Whitney.

Resultados: O prurido esteve presente em 51% da amostra, associando-se estatisticamente com o consumo de fósforo (P=0,024) e a elevação do cálcio sérico (P=0,009).

Conclusão: O prurido em pacientes renais crônicos submetidos à hemodiálise sofre influência da não adesão adequada à dieta prescrita, além da elevação de indicadores bioquímicos da função renal.

Palavras-chave: Prurido. Diálise renal. Insuficiência renal crônica. Qualidade de vida. Enfermagem.

RESUMEN

Objetivo: Analizar la asociación entre la ocurrencia del prurito y la adhesión a la dieta prescrita, indicadores bioquímicos de la función renal y la calidad de la hemodiálisis, en pacientes renales crónicos.

Método: Estudio transversal, realizado en una clínica de diálisis en el Nordeste de Brasil, con 200 pacientes sometidos a la hemodiálisis, en el primer semestre de 2015. Para el análisis de los datos se utilizó la estadística inferencial, a través de las pruebas de Qui-Cuadrado y Exacto de Fisher; y prueba de U de Mann Whitney.

Resultados: El prurito estuvo presente en el 51% de la muestra, asociándose estadísticamente con el consumo de fósforo (P = 0,024) y la elevación del calcio sérico (P = 0,009).

Conclusión: El prurito en pacientes renales crónicos sometidos a la hemodiálisis sufre influencia de la no adhesión adecuada a la dieta prescrita, además de la elevación de indicadores bioquímicos de la función renal.

Palabras clave: Prurito. Diálisis renal. Insuficiencia renal crónica. Calidad de vida. Enfermería..

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INTRODUCTION

The chronic renal patient needs to be referred to renal replacement therapy for maintenance of life. Among the treatment options, hemodialysis stands out as the most common method. However, not to replace the kidney function, the patient submitted to hemodialysis is vulnerable to experiencing various complicationsrelated to the treatment, such as: infection, hypotension, hypertension, hypothermia, muscle cramps, arrhythmias cardiac, headache, hypoxemia, rash, allergic reactions, thoracic and lumbar pain, nausea, vomiting, gas embolism, fever and chills[1].

In this context, the itching is notable for being the most frequent symptom of chronic kidney disease in your terminal, in addition to the serious consequences that causes the patient's quality of life in hemodialysis[2]. Furthermore, the itching is associated to high rates of morbidity in clientele[3]. Affects 53.8% of patients on dialysis and your etiology is not completely understood, being difficult to treat, which raises the need for investigations that may suggest new relationships for your occurrence[4].

The rash is a symptom manifested in skin and/or mucous membranes, ranging from mild to intense, widespread and intermittent form. It is characterized as an unpleasant sensation in the skin, which causes the Act or desire to scratch, with negative impacts on quality of life, in particular in the patient's sleep[5].

In patients undergoing hemodialysis may be related to three types of changes, namely: abnormalities arising from chronic kidney disease (CKD) and hemodialysis; abnormalities in the skin; and abnormalities in the regulation of itch sensation by the central nervous system. The default strategy for the treatment of pruritus associated with dialysis involves the combination of therapies to treat these triplicate etiologic[6].

The rash caused by CKD and dialysis does not present a known complement Physiology[2], however stands out as a result of the accumulation of urêmicas substances, elevation of serum levels of calcium and phosphorus, secondary hyperparathyroidism, influences of substances that start itching, such as histamine and substance P, and the complement activation and interleukins by hemodialysis membranes[6].

Front of the main risk factors for the occurrence of the rash, the literature highlights the need to observe the serum levels of mineral metabolism, with the accompaniment of laboratory tests, mainly serum levels of calcium and phosphorus [4]. Ratifying the presented study identified the prevalence of pruritus in 53.8% of kidney patients undergoing dialysis. In these patients, were identified higher levels of potassium and phosphorus, which can point to a flaw in the diet of the renal dialysis clientele[3].

Thus, the evidence presented suggests features present in renal patients report itching, highlighting the importance to investigate these factors separately, from the observation of these in the presence of pruritus. In this context, it is necessary to investigate possible associations of pruritus, as the non-adherence to prescribed diet, changes of serum biochemical indicators of kidney function, as well as the quality of dialysis to which this patient is subjected, in attempt to contribute for a better understanding as to the occurrence of pruritus and consequently achieve a better quality of life this clientele.

Thus, the question of this research study was to: membership of the prescribed diet, changes in biochemical indicators and the quality of dialysis can be related to occurrence of pruritus in chronic kidney patients? To answer such questions, the study aimed to analyze the association between the occurrence of pruritus and adherence to prescribed diet, biochemical indicators of kidney function and the quality of hemodialysis, chronic renal patients.

METHOD

This is a cross-sectional study, performed in a dialysis clinic of reference of northeastern Brazil. The study population was composed of 300 individuals undergoing dialysis in the clinic, in the period of 12 months. For the sample calculation, we used: 95% confidence level ($Z\alpha = 1.96$), sensitivity conjectured most important indicators for the occurrence of pruritus, reaching an average of 85%, one half of the length of the confidence intervals constructed of 14%. Thus, resulted in a sample that was rounded up to 200.

The inclusion criteria used were: patients over the age of 18 years; and who are undergoing hemodialysis treatment in the dialysis unit. Were excluded patients with verbal communication difficulty which precludes the collection of data and patients disoriented in relation to time, space, and psychic self. The sampling process took place for convenience, consecutively. Data collection took place during the first half of 2015.

The data collection instrument was a form, containing the variables: sex, age, origin, partner, practicing any religion, occupation, presence of pruritus, sodium intake, protein and phosphorus, serum biochemical indicators, being considered pre-and Post-Urea dialysis, creatinine, calcium, potassium, and phosphorus, plus the KT/v, which made it possible to assess the quality of dialysis.

The KT/v is an important indicator to keep under hemodialysis treatment at appropriate levels in accordan-

ce with the established by the guidelines of the *National Kidney Foundation Disease Outcomes Quality Initiative*, we recommend that your value must be greater than 1.2 to indicate an appropriate dialysis[7].

The pruritus variable was categorized qualitatively in the presence or absence, from observation of the Act of scratching or verbal report. Excessive consumption of foods rich in phosphorus, proteins, calcium and water intake were categorized from the daily recommendations for clients, evaluating the food eaten in the last 24 hours. Took into account the expected levels for consumption of phosphorus-rich foods (800-1,200 mg/day), sodium consumption (1,000-2,300 mg/day), protein consumption (1.0-1.2 g/kg/day) and water intake 500-750 ml + 24 hour urine volume (750-1,000 ml if anuric)[8].This was considered the variable, when consumption exceeded the recommended value.

The biochemical indicators of kidney function in serum levels, as well as the quality of hemodialysis suggested standard form are held in hemodialysis Clinic study source, thus, were analyzed qualitatively from the categorization in changed or not changed, and quantitatively according to the values of the tests, following the normal parameters provided by the laboratory. The lab's reference values were: Urea (Upré/Upós) 10-40 mg/dl; Creatinine (Cr) 0.4-1.3 mg/dl; Calcium (Ca) 0.9-1.1 mEq/dl; Potassium (K) 3.0-5.0 mEq/l; KT/V greater than 1.2; Phosphorus (P) 2.5-4.8 mg/d.

The data were collected during the procedure under hemodialysis. With regard to biochemical indicators of kidney function and the quality of dialysis, these were collected from patient records, in your latest version.

Then, the descriptive statistics analysis of data regarding the frequency of rash and other variables investigated. To do so, use the IBM SPSS statistical program Statistics 20.0 for Windows. They calculated the relative and absolute frequencies of categorical variables, as well as the measures of central tendency and dispersion of the quantitative data, which had your normal tested through the Kolmogorov Smirnov test.

There was use of inferential statistics to verify the binding between the rash and other variables of the study. Using Chi-square and Fisher exact tests, for the observance of the statistical association between the rash and the non-adherence to prescribed diet in relation to phosphorus, protein, sodium, water intake and biochemical indicators of kidney function and the quality of hemodialysis. The Mann Whitney U test was used for the verification of association between the rash and pre-urea, urea powder, calcium, creatinine, phosphorus, potassium and KT/v quantitatively. In order to measure the associations identified, it was considered statistically significant p value <0.05.

The study was approved in 2013 by the ethics on Research Committee of the institution responsible, under the opinion 387,837 number and Certificate of introduction to Ethics Assessment (CAAE): 18486413.0.0000.5537.

The research presented minimal risk to your participant, were assured of anonymity and privacy of any information, in addition to having the right ensured to reject or withdraw from the research at any time deemed necessary, without prejudice to the treatment which had been getting.

In that sense, by revealing the desire to participate in the research, gave an informed consent (TFCC), in two copies, performing the initial explanation what it was about the research, the procedures that would be carried out, as well as the benefits of this. All research participants signed the two lanes of the FICS, being one of the interviewee and the researcher. As for the data obtained directly from the chart signed end of compromise on the confidentiality of these by the researcher.

RESULTS

Study participants were characterized as socio-demographic and clinical characteristics. Table 1 presents the characteristics of clients referred to renal dialysis.

The participants showed on average 55 years old, lived with companion (53.5%) were women (51.0%) and retirees (87.5%). The rash was present in most patients (51.0%). Regarding eating habits, 46.0% stated not to join properly in relation to water intake diet prescribed 40.0% not adhered, the phosphorus consumption recommended in the diet, 23.0% followed inappropriately protein intake and 12.0% say do not follow the diet in relation to sodium consumption.

With regard to biochemical indicators of kidney function, these were analyzed qualitatively, in which pre-urea and calcium was changed in the customers 100.0% creatinine at 99.5%. Of the patients in the study, 57.0% presented changes in phosphorus and urea, changes were observed in 56.5% of these, and the potassium waschanged in 52.0% of customers. With respect to KT/v, 40.0% of the clientele investigated changes in dialysis quality presented. These were analyzed quantitatively, with results presented in Table 2.

Analyzed the averages of the values of these examinations, identified: pre-urea (169.7mg/dL); Post Urea (54.7 mg/dL); calcium (8.4 mg/dL); creatinine (11.1 mg/dL); phosphorus (4.6 mg/dL); potassium (5.5 mg/dL); and the KT/v with average of 1.29.

Table 1- Sociodemographic and clinical Characterization of patients undergoing hemodialysis. Natal, 2015

Variables	n = 200
Sex	
Female	102 (51)
Male	98 (49)
Age, years	55*±16.5
Marital status	
With partner	107 (53.5)
Without companion	93 (46.5)
Occupation	
Retired/pensioner	175 (87.5)
Active	13 (6.5)
Unemployed	12 (6)
Pruritus	
Present	102 (51)
Absent	0 (0)
Water intake	
Suitable	108(54)
Exacerbated	92 (46)
Consumption of phosphorus	
Suitable	120 (60)
Inappropriate	80 (40)
Protein consumption	
Suitable	154 (77)
Inappropriate	46 (23)
Sodium consumption	
Suitable	176 (88)
Inappropriate	24 (12)

Source: Research data, 2015.
Legend: Variables expressed in n (%); *Mean ± standard deviation beyond normality test.

Table 2-Characterization of laboratory data of patients undergoing hemodialysis. Natal, 2015

Laboratory data	Average	SD	P-value[1]
Pre-urea	169.7	35.3	0.059
Post-urea	54.7	14.6	0.118
Calcio	8.4	1.1	0.107
Creatinine	11.1	3.5	0.043
Phosphorus	4.6	1.1	0.080
Potassium	5.5	0.9	0.057
KT/v	1.2	0.4	0.078

Source: Research data, 2015
Legend: Kt/v dialysis quality; Standard Deviation SD; Data normality test Kolmogorov-Smirnov[1].

Table 3 presents the results of the Association of pruritus with membership of the prescribed diet, biochemical indicators of kidney function in serum levels and the quality of dialysis in clientele. Highlight changes in pre-urea and calcium in serum levels, since these were present in 100% of the clients investigated, preventing the formation of 2x2 tables and, consequently, the Statistical Association between these changes and occurrence of pruritus.

Table 3 - Statistical Association between adherence to the prescribed diet, biochemical indicators of kidney function and quality of dialysis front to the occurrence of pruritus in chronic kidney patients undergoing dialysis. Natal, 2015

Eating habits/Laboratory tests	Pruritus		P value
	This	Absent	
Sodium consumption			
Excessive consumption	15	9	0.230[1]
Follow diet	87	89	
Consumption of Phosphorus			
Excessive consumption	33	47	0.024[1] *
Follow diet	69	52	
Protein consumption			
Excessive consumption	22	24	0.624[1]
Follow diet	80	74	
Liquids			
Excessive consumption	45	47	0.586[1]
Follow diet	57	51	
Pre-urea			
Changed	102	98	-
Not changed	-	-	
PostUrea			
Changed	58	55	0.916[1]
Not changed	44	43	
Creatinine			
Changed	101	98	1.000[2]
Not changed	1	0	
Calcium			
Changed	102	98	-
Not changed	-	-	
Potassium			
Changed	54	50	0.786[1]
Not changed	48	48	
KT/v			
Changed	46	34	0.133[1]
Not changed	56	64	
Phosphorus			
Changed	59	55	0.806[1]
Not changed	43	43	

Source: Research data, 2015.
Legend: [1]Chi-square test; [2]Fisher's exact test.

Occurred statistically significant association between consumption of phosphorus and the occurrence of pruritus in clientele investigated (P = 0.024). And front of the hegemonic frequency of calcium and pre-urea, preventing the application of previous tests. The biochemical indicators of kidney function and the adequacy of hemodialysis was analyzed as well as quantitative variables to allow for other comments. Table 4 presents the statistical association between the biochemical indicators of kidney function, the adequacy of hemodialysis and the occurrence of pruritus in patients under hemodialysis kidney.

Table 4 - Statistical Association between the biochemical indicators of kidney function, the adequacy of hemodialysis quantitatively and the occurrence of pruritus in chronic kidney patients undergoing dialysis. Natal, 2015

		Pre-urea	Post Urea	CR	CA	K	KT/v	P
Pruritus	**P Value**	0.564	0.493	0.812	**0.009***	0.804	0.201	0.590

Source: Research data, 2015.
Legend: Mann Whitney U test; Creatinine CR; Calcium Ca; Potassium K; KT/v; Phosphorus

This result indicates that there was no statistical association between the rash and biochemical indicators of kidney function, which highlights the significant association with serum calcium variable (P=0.009).

DISCUSSION

Cutaneous symptoms associated with chronic kidney disease, the itching is one of the most common. Cross-sectional studies on this theme they claim that this symptom causes changes in quality of life, sleep disorders and depressive symptoms, increasing the risk of morbidity in this clientele[3]. The relationship between the rash and morbidity in renal clientele is evidenced by the literature, noting that patients with pruritus have a chance of morbidity of 23% more than the patient without itching[3].

The many dietary restrictions recommended for patients on dialysis can be difficult to achieve and, at the same time, can result in nutritional deficiencies[9]. The consumption of foods with high sodium content should be avoided, since a natural reflex of your consumption is thirst, and these patients have restriction of liquids[10]. For protein, appropriate intake levels are less than 1.1 g/kg/day, in view of the needs and preventing protein malnutrition[11].

The sample studied reported difficulties in joining the prescribed treatment regimen, in particular as regards water and dietary intake, which favors the increase in dry weight, accumulation of excess substances and the need for major losses during the session hemodialytic, culminating in the imbalance of their minerals[12].

To obtain the correct treatment is necessary to combine the hemodialysis with the dietary restrictions and water, however, although many patients understand the relevance of such restrictions, do not always manage to fulfill them[13], would require changing your habits and this entails the Elimination of preferences that are shared in family[14].

In study[14], only 31.4% of your sample followed the dietary restrictions and hydropower, 40.5% already followed partially, while 28.1 percent followed the diet. The reasons for the inadequate follow-up involve the obligation of being regularly connected to the dialysis machine, which discourages the integral care of water and food restrictions, causing them to neglect his own life.

With regard to biochemical indicators of kidney function, the changes of urea have been identified in pre-dialytic 100% of the sample and, of these, 51% reported itchiness. The accumulation of urea carries your concentration to blood levels, leading to toxic effects, responsible for the itching[15]. These toxins can disappear with the urêmicas under hemodialysis treatment, justifying the results found in the literature concerning urea pos-dialytic, in which 55 individuals, regularize their urêmicos levels, only 12 reported itching. However, the therapy does not always relieve the symptom, and may even intensify it[15]. In this context, of the 58 patients who still have tabled amendments urêmicas post-dialysis in this study, 44 complained of itching.

In relation to creatinine, study corroborates with the data of this research, in which 100% of the sample presented creatinine changes[16]. Patients with a diagnosis of renal dysfunction have characteristic elevation of serum creatinine, justified by the reduction or absence of glomerular filtration[15]. However, your relationship was not identified with the itching.

The KT/v is an index that evaluates the dose of dialysis offered to a patient with chronic renal failure (CRF), indicating the adequacy of this, when you know the values of debugging the dialyzer (K), the volume of urea distributed in the patient to be removed (V) and the session time hemodialysis (T)[17]. In this study, there was no statistical association between the KT/v and the itching.

Highlights that the average KT/v evidenced in this study were within the normal patterns. Thus, the absence of statistical association between variables suggests the quality of dialysis as a possible protective factor for the occurrence of pruritus.

Study on the etiology of pruritus in patients with CKD identified that uremic load, high levels of calcium, phosphorus, ferritin and low levels of albumin were associated with pruritus in hemodialysis patients[3]. This information corroborates with the findings of this research, in which the statistical analysis showed significant association with rash laboratory changes of levels of calcium and phosphorus consumption.

Study suggests that increased serum levels of phosphorus and calcium can lead to precipitation of these ions, being responsible for the itching that clientele. The report emphasizes the marked improvement of itching when levels of these elements were cleared after hemodialysis[18]. Only a few studies have shown a significant correlation between the serum levels ions and the presence of itching[3].

Front of the relevance of serum levels of calcium and phosphorus, this study reinforces the existing literature and advances in knowledge about the occurrence of pruritus, identifying this association with the presence of changes in biochemical indicators of kidney function. This relationship is explained as, with regard to calcium ion concentration and the itchy symptom, when that is in excess of your concentration is observed in the deeper layers of the epidermis, indicating a high gradient of calcium ions, which would justify your relationship with the pruritus[18].

In reference to the element phosphorus present in almost all foods, especially protein, when eaten in excess can lead to hyperphosphatemia framework as well as can be obtained by reduction of phosphorus debugging both the rim and the dialectics methods or by the State of bone remodeling. This framework is also associated with morbidity and mortality in these patients, mainly related to cardiovascular events, such as vascular calcification [19].

The control of hyperphosphatemia in DRC should be made from the substitution of foods, avoiding those high in phosphorus such as dairy products, beans, beverages, such as cocoa, beer and cola soft drinks, breads and cereals, and the use of phosphorous to chelators prevent and treat hiperfostatemia dialysis, efficient, verified from the KT/v, index capable of measuring the quality of this[19]. The prescription of phosphorus chelators, together with meals, becomes a crucial intervention to decrease the intestinal absorption of this mineral. Since the intestinal absorption of phosphorus is usually larger than your removal on dialysis, even in those patients with adequate intake of phosphorus becomes necessary the use of chelating agents in the meal[19].

He adds that the electrolyte changes such as increased, decreased calcium phosphorus and potassium increase, can cause itching, bone fractures, muscle pain, arrhythmia, muscle paralysis, and can evolve to the cardiac arrest[20]. Thus, the consequences become even more stringent, by promoting the need to prevent your occurrence and promote the quality of life of the patient.

Front of it, the relevance of the dietary control with health education actions and the constant monitoring of biochemical indicators of kidney function, in addition to the quality of dialysis adequacy for effective patient under hemodialysis attention, with a view to control of itching. The consequences caused by itching in the life of the renal patient do emerge the relevance of an act in your trigger factors, providing higher quality of life and minimizing risk in this business.

CONCLUSION

It is concluded that the itching may suffer influences from non-adherence to the diet, from an excessive consumption of phosphorus, besides the changes of serum calcium in hemodialytic clientele.

On the evidenced, suggests attention health team, with a multidisciplinary performance for the favoring of health education initiatives, as the importance of appropriate follow-up of the treatment regimen prescribed. In addition to highlighting the consequences of non-adherence to prescribed diet, which presents serious commitment to the quality of life of clients, most notably the occurrence of pruritus. The regular monitoring of laboratory customer changes submitted to hemodialysis also happens to be priority, favoring greater control of patient's serum levels in order to prevent the occurrence of pruritus.

So, stand out as contributions of this study the relationships now identified, once they advance in relation to the existing literature with regard to adherence to the diet and biochemical changes that customer for the occurrence of pruritus, which will provide grants to longitudinal design studies, from those results. Still, he points out the direction of the health care professional, particularly the acting nurse in Nephrology, reflecting about your care, in order to minimize the effects of itching and improve the quality of life of kidney dialysis clientele, from a national reality.

The limitations of the study were due to the fact that the variables that were diet membership parcels, representing auto referred to by the patient, and not monitored and observed by the researchers. It is suggested to conduct

studies with longitudinal design, that can show cause and effect relationships well identified.

REFERENCES

1. Oliveira APC, Sousa AS, Mendonca AEO, Silva RAR. Intradialytic complication in patients with chronic renal failure submitted to hemodialysis: integrative review. RevEnferm UFPE online. Recife. 2013; 7(esp.):6639-45. Portuguese
2. Lupi O, Rezende L, Zangrando M, Sessim M, Silveira CB, Sepulcri, MAS, Duarte DJ, et al. Cutaneous manifestations in end-stage renal disease. An. Bras. Dermatol. 2011;86(2):319-26.
3. Kimata N, Fuller DS, Saito A, Akizawa T, Fukuhara S, Pisoni RL, et al. Pruritus in hemodialysis patients: results from the Japanese Dialysis Outcomes and Practice Patterns Study (JDOPPS). Hemodial. Int. 2014;18(3):657-67.
4. Peres LAB, Passarini SR, Branco MFBT, Kruger LA. Skin lesions in chronic renal dialysis. J. Bras. Nefrol. 2014;36(1):42-7.
5. Carvalho AA, Alchorne MMA. Pruritus in the elderly. Rev Soc Bras Clin Med. 2014;12(1):93-9. Portuguese
6. Takahashi N, Yoshizawa T, Kumagai J, Kawanishi H, Moriihi M, Masaki T, et al. Response of patients with hemodialysis-associated pruritus to new treatment algorithm with nalfurafine hydrochloride: a retrospective survey-based study. Renal Replacement Therapy. 2016; 2:27.
7. National Kidney Foundation.KDOQI Clinical practice guideline for hemodialysis adequacy: 2015 update. Am J Kidney Dis. 2015;66(5):884-930.
8. Riella M. Princípios e distúrbios hidroeletrolíticos. 5. ed. Rio de Janeiro: Guanabara Koogan; 2010.
9. Luis D, Zlatkis K, Comenge B, Garcıa Z, Navarro JF, Lorenzo V, et al. Dietary quality and adherence to dietary recommendations in patients undergoing hemodialysis. J. Renal Nutr. 2016;26(3):190-5.
10. Rodrigues AM, Bento LMA, Silva TPC. Nutritional education at the interdialytic weight gain control of hemodialysis patients. UNOPAR Cient. Ciênc. Human Educ. 2015;16(5):492-9. Portuguese
11. Naylor HL, Jackson H, Walker GH, MacAfee S, Magee K, Hooper L, et al. British Dietetic Association evidence-based guidelines for the protein requirements of adults undergoing maintenance hemodialysis or peritoneal dialysis. J Hum. Nutr. Diet. 2013;26(4):315-28.
12. Nerbass FB, Morais JG, Santos RF, Krüger TS, Koene TT, Luz Filho HA. Adherence and knowledge about hyperphosphatemia treatment in hemodialysis patients with hyperphosphatemia. J Bras Nefrol. 2010;32(2):149-55.
13. Coutinho MPL, Costa FG. Depression and chronic renal failure: a socio-psychological analysis. Psicol Soc. 2015;27(2):449-59.
14. David HC, Duran KIP, Ghiroto GT, Rodrigues PMS, Silva KKF, Souza LG, et al. Análise da compreensão do autocuidado dos pacientes renais crônicos em tratamento hemodialítico e a influência da ansiedade e depressão em clínica especializada de Campo Grande-MS. Ensaios Cienc: Cienc. Biol. Agrarias Saude. 2013;17(5):63-74.
15. Costa RHS, Dantas ALM, Leite EMD, Lira ALBC, Vitor AF, Silva RAR. Complications in renal patients during hemodialysis sessions and nursing interventions. J Res Fundam Care online. 2015;7(1):2137-46.
16. Costa KAS, Scherer EF, Queiroz RCF, Freitas BQ, Lima FA, Machado NR, et al. Avaliação dos parâmetros de exames na rotina de pacientes com deficiência renal na pré e pós hemodiálise do instituto de nefrologia do Araguaia de Barra do Garças- MT. Interdisciplinar: Rev Eletrôn UNIVAR. 2015;13(1):52-7.
17. Guanaré VCSC, Maranho KMP, França AKTC, Cavalcante MCV. Fatores associados à função cognitiva de pacientes com doença renal crônica. Cad Bras Ter Ocup. 2016;24(2):287-96.
18. Makhlough A, Emadi N, Sedighi O, Khademloo M, Bicmohamadi AR. Relationship between serum intact parathyroid hormone and pruritus in hemodialysis patients. Iran J Kidney Dis.2013;7(1):42-6.
19. Covic A, Rastogi A. Hyperphosphatemia in patients with ESRD: assessing the current evidence linking outcomes with treatment adherence. BMC Nephrol. 2013; 14:153.
20. Redenna L, Basha AS, Reddy KSK. Dialysis treatment: a comprehensive description. Int J Pharmac. Res. Allied Sci. 2014;3(1):1-13.

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