

Prevalence of Disease Resulting from Chronic Renal Failure in Patients Treated in Pró-Rim Foundation in the Municipality of Gurupi-To

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Abstract— A vital function of the kidneys is to extract the waste and excess water from the body. Chronic kidney disease is characterized by the slow decline of kidney function, it increases the risk of other diseases such as hypertension, diabetes mellitus, and anemia. The prevalence of diseases arising from chronic renal failure patients on hemodialysis was evaluated through analysis of medical Kidney Foundation Pro- Gurupi the municipality, state of Tocantins, Brazil. The data were extracted from medical records of 90 patients undergoing hemodialysis in Pro Rim. The diseases found in patients with chronic kidney disease were hypertension (52.22%), diabetes (68.89%) and anemia (78.89%), hypophosphatemia (62.22%). To solve the prevalence of these diseases in the city studied, actions are needed guidance on prevention and treatment showing the importance of the foundation pro- kidney as a therapeutic mechanism for each condition, so that prevented damage to the health of patients originated from the lack of information on these diseases by the health units.

Keywords— Pro-Rim, Chronic Kidney Disease, Renal Insufficiency, Hypertension.

I. INTRODUCTION

Chronic kidney disease consists of renal injury (CKD) and progressive and irreversible loss of kidney function (glomerular, tubular and endocrine). In its most advanced phase (called the terminal phase of chronic renal insufficiency-CRF), the kidneys are unable to maintain the normality of the patient's internal environment (ROMÃO-JUNIOR, 2004).

The *National kidney Foundation-K/Doqi* (2002) reports that CKD can be diagnosed without the knowledge of its cause, and renal impairment can be confirmed by injury markers even before a renal biopsy.

Patients with chronic kidney disease, when compared to the general population, present a higher prevalence of cardiovascular diseases (CVD), including coronary, cerebral vascular, peripheral vascular disease and heart failure. The retention of sodium chloride (Na^+Cl^-) by the inappropriately elevated levels of renin for the expansion state of the extracellular fluid volume,

by sympathetic stimulation through afferent renal reflexes, and by Impairment of renal endothelial function with nitric oxide deficiency and increase in endothelin production leads to complication of hypertension in CRF, which if not treated, corresponds to cardiovascular risk (GUIMARÃES; FERREIRA, 2010).

Hemodialysis is the first-choice treatment in CRF. Over time this therapy affects other physiological systems triggering cardiac and pulmonary damage, with pulmonary congestion being the most frequent, being related to the restrictive disturbance the reduction of airflow to the pulmonary function test (PIERSON, 2006).

Certain patients offer great predisposition to chronic kidney disease and thus are considered a risk group as in the case of diabetes mellitus, hypertension, and anemia.

Anemia is defined as a hemoglobin concentration below normal values for a given age group and gender. The most common causes of anemia are acute

blood loss, hemolysis, increased plasma volume or lack of vitamins and minerals (WHO, 2004; REZENDE, 2005).

Diabetes mellitus and hypertension, which are commonly addressed in the Office, are the major contributors to CKD and, therefore, these risk factors should be rigidly controlled and these patients should be evaluated due to the renal damage that may arise (MURPHREE et al., 2010).

In view of this problem, research is needed through the bibliographical survey and analysis of medical records of patients attended at the Pró-Rim Foundation, in order to analyze the main pathologies affecting patients with chronic kidney disease in Municipality of Gurupi-TO, seeking also to seek ways of prevention and a possible delineation of methods that may minimize the symptoms and effects that these diseases cause.

Pró-Rim is a non-profit foundation specialized in nephrology, being one of the most respected in this area, which is headquartered in the city of Joinville, State of Santa Catarina. In the state of Tocantins, it is installed in the cities of Palmas, Araguaína, and Gurupi. In Gurupi it is located as an annex to the Regional Hospital where data collection will be made, bringing an important contribution to this research.

This work aims to analyze the prevalence of diseases caused by chronic renal insufficiency in patients attended at Foundation Pró-rim in the municipality of Gurupi – TO.

II. MATERIAL AND METHODS

Quantitative-Descriptive exploratory research was performed. The research was carried out at the Pró-RIM Foundation of the municipality of Gurupi – to, located at street 5 between the Avenues Pernambuco and Piauí. The sample consisted of the analysis of charts of 90 patients since this number represents the sample group in a more representative way and encompasses 100% of the patients undergoing treatment at the foundation.

The inclusion criteria were: Be regularly linked to the PRÓ-RIM Foundation undergoing hemodialysis

treatment; Medical records of patients older than 18 years of age of both sexes.

For the evaluation of the occurrence of diseases in patients with chronic kidney disease (CKD), the medical records of all patients undergoing hemodialysis were collected, where the data needed to better expose this subject were extracted, achieving the proposed objectives.

The collection of medical records was carried out between October and November 2013. After collection, we extracted. The necessary data to better expose this theme in order to achieve the proposed objectives as follows: An individual survey was made of the Patients medical records, where they were separated by disease. Ex. Of the 90 patients 30 found diabetes, 60 had high blood pressure, and so on. Thus, the control of the diseases was also verified, that is, the amount of normotensive, pre-and post-hemodialysis urea among other diseases.

It is known that the patients undergo periodic exams (monthly), and it is of these exams (Glycemia, hematocrit, calcium, potassium among others) that will be analyzed the prevalence of diseases resulting from CKD in these patients.

The data obtained were evaluated descriptively. Organization of data in charts and tables using MSOffice Excel® 7.0 for discussion and final analysis with a scientific basis.

The legal devices that regulate research activities involving public archives were observed, according to the National Health Council (CNS). The work passed by the Ethics and Research Committee, approved by the opinion no. 436719-2013, even though the research did not have an *in vivo* approach, it is worth remembering Again that the identification of the patients was confidential.

III. RESULTS AND DISCUSSION

The research was conducted with 90 patients of the Pró-Rim Foundation, being 60% male and 40% female as shown in Figure 1.

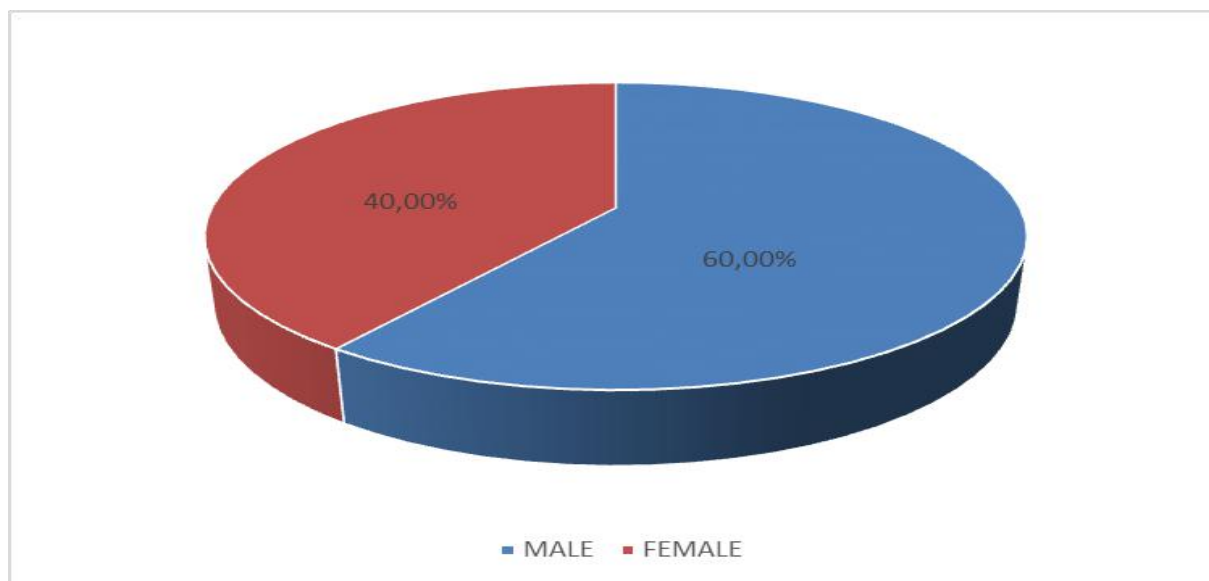


Fig.1: Gender of the pro-kidney Foundation patients

The results were the same as those found by Romagna (2010) In his research entitled "Prevalence of anemia, dyslipidemia and arterial hypertension in patients with chronic renal failure on hemodialysis in a hospital in the city of Criciúma-SC", where Data showed 40% of women and 60% of men.

In another study conducted by Marques, Pereira, and Ribeiro (2005), about 53.2% of the patients were male and, in the case series of the study by Antoniazzi et al., (2002), 56% of the patients were male and 44% female, results similar to the Present study.

Other studies also had similar results as that of Abreu et al. (2008), which found 58% of male patients and 42% of females. Bevilacqua et al. (1995) also describe results of 57.8% of male and 42.2% female individuals.

The tests of the calcium and phosphorus levels had their results out of the normality's, as shown in table 1.

Table 1: Calcium and phosphorus dosage of patients assisted at Fundação Pró-rim		
	(n)	(%)
Ca	32	35,56
	58	64,44
Total	90	100,00
P	56	62,22
	34	37,78
Total	90	100,00

This research was similar to a study conducted in our country where it was also evaluated, the knowledge of 147 individuals on hemodialysis (45% were

hyperphosphatemic) as regards the consequences and treatment of hyperphosphatemia, the mean score found, was 79.1%, similar also to the work Nerbass, et al., (2010) that detected 78.5% of this disease.

The inappropriate control of phosphorus is associated with the emergence of mineral and bone disturbance and hyperparathyroidism. Thus, the control of Hyper-phosphatemia, the most prevalent mind in people undergoing dialysis, is of great significance, establishes one of the fundamental goals of health professionals working with dialysis patients. The nutritional orientation of phosphorus consumption is very delicate since strict restrictions are contraindicated since most foods that are sources of phosphorus are sources of protein. Therefore, it is necessary to suggest the ingestion of protein foods with a small phosphorus/protein concentration, according to the need individual (Nerbass, et al., 2010).

Epidemiological evidence update evidenced the relationship between the high calcium-phosphorus product, increased levels of phosphorus and high mortality. These correlations have been evaluated secondary to the calcification of the coronary arteries with consequent ischemic heart disease, cardiac arrest, and myocardial infarction. Moreover, the increased calcium-phosphorus product can cause changes in cardiac microcirculation, predisposing patients to sudden death and arrhythmias. These actors Assume greater relevance when it is verified that cardiac arrest by unknown origin, acute myocardial infarction and all other deaths due to cardiac reasons, represent almost the half of all causes of death in individuals who are in chronic dialysis (Brazil, 2002).

The tests of the glutamic transaminase (TGP) and potassium had their normal results, as shown in table 2.

Table 2: Dosage of TGP and potassium of patients treated at the Pró-Rim Foundation

x	(n)	(%)
TGP	2	2,22%
	88	97,78%
Total	90	100,00
K	18	20,00%
	72	80,00%
Total	90	100,00

It is important to know that: 1 - the TGP is an examination that verifies the levels of the enzyme transaminase pygmy glutamic (TGP), also called ALT (alanine aminotransferase). It is found practically only in

liver cells, so very specific. It serves to verify liver functions and cirrhosis, viral hepatitis, liver ischemia, heart failure, and liver cancer. Its level is also altered in case of excessive use of alcoholic beverages, drugs, and remedies (IG, 2013a); 2 – Potassium dosage is a blood test that measures potassium (K) levels in the bloodstream. It serves to evaluate renal function, neuromuscular function, acid/basic balance and blood pressure behavior (IG, 2013b).

All patients with CKD should be evaluated for the prevention of hypokalemia and hyperkalemia. The preservation of body potassium is subject to an integrated balance sheet. Where the absorption and ingestion of potassium through the intestine are on one side and their excretion by feces and urine are on the other side (HELOU, 2004).

In relation to hemoglobin, the values were altered in 78.89% of the patients and the hematocrit also changed in 93.33% of the individuals as shown in Figure 2.

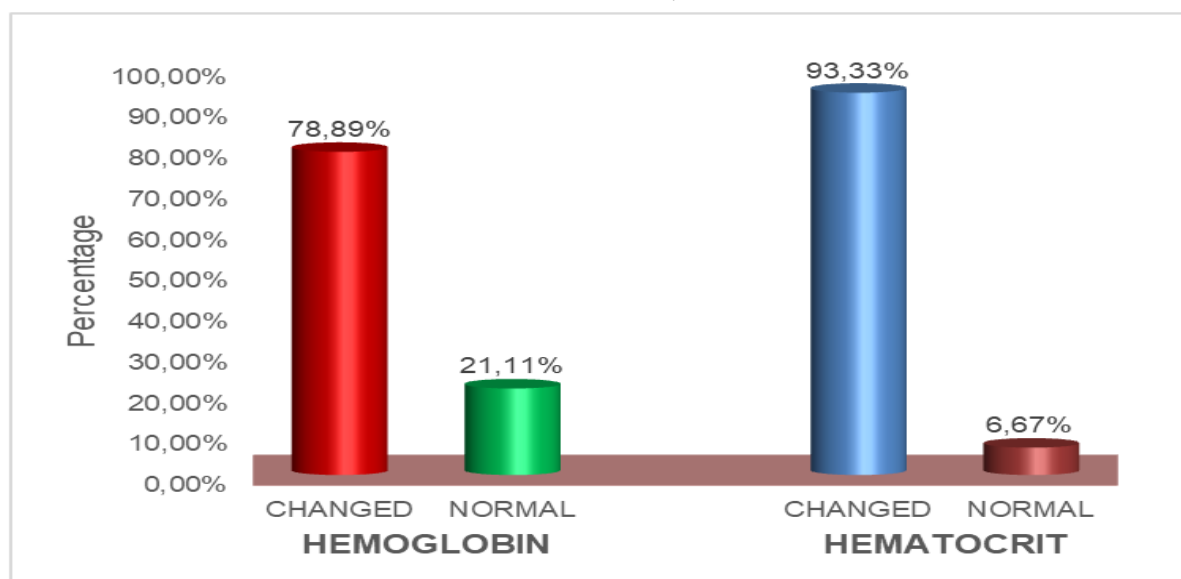


Fig.2: Hemoglobin dosage of patients treated at Foundation Pró-Rim

Draczevski (2011), in his research "evaluation of the biochemical profile and hematological parameters in patients undergoing hemodialysis" had the results similar to that of the present study, because it found a hemoglobin rate Altered in 85% of the patients and in 80% of the sample verified changes in Hematocrit.

The results are in agreement with the literature consulted, because in Ramona's research (2010) 75% of patients with CKD had anemia. In another Canadian multicenter study with 446 patients with CRF on hemodialysis, the incidence of anemia was around 90% (MIDDLETON; PARFREY FOLEY, 2001).

Anemia is a complication frequently found in patients with CKD and is related to the intensity of renal insufficiency. The origin of Anemias is characterized by anomalous hemoglobin biosynthesis, as the developing red blood cells need iron, protoporphyrin, and globin in optimal amounts for the production of hemoglobin (CARVALHO; BARACAT SGARBIER, 2006).

The administration of recombinant human erythropoietin has positive effects for the patient with CRF anemia and expressive results such as the growth of hemoglobin and hematocrit rates, the Which implies the feeling of well-being and improvement in the physical, psychic and general condition of the patient. The

maintenance of red blood cells is subject to several aspects, among the most important are an appropriate amount of erythropoietin and the presence of an iron stock in the body (Draczevski, 2011).

Anemia is a serious consequence in CKD, especially due to insufficient production of erythropoietin. Anemia stigmatizes individuals with chronic kidney

disease, since it leaves the person with cutaneous pallor, expressing a patient aspect, and deeply damaging their recovery Social (ABENSUR, 2004; BRAZILIAN SOCIETY OF NEPHROLOGY, 2008)

Regarding Diabetes and hypertension, the results were worrying due to the high prevalence, as evidenced in Figure 3.

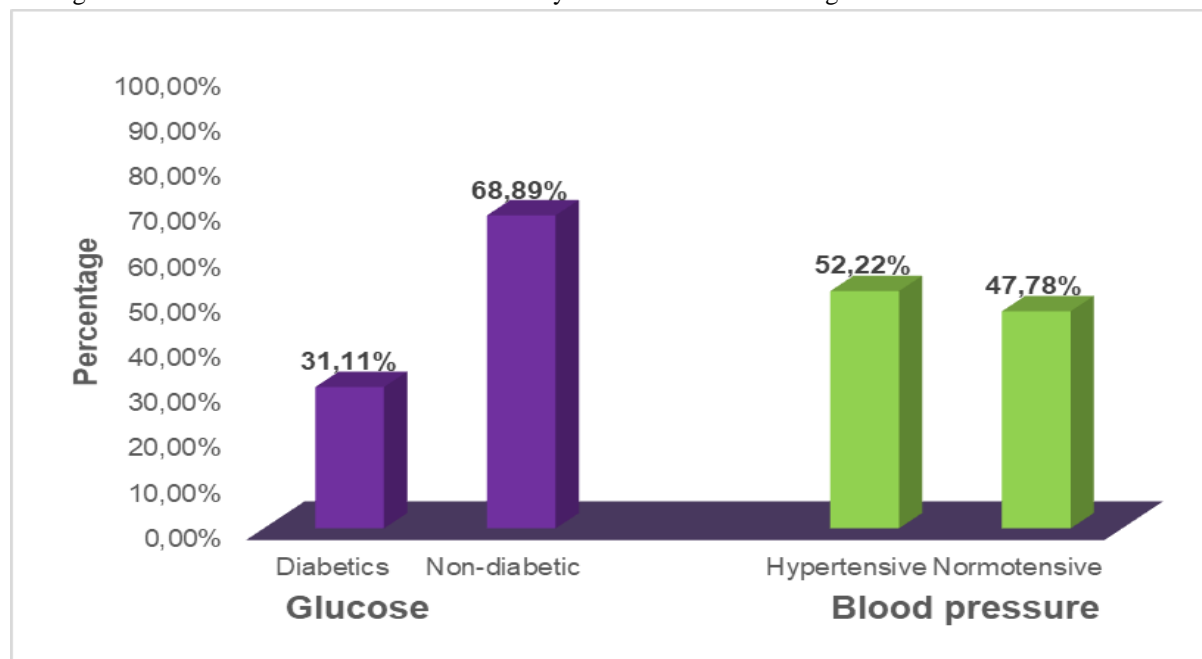


Fig.3: Degree of diabetic and hypertensive patients attended at the pro-Kidney foundation of the municipality of Gurupi-to

According to Martins (2005), arterial hypertension (SAH) can be both the cause and consequence of CRF and establishes a consecutive factor of renal injury, needing to be rigorously controlled.

In a study conducted by Barancelli and Paraboni (2008), with 45 patients undergoing hemodialysis, it was found that about 44.4% were hypertensive patients and 22.2% had diabetes-related hypertension. Data are similar to this work. Canziani et al., (2006) in his research "iron deficiency and anemia in chronic kidney disease" resulted in 35% of diabetes and 89% of hypertensive patients.

Sesso (2007) cites surveys conducted by the Brazilian Society of Nephrology (BSN) in 1996/97, where the main diseases cited as the origin of CKD in

incident patients are arterial hypertension (24%), and diabetes mellitus (17%). The prevalence of hypertension in the adult population is higher than 25%. Countless of these people do not know to be hypertensive, and among those who have the knowledge, less than 30% are appropriately treated. Thus, there is ample potential for in the coming years the HA continues to be a significant cause of CRF. Diabetes and hypertension are analyzed as a major public health problem in Brazil and in the world since each year new cases are diagnosed throughout the country. According to Barros et al. (2006) and Riella (2003), these diseases lead their patients to an accelerated impairment of renal function.

In relation to pre-and post-hemodialysis urea dosage, the results were satisfactory, as shown in table 3.

Table 3: Statistical analysis of pre-and post-hemodialysis Urea dosage in patients treated at the Pró-Rim Foundation

	Average	Mode	Median	Standard deviation
Urea Pre	172,4	206	178	58,9
Urea Pós	52	35	49,5	25,1

In a study that investigated the pre-and post-hemodialysis urea of 30 patients, it had a considerable reduction in the urea values, because it observed the efficacy of hemodialysis and consequently to the reduction of the urea values in patients with CKD, favoring the similarity with the present study, since serum urea levels were significantly reduced (SILVA; BARBOSA SOUZA, 2008). More than 50% of the samples obtained their value in accordance with the reference value, and those who continued with altered values had their serum urea levels reduced, which motivates the significance and efficacy of the dialysis treatment.

The renal tests of urea and creatinine dosage are relevant parameters in the diagnosis of CKD, serving for treatment and control. Being one of the final products of protein metabolism, urea accumulates in the blood in chronic renal insufficiency and is in such a way responsible for the causes of uremia and all the symptoms and has its serum concentration enlarged so that the rate of renal filtration decreases (LEITE et al., 2002)

Romão Junior (2004) cites that, the two main causes/consequence of chronic renal failure are arterial hypertension and diabetes, which was also the result of this study, the need for judicious action of generalist physicians who work in the area of primary health care in order to trace these problems. In addition, the essential role of the entire health team in this sense is also demonstrated. Acting together with other professionals such as nurses, nutritionist, psychologist, and physical educator can be actions that should be encouraged since strengthen the educational approach.

It is necessary to encourage the presence of a member of the patient's family or caregiver when attending consultations, and the importance of using several medications and the occasional occurrence of cognitive deficit may cause iatrogenic with undesirable effects for Patient.

It is also important to emphasize the importance of the Pró-Rim foundation for the southern region of the Tocantins and its benefit for renal patients. The results of this study showed the efficiency of hemodialysis performed in the Gurupi-TO pole because almost half of the patients managed to control the urea powders. Other aspects that we cannot forget is also that it is moved by donations from both individuals, corporations, public and private bodies, which sometimes places the institution in conditions of economic and reduced service in order to reduce the costs. Thus, it is necessary to make a work of awareness and information about the foundation in our region, since many people do not know of the existence,

the purpose and the importance of it for the regional population.

IV. FINAL CONSIDERATIONS

The present study evaluated the prevalence of diseases resulting from chronic renal insufficiency in patients treated at the pro-Kidney foundation in the municipality of Gurupi – TO, by means of statistical analyses presented in the form of graphs and tables.

Thus, it was verified that: 60% of the patients were males and 40% were females; In relation to age, the age group with the highest prevalence was "over 34 years" with 40%; 48.89% of the individuals are married; 46.67% perceived income of up to 3 minimum wages, followed by "3-4 salaries" with 32.22%; 44.44% of the patients have incomplete 1st grade and 26.67% are illiterate.

Regarding the exams: 64.44% of the calcium and 62.22% of the phosphorus were outside the reference values; 97.78% of the TGP and 80% of potassium were within the reference value; 85% of the hemoglobin rate and 80% of the hematocrit found values outside the standards of normality's; 31.11% of the patients are diabetic and 52.22% are hypertensive; pre-and post-hemodialysis urea dosage results were positive in 44.44% of the patients.

Chronic kidney disease has a high rate of mortality and morbidity, its incidence and prevalence are increasing progressively each year. In the analyses performed, the biochemical markers that assist in the detection of chronic kidney disease and in the monitoring of it were evaluated. Through the values found and compared with the data as reference values, we obtained a representation that the numbers found in the chronic renal patients are, not always, in the majority of the Times high, and in some cases, are shown exorbitant.

REFERENCES

- [1] ABENSUR, H. Deficiência de ferro na doença renal crônica. **Rev. Bras. Hematol. Hemoter.** 2010; 32(Supl.2):84-88.
- [2] ABREU, R.C.; PEREIRA, E.R.P.; GABRIEL, D.P.; CARAMOR, C.A.; BARRETTI, P. Jacqueline Costa Teixeira CARAMORI. Influência do treinamento na evolução da diálise peritoneal. **Jornal brasileiro de Nefrologia**, São Paulo, v. 30, n. 2, p. 126-131. 2008.
- [3] ANTONIAZZI, A.L. BIGAL, M.E.; BORDINI, C.A.; SPECIALI, J.G. Cefaléia relacionada à hemodiálise - Análise dos possíveis fatores desencadeantes e do tratamento empregado. **Arquivos de Neuro Psiquiatria**, São Paulo, v.60, n. 3, set. 2002.
- [4] BARANCELLI, G.; PARABONI, M.L.R. Associação entre marcadores inflamatórios e lipídicos como preditores

- de risco cardiovascular em pacientes com insuficiência renal crônica que realizam hemodiálise. **Revista Perspectiva**, Erechim/RS, p. 01-17, 2008.
- [5] BARROS, E.; MANFRO, R.C.; THOMÉ, F.S.; GONÇALVES, L.F.S. **Nefrologia rotinas, diagnóstico e tratamento**. 30 ed. Porto Alegre. Editora Artmed, 2006.
- [6] BEVILACQUA, J. L. MARABEZI, M.G.B.; CANIELLO, C.A.; CAMARGO, M.C.; EVES, A.V.; GOMES, J.G. Diálise peritoneal contínua (CAPD):- experiência de 10 anos em um centro brasileiro. **Jornal Brasileiro de Nefrologia**, São Paulo, v. 17, n. 4. p. 206-213. 1995.
- [7] BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Protocolo clínico e diretrizes terapêuticas. **Hiperfosfatemia na Insuficiência Renal Crônica**. Portaria SAS/MS nº 845, de 31 de outubro de 2002
- [8] CANZIANI, M.E.F.; BASTOS, M.G.; BREGMAN, R.; PECOITS-FILHO, R.; TOMIYAMA, C. DRAIBE, S.A., CARMO, W.B.; RIELLA, M.C., ROMÃO-JR, J.E.; ABENSUR, H. Deficiência de ferro e anemia na doença renal crônica. **J Bras Nefrol**. 2006; 28(2):86-90.
- [9] CARVALHO, M.C; BARACAT, E.C.E; SGARBIERI, V.C. Anemia Ferropriva e Anemia de Doença Crônica: Distúrbios do Metabolismo de Ferro. **Segurança Alimentar e Nutricional**, Campinas, v.13, n.2, p. 54-63, 2006.
- [10] DRACZEWSKI, L.; TEIXEIRA, M.L. Avaliação do Perfil Bioquímico e Parâmetros Hematológicos em Pacientes Submetidos à Hemodiálise. **Revista Saúde e Pesquisa**, v. 4, n. 1, p. 15-22, jan./abr. 2011
- [11] GUIMARÃES, L.R.M.; FERREIRA, A.A. Caracterização e tratamento de anemia em pacientes com insuficiência renal crônica. **V Mostra Interna de Trabalhos de Iniciação Científica** 26 a 29 de outubro de 2010.
- [12] HELOU, C.M.B. Potássio e Bicarbonato. In: Abensur, H. **Jornal Brasileiro de Nefrologia. JBN Volume XXVI - Número 3 - Supl. 1 - Agosto de 2004.**
- [13] IG. **Sódio e Potássio**. 2013b. Disponível em: <<http://saude.ig.com.br/minhasaude/exames/sodio+e+potassio/ref1237835472381.html>>. Acesso em: out., 2013.
- [14] K/DOQI. Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification. **American Journal of Kidney Diseases** 39 (2): S1-S246. 2002.
- [15] LEITE, I.C.; SCHRAMM, J.M.A.; GADELHA, A.M.J.; VALENTE, J.G.; CAMPOS, M.R.; PORTELA, M.C.; HOKERBERG, Y.H.M.; OLIVEIRA, A.F.; FERREIRA, V.M.B.; CAVALINI, L.T.; BITTENCOURT, S.A. Comparação das informações sobre as prevalências de doenças crônicas obtidas pelo suplemento saúde da PNAD/98 e as estimadas pelo estudo Carga de Doença no Brasil. **Ciência Saúde Coletiva**, v. 7, n. 4, 2002, p. 733-41.
- [16] MARQUES, AB; PEREIRA, D; RIBEIRO, RCHM. Motivos e frequência de internação dos pacientes com IRC em tratamento hemodialítico. **Arquivo Ciência da Saúde**, São Paulo, v. 12, p.67-72, abr/jun. 2005.
- [17] MARTINS, C. Insuficiência renal crônica In: LAMEU, E. **Clínica nutricional**. Rio de Janeiro: Revinter, 2005, p. 869- 888.
- [18] MIDDLETON, R.J.; PARFREY, P.S.; FOLEY, R.N. Left ventricular hypertrophy in the renal patient. **J Am Soc Nephrol**. 2001;12(5):1079-84.
- [19] MURPHREE, D.D.; THELEN, S.M. Chronic Kidney Disease in Primary Care. **Journal of the American Board of Family Medicine** 23(4):542-550.2010.
- [20] NERBASS, F.B.; MORAIS, J.G.; SANTOS, R.G.; KRÜGER, T.S.; KOENE, T.T.; LUZ-FILHO, H.A. Adesão e conhecimento sobre o tratamento da hiperfosfatemia de pacientes hiperfosfatêmicos em hemodiálise. **J Bras Nefrol** 2010;32(2):149-155.
- [21] PIERSON, D.J. Respiratory considerations in patients with renal failure. **Respiratory care**, Seattle, v. 51, n. 4, p. 413-422, Apr. 2006.
- [22] PRÓ-RIM. **Fundação Pró-Rim**. Disponível em: <<http://www.prorim.org.br/site/>>. Acesso em: abr., 2013.
- [23] REZENDE, J. Modificações sistêmicas. In: Rezende J. **Obstetrícia**. 10. ed. Rio de Janeiro: Guanabara-Koogan; 2005. p.143-59.
- [24] RIELLA, M.C. **Princípios de nefrologia e distúrbios hidroeletrólíticos**. 4ª ed. Rio de Janeiro: Guanabara Koogan, 2003.
- [25] ROMAGNA, G. **Prevalência de anemia, dislipidemia e hipertensão arterial em usuários com insuficiência renal crônica em hemodiálise de um hospital da cidade de Criciúma-SC**. 65f. 2010. Trabalho de Conclusão de Curso (obtenção do grau de bacharel no Curso de Nutrição) Universidade do Extremo Sul Catarinense – UNESC.
- [26] ROMÃO-JR, J.E. Doença Renal Crônica: Definição, Epidemiologia e Classificação. **J Bras Nefrol** Volume XXVI - nº 3 - Supl. 1 - Agosto de 2004.
- [27] SESSO, R.C.C.; GORDAN, P. Dados disponíveis sobre a doença renal crônica no Brasil. **Jornal Brasileiro de Nefrologia**, v. 29, p. 9-12, 2007.
- [28] SILVA, J. L.; BARBOSA, P. S. S.; SOUZA, H. W. O. Avaliação da dosagem de uréia pré e pós-diálise em pacientes em terapia renal substitutiva. **Revista Eletrônica de Farmácia**, Belo Horizonte, v. 5, n. 2, p. 43-47, 2008.
- [29] WHO. World Health Organization. **Assessing the iron status of populations**. Geneva; 2004.