

## Prevalence of Chronic Complications Due to Diabetes Mellitus Type 2 in a Family Medicine Unit in León Guanajuato

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### Abstract

**Title:** Prevalence of chronic complications by type 2 diabetes mellitus in a family medicine unit in León, Guanajuato. **Objective:** To determine the prevalence of chronic complications by type 2 diabetes mellitus in a family medicine unit in León, Guanajuato. **Methods:** A simple retrospective cross-sectional study including 153 eligible patients diagnosed with Type 2 Diabetes Mellitus assigned to the FMU 56 of the Guanajuato delegation who came to control with their family doctor in the period from January to July, 2017; age, sex, overweight and obesity, comorbidities, glycemic control parameters and complications such as retinopathy, nephropathy and diabetic foot were identified by means of an electronic file. For the analysis of the results, descriptive statistics were used, presenting the results in tables and graphs of frequency. **Results:** The electronic records of 153 patients who came to control with the family doctor from January to July of 2017 were checked, with an average age of 60 years and a predominance in the female gender with 56.86%. Regarding the associated comorbidity, 65% of the diabetic patients had Systemic Arterial Hypertension and overweight-obesity in 80%. Of these, 59% had poor glycemic control. As for the prevalence of chronic complications, diabetic retinopathy in 33.33%, diabetic neuropathy in 33.98%, nephropathy in 10.45% and diabetic foot in 3.26%. **Conclusions:** The prevalence of chronic complications of type 2 diabetes mellitus in FMU 56 as neuropathy is lower than those reported at national and international level; neuropathy is similar to the national average and nephropathy and diabetic foot is less than the national and international studies.

**Keywords:** Diabetes Mellitus Type 2, diabetic retinopathy and diabetic neuropathy.

### Introduction

#### Mellitus Diabetes

It is estimated that in 2014 the global prevalence of diabetes was 9% among adults over 18 years. It is estimated that in 2012 1.5 million people died as a direct consequence of diabetes. More than 80% of deaths from diabetes occur in low and middle income countries. According to projections by the World Health Organization (WHO), diabetes will be the seventh cause of mortality by 2030. Healthy diet, regular physical activity, maintenance of a normal body weight and

avoidance of tobacco use can prevent Type 2 diabetes or delay its onset.<sup>1</sup>

Latin America (LA) includes 21 countries with almost 500 million inhabitants and an increase of 14% is expected in the next 10 years. There are around 15 million people with Diabetes Mellitus in LA and this figure will reach 20 million in 10 years, much more than expected by the simple increase in population. This epidemic behavior is probably due to several factors, among which are the race, the change in the habits of life and the aging of the population. Studies in Native American communities have shown a latent but high propensity to develop diabetes and other problems related to insulin resistance, which is evident with the change in life habits, which is occurring progressively. In most Latin American countries, the annual growth rate of the population over 60 years old is of the order of 3 to 4%, while in the United States it does not exceed 0.5%.<sup>2</sup>

The prevalence of Type 2 Diabetes Mellitus in children under 30 is less than 5% and after 60 it rises to more than 20%. Diabetes Mellitus type 2 is diagnosed late. Around 30 to 50% of people are unaware of their problem for months or years (in rural areas this occurs almost 100%) and in the studies of subjects with newly diagnosed Type 2 Diabetes Mellitus, the prevalence of retinopathy ranges from 16 and 21%, nephropathy between 12 and 23% and neuropathy between 25 and 40%.<sup>3</sup>

Diabetes Mellitus type 2 occupies one of the first 10 places as a cause of consultation and mortality in the adult population. Economic studies have shown that the highest cost of care for the person with diabetes is due to hospitalizations and that this expense is doubled when the patient has a micro or macro vascular complication and is five times higher when he or she has both. Most of the causes of diabetic hospitalization can be prevented with a good education and an adequate program of early recognition of complications. The main cause of death of the person with Diabetes Mellitus type 2 is cardiovascular. Preventing it implies a comprehensive management of all risk factors such

as hyperglycemia, dyslipidemia, high blood pressure, smoking, and so on. All these factors, except smoking, are more frequent in diabetics and their impact on cardiovascular disease is also greater.<sup>4</sup>

### Complications Attributed to Diabetes Mellitus

- Diabetes increases the risk of heart disease and stroke. According to a study conducted in several countries, 50% of diabetic patients die of cardiovascular disease (mainly heart disease and stroke).
- Neuropathy of the feet combined with reduced blood flow increases the risk of foot ulcers, infection and, ultimately, amputation.<sup>5</sup>
- Diabetic retinopathy is an important cause of blindness and is the consequence of damage to the small blood vessels of the retina that accumulates over time. The 1% of global cases of blindness is a consequence of diabetes.<sup>6</sup>
- Diabetes is among the main causes of kidney failure.
- In patients with diabetes, the risk of death is at least twice as high as in people without diabetes.<sup>7</sup>

The presence of diabetes increases 40 times the probability of suffering an amputation of lower limbs. Worldwide, it is estimated that 70% of amputees are diabetic. An annual examination should be performed in all diabetic patients. The frequency of the controls will be assessed according to the presence of the different risk factors. The treatment of foot disorders is a field that requires the specific professional performance of the Podiatry Technician. The examination should mainly assess neuropathy and peripheral vasculopathy, foot deformities and minor injuries and ulcers of the lower limbs. Footwear should be checked to ensure that it is appropriate and that it fits well on the foot. Evaluate the symptoms and signs of alarm.<sup>8</sup>

### Current Panorama of Detection of Chronic Complications of the Diabetes Mellitus Type 2 Diabetic Nephropatia

The timely prevention of diabetic nephropathy consists in the adoption of measures to prevent the onset of nephropathy, such as an adequate control of blood glucose and blood pressure. Subsequently to stop the progression of the nephropathy. This is mainly achieved through a good control of blood glucose and arterial hypertension, if there is one. Angiotensin-converting enzyme (ACE) inhibitors can be used to prevent the development of clinical nephropathy (and cardiovascular events) in people over 55 with DM and some other associated cardiovascular risk factor, even without micro-albuminuria or hypertension. arterial (recommendation AA).

ACEIs should also be preferred to stop or delay the process in people with DM2 during the stage of early nephropathy (recommendation B) and during the stage of clinical nephropathy (recommendation A). Some blockers of calcium channels have shown efficacy similar to that of ACE

inhibitors in some studies, but not in all of them (level 2 evidence). The combination of an ACEI with a calcium channel antagonist may be even better, especially if hypertension can not be controlled with monotherapy (evidence level 2). Preliminary evidence suggests that angiotensin receptor blockers have an antiprotein-like action similar to that of ACE inhibitors. In the advanced clinical stages, the control of arterial hypertension continues to be of crucial importance and it is also possible to restrict the intake of proteins that has been shown to be useful in delaying renal deterioration in people with DM1.

The total protein should not be greater than 0.8 g / kg and half must be of vegetable origin (grains, etc.) (recommendation D). Hypercholesterolemia, anemia and heart failure are also factors that accelerate the process and should be corrected as much as possible. The patient should be referred to the nephrologist if the treating physician has no experience in the comprehensive management of chronic renal failure, especially when the deterioration of renal function is very accelerated (greater than 5 cc in six months), creatinine is greater than 3.0 mg / dL or creatinine clearance is less than 30 cc / min.<sup>9</sup>

### Diabetic Neuropathy

Diabetic neuropathy is the most frequent and early complication of diabetes. In spite of this, it is usually the later diagnosed. Its prevalence is difficult to establish due to the absence of unified diagnostic criteria, the multiplicity of diagnostic methods and the heterogeneity of clinical forms.

Its evolution and severity correlate with the duration of the disease and poor metabolic control.

Detection depends on the sensitivity of the diagnostic methods used. Thus, for example, through electrophysiological methods it is possible to detect neuropathy in almost all diabetic patients at the time of diagnosis or shortly thereafter.

There is a possibility that a person with DM2 has other neurological syndromes different from those caused by diabetes, so the clinician must be attentive to the differential diagnosis.<sup>10</sup>

PN can present as an acute or chronic painful process and / or as a painless process, which in its final stage leads to complications such as foot ulcer (see chapter on diabetic foot), deformities (for example, Charcot's foot.) and non-traumatic amputations.

The most common form is the painful chronic, with dysesthesias that get worse at night (tingling sensation, needles, burns, punctures, etc.) and can remit spontaneously for long periods. Some decompensated patients may present with an acute painful form, although at the beginning of treatment, with diffuse hyperesthesia and weight loss in some cases. The majority of patients with neuropathy develop progressive loss of sensibility that can proceed without pain, with only a sensation of numbness, numbness or coldness and which can cause foot injuries that go unnoticed.<sup>11</sup>

## Diabetic Foot

Diabetic foot occurs as a consequence of the association of one or more of the following components:

- Peripheral neuropathy
- infection
- Peripheral vascular disease
- Trauma
- Alterations of foot biomechanics

In addition, some conditions of the person with diabetes have been identified that increase the likelihood of developing a foot injury, such as:

- Advanced age
- Long duration of diabetes
- Male sex
- Low socioeconomic stratum and poor education
- Social factors such as living alone, being little visited, little motivation to live
- Poor glycemic control
- Presence of retinopathy, nephropathy, macro vascular disease
- Consumption of alcohol
- Smoking
- Inappropriate shoes
- Previous ulcers or amputations

**Fig 1.** Classification of degrees of severity of the diabetic foot according to the wagner scale

Grade 0	Foot in risk due to the presence of peripheral vascular disease, neuropathy, orthopedic deformities, loss of vision, nephropathy, advanced age
Grade 1	Superficial ulcer
Grade 2	Deep ulcer that reaches the tendon, ligament, joints and / or bone
Grade 3	Localized infection: cellulitis, abscess, osteomyelitis
Grade 4	Local gangrene
Grade 5	Extensive gangrene

## Diabetic Retinopathy

Diabetic retinopathy is an important cause of avoidable visual loss in developed countries and one of the main causes of blindness in middle-income countries. Reports indicate that of the 37 million blind people in the world, 5% corresponds to diabetic retinopathy and it is estimated that up to 39% of newly diagnosed diabetics already have some degree of retinopathy. The American Diabetes Association recommends that every diabetic patient have an annual retinal examination under pupillary dilatation in order to detect retinopathy. Historically, the classification and severity of diabetic retinopathy have been based on clinical data evidenced through ophthalmoscopy, classified in a gradual scale ranging from absence of retinopathy to advanced proliferative disease, passing through several stages of the disease: non-proliferative, pre-proliferative and proliferative. Diabetic retinopathy is the most common cause of blindness in developed countries.

20% of type 2 diabetic patients have retinopathy lesions at the time of diagnosis, and after 20 years of evolution of the disease, more than 60% have ocular involvement. The percentage of diabetic patients who have never undergone an ophthalmological exploration exceeds 30% according to several studies. A high percentage does not go to the recommended annual exploration. This is influenced by various factors, organization of the health system, ophthalmoscopy with pupillary dilation, waiting lists, displacements, underestimation of retinopathy, etc. The periodic examination of the fundus is justified by the efficacy of the laser photocoagulation treatment that prevents visual loss. The fundus photography with non-mydratic camera is a good alternative to ophthalmoscopy with pupillary dilation for the screening of retinopathy, since it has high sensitivity and specificity (87% and 97%), it is a simple and accessible technique, it facilitates The follow-up is more cost-effective

than the usual method and has therefore been adopted as a detection method in some primary care services.

The introduction of the non-mydratic fundus camera, as a form of rapid diagnosis, has been evaluated in different studies, being validated in most of them as a useful and quick method for the diagnosis of incipient lesions of retinopathy. The ophthalmological exploration coverage of the diabetic patient is low, with more than 30% of patients never explored and even with a high number of patients with known risk of potentially serious and treatable diabetic retinopathy, not periodically controlled. Non-mydratic camera fundus photography is a safe, effective, easy-to-use, inexpensive and accessible patient detection method that also allows the optic nerve to be scanned.

It is ideal to use a screening program with a digital camera, because blindness due to Diabetic Retinopathy is a public health problem and with this we will be able to expand the coverage of asymptomatic individuals at risk. This is important because we know its natural history, it has a latency period of several years, we have an effective treatment such as laser, we know who to treat reducing the cost and risk of doing it in a more advanced state of Diabetic Retinopathy.<sup>12</sup>

### Methods of Detection

1. Fundus oculi (FO) made by the ophthalmologist: The examination must be done with a slit lamp, with a magnifying glass and the pupil dilated. It is "Gold standard", with greater specificity and sensitivity, against which the other screening systems are compared.
2. Fundus oculi performed by a non-ophthalmologist: With direct ophthalmoscope without dilating the pupil; It is

very little sensitive and specific. It is not recommended.

3. Eye fundus with photographic cameras: Digital photographic systems have been evaluated and achieve a sensitivity and specificity comparable to the traditional form of FO, being a fast, easy to perform procedure, convenient for the patient, and mainly, cost-effective. effective, since only patients with Diabetic Retinopathy are referred to the ophthalmologist, employing less qualified personnel in the initial stage of the process. A method that uses 8 shots of photography is not suitable for massive programs because it is slow, it produces fatigue, we must store a large amount of images and it requires pupillary dilation.

The target population is all diabetic patients registered in an area or region, whether type 1, type 2 or gestational diabetes. If this is not possible, we must consider the "high risk groups" and as a recommendation we must prioritize all type 1 diabetics (10% of the total), those over 50 (in Mexico consider those over 40), with a duration of diabetes reater than 10 years in type 2 and in pregnancy, ephropathy or poor metabolic control.<sup>13</sup>

## Methodology

### Descriptive and Transversal Study

The calculation of the sample size with a 95% significance was made, taking into account the formula for a proportion for finite population (3400 diabetic patients). With an expected detection of 30%. (n = 153) Incidental non-probabilistic sampling was carried out. The study was conducted in Family Medicine Unit number 56, of the Guanajuato Delegation of the Mexican Social Security Institute from January 1, 2017 to July 31, 2017. An instrument with sections was designed: identification card (Name, SSN, doctor's office, date on which the information was obtained, age, sex and time of evolution of the T2D), somatometric data and Metabolic variables (weight, height, BMI, last number of TA, last creatinine, last serum glucose and last HbA1c), Detection of suspected chronic kidney disease, Diabetic foot diagnosis and diabetic neuropathy, Diagnostic detection Diabetic retinopathy and other

comorbidities (History of hypertension, diagnosis of diabetic retinopathy, antecedent of glaucoma and / or cataract.

Statistical analysis descriptive statistics was used and the results presented in frequency tables and graphs. The results of the research were analyzed in the statistical program SPSS version 21.

## Ethical Aspects

In accordance with the regulations of the General Health Law on health research, title two, chapter 1, article 17, category 1, this research was considered as minimal risk. For its approval and submission for consideration, the protocol was evaluated by the Local Committee for Health Research of the UMF 53.

The development of the research was carried out considering the ethical and safety recommendations for research.

## Results

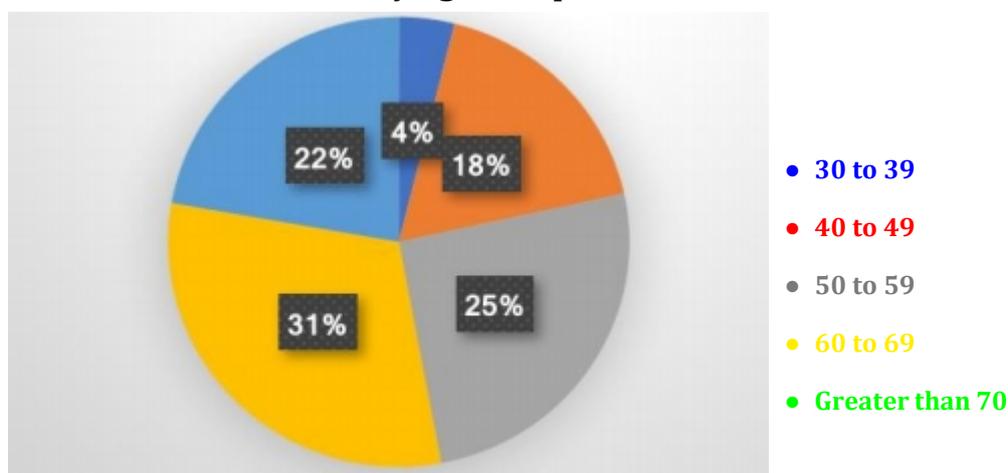
A total of 153 type 2 diabetic patients were studied, in relation to age, with an average age of 60 years, where the age group with the highest frequency was 60 to 69 years of age (31%) and only 4% ( 6) in children under 40 (Fig 1); 43.13% (66) was Male and 56.86% (87) female.

Regarding comorbidity in Diabetic patients, 65% (99) with Hypertension were presented; Only 35% (54) had Diabetes Mellitus type 2 (Fig 2).

Regarding the time of diagnosis of diabetic patients, it occurred more frequently in the group between 15 to 19 years with 23.52% (36), followed by 10 to 14 years with 20.91% (32), from 1 to 4 years with 16.99% (26) and from 5 to 9 years of evolution with 15.68% (24) (Fig 3).

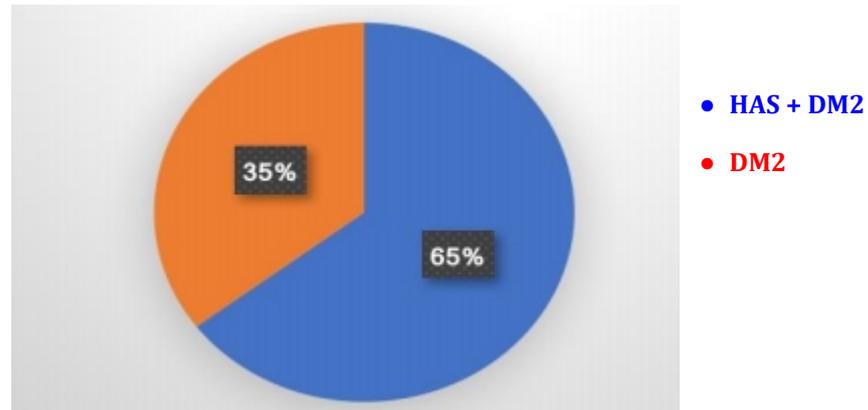
The time of diagnosis of Systemic Arterial Hypertension in the diabetic patients studied, occurred more frequently in the group between 5 to 9 years with 26.26% (26), followed by those from 10 to 14 years with 21.21% (21) , from 1 to 4 years with 20.2% (20) and from 15 to 19 years of evolution with 16.16% (16) (Fig 4).

### Distribution by Age Groups



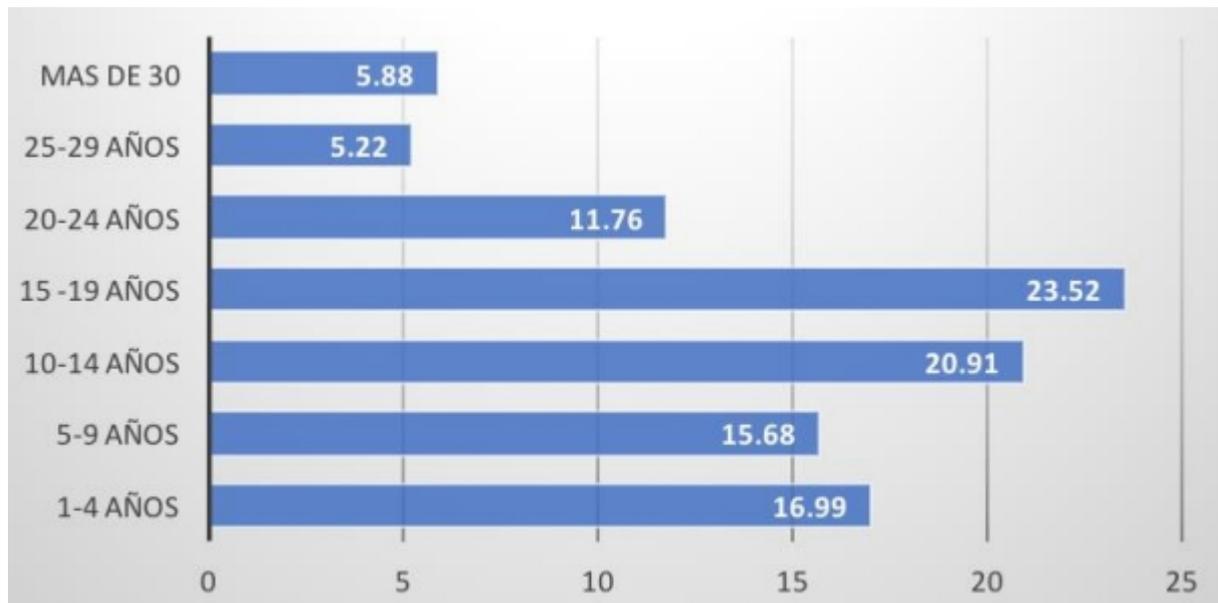
**Fig 1.** Distribution of the prevalence of Type 2 Diabetes Mellitus by age groups.

### Association of DM2 and HAS



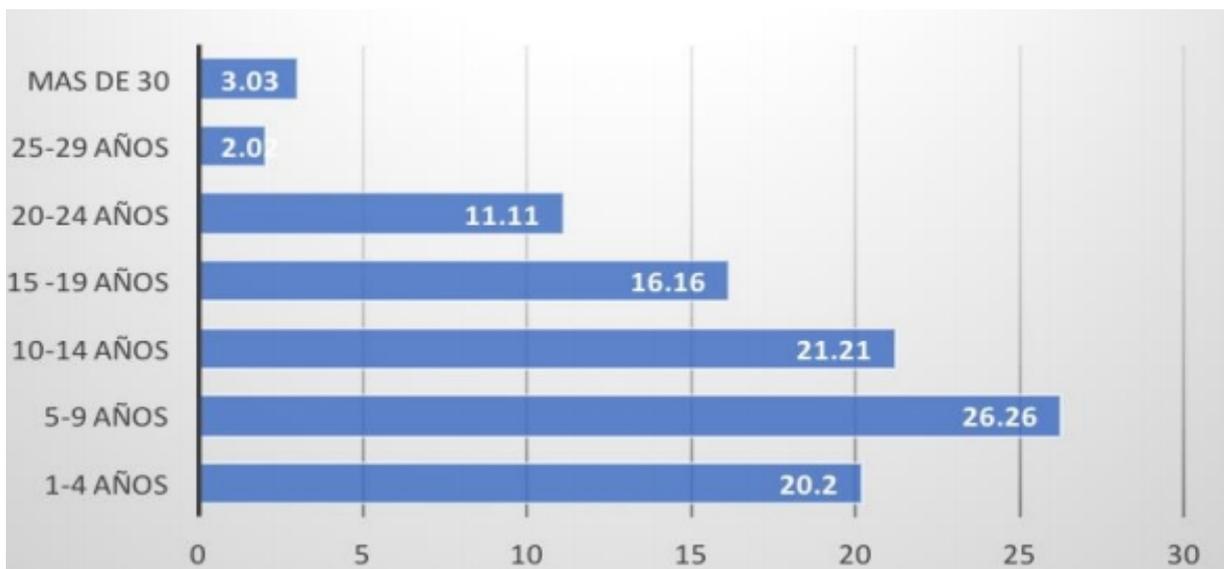
**Fig 2.** Percentage of association of DM2 and HAS.

### DM2 Diagnostic Time



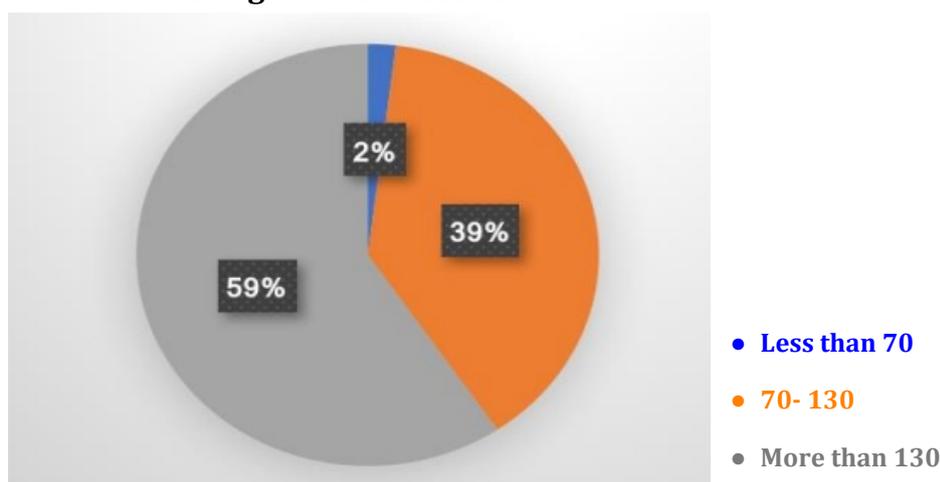
**Fig 3.** Diagnosis time of Type 2 Diabetes Mellitus.

### HAS Diagnostic Time



**Fig 4.** Time of Diagnosis of Systemic Arterial Hypertension

### Fasting Seric Glucose Levels



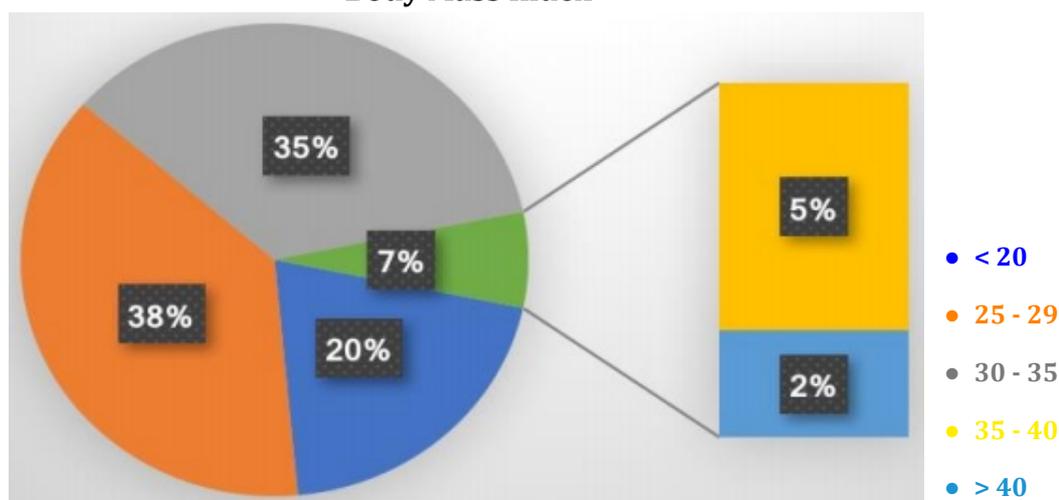
**Fig 5.** Fasting serum glucose levels in the last 6 months.

The body mass index (BMI) for ideal weight was 20% (31) (BMI <24.9 kg / m<sup>2</sup>), 38% (58) overweight (BMI 25 - 29.9 kg / m<sup>2</sup>), 35% (54) obesity grade 1 (BMI 30 - 34.9 kg / m<sup>2</sup>), 5% (7) obesity grade 2 (BMI 35 - 39.9 kg / m<sup>2</sup>) and 2% (3) obesity grade 3 ((BMI> 40 kg / m<sup>2</sup>) (Fig 6). Regarding the KDOQI classification, 44.44% (68) (TFG> or = 90ml / min) were found in stage I, 26.79% (41) in stage II (60 to 89ml / min), 18.3% (28) in stage III (TFG 30 to 59 ml / min), 4.57% (7) in stage IV (TFG 15 to 29 ml / min) and 5.88% (9) in

stage V (TFG <15 ml / min) (Fig 7). Regarding the prevalence of other chronic complications of type 2 diabetes mellitus, it was found that 3.26% (5) had diabetic foot, 33.98% (52) presented data of diabetic neuropathy and 33.33% (51) had retinopathy diabetic (Fig 8) (Table 1).

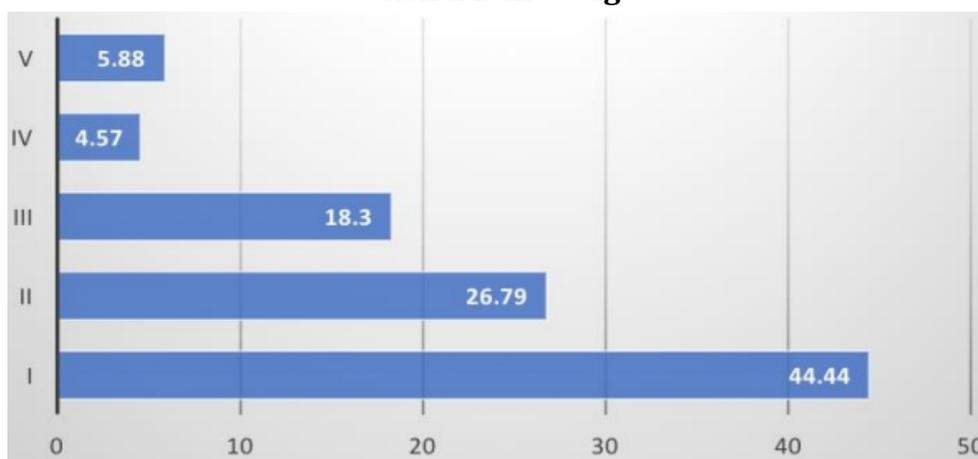
Regarding the presence of other comorbidities, the presence of Cataract was estimated at 15.03% (23) and glaucoma at 8.49% (13) (Table 2).

### Body Mass Index



**Fig 6.** Prevalence of Overweight and Obesity in diabetic patients

### Renal Dano Stage



**Fig 7.** Distribution of diabetic patients, based on the stage of renal damage according to the KDOQI classification.

**Table 1.** Presence of Chronic Complications of DM2

DM2 Chronic Complications	Diabetic foot		Diabetic neuropathy		Diabetic retinopathy	
	n	%	n	%	n	%
<b>Present</b>	5	3.26	52	33.98	51	33.33
<b>Absent</b>	148	96.73	101	66.01	102	66.66

**Table 2.** Prevalence of other comorbidities.

Other Comorbidities	cataract		Glaucoma	
	n	%	n	%
<b>Present</b>	23	15.03	13	8.49
<b>Absent</b>	130	84.96	140	91.5

## Discussion

The results obtained in the study, in relation to age, showed an average age of 60 years, in which the age group with the highest frequency was 60 to 69 years (31%); This is consistent with the results obtained from the ENSANUT 2012, in which the highest prevalence was presented in the groups of 50 to 69 years. However, in this same study, an increase in the prevalence of diabetes was observed before the age of 40 (24.2%); This differs with our results, in which only 4% of diabetic patients were in this age range. Regarding the associated comorbidity, 65% of the diabetic patients had arterial hypertension, with a greater frequency in the diagnosis time between 5 to 9 years; This is superior to the results obtained in the study conducted by Aída Jiménez-Corona, et al, in Cuernavaca, Morelos, Mexico, in 2012; In which this association was observed only in 50% of diabetic patients.

In relation to sex, the majority of the study population corresponds to women with 56.86%; Close to the results obtained by Chaverri-Fallas, in 2015, in the Central American population with 64.2%. Regarding the last measurement of fasting serum glucose in these patients, 59% of the patients did not have adequate glycemic control, presenting serum levels greater than 130mg / dl, which is an alarm data for our health system, because according to the UKPDS 2004, I provide evidence about the importance of the optimal control of glycaemia to reduce the risk of developing microvascular complications.

Obesity is considered the main risk factor for the development of chronic diseases such as type 2 diabetes and cardiovascular diseases. In Mexico the prevalence of obesity has increased, according to ENSANUT 2012, the combined prevalence of overweight and obesity was 71.2%, which is close to what was obtained in the present study, in which it was presented in an 80 % overweight-obesity.

Diabetes Mellitus type 2 is diagnosed late. Around 30 to 50% of people do not know their problem for months or years and in the studies of subjects with newly diagnosed Diabetes Mellitus type 2, the prevalence of retinopathy ranges

between 16 and 21%, that of nephropathy between 12 and 23% and neuropathy between 25 and 40%. In the present study, a diagnosis time of diabetes mellitus between 10 to 19 years was most frequent, with a prevalence of diabetic foot in 3.26% with foot, of diabetic neuropathy in 33.98%, of nephropathy in 10.45% and of Diabetic retinopathy in 33.33%. There is an increase in the prevalence of diabetic retinopathy.

## Conclusions

The prevalence of chronic complications of type 2 diabetes mellitus in FMU 56 such as neuropathy is lower than those reported nationally and internationally; Neuropathy is similar to the national average and diabetic nephropathy and foot disease is lower than national and international studies.

In the future, the incidence of diabetes mellitus and obesity will increase, as a consequence, related complications such as retinopathy, nephropathy and neuropathy. With the results obtained it is necessary that the decision makers prioritize risks and initiate the necessary steps to strengthen the priority programs that have the greatest impact on the user population that receives health services, in order to prevent the chronic complications of type diabetes mellitus.

The target population to be screened is all diabetic patients, those older than 40 years, with diabetes duration greater than 10 years or poor metabolic control and even better the proposal to train a family doctor to identify normal and abnormal retinas to optimize screening in the same first level of attention.

The first-level care physician must act on the basis of control goals in blood glucose, cholesterol, triglycerides, blood pressure, nephroprotection and care of the feet.

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## ANNEXES

### Data collection instrument (annex 1)

#### Mexican Institute of Social Security

#### Delegation Guanajuato

#### 56 UMF

#### Detection of complications of DM2 Chronicles

##### I. Identification Card:

Name: NSS:
Office: Shift: TM ( ) TV ( ) date: / / 2017 age: sex:
The DM2 diagnosis time:

##### II. Somatometric data and Metabolic Variables:

Size: m. weight: kg. IMC: Last creatinine: mg/dl
Last digit of TA: / mmHg last glucose: mg/dl (month) HbA1c:

##### III. Detection of Suspicion of Chronic Kidney Disease, Diabetic Foot Diagnosis and / or Diabetic Neuropathy:

TFG: ml/min. Renal stage: I II III IV V ( ) ( ) ( )
Diabetic foot: If ((not))
Neuropathy diabetic Yes ( ) NO

##### IV. Diagnostic Detection of Diabetic Retinopathy and other Comorbidities:

History of systemic Arterial Hypertension: if ( ) NO ( ) time of diagnosis:
Diagnosis of diabetic retinopathy: if ((not))
History of glaucoma: if ((not))
History of cataract: if ((not))
Doctor: _____ Enrollment: _____
Firm: _____