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## Research Article

# Prevalence of chronic kidney disease by stage in diabetic patients

## Summary

**Fundamentals.** Diabetes mellitus 2 is a chronic disease with an increasing prevalence in recent years, it is expected that by 2030 there will be 336 million diabetics worldwide, and the increase in life expectancy will influence the presentation of chronic complications, including chronic kidney disease with a prevalence of 10 to 14% of the adult population. The objective of the study was to identify the prevalence of chronic kidney disease by stage in diabetic patients. **Methods:** A descriptive cross-sectional study in patients with a diagnosis of diabetes mellitus 2 included 426 patients attending the first level of care; were excluded patients with a diagnosis of diabetes mellitus 1, with rheumatic disease or with cystic nephropathy. Sociodemographic variables, anthropometric, serum creatinine and glomerular filtration rates were studied according to the CKD-EPI formula. The analysis plan included averages, percentages, and confidence intervals.

**Results:** Women predominated in 63.2% (95% CI; 58.6-67.8), mean age 62.99 years (95% CI; 61.99-63.99), and diabetes evolution time 11.89 years (CI 95%; 11.16-12.62). The mean glomerular filtration rate was 81.34 ml/min (95% CI; 78.88-83.79), and stage 1 predominated with 46.6% (95% CI; 41.9-51.3). **Conclusion:** The prevalence of chronic renal disease was identified by stages and the early stages predominated.

## Introduction

Diabetes mellitus 2 is a chronic disease with an increasing prevalence in the last years, by 2030 there will be 336 million diabetics worldwide<sup>1-4</sup>. In addition, the increase in life expectancy will influence the presentation of chronic complications, including chronic kidney disease, which is a public health problem; The prevalence is reported between 10 and 14% of the adult population, is the main cause of renal replacement therapy and one of the main causes of death. This scenario is associated with high costs of treatment for the patient and for health institutions, becomes more important as it is estimated that by 2030 70% of patients with endstage renal disease will be patients residing in developing countries, whose resources are limited [2-10].

The prevalence of chronic kidney disease in diabetic patients, the under diagnosis and the progressive and modifiable character, invites the design of programs in the first level of attention that facilitate the detection of renal disease in the early stages, to delay the progression to more advanced stages, avoiding the development of associated cardiovascular complications and taking actions that allow the patient to be prepared well in advance for renal function replacement techniques [9,11-15].

Chronic kidney disease is defined as the presence of renal lesions or the decrease in the glomerular filtration rate (GFR) of more than three months of evolution, it is classified into 5 stages ordered by degree of intensity with subdivisions in grade 3 in 3a and 3b. Complications are related to each degree and therapeutic recommendations should be adapted according to each. Diagnosis of chronic renal failure is established when the glomerular filtration rate is lower than 60 / ml / min / 1.73 m<sup>2</sup> of body surface area [16-19].

In this epidemiological panorama, it is necessary to know the degree of renal function to adapt the care and actions that allow to decrease the progression [4,10,13]. In this context the aim of this article is to identify the prevalence of chronic kidney disease by stage in diabetic patients.

## Material and Methods

A descriptive cross-sectional study was carried out in a population with type 2 diabetes mellitus from September 2015 to September 2016 in a family medicine unit of a social security institution in Mexico.

Patients with a diagnosis of diabetes mellitus 2 regardless of the time of evolution, of any age and sex, and with serum creatinine in the study period were included; we excluded



patients with diabetes mellitus 1, diabetic patients with rheumatologic disease and diabetic patients with cystic nephropathy.

The sample size was calculated using the percentage formula for infinite population, with 95% confidence level for a rejection zone ( $z$  alpha = 1.64), test power 80% ( $z$  beta = 0.84), prevalence of Stage 5 of 8.1%, and margin of error = 0.035, for a total sample of 374 patients, however the size was managed was 426 patients.

The sampling technique was simple random, using as sample frame the list of patients with diabetes mellitus 2 attended at the medical unit consultation. When the selected patient did not meet the selection criteria, the next one was chosen. The variables studied included age, sex, weight measured in kilograms, length measured in meters, time of evolution of diabetes counted from the medical diagnosis and serum creatinine reported in the last consultation received. The estimated glomerular filtration rate with the CKD-EPI formula adapted for white race, male or female as a function of reported serum creatinine, with the following formulas:

Woman	Man
Serum creatinine less than or equal to 0.7	Serum creatinine less than or equal to 0.9
$(144 * ((\text{Serum Creatinine} / 0.7) - 0.329) * (0.993 \text{ age}))$	$(141 * ((\text{serum creatinine} / 0.9) - 0.411) * (0.993 \text{ age}))$
Serum creatinine greater than 0.7	Serum creatinine greater than 0.9
$(144 * ((\text{Serum Creatinine} / 0.7) - 1.209) * (0.993 \text{ age}))$	$(141 * ((\text{Serum Creatinine} / 0.7) - 1.209) * (0.993 \text{ age}))$

The tables developed by the association KDOQI 2002 and the association KDIGO 2012 were used to determine the prevalence by stages.

Classification KDOQI 2002	Classification KDIGO 2012
Stage 1 $\geq 90$ ml/min/1.73 m <sup>2</sup> body surface area	Stage 1 $\geq 90$ ml/min/1.73 m <sup>2</sup> body surface areal.
Stage 2 of 60-89 ml/min/1.73 m <sup>2</sup> body surface area.	Stage 2 of 60-89 ml/min/1.73 m <sup>2</sup> body surface area.
Stage 3 of 30-59 ml/min/1.73 m <sup>2</sup> body surface area.	Stage 3a of 45-59 ml/min/1.73 m <sup>2</sup> body surface area. Stage 3b de 30-44 ml/min/1.73 m <sup>2</sup> body surface area.
Stage 4 of 15 a 29 ml/min/1.73 m <sup>2</sup> body surface area	Stage 4 of 15 a 29 ml/min/1.73 m <sup>2</sup> body surface areal
Stage 5 $\leq 15$ ml/min/1.73 m <sup>2</sup> body surface area.	Stage 5 $\leq 15$ ml/min/1.73 m <sup>2</sup> body surface area.

The statistical analysis plan included averages, percentages, and confidence intervals.

## Results

The women were 63.2% (95% CI, 58.6–67.8), mean age was 62.99 years (95% CI, 61.99–63.99), duration of diabetes was 11.89 years (95% CI, 11.16–12.62), Mean weight of 72.47 kg (95% CI, 71.11–73.82), height 1.57 meters (95% CI, 1.56–1.58), and mean serum creatinine 1.01 mg / dl (95% CI, 0.90–1.13).

The mean glomerular filtration rate calculated with the CKD-EPI formula was 81.34 ml / min (95% CI, 78.88–83.79).

Tables 1,2 presents the average by stages, taking into account the KDOQI and KDIGO classification.

When stage prevalence is analyzed, stage 1 predominates 46.6% (95% CI, 41.951.3). Tables 3,4 presents the prevalence by stages and confidence intervals, according to the KDOQI and KDIGO classifications.

## Discussion

Chronic kidney disease is a serious public health problem throughout the world. This increased the morbidity and mortality of patients and has reduced their quality of life, threatening the social and economic development of millions

**Table 1:** Glomerular filtration average rate per stage and total according to KDOQI classification.

Stage	Glomerular filtration Average	CI 95 %	
		Lower	Upper
1	100.78	99.72	101.85
2	77.34	75.94	78.73
3	46.87	44.54	49.19
4	24.74	20.01	28.46
5	6.60	3.88	9.32
Total	81.34	78.88	83.79

**Table 2:** Glomerular filtration average rate per stage and total according to KDIGO 2012 classification.

Stage	Glomerular filtration average	CI 95 %	
		Lower	Upper
1	100.78	99.71	101.85
2	77.34	75.94	78.73
3a	52.88	51.33	54.48
3b	38.11	36.10	40.12
4	24.74	21.01	22.46
5	6.60	3.88	9.32
Total	81.34	78.88	83.79

**Table 3:** Chronic kidney disease prevalence by stage according to KDOQI 2002.

Stage	Chronic kidney disease prevalence	CI 95 %	
		Lower	Upper
1	46.6	41.9	51.3
2	34.9	30.4	39.4
3	14.3	11.0	17.6
4	2.4	0.9	3.9
5	1.9	0.6	3.2

**Table 4:** Chronic kidney disease prevalence by stage according to KDIGO 2002.

Stage	Chronic kidney disease prevalence	CI 95 %	
		Lower	Upper
1	46.6	41.9	51.3
2	34.9	30.4	39.4
3a	8.5	5.9	11.5
3b	5.8	3.6	8.0
4	2.4	0.9	3.9
5	1.9	0.6	3.2

of people [7]. The alarming increase seen in recent years has led to an unfavorable scenario in relation to the disease [5]. The importance of this study is that, in addition to chronic kidney disease being the major predictor of the development of chronic end-stage renal disease, mortality is very high in patients with glomerular filtration of less than 60 ml / min / 1.73 m<sup>2</sup> of body surface area, mainly due to the cardiovascular complications associated with renal failure [9]. For this reason it is important to know the prevalence by stages to perform specific and targeted interventions, paying more attention to the early stages of the disease and thus achieving a greater impact on the population from a preventive approach.

The average glomerular filtration rate was 81.34 ml / min / 1.73 m<sup>2</sup> of body surface area, placing the population in grade 2 of chronic kidney disease according to the KDIGO classification, this result is an important reference for making Decisions in the first level of attention since no other studies were found that report the prevalence of chronic kidney disease in diabetics with the use of this formula. The prevalence of chronic kidney disease in grade 1 and 2 was higher than that reported in another study performed in a first level care unit in Mexico [14], but not with the more advanced degrees 3, 4 and 5 where prevalence is inverted, this result is determined by the use of the formula CKD-EPI, which reports more accurate data, unlike the formula of Cockcroft and Gault or the formula MDRD, in these are overestimated the low grades and underestimate the high grades, And together with it, are not approved for the Mexican population<sup>5</sup>. In studies conducted in other countries such as Spain, the United States of America, the United

Kingdom and Norway, the prevalence is significantly lower in all stages, with stage 3 predominating in all of them, but they are not comparable results either because they are different population [11].

These results give the guideline for strategies that impact on the population with diabetes mellitus 2, with which patients can be empowered to carry out an adequate metabolic control and thus avoid the early development of disease and when it is already established by encouraging changes in the patient's lifestyle that can stop the progression to more advanced degrees, where there is very little that can be offered to preserve renal function [5].

The results show a worrying but encouraging picture, since the population under study was found in a higher percentage in early stages, which translates into a great opportunity for intervention by family medicine, to carry out preventive measures focused on preserving the renal function.

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