Complications related to type 2 diabetes (T2DM) and treatments in a population of NADOR in the NORTH of MOROCCO

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SUMMARY

Type 2 diabetes is prone to numerous complications that arise from complex mechanisms involving hyperglycemia, insulin resistance, low-grade inflammation and accelerated atherogenesis. Cardiocerebrovascular complications affect the prognosis of diabetes. The present study is to investigate T2DM-related complications and treatments in a population of NADOR in the NORTH of MOROCCO. This study was conducted in a private laboratory of medical analysis in the city of NADOR over a period of one year from 01 / 10 / 2018 to 01 / 10 / 2019. This epidemiological study was carried out on 830 male and female subjects aged 18 years and over who reside in the city of Nador. The collected data were entered in Excel, after filtration and coding we transmitted them on a statistical exploitation support SPSS (Statistical Package for Social Sciences) version 23.0. Quantitative variables were expressed as means ± standard deviation, and qualitative variables as frequencies and percentages. The hypothesis tests applied to compare the means and proportions are respectively T Student and the Chi-2 test of independence. Fasting blood glucose was determined by an automated biochemistry machine after 5 min of decantation and 10 min of centrifugation. HbA1c was determined on whole blood by an HPLC (High Performance Liquid Chromatography) machine. Our population had a mean fasting blood glucose level of 2.32±0.78 g /l, glycated hemoglobin above 9% was the majority in our population (47.70%) followed by the range between [7-8%] and then [8-9%] and then below 7%. complications, we find that renal failure is the most common complication of T2DM in our population with a rate of 18.19% followed by 17.23% of patients with hypertension, and 14.83% had dyslipidemia, all our patients had complications related to T2DM. In our population 93.5% used Oral Antidiabetics (OADs) divided into 65.8% of the population treated with Sulfonamides versus 27.7% uses Biguanides, thus OAD treatment was the most used therapy in our study population. The combination of ADO and insulin therapy had a rate of 3.37% versus 2.3% of insulin therapy (1.3% definitive insulin therapy and 1% transient). The results show the important role of self-monitoring of blood glucose and HbA1c in achieving glycemic control in diabetics treated with oral antidiabetic drugs, and the need to develop a strategy to improve the quality of management of type 2 diabetes.

Key words: diabetes, type 2 diabetes, management, glycemic control, self-monitoring of blood glucose, glycemic control, ADO, HTA, Nador.

INTRODUCTION

Diabetes is a serious chronic disease that occurs when the pancreas does not produce enough insulin (the hormone that regulates blood sugar), or when the body is unable to effectively use the insulin it produces [1]. Hyperglycemia, a common consequence of uncontrolled diabetes, can, over time, lead to serious heart, vascular, eye, kidney and nerve damage. More than 400 million people live with diabetes.

Type 2 diabetes, non-insulin dependent, also called maturity-onset diabetes, is characterized by an excess of sugar and is due to an insufficiency or misuse of the insulin produced by the human body. It results from the body's inability to respond properly to the action of the insulin produced by the pancreas. It leads to long-term damage, dysfunction and failure of various organs [2].

T2DM is one of the most critical diseases in both industrialized and developing countries [3]. Type 2 diabetes (previously called non-insulin-dependent diabetes or adult-onset diabetes) results from the body's inefficient use of insulin. Type 2 diabetes affects the vast majority of people living with diabetes worldwide [1]. Symptoms may be similar to those of type 1 diabetes, but are often less marked or absent. Therefore, the disease may remain undiagnosed for several years, until existing complications are found. For many years, type 2 diabetes was only seen in adults, but it has started to affect children.

Without proper management of diabetes, the complications that follow compromise health and are life-threatening. Acute complications are an important cause of mortality, expense and poor quality of life. Abnormally high blood sugar can be life-threatening if it triggers diseases such as diabetic ketoacidosis in type 1 or 2 diabetics, and hyperosmolar coma in type 2 diabetics. Regardless of the type of diabetes, hypoglycemia can occur and cause a seizure or loss of consciousness. This can happen when the patient has skipped a meal or exercised more than usual, or if the dosage of an antidiabetic drug was too high. Diabetes, over the long term, can affect the heart, blood vessels, eyes, kidneys and nerves, and increase the risk of heart disease and myocardial infarction. These injuries can reduce blood flow, which - along with nerve damage (neuropathy) affecting the feet - increases the risk of foot ulceration and infection, ultimately requiring amputation. Diabetic retinopathy is an important cause of blindness and results from the long-term accumulation of damage to the small blood vessels in the retina. Diabetes is one of the leading causes of kidney failure.

The degenerative complications depend closely on the quality of control and the age of the disease and are still frequent and threatening. Diabetic nephropathy is another cause of mortality since renal failure is observed in 15% of cases and 25% of dialysis patients are diabetics [4].

High blood pressure (HBP) is associated with type 2 diabetes (T2D) in 80% of cases, contributing to the high risk of cardiovascular disease associated with type 2 diabetes [5]. Indeed, diabetic patients are often polyvascular, hypertensive and multitargeted, which forces

physicians to prescribe complex therapies, making it difficult to comply with the multiple therapies prescribed. Morocco is in the midst of a demographic, nutritional and epidemiological transition [6,7], T2DM is considered a disease of the century; a metabolic disease linked to changes in lifestyle and dietary habits over the last 30 years. [8]

The main objective of this study is to investigate T2DM-related complications and treatments in a population of NADOR in the NORTH of MOROCCO.

MATERIALS AND METHODS

Our study is an epidemiological study that took place in a private medical analysis laboratory in the city of NADOR over a period of one year from 01 / 10 / 2018 to 01 / 10 / 2019. It was carried out on 830 male and female subjects aged 18 years and older who reside in the city of NADOR.

We first applied for an internship at a private medical analysis laboratory in the city of Nador, after obtaining the agreement; we explained the objective of the study to the physician biologist. The subjects recruited were type 2 diabetic patients who came to the laboratory to check their blood sugar. Their blood glucose was ≥ 1.26g/l (7 mmol) on two occasions [9]with the help of the reception and sampling team at the laboratory, which consisted of three secretaries and two nurses, we explained the purpose of the study and then they volunteered and signed the consent form and were then surveyed. We collected sociodemographic information: age, marital status, educational level and employment as well as clinical information of the 830 subjects, we also used materials to make anthropometric measurements and the necessary biological assays. These measurements were performed in a room reserved for these subjects. Their confidentiality and privacy have been respected. The ethics is allocated to the physician Biologist, responsible for the laboratory.

Inclusion criteria

- All Type 2 diabetic patients, with or without degenerative complications and regardless of the age of the diabetes.
- Patients who are 18 years of age or older.
- Both sexes (men and women)
- Patients residing in the city of NADOR

Exclusion Criteria

- Pregnant women.
- Breastfeeding women.
- Childrens.
- Patients with type 1 diabetes and Gestational Diabetes.
- Non-residents in Nador

Methods of collection

For each fasting subject (12 hours of fasting), we collected two vials of venous blood by venipuncture at the level of the elbow, with a loose tourniquet, using single-use needles inserted into the patient's vein and into vacuum-sealed tubes. We collected two tubes; one dry tube (Lithium Heparin - glass vacuum blood collection tube) for the determination of fasting blood glucose and the second EDTA tube (Ethylene-diamine-tetra-acetic acid) for the determination of glycated hemoglobin, these samples were taken by the laboratory nurse. Fasting blood glucose was determined by an automated biochemistry machine after 5 min of decantation and 10 min of centrifugation.

HbA1c was determined on whole blood by an HPLC (High Performance Liquid Chromatography) machine. These assays were performed by a laboratory technician and validated by the medical biologist. Diabetes complications and treatment were collected from the patient intake record. Each file is filled on a computer software "KALISIL", once validated with the patient, the secretary scans the prescription in this software directly to have a traceability including the clinical information of the patients, then she prints the bench sheet.

This file contains the patient's personal information, associated pathologies, treatments and their doses.

Input and analysis of results

The collected data were entered on Excel, after filtration and coding we transmitted them on a statistical exploitation support SPSS (Statistical Package for Social Sciences) version 23.0. Quantitative variables were expressed as means ± standard deviation, and qualitative variables as frequencies and percentages. The hypothesis tests applied to compare the means and proportions are respectively T Student and the Chi-2 test of independence.

RESULTS

Biological characteristics of the population

Our population has a mean fasting blood glucose of 2.32±0.78 g /l with a minimum blood glucose of 0.46g /l and a maximum blood glucose of 5.55g/l. The mean blood glucose level in men was 2.25g/l±0.71g/l and in women was 2.34g/l ±0.81g/l. A glycated hemoglobin above 9% was the majority in our population (47.70%) followed by the range between [7-8%] then [8-9%] and then below 7%.

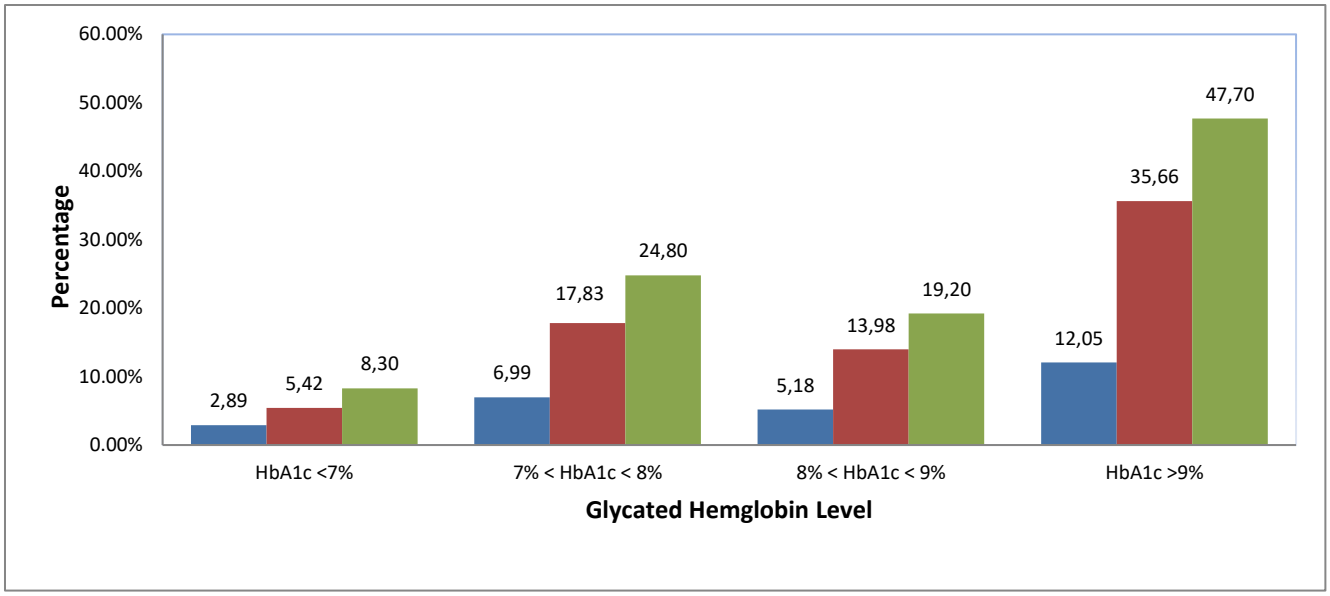


Figure 1. Distribution of the population according to HbA1c Level

Complications related to Type 2 Diabetes in our population:

For complications, we find that renal failure is the most common complication of T2DM in our population with a rate of 18.19% followed by 17.23% of patients with hypertension, and 14.83% had dyslipidemia, all our patients had T2DM-related complications.

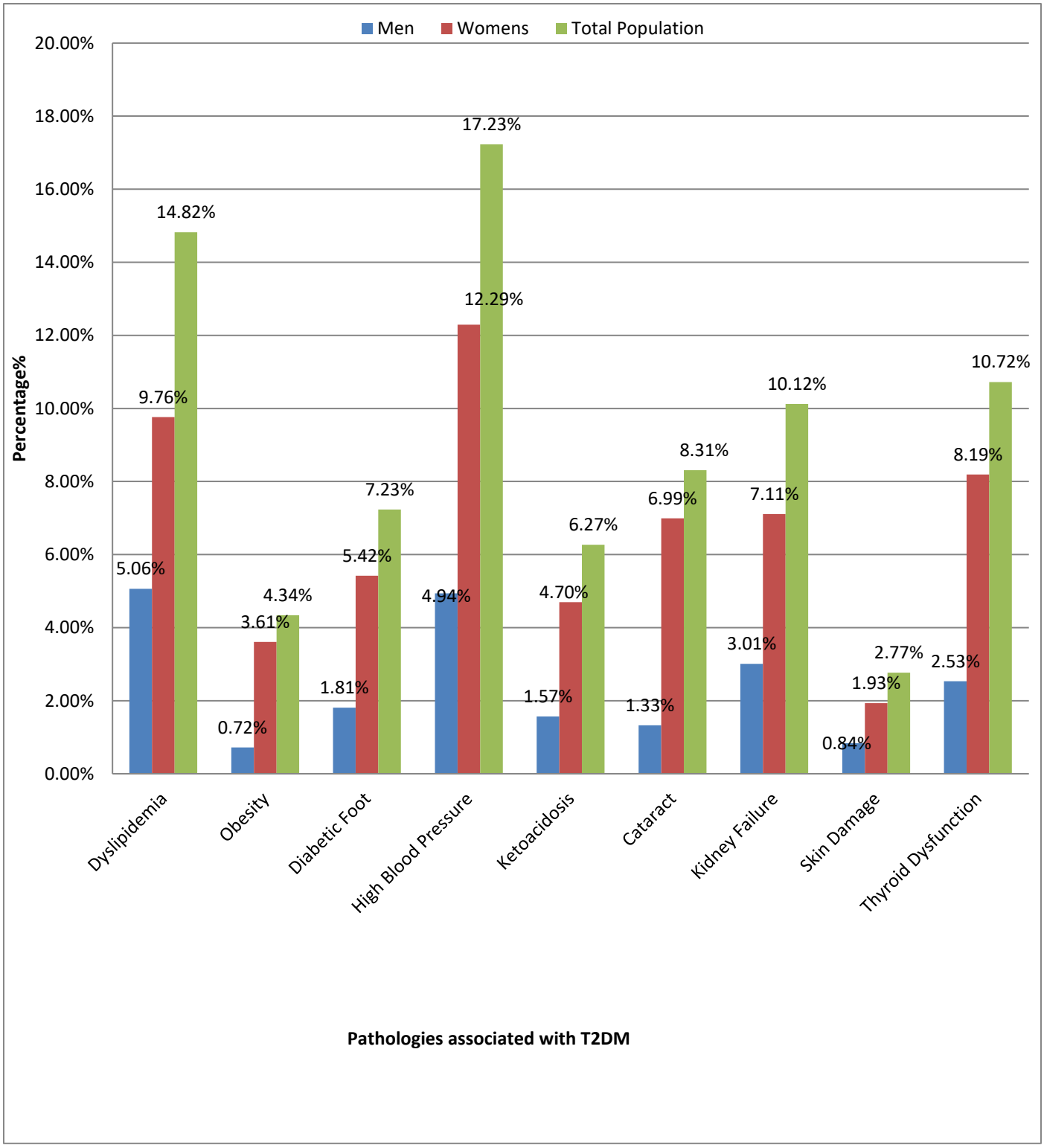
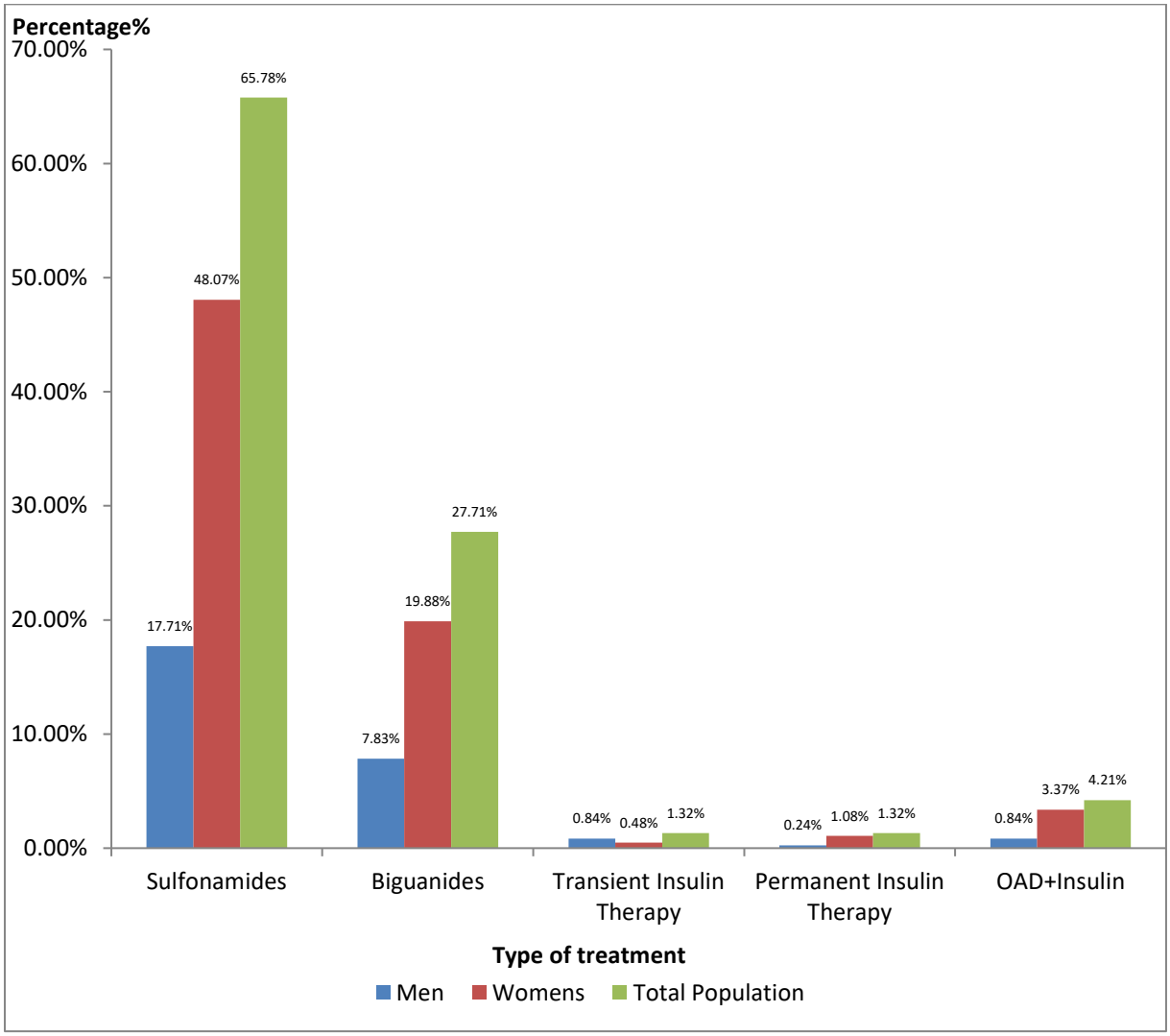


Figure 2. Distribution of the population according to the pathologies associated with T2DM

Population Pharmacological Treatments

In our population 93.5% used oral antidiabetic drugs (OADs) divided into 65.8% of the population treated with Sulfonamides against 27.7% used Biguanides, thus OAD treatment was the most used therapy in our study population. The combination of oral antidiabetics and

insulin therapy had a rate of 4.21% against 2.3% of insulin therapy (1.32% definitive insulin therapy and 1.32% transitory).



OAD: Oral antidiabetic drugs

Figure 3. Distribution of the population according to pharmacological treatments

DISCUSSION

We conducted a study on non-insulin dependent diabetic patients consulting the private laboratory, since Type 2 Diabetes is the most common form of diabetes [10].

In total, we have a population of 830 subjects of which 27.2% are men and 72.8% are women, our population has a mean blood glucose level of 2.32±0.78 g /l with a minimum blood glucose level of 0.46g/l and a maximum blood glucose level of 5.55g/l; the mean blood glucose level in men was 2.25±0.71g/l and in women was 2.34±0.81g/l.

The mean glycated hemoglobin of the population was 9.39±2.20% with a minimum HbA1c of 6.3% and a maximum HbA1c of 19.6%; in men, the mean HbA1c was 9.25±2.38%, almost equal to the mean in women: 9.43±2.14%. From the statistical study we observe that there is

no significant difference between the HbA1c of the two sexes. HbA1c greater than 9% was the most dominant in our population with 369 (47.7%) versus 69 (8.3%) with HbA1c less than 7%. These results are consistent with other studies that showed the importance of glycemic control; a recent study conducted on 1002 type 2 diabetic patients followed at the basic health care network in Fez where 80% of the patients failed to achieve the recommended HbA1c level (≤ 7%).(11) This type of outcome was already addressed in 2011 by the International Diabetes Management Practice Study (DMPS), which reported that the glycemic target of HbA1c set at 7%, is achieved in only 30.9% of type 2 patients. Achieving a glycated hemoglobin <7% was among the study's target goals. These results show the important role of the quality of management of type 2 diabetes, especially in achieving glycemic control [12,13].

For complications, we find that kidney failure is one of the most common complications of T2DM in our population with a rate of 18.19% followed by 17.23% of patients with hypertension, and 14.83% had dyslipidemia, all our patients had complications related to T2DM. For hypertension, a prospective descriptive study, conducted from January 2011 to March 2011 on a population of hypertensive type 2 diabetic patients seen in consultation or hospitalized at the Department of Endocrinology, Diabetology and Metabolic Diseases of the Mohammed VI University Hospital, showed that the hypertensive diabetic patient is a subject at very high cardiovascular and renal risk. As such, it should benefit from early and intensive antihypertensive treatment [14]. In addition to hygienic and dietary measures, which continue to play a key role in the management of hypertension, the immediate initiation of antihypertensive medication is recommended [15] in combination with antidiabetic treatment. It is therefore necessary to implement therapeutic strategies that are often cumbersome, involving the combination of a wide variety of therapies, including oral antidiabetic treatment or insulin therapy or mixed treatment, antiplatelet agents, beta-blockers, nitrates or potassium agonists, statins, calcium channel blockers, and conversion enzyme inhibitors. All of these factors may hinder adherence to treatment in the polymedic hypertensive diabetic patient.

Hypertension is most commonly associated with type 2 diabetes as part of the metabolic syndrome, is less common in type 1 diabetes and usually occurs after the development of kidney failure [13]. These two pathologies, associated in 80% of the cases, are more frequent particularly in the elderly, with a peak located between 66 and 69 years. This combination of hypertension and type 2 diabetes is responsible for an increased cardiovascular risk [16,17]. In this study, 66% of the patients were female. The average age of the patients is about 52.38 years, elderly patients constitute 18% of the population.

Diabetes occupies the first place among the 41 ALD managed by the CNOPS in terms of insured persons affected with 40% [18]. On the other hand, diabetes is the 1st cause of blindness, the 1st cause of chronic end-stage kidney failure and the 1st cause of lower limb amputations [19].

In our population 93.5% used Oral Antidiabetics (OADs) divided into 65.8% of the population treated with Sulfonamides versus 27.7% using Biguanides, thus OAD treatment was the most used therapy in our study population. The combination of ADO and insulin

therapy had a rate of 3.37% against 2.3% of insulin therapy (1.3% definitive insulin therapy and 1% transient) this can be explained by the importance of the glycemic imbalance and the complications that accompany it and the failure against the less intense therapies. Insulin therapy can be considered at the stage of failure of a dual oral therapy and remains without alternative in the situation of failure of a triple therapy [19].

Moroccans, as well as North Africans, generally do not accept the notion of a chronic disease requiring life-long treatment. Also, when diabetes is well controlled, they often stop the treatment and the rigor in the quality of the follow-up (regular clinical and biological controls), thinking that the cure is acquired, which causes relapses. This situation is further aggravated when patients are advised to abandon effective treatments in favor of empirical drugs that have the advantage of being inexpensive and part of a pharmacotherapy integrated into the cultural past [20].

CONCLUSION

Diabetes is a chronic and complex pathology that exposes to many complications, it is also a risk factor for cardiovascular diseases. Kidney failure is one of the most severe manifestations of diabetic disease; several studies have shown that good blood pressure control slows the decline in kidney function [21].

The results of our study showed us that a significant proportion of the population suffers from a glycemic imbalance, in order to curb this problem, it is essential to set up strategies and preventive actions as well as curative actions aiming at promoting a good control of the disease (Self-monitoring, Self-glycemic control). The fight against risk factors (hypertension, hyperlipidemia, smoking, obesity, sedentary lifestyle), and to prevent the appearance of severe complications related to T2D.

Therefore, the implementation of educational programs and the follow-up of hygienic and dietary measures within the framework of an organized management of diabetes will allow to effectively reduce the intensity and the severity of complications associated with T2DM. In this context, the role of nutritional education, awareness of type 2 diabetic patients and their entourage of the severity of the disease are essential for a good maintenance of glycemic balance and reduce metabolic and vascular risks; this is why diabetic education must be considered and rightly so as one of the most important pillars for the treatment and management of diabetes in general and T2DM in particular in our country [22].

Conflict of interest: Authors declare no conflict of interest.

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