

Educational nursing intervention to reduce the hyperphosphatemia in patients on hemodialysis

Intervenção educacional de enfermagem para redução da hiperfosfatemia em pacientes em hemodiálise
Intervención educativa de enfermería para reducir hiperfosfatemia en pacientes en hemodiálisis

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ABSTRACT

Objective: to evaluate the effectiveness of an educational nursing intervention to reduce hyperphosphataemia in chronic renal patients on hemodialysis. **Method:** quasi-experimental study with 63 hyperphosphatemic patients on hemodialysis. The intervention consisted of developing and providing a printed and illustrated manual to patients containing information on disease control. The participant was asked to complete a daily checklist with the aim to reinforce aspects provided in the manual. Laboratory tests and itching intensity were analyzed at the beginning of the study, and at 30 and 60 days after the educational intervention. **Results:** the mean age of participants was 58 ± 13.1 years, with a treatment time of 51.1 ± 44.7 months. A reduction in serum phosphorus values of 7.06 ± 1.43 to 5.80 ± 1.53 ($p < 0.001$) and the intensity of itching after the intervention was observed. **Conclusion:** the educational nursing intervention was effective in reducing phosphate and decreasing itching in hyperphosphatemic patients.

Descriptors: Renal Dialysis; Hyperphosphataemia; Nursing; Hemodialysis; Renal Insufficiency, Chronic.

RESUMO

Objetivo: avaliar a efetividade de uma intervenção educacional de enfermagem para redução da hiperfosfatemia em pacientes renais crônicos em hemodiálise. **Método:** estudo quase experimental realizado com 63 pacientes hiperfosfatêmicos em hemodiálise. A intervenção se constituiu em orientar e disponibilizar um manual impresso e ilustrado aos pacientes, contendo informações sobre o controle da doença. Foi solicitado o preenchimento de um *checklist* diário, com finalidade recordatória dos aspectos abordados no manual. Os exames laboratoriais e a intensidade do prurido foram analisados no início do estudo, aos 30 e 60 dias após a intervenção educacional. **Resultados:** a média de idade dos participantes foi $58 \pm 13,1$ anos e tempo de tratamento de $51,1 \pm 44,7$ meses. Houve redução dos valores séricos do fósforo de $7,06 \pm 1,43$ para $5,80 \pm 1,53$ ($p < 0,001$) e da intensidade do prurido após a intervenção. **Conclusão:** a Intervenção Educacional de Enfermagem foi efetiva para redução do fósforo e diminuição do prurido nos pacientes hiperfosfatêmicos.

Descritores: Diálise Renal; Hiperfosfatemia; Enfermagem; Hemodiálise; Insuficiência Renal Crônica.

RESUMEN

Objetivo: evaluar la eficacia de una intervención educativa de enfermería para reducir hiperfosfatemia en pacientes con insuficiencia renal crónica en hemodiálisis. **Método:** estudio cuasi-experimental con 63 pacientes en hemodiálisis con hiperfosfatemia. La intervención consistió en guiar los pacientes y proporcionar un manual impreso e ilustrado con informaciones sobre el control de la enfermedad. Se solicitó completar una lista de verificación todos los días con el propósito de recordar los aspectos tratados en el manual. Se analizaron las pruebas de laboratorio y la intensidad del picor al inicio del estudio, 30 y 60 días después de la intervención educativa. **Resultados:** la edad promedio de los participantes fue $58 \pm 13,1$ años y el tiempo de tratamiento fue $51,1 \pm 44,7$ meses. Hubo reducción de los valores séricos de fósforo de $7,06 \pm 1,43$ para $5,80 \pm 1,53$ ($p < 0,001$) y de la intensidad del picor después de la intervención. **Conclusión:** la intervención educativa de enfermería fue eficaz en la reducción de fosfato y disminución del picor en pacientes con hiperfosfatemia.

Descriptor: Diálisis Renal, Hiperfosfatemia, Enfermería, Diálisis Renal, Insuficiencia Renal Crónica.

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INTRODUCTION

Chronic kidney disease (CKD) occurs in 5-10% of the population and has gradually increased in Brazil, which may be associated with the increased percentage of individuals diagnosed with diabetes and hypertension⁽¹⁾. The number of patients on dialysis programs in Brazil has increased significantly, from 42,695 patients in 2000, to 92,091 in 2010, and 112,004 in 2014, representing an increase of 20,000 patients in the last four years⁽²⁾. Data from the *Brazilian Chronic Dialysis Census, 2014*, showed an increase in the prevalence rate of dialysis treatment in relation to 2013, and a growth in the incidence rate⁽²⁾. These data are also associated with longevity of the population and quality of life⁽¹⁻³⁾.

Most chronic renal patients on hemodialysis develop hyperphosphataemia, resulting from excessive phosphorus (P) intake, reduced P clearance, and conditions of bone remodeling⁽⁴⁾. The increase in P in the chronic kidney patient is related to a high risk of cardiovascular disease, secondary hyperparathyroidism, and reduced production of calcitriol⁽³⁾. Furthermore, changes in the calcium and phosphate metabolism contribute to an increased risk of mortality in this population⁽⁵⁻⁶⁾. *Fibroblast growth factor 23* (FGF-23), discovered more than ten years ago, has among its functions the inhibition of 1 α -hydroxylase, the enzyme responsible for calcitriol synthesis⁽⁷⁾. This finding led to a new understanding about phosphorus control mechanisms associated with mortality in chronic renal failure patients⁽⁷⁾.

In the early stage of CKD, renal adaptation occurs, characterized by a decrease in tubular reabsorption of phosphorus and increased phosphaturia in the remaining nephrons. This process is maintained by increased levels of the parathyroid hormone (PTH)⁽⁶⁾. With the gradual decline of the glomerular filtration rate (GFR), this compensatory mechanism fails to maintain the phosphate levels within the normal range. The consequences of hyperphosphatemia occur, such as: secondary hyperparathyroidism, metastatic calcifications, cystic fibrous osteitis, as well as its contribution to the progression of renal failure, significant morbidity due to pain, osteopenia, increased risk of fractures, anemia, hypertension, atherosclerotic vascular disease, pruritus, and sexual dysfunction⁽⁶⁾.

The dialytic methods are very effective for removal of serum phosphorus, while adherence to the controlled diet is difficult, which makes use of phosphate binders essential for

hyperphosphatemic patients. There is a lack of programs to evaluate food intake, such as the addition of phosphorus in food, that is not considered to be a problem, as the bioavailability of it is greater⁽⁸⁾. Chelating agents promote the reduction of serum phosphorus absorption by binding to phosphorus in food in the intestine⁽⁴⁾. The role of their chelators on the FGF-23 levels and its clinical impact on mortality and progression of CKD require randomized, controlled studies, with a significant number of patients⁽⁷⁾.

The guidelines of the *Kidney Disease Improving Global Outcomes* (KDIGO) and *Kidney Disease Outcomes Quality Initiative* (KDOQI) recommend the use of phosphate binders for hyperphosphatemic patients in all stages of ESRD⁽⁵⁻⁶⁾. The chelator of choice must be individualized; all available types on the market are effective in reducing the serum phosphorus. There is a lack of evidence on the effects of each chelator class on morbidity and mortality, vascular calcification, and bone disease^(5-6,9).

In a randomized study comparing sevelamer and *calcium-chelation agent*, the authors affirm that high serum phosphorus and calcium are associated with arterial calcification and mortality in patients on dialysis⁽¹⁰⁾. In elderly individuals over 65 years of age, a significant effect of sevelamer on reducing mortality was identified⁽¹⁰⁾. The KDIGO recommends against using aluminum-based chelators⁽⁶⁾ to prevent metal poisoning. Phosphorus dietary restriction is important and does not affect the nutritional status of patients, but new evidence demonstrating the impact of interventions on clinical outcomes are not available. Meanwhile, the KDIGO guidelines do not recommend specific values for daily phosphorus intake, however the KDOQI recommended daily phosphorus intake of 800 mg, which is similar to the Brazilian guideline^(9,11-12).

In a study that analyzed the impact of an educational intervention for controlling bone disorder markers, adherence to the use of chelating medications, and knowledge about such medications, showed that there were no statistically significant changes in clinical markers, but a significant improvement in the proportion of patients who joined the chelating treatment, from 44% to 72% ($p=0.016$), and an expanded knowledge of the medicinal product⁽¹³⁾. These results report the relevance of the nurse's role as a health educator, in order to empower patients to increase knowledge and improve the adherence to treatment.

In this context, the lack of adherence to one or more aspects of hemodialysis treatment is a constant concern of the healthcare

team in nephrology, as it may increase morbidity and mortality, and thereby compromise the quality of life of chronic renal patients⁽¹⁴⁾. Itching is among the clinical conditions secondary to hyperphosphatemia that impact the quality of life of these patients.

The etiology of itching is related to xerosis, secondary hyperparathyroidism, high serum phosphate and magnesium, among others. Dialysis has an insignificant impact on the improvement of itching, which contributes to an important therapeutic challenge⁽¹⁵⁾. Thus, the healthcare professionals who deal with these patients need the knowledge of these manifestations, aiming at early detection, proper management and cooperation with investigations that contribute to clarify the pathophysiology, thereby establishing effective treatments for resolving these conditions. In this context, the treatment of hyperphosphatemia has better results if it is sustained by the triad: use of chelation, proper diet, and adherence to treatment⁽¹⁵⁻¹⁷⁾.

This triad can be made possible by the nurse's performance in educational actions. The educational nursing intervention provides the patient approach in order to establish communication and relationship, as well as to facilitate understanding about the disease, enabling a greater adherence to treatment. The intervention may be constituted by printed information such as educational materials, personalized or group guidance, in order to provide the individual with skills for self-care, such as the subject of their treatment,⁽¹⁸⁾ reducing the morbidity related to the disease, and improving the quality of life of this population.

Considering the above, this study can contribute positively to the quality of care to patients with renal failure. Educational intervention can mobilize patients for treatment adherence, enabling greater knowledge about the disease, hyperphosphatemia treatment, and decreasing complications, morbidity and mortality, and can improve the assessment of their quality of life.

OBJECTIVE

To evaluate the effectiveness of a nursing educational intervention (NEI) for reduction of hyperphosphatemia in chronic renal patients on hemodialysis.

METHOD

Ethical aspects

The chronic renal failure patients on hemodialysis were consulted about their availability to participate in the study, and were informed about the study objectives as well as the confidentiality of their identity. All participants signed the Terms of Free and Informed Consent form in duplicate, with one given to the respondent and the other remaining with the researcher, in accordance with Resolution No. 196/96. The study was preceded by the approval of the Ethics Committee of the Federal University of São Paulo.

Design, site and study period

This was a quasi-experimental study, of a before and after design, conducted during the period from 2011 to 2014, in a renal dialysis unit of the interior of Rio Grande do Sul, which provided care for an average of 110 patients per month.

Sample

The study included 63 chronic renal failure patients who met the inclusion criteria, which were: receiving hemodialysis three times a week, for a period of four hours; mean serum phosphorus above 5.5 mg/dL in the last six months, and literate. Patients who had difficulty understanding the guidelines for disease control, explained in the manual, were excluded.

Study protocol

Data were collected using a study protocol composed of a clinical, laboratory and socio-demographic characteristics form. This information was collected directly from patient records.

For implementation of the educational nursing intervention, a manual with ten domains for patients with hyperphosphatemia was used, developed as recommended by Echert⁽¹⁹⁾ according to the Ordinance of the Health Care Department/MS No. 225 - May 10, 2010⁽²⁰⁾, which includes the Protocol and Therapeutic Guidelines - Hyperphosphatemia in Chronic Renal failure. The manual includes guidelines, in a language accessible by patients, about CKD, hyperphosphatemia, signs and symptoms, treatment, phosphate binder use, dietary care, benefits, risks and options for improving health-related quality of life⁽¹⁸⁾.

A *checklist* was developed consisting of 16 explicative questions about the manual for the patient to record his/her daily actions of care and morbidity control. Of the 16 questions, 13 were dichotomous, "yes or no", which denoted the understanding and comprehension about the explicit content of the manual. Question 14 refers to the daily record of the itching intensity, using a Likert scale; considered the following scores in a Likert scale (1-None; 2-Little, 3-More or less; 4 - Much, and 5 - Very much). Question 15 was answered by the researcher at the end of the intervention, referring to attending hemodialysis sessions for medical and nursing guidance, and the question 16 assessed the positive attitude towards the disease, treatment adherence, and perceptions of confronting the health-related quality of life. The manual content and checklist were validated for internal consistency by nurses and later by 21 patients⁽¹⁸⁾.

The manual and checklist content validation was conducted in two phases: the first consisted of the validation by nurses and the second by patients, using the Delphi technique. The draft manual and the checklist was presented to seven nurses, experts in nephrology, who made minor suggestions in the text. Once consensus was obtained, the final version was redesigned and in the second phase it was validated by 21 patients, cared for in a kidney unit of a general hospital. At this stage, the patients reported if the checklist represented the content of the manual and whether the questions were understood, answering "yes or no". Next, the Cronbach's alpha test was performed to verify the understanding of patients related to the manual information and the checklist⁽¹⁸⁾.

The study protocol was applied to the patients who met the inclusion criteria. The educational nursing intervention consisted of individual guidance to participants on the aspects of the printed and illustrated manual. The laboratory tests used for analysis were those from the month in which the patient was included in the study, prior to undergoing the intervention (pre), values from 30 days after the beginning of the study, and from 60 days after the intervention (post). The laboratory tests assessed were:

phosphorus, calcium, potassium, hematocrit, hemoglobin, alkaline phosphatase, parathyroid hormone, and urea removal index (Kt/V), the main indicator of hemodialysis adequacy⁽²¹⁾.

Data analysis

Data were analyzed using descriptive statistics, using the *Statistical Package for the Social Sciences* (SPSS), version 15.0. The difference between the means of laboratory results of *hyperphosphatemic* patients was verified using the ANOVA, Tukey test, and Student's t-test. The relationship between the itching intensity reported by the patients was analyzed with the Pearson correlation test.

RESULTS

Table 1 presents the sociodemographic and clinical data of 63 *hyperphosphatemic* patients included in the study.

It was found that 66.7% of patients were male, 63.5% were married, with a mean age of 58.8 ± 13.1 years. The level of education, measured by years of study, had a median of five years. For 80.9% of patients, income was derived from retirement. The most common causes of CKD were systemic arterial hypertension (SAH), diabetes mellitus (DM) or undetermined cause. For calculation of time living with CKD, the median and 25th and 75th percentiles was used; 25% of patients had the diagnosis less than two years, 50% within five years, and 75% less than ten years. Time on hemodialysis showed that 25% of patients began treatment within the past 18 months, 50% within 36 months, and 75% less than 72 months.

Table 2 shows the results of laboratory tests of *hyperphosphatemic* patients.

A statistically significant reduction in the mean creatinine and phosphorus was identified, at the beginning and 30 days after completion of the educational nursing intervention ($p < 0.001$) but after 60 days, an increase in the phosphorus mean values was identified in relation to the assessment conducted at 30 days. The comparative analysis between the mean values obtained at 30 and 60 days showed no reduction [$5.80 (\pm 1.53)$ versus $6.51 (\pm 1.74)$], although it remained below the initial values [$7.06 (\pm 1.43)$].

The analysis of the creatinine values, at 30 and 60 days after the intervention, showed reductions that were statistically significant differences [$11.22 (\pm 3.10)$ $8.95 (2.37 \pm)$ and $8.61 (\pm 2.25)$, $p 0.001$], respectively.

Table 1 – Sociodemographic and clinical data of *hyperphosphatemic* patients on hemodialysis, Ijuí, Rio Grande do Sul, Brazil, 2013

Characteristics	n (%)
Sex	
Male	42(66.7)
Female	21(33.3)
Age*	58.87 ± 13.12
Marital status	
Married	40(63.5)
Single	10(15.9)
Divorced/separated	5(7.9)
Widowed	8(12.7)
Education (years of study)**	(4;5;7)
Income	
Retirement	51(80.9)
Others	12(19.0)
Cause of the kidney disease	
Systemic arterial hypertension	22(34.9)
Undetermined cause	18(28.6)
Diabetes mellitus	10 (15.9)
Systemic arterial hypertension + Diabetes mellitus	7 (11.1)
Other	6 (9.5)
Time treating chronic kidney disease (years)**	(2;5;10)
Time in hemodialysis (months)**	(18;36;72)

Note: * mean ± standard deviation ** (Percentile 25; Median; Percentile 75)

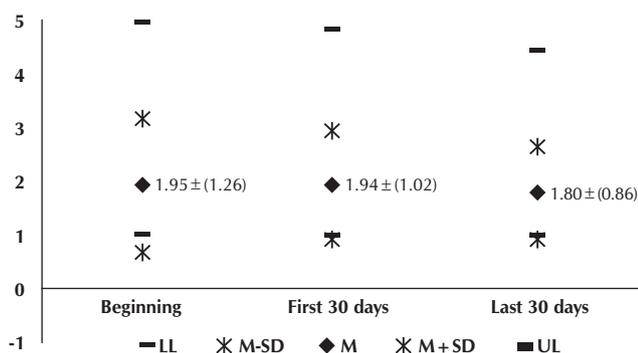
Table 2 – Results of laboratory tests of *hyperphosphatemic* patients, 30 and 60 days after the educational intervention in nursing, Ijuí, Rio Grande do Sul, Brazil, 2013

Test	Beginning Mean ± SD	30 days Mean ± SD	60 days Mean ± SD	p value (ANOVA)
Urea (mg/dl)	171.84 ± 47.92	177.16 ± 40.59	164.60 ± 35.94	> 0.05
Creatinine (mg/dl)	11.22 ± 3.10*	8.95 ± 2.37*	8.61 ± 2.25*	< 0.001
Calcium (mg/dl)	9.33 ± 1.34*	9.55 ± 1.33*	10.57 ± 1.66*	< 0.001
Phosphorus (mg/dl)	7.06 ± 1.43*	5.80 ± 1.53*	6.51 ± 1.74**	< 0.001
Potassium (mEq/l)	5.70 ± 1.04	5.38 ± 1.07	5.39 ± 0.89	> 0.05
Hematocrit (%)	32.96 ± 6.68	33.67 ± 7.29	33.28 ± 7.99	> 0.05
Hemoglobin (g/dl)	10.78 ± 2.10	10.79 ± 2.20	10.93 ± 2.19	> 0.05
Urea removal index	1.43 ± 0.18	1.41 ± 0.15	1.42 ± 0.19	> 0.05
Alkaline Phosphatase (ui/l)	144.08 ± 65.01		153.68 ± 85.51	> 0.05 (Teste t)
Parathyroid hormone (pg/ml)***	465.78 ± 524.17		519.51 ± 621.81	< 0.05 (Teste t)

Note: SD = Standard Deviation; significant difference between the mean - determined by ANOVA; * $p < 0.05$ significant difference between the mean (Tukey test); Creatinine mean beginning, after 30 and 60 days; Calcium mean beginning, after 60 days between 30 and 60 days; Phosphorus mean beginning, after 30 days; ** $p < 0.001$ significant difference between the mean Phosphorus in draws after 30 and 60 days - determined by the Tukey test; $p < 0.05$ significant difference between the mean PTH at the beginning and end of the NEI - ascertained using Student's t-test; *** $p < 0.05$ significant difference between the mean (Tukey test); ** $p < 0.001$ significant difference between the mean Phosphorus (Tukey test); *** $p < 0.05$ significant difference between the mean PTH at the beginning and end of the NEI (Student t-test).

A statistically significant increase of serum calcium levels was identified within the mean beginning of the IEE, 30 and 60 days after [9.33 (\pm 1.34), 9.55 (\pm 1.33), 10.57 (\pm 1.66); p = 0.001], respectively. No statistically significant differences were found between the means of urea, potassium, hemoglobin, hematocrit, urea removal index, alkaline phosphatase. The PTH showed an increase with a statistically significant difference [465.78 (\pm 524.17) versus 519.51 (\pm 621.81), p < 0.05] in the measurements obtained at the beginning and after 60 days of nursing educational intervention.

Figure 1 shows the mean (\pm SD) scores of daily evaluation of itching at the beginning, at 30 days and 60 days after the nursing educational intervention. A decrease was observed in the mean and standard deviation scores obtained in these periods (1.95 (\pm 1.26); 1.94 (\pm 1.02) and 1.80 (\pm 0.86), respectively). There was a significant correlation (p < 0.01) between the beginning and the first 30 days after intervention (r = 0.77) between the first 30 days and after 60 days (r = 0.79) and between the beginning and after 60 days of intervention (r = 0.55).



Note: Scores: 1-None; 2-Little; 3-More or less; 4-Much; 5-Very much; Mean \pm standard deviation: Beginning-1.95 \pm 1.26; First 30 days-1.94 \pm 1.02; Last 30 days, 1.80 \pm 0.86; Significant correlation (p < 0.001): Beginning and first 30 days (r = 0.77); the first 30 days and after 60 days (r = 0.79); beginning and after 60 days (r = 0.55).

Figure 1 – Daily assessment of itching at the beginning, after the first 30 days, and after 60 days of nursing educational intervention, Ijuí, Rio Grande do Sul, Brazil, 2013

DISCUSSION

The population of *hyperphosphatemic* patients had a predominance of male retirees, with a mean age of 58.87 years, with a low level of education. The median of CKD diagnosis was five years, and the median time on hemodialysis was 36 months. These results are similar to a multicenter study conducted with 43 patients treated in nine *hyperphosphatemic* renal clinics of Stockholm, Sweden, whose patients showed a mean age of 60.7 years, 70% had finished elementary school, and 88% had a mean of 31 months on hemodialysis⁽²²⁾.

Hypertension (34.9 %) was the most often associated disease with CKD, results similar to the *Brazilian Chronic Dialysis Census*⁽²⁾ and a study conducted with 33 hyperphosphatemic patients on hemodialysis⁽²¹⁾.

As hemodialysis is an invasive treatment modality that requires specialized care, high economic costs, demand and implies physical and psychosocial debilitation for both patients and family, nurses must know the profile of the chronic kidney patient receiving care, in order to appropriately intervene. Because of their close and continuous contact with the patient and their responsibility for the care, nurses constitute an axis that includes a series of actions, such as comprehensive care and health education, involving both the team of professionals and family caregivers⁽²³⁾.

This study identified a significant reduction in the serum levels of creatinine and phosphorus, at the beginning and after 30 days of nursing educational intervention, showing this intervention was effective. When comparing the means of serum phosphorus levels at the beginning and after 60 days of intervention, the reduction in levels was statistically significant; the mean values remained lower than before the intervention.

A multicenter study of Stockholm, showed that the hyperphosphatemic patients who had participated in a continuous educational program on the balance of calcium and phosphate, had a significant decrease in their phosphate mean plasma after the intervention (2.14 to 1.87 mmol, p < 0.05) and remained low over time, 1.78 mmol/l at 12 months of follow-up (p < 0.001)⁽²²⁾. In addition, the authors showed that the patients' knowledge about food intake, calcium/phosphate balance, and use of phosphate binders increased significantly after the educational intervention (p < 0.001)⁽²²⁾. These results show the effectiveness of a structured education program and reinforce the need for it to be included in the educational interventions assistance for a better adherence to treatment and better clinical outcomes.

In this context, the continuity of home care requires nursing instructions for the patient and family, related to difficulties in dealing with the disease and its economic, emotional and social consequences⁽²³⁾. These individuals require a set of knowledge to adhere to therapy and, in addition, a support strategy that provides mechanisms to handle the difficulties of the disease. In this regard, the role of nurses as health educators is to maintain effective communication with patients and families and to develop interventions that increase knowledge and promote behavior changes that are reflected in clinical and laboratory results, and quality of life.

Results of a cohort study conducted with 33 patients, randomized to two groups, that evaluated effects of a teaching-learning program on metabolism and control of serum calcium (Ca), phosphorus (PO₄), parathyroid hormone, Ca/PO₄ product, indicated that a short-term program did not produce significant changes in behavior, measured by biochemical parameters⁽²¹⁾. This evidence demonstrate that, in order to be effective, programs of this type must be permanent and interdisciplinary, aiming at behavioral changes and adherence to dietary and pharmacological measures.

In this context, an ethnographic approach studying nurses on a hemodialysis unit in Mexico, showed the needs and challenges of coordinated care between hospital and home on the care of renal patients on hemodialysis⁽²³⁾. The results demonstrated needs and challenges faced by nurses in the care of chronic kidney disease, and identified barriers, such as work overload and lack of a systematic strategy for education and lifelong orientation of patients, families and caregivers⁽²³⁾. In a similar way, this study demonstrates the importance of and need for a multidisciplinary strategy beyond the provision of conventional guidance, to ensure coordinated hospital-home care, in order to increase adherence to therapy, the effectiveness of substitution therapy, and the quality of life of the patient.

The increase in serum calcium levels was statistically significant between the means ($p < 0.001$), comparing the beginning of the intervention and 60 days after, and within the 30 and 60 days after the completion of the nursing educational intervention, different from the Stockholm study results⁽²²⁾. The cited study did not show significant differences between the means of urea, potassium, hemoglobin, and hematocrit during these different periods of the intervention.

The Removal Index Urea (Kt/V) is the main indicator of hemodialysis adequacy. In this study, no statistically significant difference in Kt/V was identified, when compared to the value obtained at the beginning (1.43), 30 days post-intervention (1.41), and at the end of the study (1.42). This data corroborates the hypothesis that the nursing educational intervention was effective in reducing the phosphorus, calcium elevation and decreased itching, regardless of the Kt/V.

In the analysis of the mean score of the daily itching assessment reported by hyperphosphatemic patients, there was a strong and statistically significant ($p < 0.001$) correlation in itching reduction in the three stages, at the beginning, 30 days and 60 days after the nursing educational intervention. Thus, it can be said that the intervention was effective in reducing hyperphosphatemia and that the more informed patients are about their disease and treatment, the better their treatment adherence, which may have a possible impact of reducing morbidity and mortality, and improving quality of life of chronic renal patients.

In an action-research developed by nurse educators, the teaching-learning processes were used, with training for self-care and empowerment of older people in two locations⁽²⁴⁾. Educational sessions were followed by reflective meetings, and the results showed different educational interests present together with the need for dialogue as a reference for participants and nurses. The authors highlighted the relevance of adopting epistemological positions that contribute to greater autonomy, aiming for dialogical learning in health⁽²⁴⁾.

According to the data presented, the performing of educational interventions and the improvement of adherence to treatment in chronic renal failure is a major challenge for the multidisciplinary team, because when this process is performed in an ongoing way, the results are effective. Different

studies show that among all of the health professionals who care for dialysis patients, nurses are ideally placed to influence change because of their continuous contact in each session^(13,25-26). In particular, this study demonstrates the effectiveness of an individualized, patient-centered nursing educational intervention, which can be more successful than a "one size fits all" Approach. Thus, the manual and individual monthly checklist are positive elements that can be used by nurses working in nephrology, with positive results in patient adherence to the treatment of hyperphosphatemia and reduction in the harm caused in the patient's life.

Study limitations

The sample size, the lack of a control group, and the fact that the educational nursing intervention was used only once with the patient, rather than continuously, can be considered limitations of this study, which may possibly have contributed to the slight elevation of the phosphorus between 30 and 60 days after intervention. Even though nurses are well positioned to influence the adherence to treatment, the inclusion of every healthcare professional, led by a researcher, could maximize educational intervention.

Contributions to nursing care

This research refers to an expansion of knowledge for nursing as a science, regarding the expansion of evidence, with emphasis on the use of an educational intervention to empower the chronic renal patient and thus make him the subject of treatment. The results of this research can also be important both for nurses and for the other healthcare team members who work in the care of chronic kidney patient, in order to reflect, discuss and implement educational actions to qualify the care for this significant percentage of the population, which requires specific treatment for sustaining life with quality.

CONCLUSION

The results of this study demonstrate the importance of establishing educational interventions with hyperphosphatemic chronic renal patients on hemodialysis, aiming for the realization of a nursing educational intervention, in reducing the serum phosphate levels, creatinine and itching reduction.

As the nurse is the professional who manages the team responsible for patient care in a kidney unit, the nursing educational intervention should be considered an essential tool for successful treatment. In addition, the nurse continuously interacts with the patients and their families, which favors the realization of educational activities to elucidate aspects of the disease and alternatives to reduce damage to health and better coping with chronic illness.

Thus, the nursing educational intervention was effective in reducing hyperphosphatemia, and the more informed patients were about their disease and treatment, the better their adherence to treatment, which possibly will impact quality of life, reducing the high morbidity and mortality affecting this population.

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