Avaliação dos Fatores de Risco Associados à Progressão da Doença Renal Crônica em Crianças e Adolescentes no Estado de Pernambuco, Brasil

Progressão da DRC: fatores de risco em Pediatria

Assessment of Risk Factors Associated with the Progression of Chronic Kidney Disease in Children and Adolescents in the State of Pernambuco, Brazil

CKD Progression: Risk Factors in Children

Evaluación de los factores de riesgo asociados con la progresión de la enfermedad renal crónica en niños y adolescentes en el estado de Pernambuco, Brasil

Progresión de la ERC: Factores de riesgo en niños

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RESUMO

Antecedentes e objetivos: A doença renal crônica (DRC) em crianças está associada a elevada morbidade e mortalidade; entretanto, os dados regionais do Brasil são escassos. Este estudo teve como objetivo identificar fatores de risco para a progressão da DRC em uma coorte pediátrica do Nordeste do Brasil.

Métodos: Foi realizado um estudo de coorte retrospectivo com 35 pacientes, de 1 a 18 anos, com DRC em estágios III a V, acompanhados entre 2019 e 2022. O desfecho primário foi definido como necessidade de terapia renal substitutiva, redução ≥50% da TFG, TFG <15 mL/min/1,73m² ou óbito.

Resultados: A progressão da DRC ocorreu em 28,6% dos pacientes. Na análise multivariada, níveis baixos de hemoglobina, hiperfosfatemia e PTH ≥2 vezes o limite superior de referência estiveram independentemente associados à progressão.

Conclusões: O monitoramento da anemia e do metabolismo mineral é essencial no manejo da DRC pediátrica. Estudos multicêntricos de maior escala são necessários para validar esses achados.

Palavras-chave: Criança; Doença Renal Crônica; Fatores de risco; Progressão.

ABSTRACT

Background and objectives: Chronic kidney disease (CKD) in children is associated with high morbidity and mortality; however, regional data from Brazil are scarce. This study aimed to identify risk factors for CKD progression in a pediatric cohort from Northeastern Brazil.

Methods: A retrospective cohort study was conducted with 35 patients aged 1–18 years, with CKD stages III to V, followed between 2019 and 2022. The primary outcome was defined as the need for kidney replacement therapy, ≥50% decline in GFR, GFR <15 mL/min/1.73m², or death.

Results: CKD progression occurred in 28.6% of patients. In multivariate analysis, low hemoglobin levels, hyperphosphatemia, and PTH ≥2 times the upper reference limit were independently associated with progression.

Conclusions: Monitoring anemia and mineral metabolism is essential in pediatric CKD management. Larger multicenter studies are needed to validate these findings.

Keywords: Pediatrics; Chronic Kidney Disease; Risk factors; Progression.

RESUMEN

Antecedentes y objetivos: La enfermedad renal crónica (ERC) en niños se asocia con alta morbilidad y mortalidad; sin embargo, los datos regionales de Brasil son escasos. Este estudio tuvo como objetivo identificar factores de riesgo para la progresión de la ERC en una cohorte pediátrica del noreste de Brasil.

Métodos: Se realizó un estudio de cohorte retrospectivo con 35 pacientes de entre 1 y 18 años, con ERC en estadios III a V, seguidos entre 2019 y 2022. El desenlace primario se definió como la necesidad de terapia de reemplazo renal, una disminución ≥50% de la TFG, TFG <15 mL/min/1.73m² o muerte.

Resultados: La progresión de la ERC ocurrió en el 28,6% de los pacientes. En el análisis multivariado, los niveles bajos de hemoglobina, la hiperfosfatemia y la PTH ≥2 veces el límite superior de referencia se asociaron de manera independiente con la progresión de la enfermedad.

Conclusiones: El monitoreo de la anemia y del metabolismo mineral es esencial en el manejo de la ERC pediátrica. Se necesitan estudios multicéntricos más amplios para validar estos hallazgos.

Palabras clave: Niño; Enfermedad Renal Crónica; Factores de riesgo; Progresión.

Introdução

A Doença Renal Crônica (DRC) representa um importante desafio de saúde pública em escala global, não apenas pelas altas taxas de morbidade e mortalidade que acarreta, mas também pelos impactos socioeconômicos impostos a indivíduos, famílias e sistemas de saúde[1,2]. No contexto pediátrico, essa realidade torna-se ainda mais preocupante, visto que crianças acometidas por DRC apresentam risco de mortalidade até trinta vezes maior do que seus pares saudáveis, refletindo a gravidade e a complexidade do manejo dessa condição na infância[3].

Dada a natureza multifatorial da progressão da DRC, fatores modificáveis surgem como alvos críticos para intervenções voltadas a retardar sua evolução. A proteinúria é um marcador precoce de progressão, associada à perda progressiva da função renal. Paralelamente, a hipertensão arterial contribui para acelerar esse processo ao aumentar a pressão intraglomerular e a sobrecarga renal. Além desses fatores, outros mecanismos, como acidose metabólica, hiperparatireoidismo secundário, hiperfosfatemia, anemia, hiperuricemia e dislipidemia, também têm sido descritos como contribuintes para a progressão da DRC em crianças[4].

A contribuição de cada um desses fatores varia entre diferentes populações estudadas, sendo que a maioria das pesquisas foi conduzida em países desenvolvidos. No entanto, observa-se uma notável escassez de estudos brasileiros, especialmente com foco regional. Diante disso, o presente estudo tem como objetivo identificar os principais fatores de risco para a progressão da DRC em crianças e adolescentes acompanhados em um hospital de referência no Nordeste do Brasil.

Materiais e Métodos

Foi realizado um estudo de coorte retrospectivo envolvendo pacientes pediátricos com doença renal crônica (DRC), acompanhados na Unidade de Nefrologia Pediátrica de

um hospital terciário de referência em Pernambuco, Brasil, entre janeiro de 2019 e dezembro de 2022. Os participantes elegíveis tinham entre 1 e 18 anos, estavam em estágios III a V da DRC sob tratamento conservador (isto é, sem diálise), não apresentavam histórico prévio de diálise e possuíam um período mínimo de seguimento de um ano. Os critérios de exclusão incluíram estar em tratamento dialítico no momento da inclusão, prontuários médicos incompletos ou recusa em participar do estudo.

As variáveis avaliadas incluíram dados demográficos, medidas antropométricas e parâmetros clínicos, como pressão arterial. A taxa de filtração glomerular (TFG) foi estimada pela fórmula de Schwartz[5]. O desfecho primário foi definido como a ocorrência de qualquer um dos seguintes eventos: início de terapia renal substitutiva (diálise ou transplante), redução ≥50% da TFG, TFG <15 mL/min/1,73 m² ou óbito.

Os parâmetros laboratoriais analisados incluíram bicarbonato sérico, hemoglobina, perfil lipídico, ácido úrico, vitamina D, paratormônio (PTH), cálcio, fósforo e fosfatase alcalina. Os valores de referência foram interpretados com base em critérios estabelecidos na literatura previamente publicada[6]. A proteinúria foi definida como razão proteína/creatinina urinária >0,2 g/g.

O protocolo do estudo foi aprovado pelo Comitê de Ética em Pesquisa Institucional (número CAAE 77633124.2.0000.520). A progressão da DRC foi avaliada por meio de análise de sobrevivência de Kaplan–Meier. Os fatores de risco associados à progressão da doença foram analisados utilizando regressão de riscos proporcionais de Cox univariada. Variáveis com valor de $p < 0,20$ na análise univariada foram incluídas no modelo multivariado. Para todas as análises estatísticas, considerou-se nível de significância de $\alpha \leq 0,05$.

Resultados

Dos 38 pacientes inicialmente acompanhados, três foram excluídos devido a registros incompletos, estarem em estágios I ou II de DRC ou já estarem em terapia dialítica. Assim, 35 pacientes foram incluídos na análise final. A mediana de idade ao final do estudo foi de 10 anos (intervalo interquartil: 3,6–14,0 anos), com predomínio do sexo masculino (n = 24; 68,6%). O tempo médio de acompanhamento foi de 66 meses (13–177). A etiologia da DRC foi doença glomerular em dois pacientes (5,7%) e não glomerular em 33 (94,3%). A mediana da TFG apresentou redução significativa, de 36,6 (27,9–49,0) para 28,7 (16,2–37,3) mL/min/1,73m² (p = 0,001) durante o período de estudo. Paralelamente, houve melhora no escore z de altura para idade durante o acompanhamento [-2,1 ± 1,9 no início para -2,0 ± 1,9 ao final (p = 0,001)], embora essa alteração não tenha impactado a prevalência de baixa estatura (45,7% no início e 40,0% ao final; p = 0,612).

Em relação à pressão arterial, 37,1% dos pacientes apresentavam hipertensão no início, comparados a 28,6% ao final (p = 0,128). Observou-se redução da prevalência de acidose metabólica, de 26,8% para 18,0% (p = 0,001). Os níveis médios de hemoglobina aumentaram de 10,3 ± 2,0 g/dL para 11,0 ± 2,0 g/dL (p = 0,001), acompanhados de tendência à redução da prevalência de anemia (74,3% para 60,0%; p = 0,0585). A hiperfosfatemia foi observada em 11,4% dos pacientes no início e 14,3% ao final do estudo (p = 0,477). Os níveis de PTH aumentaram significativamente, com mediana de 92,3 pg/mL (51,4–174,4) no início para 137,0 pg/mL (90,3–346,0) ao final (p = 0,005). A proteinúria apresentou alta prevalência desde o início (68,6%) e manteve-se elevada ao final (80,0%), sem melhora estatisticamente significativa (p = 0,275). Esses dados estão detalhados na Tabela 1.

Dos 35 pacientes incluídos, 28,6% apresentaram progressão da DRC durante o acompanhamento, definida pelo início de terapia de substituição renal (transplante n=2, diálise n=4), redução ≥50% da TFG ou TFG <15 mL/min/1,73m² (n=3) e um óbito (n=1). A Figura 1 apresenta a curva de Kaplan-Meier para o desfecho.

Na análise de regressão de Cox univariada, o escore z de altura para idade, TFG, estágios avançados de DRC (IV e V), níveis séricos de hemoglobina, bicarbonato, fósforo, fosfatase alcalina, PTH, PTH ≥2 vezes o valor de referência e presença de hiperfosfatemia apresentaram associação significativa com a progressão da doença. No entanto, na análise multivariada, apenas os níveis séricos de hemoglobina, PTH ≥2 vezes o valor de referência e hiperfosfatemia permaneceram independentemente associados à progressão da DRC (Tabela 2).

Discussão

Neste estudo com 35 crianças e adolescentes com doença renal crônica (DRC) acompanhados em um hospital terciário no Nordeste do Brasil, a taxa de progressão da DRC foi de 28,6%, consistente com achados de estudos nacionais e internacionais. Uma coorte multicêntrica da América do Norte e Europa relatou uma taxa de progressão de 35% ao longo de quatro anos,[7] enquanto um estudo brasileiro conduzido em São Paulo observou uma taxa de progressão de 21% em dois anos.[8] Esses resultados comparáveis reforçam a relevância de nossos achados, particularmente em um contexto regional caracterizado por possíveis limitações no acesso à saúde e escassez de dados epidemiológicos sobre DRC pediátrica.

A análise multivariada identificou três variáveis independentemente associadas à progressão da DRC: baixos níveis de hemoglobina, concentrações de hormônio paratireoideano (PTH) maiores que duas vezes o limite superior de referência e hiperfosfatemia. A hemoglobina manteve-se significativamente associada à progressão

após ajuste para fatores de confusão, corroborando pesquisas anteriores de Belangero et al., que destacam a anemia como um fator que contribui para a deterioração da DRC em crianças.[8]

Níveis elevados de PTH também foram associados a desfechos piores, refletindo a contribuição dos distúrbios minerais e ósseos para o aumento da morbidade e declínio da função renal,[9] como relatado por Hu et al. em dados de adultos,[10] e ainda respaldado por pesquisas pediátricas que demonstram que concentrações de PTH acima do dobro do valor de referência impactam negativamente a saúde óssea, o crescimento e a morbidade geral.[11] A hiperfosfatemia, frequentemente associada a dano tubular e disfunção endotelial, foi outro preditor significativo de progressão em nossa coorte.[12] Em pacientes pediátricos, essa associação é particularmente crítica devido ao papel do fósforo no desenvolvimento esquelético e crescimento.[13]

Na análise univariada, outras variáveis também se associaram à progressão, como o z-escore de estatura, TFG inicial, estágios IV e V da doença, níveis séricos de bicarbonato, fosfatase alcalina e fósforo. A estatura, como indicador do estado nutricional, e a TFG basal refletem o grau de comprometimento funcional, sendo preditores esperados.[14]

Baixos níveis séricos de bicarbonato surgiram como possível fator de risco para progressão. Esse achado está alinhado com estudos pediátricos prévios que implicaram a acidose metabólica na patogênese da progressão da DRC e na inflamação sistêmica.[15]

Apesar da relevância clínica, proteinúria e hipertensão arterial não apresentaram significância estatística neste estudo. Ainda assim, foram mantidas na análise multivariada, considerando sua prevalência elevada nesse estudo, e o consenso na literatura sobre seu papel na progressão da DRC. A ausência de associação pode estar relacionada ao pequeno tamanho amostral e à variabilidade da resposta ao tratamento.

Diversos estudos sustentam que a persistência da proteinúria e o controle inadequado da pressão arterial são determinantes críticos da perda de função renal em crianças com DRC. Portanto, o controle rigoroso da proteinúria e da pressão arterial continua sendo estratégia essencial para retardar a progressão da DRC.[4]

Este estudo apresenta algumas limitações, incluindo o pequeno tamanho amostral e o delineamento retrospectivo, o que podem limitar a generalização dos achados e a captação de variáveis intervenientes. No entanto, destaca-se por abordar uma população pediátrica de uma região com carência de dados sobre DRC, contribuindo para o conhecimento da evolução da doença nesse contexto. O uso de análise multivariada fortalece a identificação de fatores independentes de risco.

Conclusões

A monitorização da anemia, do metabolismo mineral e da função renal são estratégias fundamentais na gestão da DRC pediátrica. Estudos multicêntricos e com maior poder amostral são necessários para aprofundar o entendimento dos determinantes da progressão da DRC em crianças no Brasil.

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Os autores declaram que este trabalho foi realizado com recursos próprios.

CONFLITOS DE INTERESSE

Os autores declaram não haver conflitos de interesse.

DECLARAÇÕES ÉTICAS

Uso de seres humanos e animais: Os autores afirmam que nenhum estudo envolvendo participantes humanos ou animais foi realizado como parte desta pesquisa.

Confidencialidade dos dados: Os autores confirmam a observância das diretrizes institucionais quanto à proteção e publicação dos dados dos pacientes. Privacidade e consentimento informado: O consentimento informado por escrito foi obtido de todos os indivíduos mencionados no artigo. O autor correspondente detém a documentação que comprova este consentimento. Uso de inteligência artificial generativa: Os autores declaram que nenhuma ferramenta de IA generativa foi utilizada na elaboração do texto do manuscrito, nem na criação de figuras, tabelas, imagens ou legendas relacionadas.

Introduction

Chronic Kidney Disease (CKD) represents a significant public health challenge on a global scale, not only due to the high rates of morbidity and mortality it causes, but also because of the socioeconomic impacts it imposes on individuals, families, and healthcare systems[1,2]. In the pediatric context, this reality becomes even more concerning, as children affected by CKD have a mortality risk up to thirty times higher than their healthy peers, reflecting the severity and complexity of managing this condition in childhood[3].

Given the multifactorial nature of chronic kidney disease (CKD) progression, modifiable factors emerge as critical targets for interventions aimed at decelerating its course. Proteinuria is an early marker of progression, associated with progressive loss of kidney function. In parallel, arterial hypertension contributes to accelerating this process by increasing intraglomerular pressure and renal overload. In addition to these factors, other mechanisms, such as metabolic acidosis, secondary hyperparathyroidism, hyperphosphatemia, anemia, hyperuricemia, and dyslipidemia, have also been described as contributors to CKD progression in children[4].

The contribution of each of these factors varies among different populations studied, with most research conducted in developed countries. However, there is a notable lack of Brazilian studies, particularly with a regional focus. In light of this, the present study aims to identify the main risk factors for CKD progression in children and adolescents followed at a referral hospital in Northeastern Brazil.

Materials and Methods

A retrospective cohort study was conducted involving pediatric patients with chronic kidney disease (CKD) who were followed at the Pediatric Nephrology Unit of a tertiary referral hospital in Pernambuco, Brazil, between January 2019 and December

2022. Eligible participants were aged between 1 and 18 years, had CKD stages III to V managed conservatively (i.e., without dialysis), had no prior history of dialysis, and had a minimum follow-up period of one year. Exclusion criteria included ongoing dialysis treatment, incomplete medical records, or refusal to participate in the study.

The variables assessed included demographic data, anthropometric measurements, and clinical parameters, such as blood pressure. The glomerular filtration rate (GFR) was estimated using the Schwartz formula[5]. The primary outcome was defined as the occurrence of any of the following events: initiation of kidney replacement therapy (dialysis or transplantation), a ≥50% reduction in GFR, a GFR <15 mL/min/1.73 m², or death.

Laboratory parameters evaluated included serum bicarbonate, hemoglobin, lipid profile, uric acid, vitamin D, parathyroid hormone (PTH), calcium, phosphate, and alkaline phosphatase levels. Reference values were interpreted based on criteria established in previously published literature[6]

. Proteinuria was defined as a urinary protein-to-creatinine ratio >0.2 g/g.

The study protocol was approved by the Institutional Research Ethics Committee (protocol number CAAE 77633124.2.0000.520). CKD progression was assessed using Kaplan–Meier survival analysis. Risk factors associated with disease progression were analyzed using univariate Cox proportional hazards regression. Variables with a p-value <0.20 in univariate analysis were included in the multivariate model. A significance level of $\alpha \leq 0.05$ was considered for all statistical analyses.

Results

Of the 38 initially followed patients, three were excluded due to incomplete records, being in CKD stages I or II, or already on dialysis. Thus, 35 patients were included in the final analysis. The median age at the end of the study was 10 years

(interquartile range: 3.6 – 14.0 years), with a predominance of males (n = 24; 68.6%). The median follow-up time was 66 months (13–177). The etiology of CKD was glomerular disease in two patients (5.7%) and non-glomerular in 33 (94.3%). The median GFR decreased significantly from 36.6 (27.9–49.0) to 28.7 (16.2–37.3) mL/min/1.73m² (p = 0.001) during the study period. Alongside, there was an improvement in the mean height-for-age z-score during follow-up [-2.1 ± 1.9 at baseline to -2.0 ± 1.9 at end (p = 0.001)], although this change did not impact the prevalence of short stature (45.7% at baseline and 40.0% at end; p = 0.612). Regarding blood pressure, 37.1% of patients were hypertensive at the beginning, compared to 28.6% at the end (p = 0.128). There was a reduction in the prevalence of metabolic acidosis from 26.8% to 18.0% (p = 0.001). Mean hemoglobin levels improved from 10.3 ± 2.0 g/dL to 11.0 ± 2.0 g/dL (p = 0.001), along with a trend toward decreased anemia prevalence (74.3% to 60.0%; p = 0.0585). Hyperphosphatemia was 11.4% at baseline and 14.3% at study end (p = 0.477). PTH levels increased significantly, with a median of 92.3 pg/mL (51.4–174.4) at baseline to 137.0 pg/mL (90.3–346.0) at end (p = 0.005). Proteinuria was highly prevalent from the start (68.6%) and remained high at the end (80.0%), with no statistically significant improvement (p = 0.275). These data are detailed in Table 1.

Of the 35 children included, 28.6% showed CKD progression during follow-up, defined by initiation of replacement therapy (transplant n=2, dialysis n=4), ≥50% reduction in GFR or GFR <15 mL/min/1.73m² (n=3), and one death (n=1). Figure 1 shows the Kaplan-Meier curve for the outcome.

In the univariate Cox regression analysis, height-for-age z-score, GFR, advanced CKD stages (IV and V), serum levels of hemoglobin, bicarbonate, phosphorus, alkaline phosphatase, PTH, PTH ≥2 times the reference value, and presence of hyperphosphatemia were significantly associated with disease progression. However, in the multivariate

analysis, only serum hemoglobin levels, PTH ≥2 times the reference value, and hyperphosphatemia remained independently associated with CKD progression (Table 2).

Discussion

In this study of 35 children and adolescents with chronic kidney disease (CKD) followed at a tertiary hospital in Northeastern Brazil, the CKD progression rate was 28.6%, consistent with findings from both national and international studies. A multicenter cohort from North America and Europe reported a 35% progression rate over four years[7], while a Brazilian study conducted in São Paulo observed a 21% progression rate over two years[8]. These comparable results underscore the relevance of our findings, particularly within a regional context characterized by potential healthcare limitations and a paucity of epidemiological data on pediatric CKD.

Multivariate analysis identified three variables independently associated with CKD progression: low hemoglobin levels, parathyroid hormone (PTH) concentrations greater than twice the upper reference limit, and hyperphosphatemia. Hemoglobin remained significantly associated with progression after adjustment for confounders, supporting previous research by Belangero et al., that highlights anemia as a contributor to CKD deterioration in children[8].

Elevated PTH levels were also associated with worse outcomes, reflecting the contribution of mineral and bone disorders to increased morbidity and declining kidney function[9], as reported by Hu et al. in adult data[10], and further supported by pediatric research demonstrating that PTH concentrations above twice the reference range negatively impact bone health, growth, and overall morbidity[11]. Hyperphosphatemia, frequently linked to tubular damage and endothelial dysfunction, was another significant predictor of progression in our cohort[12]. In pediatric patients, this association is particularly critical due to the role of phosphate in skeletal development and growth[13].

Other variables, including height-for-age z-score, baseline glomerular filtration rate (GFR), CKD stages IV and V, and serum levels of bicarbonate, alkaline phosphatase, and phosphate, were also associated with CKD progression in Univariate analysis. Height, as an indicator of nutritional and developmental status, and baseline GFR, as a marker of initial disease severity, are well-established predictors of progression in pediatric CKD populations[14].

Low serum bicarbonate levels emerged as a potential risk factor for progression. This finding aligns with previous pediatric studies that have implicated metabolic acidosis in the pathogenesis of CKD progression and systemic inflammation[15].

Although proteinuria and arterial hypertension are well-established risk factors for CKD progression, they were not statistically significant in this study. Nonetheless, both variables were included in the multivariate analysis due to their high prevalence in the cohort and the convincing evidence in the literature supporting their role in disease progression. The absence of a significant association may be attributed to the limited sample size and variability in treatment responses among participants. Numerous studies have demonstrated that persistent proteinuria and poor blood pressure control are key contributors to the decline in kidney function in pediatric CKD. Therefore, maintaining tight control of proteinuria and hypertension remains a fundamental strategy for slowing CKD progression in children[4].

This study has several limitations, including its small sample size and retrospective design, which may affect the generalizability of the findings and limit the ability to control for confounding variables. However, it provides valuable insights into a pediatric population in a region where data on CKD are scarce. Moreover, the use of multivariate analysis enhances the robustness of the findings by identifying independent risk factors associated with disease progression.

Conclusions

In addition to the management of proteinuria and hypertension, close monitoring of anemia, mineral metabolism, and renal function is essential for the effective management of pediatric CKD. Further large-scale, multicenter studies are warranted to enhance the understanding of the factors influencing CKD progression in this population.

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The authors declare that this work was carried out with the authors' own resources.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

ETHICAL DISCLOSURES

Use of human and animal subjects: The authors affirm that no studies involving human participants or animals were conducted as part of this research. Data confidentiality: The authors confirm adherence to institutional guidelines regarding the protection and publication of patient data. Privacy and informed consent: Written informed consent was obtained from all individuals referenced in the article. The corresponding author holds the documentation confirming this consent. Use of generative artificial intelligence: The authors declare that no generative AI tools were utilized in the preparation of the manuscript text, or in the creation of figures, tables, images, or related captions.

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Tabela 1 – Dados demográficos, clínicos e laboratoriais dos pacientes no início e ao final do período de estudo

Variável	**Início do acompanhamento n=35**	**Fim do período de estudo n=35**	**P**
Idade (anos)	4,0 (1,0 – 8,0)	10,0 (3,6 – 14,0)	0,001
Sexo masculino (n, %)	24,0 (68,6)	-	-
Tempo de acompanhamento	-	66 (13-177)	-
Etiologia (n, %)	-	-	-
Glomerular (n, %)	2,0 (5,7)	-	-
Não glomerular	33,0 (94,3)	-	-
Escore Z de altura para idade	-2,1 ± 1,9	-2,0 ± 1,9	0,001
Baixa estatura	16,0 (45,7)	14,0 (40,0)	0,612
Pressão arterial sistólica	90,0 (86,0 – 100,0)	98,0 (89,0 – 110,0)	0,276
Pressão arterial diastólica	60,0 (50,0 – 60,0)	60,0 (55,0 – 75,0)	0,041
Hipertensão	13,0 (37,1)	10,0 (28,6)	0,128
TFG (mL/min/1.73m²)	36,6 (27,9– 49,0)	28,7(16,2 – 37,3)	0,001
Creatinina (mg/dL)	1,2 (0,9 – 1,9)	2,6 (1,6 – 3,4)	0,001
Bicarbonato (mEq/L)	17,9 ± 4,4	21,2 ± 3,3	0,001
Acidose metabólica	26,0 (74,3)	18,0(51,4)	0,004
Hemoglobina (g/dL)	10,3 ± 2,0	11,0 ± 2,0	0,001
Anemia	26,0 (74,3)	21,0 (60,0)	0,058
Cálcio (mg/dL)	9,8 ± 0,9	9,4 ± 0,7	0,827
Fósforo (mg/dL)	5,5 (4,7 – 5,9)	4,9 (4,4 – 5,7)	0,189
Hiperfosfatemia	4,0 (11,4)	5,0 (14,3)	0,477
Fosfatase alcalina (U/L)	309,0(208,0 – 444,0)	300,0 (226,0 – 403,0)	0,248
PTH (pg/mL)	92,3 (51,4 – 174,4)	137,0 (90,3 – 346,0)	0,005
PTH ≥2× valor normal	13,0 (37,1)	17,0(48,6)	0,238

Vitamina D (UI)	36,0 (30,9 – 46,0)	41,0(33 – 46)	0,298
Colesterol (mg/dL)	154,4 ± 35,4	176,0 ± 41, 4	0,466
Ácido úrico (mg/dL)	4,9 (3,7 – 6,3)	5,2 (4,7 – 6,6)	0,278
Relação P/C (>0.2 g/g)	24,0 (68,6)	28,0 (80,0)	0,275

Os dados são apresentados como n/%, média ± desvio padrão ou mediana (intervalo interquartil). O tempo de acompanhamento é apresentado em meses. Relação P/C = proteína/creatinina.

Figura 1 – Curva de Kaplan-Meier mostrando a progressão da DRC

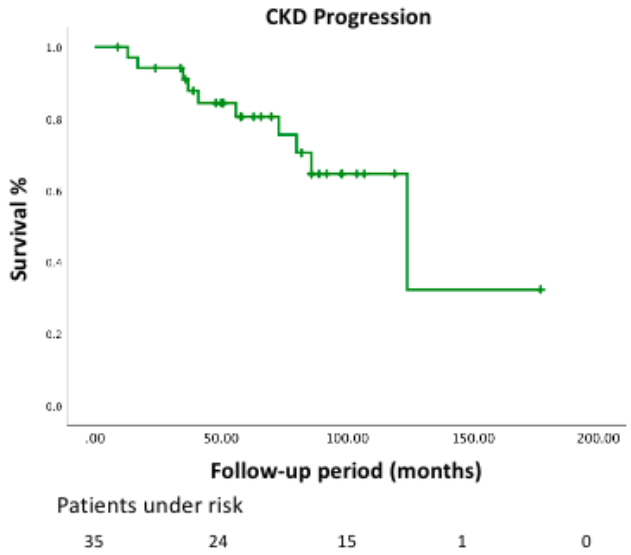

Tabela 2 – Análise dos fatores de risco para progressão da doença renal crônica presentes no início do acompanhamento

	Análise Bivariada		
Variável	RR	IC 95%	p=
Idade	0,91	0,75 – 1,11	0,382
Sexo	0,82	0,23- 2,96	0,773
Escore Z de altura para idade	0,62	0,41- 0,92	0,019
Creatinina	1,45	0,75 -2,78	0,264
TFG	0,92	0,86– 0,99	0,038
Estágios IV e V	4,30	1,18 – 15,90	0,027
Hemoglobina	0,70	0,55- 0,90	0,005
Anemia	0,02	0,00- 7,95	0,212
Bicarbonato	0,82	0,69– 0,98	0,032
Acidose metabólica	0,41	0,52- 3,36	0,411
PTH	1,00	1,00- 1,00	0,014
PTH 2x > normal	0,09	0,02- 0,49	0,005
Fosfatase alcalina	1,00	1,00 – 1,00	0,007
Cálcio	0,57	0,29 – 1,13	0,113
Vitamina D	0,96	0,90– 1,02	0,274
Fósforo	2,49	1,36- 4,54	0,003

Hiperfosfatemia	41,1	4,06 – 416,7	0,002
Colesterol	0,97	0,95 – 1,00	0,084
Ácido úrico	0,94	0,69 – 1,29	0,724
Proteinúria	0,67	0,13 – 3,24	0,619
Hipertensão	1,25	0,31- 5,04	0,747

Análise Multivariada – Stepwise Forward

Variável	RR	IC 95%	p=
Hemoglobina	0,557	0,337- 0,919	0,022
PTH 2x > normal	25,92	2,325 – 289,42	0,008
Hiperfosfatemia	277,845	8,062 - 9575,56	0,002

ANEXO TEXTO COM AS INSTRUÇÕES DE FORMATAÇÃO PARA A REVISTA LATINOAMERICANA DE NEFROLOGIA + ARQUIVO CLICÁVEL

Instructions to
authors - nefrologia

Instructions to authors

Revista Nefrología Latinoamericana (Latin American Journal of Nephrology) is the official publication of the Latin American Society of Nephrology and Hypertension (Sociedad Latinoamericana de Nefrología e Hipertensión, SLANH).

SLANH is a scientific body founded in 1970, consisting of the National Nephrology Societies of more than 20 countries and of nephrology physicians of Latin America, which has as its basic aims to work for the renal health of the Latin American population by improving the training of the nephrologists of the region and the promotion and dissemination of the scientific advances associated with these aims.

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