

Original Research Article

## The Intensity of Chronic Kidney Disease-Associated Pruritus Measured Through the WI-NRS and Phosphorus

Pérez-Nieto José E<sup>1\*</sup>, Marcos-Ramírez Marcos D<sup>1</sup>, Rosas-García Mariela<sup>1</sup>, Gómez-Villanueva Damayanty<sup>1</sup>

<sup>1</sup>Hospital General Tacuba, Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, Mexico City, Mexico

\*Corresponding Author: Pérez-Nieto José E

Hospital General Tacuba, Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, Mexico City, Mexico

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**Abstract:** *Background:* The chronic kidney disease-associated pruritus is very common and its impact on patient's quality of life is relevant. Although pathophysiology is not clear; it seems that phosphorus values influence the intensity of itching. The objective of the current study is to find the correlation between phosphorus and the Worst Itching Intensity Numerical Rating Scales. *Methods:* Cross-sectional study that included subjects with Diabetes and Chronic Kidney Disease who had serum phosphorus measured and performed the WI-NRS. To find the correlation between these variables, the Spearman Correlation Coefficient and the Concordance Correlation Coefficient were used. The analysis was performed using STATA 14.0. *Results:* A discrete direct association was found between phosphorus and WI-NRS ( $r^s = 0.445$ ,  $p = 0.013$ ). The concordance analysis was not relevant. *Conclusion:* The present study cannot suggest an association between serum phosphorus and WI-NRS.

**Keywords:** Pruritus, phosphorus, urea, skin, intensity, CKD.

## INTRODUCTION

In 2009, the International Forum on the Study of Itch (IFSI) defined itching as an unpleasant sensation of the skin that leads to a desire to scratch [1]. We know that itching is one of the most frequent symptoms in the population and this could be the beginning of a major illness or even affect the prognosis of the patient's quality of life.

One of these entities is chronic kidney disease (CKD) where the majority of patients who suffer from it suffer from itching, especially those in the last stage, with the face and extremities being the most commonly affected regions, although it can be generalized up to 25-50% [2]. The impact is so great that it can affect your sleep hours, trigger fatigue and affect your mood.

The Worst Itching Intensity Numerical Rating Scales (WI-NRS) is a unique and easy-to-use item in patients with chronic kidney disease-associated pruritus (CKD-aP) [3] where each individual rates the worst itching sensation in the last 24 hours and represents it numerically. Although this scale was validated for patients with psoriasis and atopic dermatitis [4-6], it can be used in patients with CKD-aP due to its ease of referral to the physician.

The pathophysiology of CKD-aP remains unclear. In uremia, pruritus appears to be secondary to changes associated with hyperparathyroidism, structural changes in the skin due to dehydration, systemic inflammation, and immune dysfunction [7]. High phosphorus levels appear to be associated with the severity of pruritus [8] and the normality of its values seem to correlate positively with the intensity of the itch [9]. The objective of the current study is to find a correlation between phosphorus and the intensity of itch measured through WI-NRS.

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## METHODS

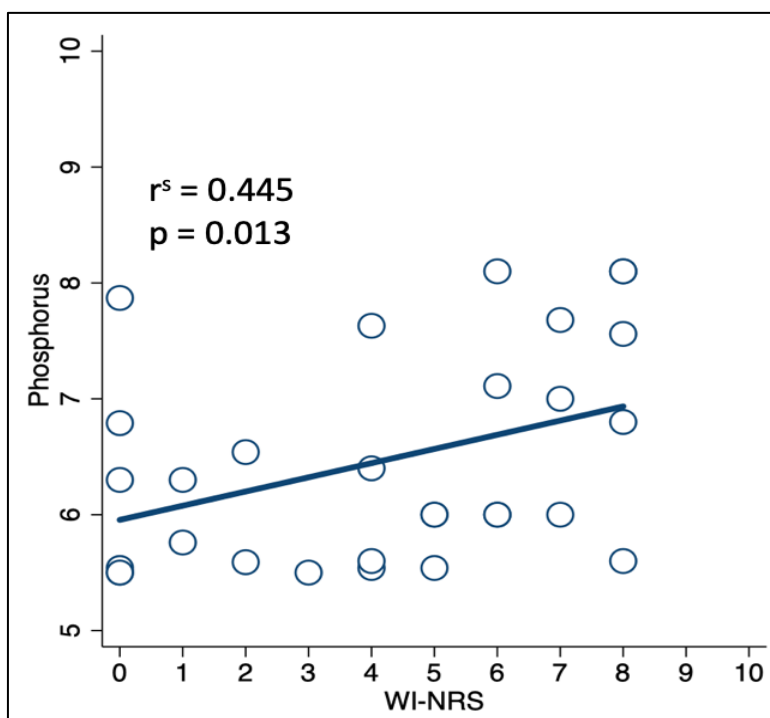
Cross-sectional study that included 30 subjects over 18 years with a diagnosis of Diabetes and CKD KDIGO 5 with renal replacement treatment who were hospitalized in the internal medicine department for some reason external to kidney disease. All patients had a phosphorus level greater than 5.5 mg/dl, none of them had used any phosphorus binder in the last 7 days. All patients underwent WI-NRS and serum phosphorus levels were taken. For the WI-NRS, they were asked numerically from 1 to 10 about the worst itching sensation in the last 24 hours. To establish the strength of association between variables we performed an analysis using the Spearman Correlation Coefficient ( $r^s$ ) and, in a complementary manner, an analysis using the Concordance Correlation Coefficient (CCC). Statistical significance was taken at  $p < 0.05$ . The analysis and creation of graphs was carried out using the STATA/SE ® program version 14.0 (College Station, Texas 77845 USA).

## RESULTS

18 men and 12 women were studied. The demographic characteristics are shown in Table 1. As expected, a direct association was found with an  $r^s$  of 0.445 with a  $p$  of 0.013 (Figure 1), however, when performing the concordance analysis we obtained a CCC of 0.141 (0.009 – 0.273) with a  $p$  of 0.036. There were no better results when performing the analysis by subgroups.

**Table 1: General characteristics of the population, (N = 30)**

Male sex (%)	60
Age (years)	61 ± 14
Height (cm)	162 ± 9
Weight (kg)	74 (61-86)
BMI (kg/m <sup>2</sup> )	26.7 (23.5-32.3)
Hemoglobin (g/dl)	9 (8.4 - 10.7)
leukocytes (x 10 <sup>3</sup> /µl)	8.7 (7.15 - 10.88)
Platelets (x 10 <sup>3</sup> /mm <sup>3</sup> )	260 (186 - 324)
Phosphorus (mg/dl)	6.1 (5.6 - 7.1)
BUN (mg/dl)	70 (44 - 91)
Creatinine (mg/dl)	5.5 (4.4 - 6.5)
WI-NRS	4 (1 – 7)
Variables with normal distribution are expressed as mean ± standard deviation.	
Variables with non-normal distribution are expressed as median with 25-75th percentile.	



**Figure 1: Correlation between phosphorus and WI-NRS**

## DISCUSSION

There is no doubt that the physiopathogenesis of CKD-aP is still unclear; the most accepted premise is that serum phosphorus combines with calcium, forming calcium phosphate and finally deposited in skin, subsequently due to irritation of the nerve fibers pruritus is developed [10]. The fact that we found in our results higher values of phosphorus as the WI-NRS increases, although discretely, could suggest that phosphorus plays a role in the development of CKD-aP.

However, the correlation and concordance found in this study is low but may be due to the small sample. It is also important to mention that phosphorus is not the only independent variable described, so more studies involving multivariate regressions should be considered.

Undoubtedly, CKD-aP influences the patient's quality of life; therefore, dietary phosphorus restriction or chelators treatment should be taken as the first therapeutic step in the management of CKD-aP [11]. Adequate phosphorus control could lead to better management of pruritus in patients with CKD-aP.

Another variable that we should consider is skin care, this is very important and goes hand in hand with biochemical control, the current evidence of treatments in general is weak and therefore, reinforce general skin care measures such as routine use of emollients, non-rubbing of the skin, and sunscreen are a consideration. With the above, the repeated use of emollients should be recommended to restore the permeability of the skin barrier [12].

One of the main limitations of this study is that WI-NRS is a subjective scale and depends greatly on the threshold of each patient, since despite having a high phosphorus we can find a low WI-NRS and the other way around. The study is cross-sectional and in itself carries biases.

## CONCLUSION

The correlation between phosphorus levels and WI-NRS is low with non-relevant agreement, therefore, the present study cannot suggest an association between these variables. However, there is an emphasis on using WI-NRS in the management of a patient with CKD-aP.

### Conflict of Interest

The authors declare that there are no conflicts of interest at the time of publication of this article.

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