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Artículos científicos

La enfermedad renal oculta en la población diabética de Copalillo, Guerrero, México

Occult Renal Disease in the Diabetic Population of Copalillo, Guerrero, Mexico

Doença renal oculta na população diabética de Copalillo, Guerrero, México

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Resumen

Las enfermedades renales presentan una alta prevalencia entre la población mexicana. En el primer semestre del 2021, ocuparon el 10.º lugar como causa de muerte en México. La enfermedad renal crónica (ERC) se asocia con una disminución de la función renal relacionada con la edad, la presencia de hipertensión, diabetes, obesidad y trastornos renales primarios. Para esta investigación, durante el año 2018, se realizó un estudio descriptivo analítico en Copalillo, Guerrero, México, con el objetivo de identificar las alteraciones bioquímicas y antropométricas que influyen en la presentación y desarrollo de la enfermedad renal oculta (ERO) y la ERC en pacientes diabéticos. Se determinaron parámetros antropométricos y bioquímicos: creatinina, glucosa, urea, colesterol, triglicéridos, albuminuria y filtrado glomerular (FG). Para la determinación del FG, se empleó la ecuación denominada *CKD-EPI*, basada en la utilización de creatinina estandarizada, ajustada en función de la edad, sexo y raza. Para los parámetros cuantitativos se obtuvieron los valores estadísticos de: media, desviación estándar, valor máximo y valor mínimo; para la comparación de medias, se utilizó el valor *p* mediante la prueba *t* de Student usando el *software* Stata v14.2. La población total del estudio estuvo constituida por 86 pacientes adultos diabéticos y 114 no diabéticos, de los cuales 71 % (142) fueron del sexo femenino y 29 % (58) del masculino. Se identificó que 45 % de los pacientes diabéticos no seguían el tratamiento para esta patología, 87 % presentaron hiperglucemia y 7 % presentaron valores elevados de creatinina. La determinación del FG por medio de la ecuación de CKD-EPI permitió identificar a 11 pacientes con enfermedad renal, de los cuales cinco tenían ERO y seis ERC, esto es, 2.5 % y 3 % de la población total, respectivamente. Además, 81 % de estos pacientes con enfermedad renal eran diabéticos. Por último, se observaron diferencias estadísticamente significativas en los parámetros de creatinina, urea, albuminuria, filtrado glomerular, presión arterial diastólica, presión arterial sistólica y la edad entre los pacientes con enfermedad renal y aquellos sin la enfermedad.

Palabras clave: diabetes, enfermedad renal, tasa de filtrado glomerular.

Abstract

Renal diseases are highly prevalent among the Mexican population. In the first half of 2021, they ranked 10th as a cause of death in Mexico. Chronic kidney disease (CKD) is associated with an age-related decline in renal function, the presence of hypertension, diabetes, obesity and primary renal disorders. For this research, during 2018, a descriptive analytical study was conducted in Copalillo, Guerrero, Mexico, with the aim of identifying the biochemical and anthropometric alterations that influence the presentation and development of occult renal disease (ORD) and CKD in diabetic patients. Anthropometric and biochemical parameters were determined: creatinine, glucose, urea, cholesterol, triglycerides, albuminuria and glomerular filtration rate (GFR). For the determination of GFR, the CKD-EPI equation was used, based on the use of standardized creatinine, adjusted for age, sex, and race. For the quantitative parameters, the statistical values of mean, standard deviation, maximum value and minimum value were obtained; for the comparison of means, the p-value was used by applying Student's t-test using Stata v14.2 software. The total study population consisted of 86 adult diabetic patients and 114 non-diabetic patients, of whom 71 % (142) were female and 29 % (58) male. It was identified that 45 % of the diabetic patients were not following the treatment for this pathology, 87 % presented hyperglycemia and 7 % presented elevated creatinine values. The determination of GFR by means of the CKD-EPI equation made it possible to identify 11 patients with kidney disease, of whom five had ROS and six had CKD, that is, 2.5 % and 3 % of the total population, respectively. In addition, 81 % of these patients with kidney disease were diabetic. Finally, statistically significant differences were observed in the parameters of creatinine, urea, albuminuria, glomerular filtration rate, diastolic blood pressure, systolic blood pressure and age between patients with kidney disease and those without the disease.

Keywords: diabetes, renal disease, glomerular filtration rate.

Resumo

As doenças renais têm uma alta prevalência entre a população mexicana. No primeiro semestre de 2021, eles ficaram em 10º lugar como causa de morte no México. A doença renal crônica (DRC) está associada ao declínio da função renal relacionado à idade, à presença de hipertensão, diabetes, obesidade e distúrbios renais primários. Para esta pesquisa, durante o ano de 2018, foi realizado um estudo analítico descritivo em Copalillo, Guerrero, México, com o objetivo de identificar as alterações bioquímicas e antropométricas que influenciam a apresentação e o desenvolvimento da doença renal oculta (ROS) e DRC. pacientes diabéticos. Foram determinados parâmetros antropométricos e bioquímicos: creatinina, glicose, uréia, colesterol, triglicerídeos, albuminúria e taxa de filtração glomerular (TFG). Para a determinação da TFG foi utilizada a equação denominada CKD-EPI, baseada no uso de creatinina padronizada, ajustada conforme idade, sexo e raça. Para os parâmetros quantitativos, foram obtidos os valores estatísticos de: média, desvio padrão, valor máximo e valor mínimo; para a comparação das médias, utilizou-se o valor de p pelo teste t de Student no software Stata v14.2. A população total do estudo consistiu de 86 pacientes adultos diabéticos e 114 não diabéticos, dos quais 71% (142) eram do sexo feminino e 29% (58) do sexo masculino. Identificou-se que 45% dos pacientes diabéticos não seguiram o tratamento para esta patologia, 87% apresentaram hiperglicemia e 7% apresentaram valores elevados de creatinina. A determinação da TFG por meio da equação CKD-EPI permitiu a identificação de 11 pacientes com doença renal, sendo cinco com ERO e seis com DRC, ou seja, 2,5% e 3% da população total, respectivamente. Além disso, 81% desses pacientes com doença renal eram diabéticos. Por fim, foram observadas diferenças estatisticamente significativas nos parâmetros de creatinina, ureia, albuminúria, taxa de filtração glomerular, pressão arterial diastólica, pressão arterial sistólica e idade entre os pacientes com doença renal e aqueles sem a doença.

Palavras-chave: diabetes, doença renal, taxa de filtração glomerular.

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Introduction

Chronic kidney disease (CKD) has a high prevalence, as does diabetes mellitus (DM) and arterial hypertension (HTN). During the last decade, the recognition of CKD has allowed nephrology to go beyond a specialty that treated low-incidence-prevalence pathologies such as classic nephrological diseases to centralize an important public health problem associated with premature mortality, especially of cardiovascular origin , with important social and economic implications. All of this has made it advisable not only to diagnose and detect early by means of routine laboratory tests, but also to increase knowledge and transversal coordination between specialties and between different levels of care (Bencomo, 2015).

The Kidney Disease Foundation: Improving Global Outcomes [KDIGO] (2013) defines CKD as a decrease in the glomerular filtration rate (GFR) <60 ml/min/1.73 m2 accompanied by structural or functional abnormalities for more than three months with implications for health, and classifies it into five different stages according to GFR and albuminuria. Occult kidney disease (ROS), on the other hand, includes both patients with creatinine levels within normal limits but with decreased GFR (Labrador et al., 2007; Heras et al., 2015) as well as patients with structural alteration or renal function and proteinuria with or without a decrease in GFR (<60 ml/min/1.73 m2) (Otero, Abelleira and Gayoso, 2006).

Kidney disease has been reported to be associated with an age-related decline in kidney function and a more rapid decline in the presence of hypertension, diabetes, obesity, and primary kidney disorders (Gansevoort et al., 2013). Risk factors for the development and progression of CKD include low nephron numbers at birth, nephron loss due to increasing age, and acute or chronic kidney injury caused by toxic exposures or disease; Additionally, different diseases that lead to the development of CKD have been reported, but the most common underlying pathologies associated are diabetes mellitus (DM) and hypertension, particularly in high- and middle-income countries, with an estimated prevalence of 30% a year. 40%; also, CKD is associated with infectious diseases such as glomerulonephritis (diseases that lead to inflammation of the glomerulus) and the inappropriate use of medications, traditional remedies with possible nephrotoxins, nonsteroidal anti-inflammatory drugs, and nephrotoxic antibiotics (Collister, Ferguson, Komenda y Tangri, 2016).

DM is associated with massive glomerular hyperfiltration, decreased total GFR, and renomegaly. Hyperglycemia promotes sodium-driven reabsorption and activation of glucose cotransporter two (SGLT2) in the proximal tubule, a process that subsequently inactivates the glomerular tubule, feeds back, and activates the renin-angiotensin system in the macula densa of the distal tubule. DM-driven glomerular hyperfiltration can be counteracted in younger patients with normal nephron numbers; accelerated hyperfiltration is due to nephron loss related to injury, aging, obesity, or pregnancy; This combination is highly prevalent in older patients with type 2 diabetes, so treatments that inhibit SGLT2 and the renin-angiotensin system can lead to potent renal-protective effects by reducing glomerular hyperfiltration and proximal tubular workload, as well as other potentially protective mechanisms (Anguiano, Lei, Kumar, & Anders, 2018; Wanner et al., 2016).

In Mexico, during the January-June 2021 period, deaths from the 2019 coronavirus disease (covid-19) were the leading cause of death nationwide with 145,159 cases; It was followed by heart disease with 113,899 and DM with 74,418 cases (National Institute of Statistics and Geography [Inegi], January 24, 2022). This is undoubtedly worrying, since the main cause of death from CKD in Mexico is DM, whose impact on mortality has progressed; diabetic nephropathy was in 19th place in 1990, after 25 years, in 2015, it became the third cause of death, that is, an increase of 67.0% (Torres, Granados and López, 2017). There are reports that document that 8% of the population has CKD, one of the main causes of death, with an annual mortality rate of 12.3 deaths per 100,000 inhabitants, and ranks second as a cause of premature death in the country (Garcia et al., 2019). In 2017, a CKD prevalence of 12.2% and 51.4 deaths per 100,000 inhabitants were reported in Mexico (Tamayo and Lastiri, 2016). It has been estimated that, currently, around 6.2 million Mexicans with diabetes have kidney failure in its different stages, some without knowing they have it. Up to 98% of people with CKD due to diabetes in Mexico are found in the early stages, when fortunately the CKD is still controllable and reversible. However, these data do not include patients who, due to other causes such as systemic hypertension, autoimmune diseases, infections, congenital history, obstructive problems and drug damage, also develop CKD progressively until reaching late stages and who, in most cases, it does so silently (Obrador, Rubilar, Agazzi and Estefan, 2016).

Based on the above, the objective of the study was to identify the biochemical and anthropometric alterations that influence the presentation and development of kidney disease and to know the frequency of ROS and CKD in diabetic patients, since it has been reported that their incidence is is on the rise.

Method

An analytical descriptive study was carried out in diabetic patients assigned to the Copalillo Health Center, Guerrero, Mexico, and who benefited from the Prospera program during the year 2018. 86 patients with diabetes and 114 patients without diabetes were recruited, all signed the letter informed consent to participate in the study.

The data were collected and analyzed during the period from January to August 2018. During the medical consultation, anthropometric measurements were obtained (weight, height and body mass index), blood pressure measurement (SBP and DBP), a socioeconomic survey, blood and urine samples were taken. The latter were processed in the Clinical Biochemistry Laboratory of the Higher School of Natural Sciences of the Autonomous University of Guerrero, using the Cobas Integra 400 equipment (Roche Diagnostics). Albuminuria screening was performed by immunochromatography, patients who were positive were quantified using the Integra 400 equipment.

To estimate GFR, the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation (Levey et al., 2009) was used, based on the use of standardized creatinine. The following considerations were followed:

Formula

Table 1. CKD-EPI, based on standardized creatinine utilization, adjusted for age, gender, and race

Etnia negra
Mujeres Si creatinina ≤62: FG estimado = 166 × ([creatinina/88.4/0.7]$^{-0.329}$) ×0.993^{edad} Si creatinina >62: FG estimado = 166 × ([creatinina/88.4/0.7]$^{-1.209}$) ×0.993^{edad} - Hombres Si creatinina ≤80: FG estimado = 163 × ([creatinina/88.4/0.9]$^{-0.411}$) ×0.993^{edad} - Si creatinina >80: FG estimado = 163 × ([creatinina/88.4/0.7]$^{-1.202}$) × 0.993^{edad}
Etnia blanca y otras
Mujeres Si creatinina ≤62: FG estimado = 144 × ([creatinina/88.4/0.7]$^{-0.329}$) × 0.993^{edad} Si creatinina >62: FG estimado = 144 × ([creatinina/88.4/0.7]$^{-1.209}$) × 0.993^{edad}

Hombres

Si creatinina ≤80: FG estimado = 141 × ([creatinina/88,4/0.9]$^{-0.411}$) × 0.993^{edad}

- Si creatinina >80: FG estimado = 141 × ([creatinina/88.4/0.7]$^{-1.209}$) ×0.993^{edad}

Source: Levey *et al*. (2009)

The data was tabulated in the spreadsheet of the Excel 2010 program and exported to be analyzed using the statistical package Small Stata version 14.2. Descriptive statistics were used to compare the differences between the patients, performing measures of central tendency (mean) and measures of dispersion (standard deviation) for the quantitative variables, as well as obtaining the minimum and maximum values of each parameter. In addition, the p value was determined, where it was considered significant if $p < 0.05$; for the comparison of means, the Student's t-test was used.

Results

Regarding the gender of the participants, 29% were male and 71% female. Most of them worked as craftsmen.

Biochemical and anthropometric parameters were compared according to the sex of the Copalillo population, and significant differences ($p < 0.05$) were found for creatinine (p 0.000), urea (p 0.012), SBP (0.001), DBP (0.000), weight and height (p 0.000). The highest values were observed in the male population (Table 2).

Table 2. Biochemical and anthropometric parameters according to sex

Parámetros	Sexo	Media	DS	Mínimo	Máximo	*p*
Glucosa (mg/dL)	Masculino	136	88.3	65	416	0.434
	Femenino	135	75.0	69	431	
Creatinina (mg/dL)	Masculino	0.77	1.7	0.49	1.4	0.000
	Femenino	0.61	3.0	0.3	3.1	
Urea (mg/dL)	Masculino	26.8	10.7	8.18	71	0.012
	Femenino	23.5	11.1	9.19	70	
Albuminuria (mg/L)	Masculino	12.3	18.9	7	150	0.170
	Femenino	10.6	6.77	7	50	
PAS (mmHg)	Masculino	123	15.8	98	174	0.001
	Femenino	114	19.9	79	185	
PAD(mmHg)	Masculino	80.9	10.2	65	114	0.000
	Femenino	75.3	9.71	41	114	
Talla (m)	Masculino	1.63	0.060	1.54	1.79	0.000
	Femenino	1.52	0.062	1.41	1.71	
Peso (kg)	Masculino	69.6	12.9	36.1	98.1	0.000
	Femenino	60.6	11.5	32.6	97.4	
IMC	Masculino	25.8	4.23	15.0	35.5	0.366
	Femenino	26.0	4.32	16.3	38.2	

SD: Standard deviation, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, BMI: Body mass index.

Source: self made

Statistically significant differences were observed between diabetic and non-diabetic patients in SBP ($p < 0.018$) and DBP ($p < 0.021$) parameters. A statistically significant difference was also observed in urea ($p < 0.009$), glucose and GFR ($p < 0.000$) (see table 3).

Table 3. Anthropometric and biochemical parameters of patients with and without diabetes.

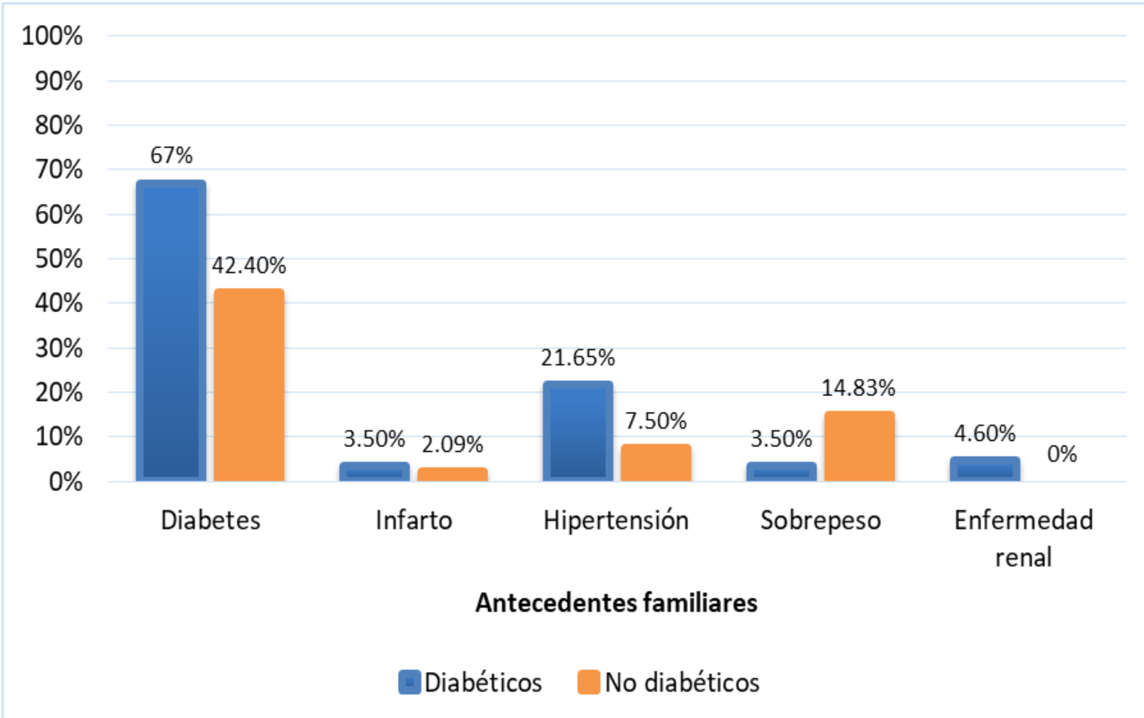
Parámetros	Variables	Media	DS	Mínimo	Máximo	Valor *p*
PAS (mmHg)	Diabético	120.7	20.6	87	174	*0.018*
	No diabético	114.8	18	79	115	
PAD (mmHg)	Diabético	78.86	10	62	114	*0.021*
	No diabético	75.84	10	41	114	
Talla (m)	Diabético	1.54	0.074	1.43	1.71	0.144
	No diabético	1.55	0.085	1.41	1.49	
Peso (Kg)	Diabético	61.64	10.7	41.1	97.4	0.095
	No diabético	64.06	13.3	32.6	98.1	
IMC	Diabético	25.69	3.71	18.4	38	0.202
	No diabético	26.22	4.56	16.5	39.2	
Glucosa (mg/dL)	Diabético	216	81.9	111	431	*0.000*
	No diabético	90	10.1	65	110	
Creatinina (mg/dL)	Diabético	0.68	0.279	0.30	1.82	0.156
	No diabético	0.64	0.281	0.36	3.1	
Urea (mg/dL)	Diabético	27.9	13.1	9.87	71	*0.009*
	No diabético	22.7	9.82	8.98	68.1	
Albuminuria (mg/dl)	Diabético	11.4	8.11	7	50	0.361
	No diabético	10.8	13	7	150	
FG (mL/min/1.73 m^2)	Diabético	104	24	28.6	148	*0.000*
	No diabético	119	22.3	17	159	

SBP: systolic blood pressure, DBP: diastolic blood pressure, BMI: body mass index, GFR: glomerular filtration rate.

Source: self made.

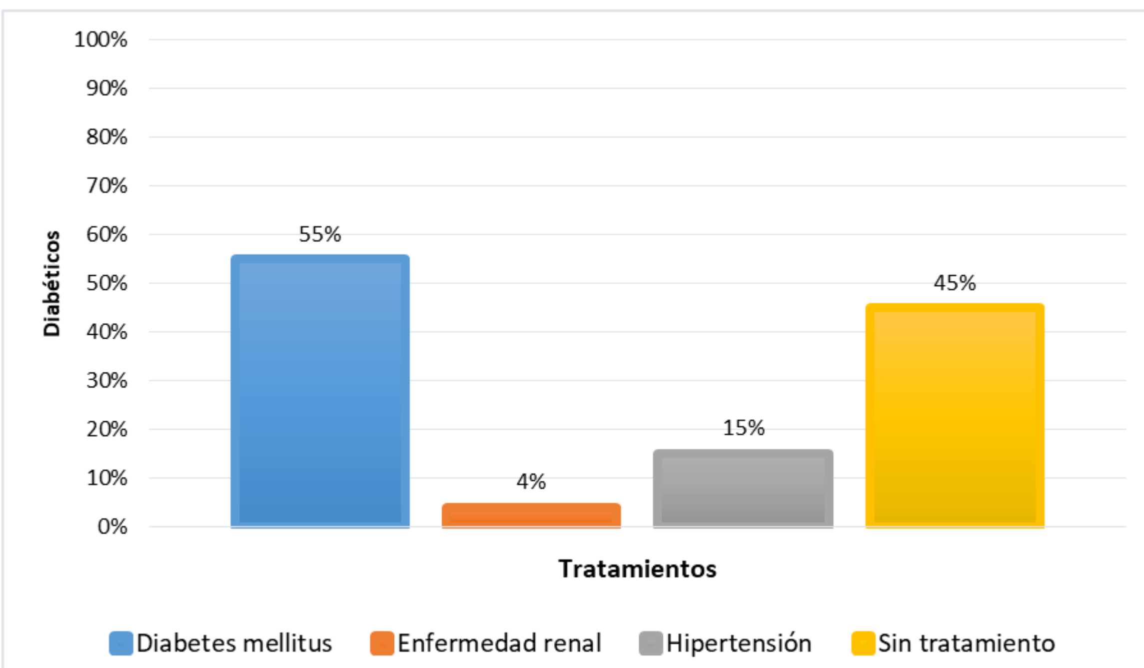
Diabetic patients had a high frequency of family history of DM (67%) and hypertension (21.65%), compared to non-diabetics. While non-diabetic patients presented a higher percentage of family inheritance with overweight (14.83%) (figure 1).

Figure 1. Percentage of patients with and without diabetes with familial inheritance of concomitant diseases



Source: self made

Figure 2. Diseases controlled with pharmacological treatments by diabetic patients in Copalillo, Guerrero, Mexico



Source: self made

Table 4 shows the diabetic and non-diabetic patients who present alterations in the biochemical parameters of the sampled population (n = 200). The high number of diabetic patients with high glucose values is striking.

Table 4. Altered biochemical parameters in patients with and without type 2 DM

Parámetros	Diabéticos % (*n*)	No diabéticos % (*n*)
Glucosa	87.0 % (75)	18.4 % (21)
Creatinina	7.0 % (6)	0.9 % (1)
Urea	15.1 % (13)	4.4 % (5)
Albuminuria	5.8 % (5)	0.9 % (1)
FG	10.46 % (9)	1.8 % (2)

FG: filtrado glomerular, %: pacientes representados en porcentaje, *n*: número de pacientes.

Source: self made

The determination of the glomerular filtration through the CKD-EPI formula (2009) allowed the identification of five patients with ROS (2.5%). Through the biochemical and anthropometric evaluation and the historical review of the patient files, the presence of six cases of CKD (3%) was confirmed (see Table 5).

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Table 5. Patients with CKD and ROS

Sexo	Estatus	ER	Años	Glu	Urea	Cr	Au	Col	Tg	Alb	FG	PAS	PAD	IMC
F	D	ERO	65	162	36.7	1.03	3.73	184	249	10	57	140	87	30.01
F	D	ERC	65	120	70	1.82	4.8	234	314	50	28.6	167	96	21.45
F	N/D	ERO	74	72	52	1.1	7.1	161	117	10	49.4	154	92	19.34
F	D	ERC	70	136	44	1.24	6.7	211	139	10	44	149	89	24.11
M	D	ERC	62	152	61	1.46	8.4	111	183	10	50.8	126	82	24.42
F	D	ERO	68	135	34	1.07	6.8	123	141	10	53.3	125	70	25.36
F	D	ERC	47	102	68.16	3.1	4.9	238	242	50	17	165	92	29.62
M	D	ERC	51	95	55.58	1.4	8	149	168	150	58	146	89	24.55
F	D	ERO	57	431	55.94	1.14	5.7	294	817	50	53.3	171	95	26.78
F	D	ERO	55	153	50.7	1.02	4.3	204	271	50	59.1	154	104	25.68
F	N/D	ERC	58	94	44	1.22	6.6	174	283	10	48.8	145	100	33.51

F: female, M.: male, RD: kidney disease, ROS: occult kidney disease, CKD: chronic kidney disease, Glu: glucose, Cr: creatinine, Au: uric acid, Col: cholesterol, Tg: triglycerides, Alb: albuminuria , GFR: glomerular filtration rate, SBP: systolic blood pressure, DBP: diastolic blood pressure, BMI: body mass index, D: diabetic, N/D: non-diabetic.

Source: self made.

Statistically significant differences were observed in the parameters of creatinine, urea, albuminuria, glomerular filtration rates, DBP and DBP, and age between patients with RD and those without the condition (Table 6).

Table 6. Comparison of parameters in patients with RD and without RD in the population of Copalillo

Parámetro	Paciente	Media	DE	Mínimo	Máximo	Valor *p*
Glucosa	ER	150.18	97.46	72	431	0.265
	Normal	134.84	77.6	65	416	
Creatinina	ER	1.41	0.6	1.02	3.1	0.001
	Normal	0.61	0.16	0.3	1.54	
Urea	ER	52.01	11.74	34	70	0.001
	Normal	23.05	9.15	8.98	71	
Albuminuria	ER	37.27	42.21	10	150	0.001
	Normal	9.57	1.76	7	30	
FG	ER	47.46	13.38	17	61.9	0.001
	Normal	117.6	18.07	63.5	159	
Edad	ER	61.09	8.3	47	74	0.001
	Normal	41.07	14.24	18	79	
Talla	ER	1.52	0.09	1.42	1.71	0.92
	Normal	1.55	0.08	1.41	1.79	
IMC	ER	25.89	3.99	19.34	33.51	0.79
	Normal	26.03	4.3	15.02	38.21	
PAS	ER	149.27	15.24	125	171	0.001
	Normal	115.1	17.72	79	185	
PAD	ER	86.63	10.87	70	104	0.001
	Normal	76.36	9.84	41	114	

GFR: glomerular filtration rate, SBP: systolic blood pressure, DBP: diastolic blood pressure. BMI: body mass index, RD: diabetic kidney disease, Normal: no kidney disease.

Source: self made

Discussion

From the results obtained, it was identified that the majority of the participants are female (71%), due to the fact that, in the municipality of Copalillo belonging to the state of Guerrero, women received economic support through the Prospera program, the which forced them to attend a medical consultation as a requirement to maintain said support, which did not happen with the male sex (29%). Our results are similar to a study in Ponchitlan, Jalisco, Mexico, published this year, where they obtained a prevalence of 68% female participation in their project (Garcia et al., 2019).

Alterations in blood pressure were identified, an increase in the mean value was observed in diabetic patients in relation to non-diabetic patients, and significant differences were found for SBP (p= 0.018) and for DBP (0.021). In patients with kidney disease, the increase in blood pressure was found to be related to the increase in BMI, since 54% of patients with kidney disease had BMI values greater than 25, and 27%, values between 24 and 25. BMI; thus, hypertension is associated with the presence of kidney disease, which has been reported as a modifiable risk factor for both the development of CKD and its progression (Balderas et al., 2020; Sepanlou et al., 2017) . In addition, BMI <25 has been mentioned as a protective factor for kidney disease (Kalyesubula et al., 2017), possibly due to the relationship between obesity and kidney damage due to the accumulation of adipose tissue, mainly in the viscera, which it causes compression of the kidney, with the consequent increase in intrarenal pressure.

Within the biochemical parameters, alterations in glucose were observed in 87% of the diabetic population ($p < 0.000$), with maximum levels of up to 400 mg/dL, which showed a lack of glycemic control in diabetic patients, probably as a consequence of that only 55% of diabetic patients take a pharmacological treatment for diabetes, as well as the resistance to perform clinical laboratory studies in this rural community, since only 7% of the group of diabetics went to perform laboratory studies every month , and 31.3% every six months. It has been documented that lack of glycemic control is associated with inadequate monitoring of DM, which affects the patient's quality of life. Llisterri et al. (2020) affirm that said pathology is one of the main variables associated with suffering from CKD.

In the study population, a high percentage of family history was found regarding DM, 67% in diabetics and 42.4% in non-diabetics. Family history of diabetes has been shown to be an independent risk factor associated with the onset of DM2 (Llorente, Miguel, Rivas, & Borrego, 2016).

In the diabetic population, 7% were observed with elevated creatinine levels, which serves as an indicator of the presence of kidney disease, since this parameter in clinical practice is the most used to determine the presence of kidney disease (Calvo, Sánchez and Yáñez, 2015). In relation to the treatments received by diabetic patients, shown in Figure 2, it was observed that only 55% of diabetics receive treatment for diabetes, and in the case of patients who had more than one concomitant disease, 15% had treatment for diabetes. hypertension and 4% received treatment for kidney disease, which could be influencing the development of advanced CKD in these. Chen, Knicely, and Grams (2019) have mentioned the importance of proper screening, diagnosis, and treatment, necessary to prevent adverse outcomes associated with CKD, including cardiovascular disease, end-stage renal disease, and death. They explain that in developed countries, CKD is more commonly attributed to DM and hypertension. However, less than 5% of patients with early CKD are unaware of their disease. It is worth mentioning that, within non-diabetic patients, 18% presented prediabetic values.

In the determination of the biochemical and anthropometric studies according to sex, the existence of a statistically significant difference was shown between the values of creatinine, urea, GFR, SBP, DBP, height and weight, these being higher in male patients. . This can be explained because the male population presented inadequate eating habits, lack of glycemic control and older age, which, according to Vázquez et al., (2019), are factors that modify the anthropometric profile (weight, height), biochemical (total cholesterol, creatinine, urea and glucose) and clinical (blood pressure and heart rate), which are important aspects to consider for the development of type 2 DM in adults aged between 45 and 70 years.

On the other hand, there was a greater alteration of the biochemical parameters of glucose, urea, creatinine, albuminuria and GFR in diabetic patients. The investigation by Castellanos, Fong, Vázquez and Fong (2018) points to the parameters mentioned as markers of kidney damage, which coincides with the results of the present investigation. The authors in question identified elevated levels of glucose, urea, creatinine and decreased GFR associated with the presence of albuminuria in 21.7% of the patients who made up their sample. In fact, the importance of albuminuria lies in the fact that it is a marker of endothelial damage both in patients with DM and in those who do not have this disease (Miranda, Vega, García and Alemán, 2016).

The determination of the GFR showed that 3% of the patients had established CKD and 2.5% had ROS, of which nine people were women and two men, this frequency is much lower than that reported in other studies (Calvo et al., 2015; Lopez et al., 2017). However, after identifying the population with and without the presence of RD, it was evidenced in the present investigation that the parameters mentioned above as markers of kidney damage show alterations: high values are presented in people with RD in creatinine, urea, albuminuria and a decrease in GFR (Castellanos *et al.,* 2018).

The present investigation shows that the presence of kidney disease is more frequent after 50 years of age, which is associated with the presence of DM, as well as the deterioration of kidney function due to the years of evolution of the disease. , since 81% of the patients who presented kidney disease were diabetic and older than 50 years. This coincides with what was mentioned by Ferragurt, Martínez, Bahamonde and Calero (2020), who mention that the higher frequency of CKD has been registered in other countries, in patients older than 50 years, which constitutes a higher risk to suffer from the disease, which consequently appears in people still of working age and with the ability to fend for themselves.

With regard to CKD, different studies determined the importance of early identification of kidney disease in diabetic and non-diabetic patients who were of legal age. According to their results, established kidney disease was practically the same as hidden kidney disease (Barrios, Escobar, Echarri, & Gómez, 2010; Ruiz, Ríos, Rodríguez, & Llorente, 2017), which is of concern and is consistent with this research, since ROS presented a similar prevalence than CKD, with greater frequency in the diabetic population.

Conclusions

ROS and CKD are present in rural communities, and are complicated in the diabetic population, which has a greater number of risk factors. The lack of adherence to the treatments of chronic diseases such as diabetes and hypertension cause metabolic lack of control and favor the presentation of renal pathology.

It is convenient to design new strategies to promote early diagnosis of kidney disease and adherence to treatment, with special emphasis on the diabetic population of rural communities.

Future lines of research

It would be convenient in future research to identify the factors that influence the lack of adherence to treatment and the consequent hyperglycemia that occurs in rural communities, where problems coexist that include communication (a significant number of patients did not speak Spanish) and other factors that can influence the presentation of pathologies such as kidney disease. It would also be important to include in future studies the follow-up of patients identified with the presence of CKD, ROS and prediabetes.

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