

Diagnosis of chronic renal insufficiency by Cockcroft formula in elderly adults with Diabetes Mellitus type II

Diagnóstico de insuficiencia renal crónica por fórmula de Cockcroft en adultos mayores con Diabetes Mellitus tipo II

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DOI: 10.35429/JOHS.2022.26.9.9.13

Received January 15, 2022; Accepted June 30, 2022

Abstract

Objective: To determine the diagnosis of Chronic Renal Insufficiency, by Cockcroft formula, in type II diabetic patients aged 40 to 80 years old from the community of Santa Cruz, Hecelchakán during the period from August 2020 to July 2021. **Materials and methods:** This is a prospective, cross-sectional, descriptive and observational study in which the diagnosis of renal failure in any of its 5 stages will be investigated. Patients were asked for laboratory tests of plasma creatinine, weight and age, to later calculate the creatinine clearance using the Cockcroft and Gault formula and classify the stage of renal failure in which each patient is to formulate plans of practice of according to your state. **Results:** We found 10 cases with chronic kidney disease in stage 1, 3 men and 7 women, in stage 2 8 patients were found, 2 men and 6 women, and 5 patients with stage 3, all of them female. **Conclusions:** In the community of Santa Cruz, Hecelchakán, there is a prevalence of 3.9% in diabetes mellitus, 42 people who come monthly from a total population of 1,060 according to the November 2020 population census.

Chronic renal failure, Cockcroft formula, Type II Diabetes Mellitus

Resumen

Objetivo: Determinar el diagnóstico de Insuficiencia Renal Crónica, por fórmula de Cockcroft, en los pacientes diabéticos tipo II en edad de 40 a 80 años de la comunidad de Santa Cruz, Hecelchakán durante el periodo de agosto de 2020 a julio de 2021. **Materiales y métodos:** Se trata de un estudio prospectivo, transversal, descriptivo y observacional que investigará el diagnóstico de insuficiencia renal en cualquiera de sus 5 etapas. Se solicitaron a los pacientes exámenes de laboratorio de creatinina plasmática, peso y edad, para posteriormente calcular la depuración de creatinina mediante la fórmula de Cockcroft y Gault y clasificar la etapa de insuficiencia renal en la que se encuentra cada paciente para formular planes de practica de acuerdo con su estado. **Resultados:** Se encontraron 10 casos con enfermedad renal crónica en etapa 1, 3 hombres y 7 mujeres, en etapa 2 se encontraron 8 pacientes, siendo 2 hombres y 6 mujeres, y 5 pacientes con etapa 3, todos ellos del sexo femenino. **Conclusiones:** En la comunidad de Santa Cruz, Hecelchakán, existe una prevalencia de 3.9 % en diabetes mellitus, 42 personas que acuden de manera mensual en una población total de 1,060 según el censo de población noviembre 2020.

Insuficiencia Renal Crónica, Fórmula de Cockcroft, Diabetes Mellitus tipo II

Citation: SARABIA-ALCOCER, Betty, AKÉ-CANCHÉ, Baldemar, VELÁZQUEZ-SARABIA, Betty Mónica and LÓPEZ-GUTIÉRREZ, Tomás. Diagnosis of chronic renal insufficiency by Cockcroft formula in elderly adults with Diabetes Mellitus type II. Journal of Health Sciences. 2022. 9-26:9-13.

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Introduction

Type II Diabetes Mellitus (Type II DM) is one of the main causes of Chronic Renal Failure in our country. Sustained hyperglycemia, as well as poor metabolic control, lead to a progressive and declining condition of renal function. The improvement in the control of blood glucose and the most effective therapeutic measures to correct hypertension, which frequently accompanies this metabolic disorder, can reduce the development of end-stage renal disease among diabetics.

Chronic kidney disease (SRI) has acquired the proportions of a true epidemic, whose full spectrum is just beginning to be understood. Considering the demographic trend, it has been projected that, in the year 2030, there will be approximately 2.2 million patients that will require dialysis or transplantation.

Among the causes that lead to chronic renal failure, Type II Diabetes Mellitus occupies the first-place accounting for 40% of patients who enter renal replacement therapy.

In the community of Santa Cruz, Hecelchakán, diabetic patients are people of low resources and low level of education, some still attached to traditional medicine to heal their illnesses; all these factors lead to poor compliance with the pharmacological and dietary measures implemented, which leads to a constant rise in blood glucose levels.

Chronic Renal Insufficiency (CRF) is defined as the progressive, permanent, and irreversible loss of the Glomerular Filtration Rate (GFR) over a variable time, sometimes even years, expressed by a reduction in estimated creatinine clearance $< 60 \text{ ml / min / } 1.73 \text{ m}^2$.

Strictly speaking, any decrease in GFR below normal could be considered as renal failure, but for practical purposes renal failure is defined as a GFR $< 60 \text{ ml / min / } 1.73 \text{ m}^2$, corresponding to phases 3,4 and 5.

It has been estimated that at least 6% of the adult population of the United States has chronic kidney injury with a GFR $> 60 \text{ ml / min}$ for 1.73 m^2 of SC (stages 1 and 2), and therefore is at imminent risk of experiencing further deterioration progressive of this function. In addition, about 4.5% of the population of that country suffer from chronic kidney disease in stages 3 and 4.

Diabetic nephropathy is the first cause of terminal stage nephropathy in the United States, and one of the leading causes of morbidity and mortality related to DM. Patients with Diabetes Mellitus type 1 develop diabetic nephropathy in 30-40% of cases, while in patients with type II DM this percentage is reduced to 10-20%.

Although renal disease is less frequent in patients with type II DM, these are usually detected within the first 10 years following the clinical diagnosis. According to results of other investigations, the male sex is more predisposed to develop microalbuminuria. Another study mentions that it is likely that between 20-40% of patients with type II DM will progress to diabetic nephropathy in a period of approximately 10 years.

Nephronal loss, regardless of its etiology, causes adaptive responses in the remaining nephrons that lead to hypertension and glomerular hyperfiltration, passage of proteins to the urinary space with proteinuria, intrarenal activation of the renin angiotensin system (RAS), tubular activation with tubulointerstitial involvement, transdifferentiation of tubular epithelial cells to myofibroblasts and finally fibrosis of the renal parenchyma with definitive loss of function.

The pathogenesis of diabetic nephropathy is related to chronic hyperglycemia. CRF is a progressive disease that evolves in different stages in which clinical manifestations are increasing. These stages are established based on renal function measured by the estimated glomerular filtration rate.

Stage	Description	VFG	Action
1	Kidney injury with normal or increased VFG	≥ 90	Dx and Tx Tx of concomitant pathologies. Reduction of risk of cardiovascular disease.
2	Kidney injury with mild decrease in VFG	60-89	Progression estimation.
3	Moderate decrease in VFG	30-59	Complication evaluation and tx.
4	Severely decreased VFG	15-29	Preparation for renal function substitution tx.
5	Renal insufficiency	< 15 or on dialysis	Replacement.

Table 1 Stages of CRI: an action plan with a clinical approach

Source: Tierney, McPhee, Papadakis (2005) *Diagnóstico clínico y tratamiento. 40ª edición. Editorial Manual Moderno*

It is advisable to measure the GFR, either with the formula of the clearance or the estimated according to the formulas of Cockcroft-Gault or MDRD.

Cockcroft and Gault formula

$$\text{VFG} = \frac{(140 - \text{age}) \times \text{weight (kg)}}{\text{PCr} \times 72} \quad (1)$$

For women, the estimated VFG is multiplied by 0.85 because the muscle mass is smaller.

Methodology

A prospective, cross-sectional, descriptive, and observational study was conducted within the period from August 2020 to July 2021, Rural Medical Unit of Santa Cruz, Hecelchakán. All patients between 40 and 80 years of age with type II DM who attended their monthly control at the UMR Santa Cruz were included, excluding all those who did not meet the previously established criteria.

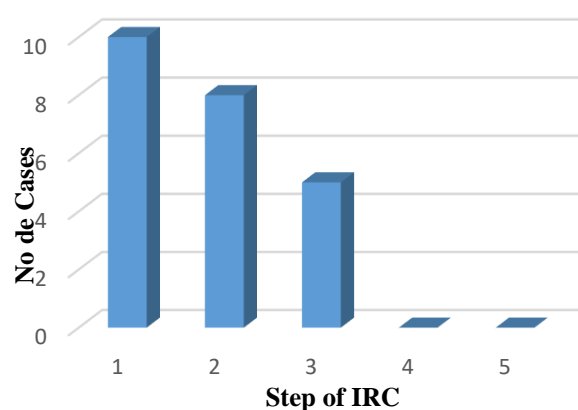
Results

The study was carried out in the Santa Cruz Rural Medical Unit, Hecelchakán, during the period from August 2020 to July 2021.

The community of Santa Cruz is made up of a population of 1,060 inhabitants, of which, within the age group of 40 to 80 years comprise 239 people, distributed by sex in 121 men and 118 women, according to the November 2020 population census.

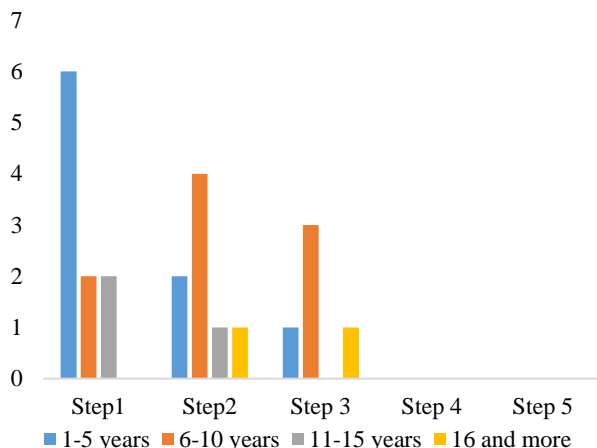
The percentage of type II DM in the studied age group is 17.57%; that is, out of a total of 239 people, 42 have DM2. A total of 23 patients were included in the study, who met the inclusion criteria, 5 men and 18 women.

A total of 5 patients with CRF were found (defined as stages 3, 4 and 5). That is, in 21.73% CRF was developed within the group of diabetic patients studied. The rest of the patients were in stages 1 and 2, with 10 patients in stage 1, representing 43.47% and 8 patients in stage 2 with 34.78%. (Graphic 1).



Graphic 1 Classification according to the K / DOQI 2002 guidelines of the National Kidney Foundation

In Graphic 2, we can see that we find 9 patients who have a time of evolution of type II DM that goes from 1 to 5 years, 39.13%; in the range of 6-10 years of evolution were 9 patients, 39.13%; 3 patients with a duration of type II DM of 11-15 years, 13.04 and only 2 with an evolution of 16 years and more, being 8.69%. Among the 5 patients who presented renal failure, 1 was a diabetic with 1-5 years of evolution of type II DM, 20%: 3 patients with an evolution of 6-10 years, being 60% and 1 person with 16 and more years of DM2, with 20%.

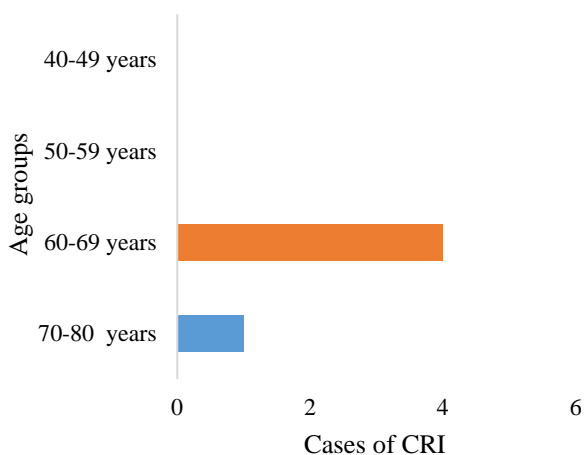


Graphic 2 Predominance of CKD according to the time of evolution of DM2

Regarding the predominance by age, in Table 2 we can find that 4 cases of CRI were found (stages 3, 4 and 5) in the age group of 60-69, with 80% and only 1 case in the group of 70-80 years, 20%. The rest of the cases (which are not considered CRF because they correspond to stages (1 and 2) were distributed as follows: 9 patients in the age range of 40-49, 6 patients aged 50-59 years, 2 patients in the group of 60-69 and 1 patient without CKD in the group of 70-80 years (Graphic 3).

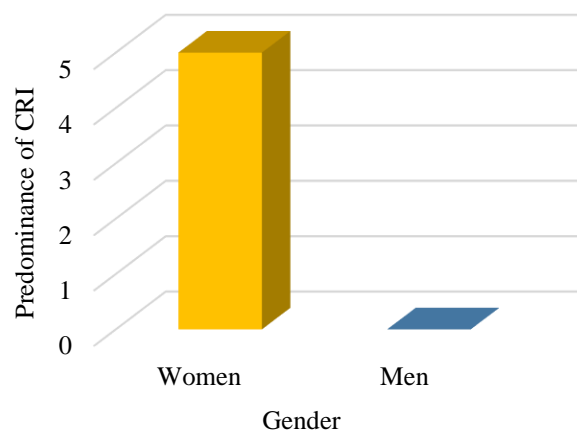
Age groups in years	No. of cases with irc
40- 49	0
50- 59	0
60- 69	4
70- 80	1

Table 2 Predominance of CRI cases according to the age group



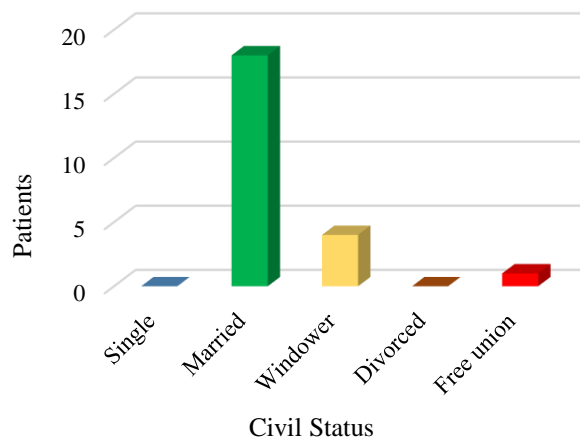
Graphic 3 Predominance of CRI cases according to the age group

In the distribution of cases of chronic renal failure according to the gender of the patients. We observed that no case of CRI was developed in the male sex, while 5 cases were detected in the female sex. (Graphic 4)



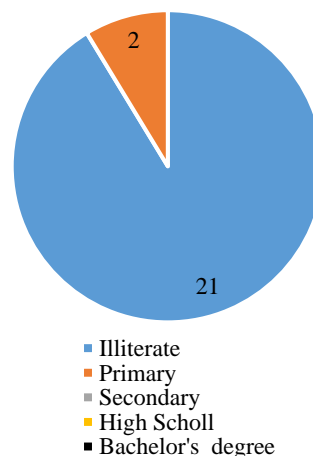
Graphic 4 Predominance of CRI (Stages 3, 4 and 5) according to gender

The marital status of the patients, we obtained 0 singles, 18 married, which corresponds to 78.26%; 4 widowed patients, 17.39%; no patient divorced and 1 in free union, 4.34%. (Graphic 5)



Graphic 5 Classification of the civil status of the patients

The division of diabetic patients according to their level of education. We found a total of 21 illiterate patients, being 91.3%: and 2 patients with primary education, 8.69%. (Graphic 6)



Graphic 6 Classification of the degree of schooling of patients

Conclusions

In the study conducted in the Rural Medical Unit of the community of Santa Cruz, Hecelchakán, during the period from August 2020 to July 2021, 42 patients with type II DM were reported, of which 23 met the inclusion criteria.

The stage classification of renal failure was performed to assess how many have developed chronic renal failure, finding that 43.47% are in stage 1 with 10 cases. In stage 2, 8 cases were found with 34.78%. In stage 3 it was 21.73% reporting 5 cases. No case was classified within stages 4 and 5.

It was determined that the patients who developed CRF had an evolution time of type II DM that ranges from 6 to 10 years.

The age group where the existence of renal failure predominated was that of 60-69 years, with 80% of those affected in this age group.

The genus that presented more chronic renal failure, with a decrease in GFR <60 ml / min, was the female sex with 100% of cases.

The predominant marital status among patients with DM2, including those with CRF, was that of married (a) with 78.26%.

The level of education that predominated was illiteracy, representing 91.30% among patients and 100% in those who developed CRI.

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