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## Research Article

### LIPID PROFILE OF TYPE 2 DIABETIC IN MAURITANIA: CROSS-SECTIONAL STUDY OF 87 CASES

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#### ABSTRACT

**Objectives:** The objectives of this study were to assess the prevalence of dyslipidemia in type 2 diabetics in Mauritania, to determine the types of dyslipidemia observed in the type 2 diabetic in Mauritanian.

**Patients and Methods:** We carried out a prospective study from January to November 2014, in the department of internal medicine of the National Hospital of Nouakchott. This study involved 87 patients. This study included only patients hospitalized in the service during this period.

**Results:** The average age of our patients was 65 years with extremes of 40 and 90 years. The sex ratio was 1.2 in favor of women. Half of the patients were from Nouakchott (49%), and 70% were married. The mean weight of the patients was 72.5 kg with extremes of 45 and 100 kg. The average body mass index (BMI) of our patients was 27.35 kg / m<sup>2</sup> with extremes of 15 kg / m<sup>2</sup> and 39 kg / m<sup>2</sup>. Overweight accounted for 64% (55 patients), and obesity was observed in 31 patients (35.6%). The mean duration of development was 10.5 years with extremes of 0 and 21 years. The mean venous blood glucose was 3.66 g / l with extremes of 0.18 g / l and 7.15 g / l, and was elevated in 65 patients, a frequency of 75.7%. The mean value of glycated hemoglobin was 11.45% with extremes of 5.1 and 17.8%. Glycated hemoglobin was elevated in 53 patients, or 60.2%. Several cardiovascular risk factors were associated with diabetes: age was a risk factor in 40 patients, a frequency of 45.9%. Heredity was found in 41 patients, a frequency of 47.2%. The prevalence of smoking was 23%, 20 cases. The average number of packages-years was 6 with extremes of 2 and 10 pack-years. High blood pressure (hypertension) was found in 14 patients (16.1%). Microalbuminuria was found in 19 patients, a frequency of 21.8%. The cardiovascular risk level of patients was: Low in 12.60%, moderate in 19.5% and high in 67.9% of cases. The classification of dyslipidemias revealed the 3 main types of dyslipidemia in 28 patients, a prevalence of 32.1%. Hypertriglyceridaemia associated or not with a low HDL level, represent 15 patients, ie 53.6% of pure hypercholesterolemia, 8 patients (28.5%) had high LDLc, HDLc and triglycerides were normal. Mixed dyslipidemia in 5 patients (17.9%), associated or not with low HDL levels. 16 cases, ie 57% with an age group of 50 to 60 years then 6 patients, or 21% of 60 to 70 years. Hypertension was associated with dyslipidemia in 57.6% or 8 patients. Diabetes had been evolving for less than 5 years in 59 patients, ie 67.8% (including 29 patients less than one year, 30 from 1 to 5 years), 17 patients, ie 19%, between 6 and 10 years, and beyond Of 10 years 11 patients or 12%. The prevalence of dyslipidemia in our patients is 32.2% or 28 patients, including 7 patients (25%) with cardiovascular disease. Chronic renal insufficiency in 10 patients (35.7%), diabetic nephropathy in 3 patients (10.7%).

**Conclusion:** Despite a poor review, the biological diagnosis of dyslipidemia in type 2 diabetics is essential for adequate and early management. Because dyslipidemia is one of the risk factors for diabetes, the association with other risk factors in type 2 diabetic increases cardiovascular risk, namely that this study is the first in hospital in Mauritania.

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#### INTRODUCTION

Dyslipemie: Or Dyslipidemia is a primary or secondary pathological modification of serum lipids. Dyslipidemia corresponds to a qualitative or quantitative modification of one or more parameters of the serum lipids. Atherogenic dyslipidemia corresponds to one or more of the following abnormalities: hypercholesterolemia, hypertriglyceridaemia, decrease in HDL-c, and increase in LDL-c. They are organic

molecules insoluble in water (lipos) and soluble in apolar organic solvents such as benzene, chloroform, ether, etc. They are characterized by the presence in the molecule of at least one fatty acid or chain fat. Due to their insolubility in water, cholesterol, steroids, vitamin D, which are polyisoprene derivatives (1), are attached to the lipids. The diagnosis of dyslipidemia is essentially biological, with clinical examination generally poor. Its therapeutic management by the hygiene-

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dietetic rules and the hypolipémians greatly reduces the cardiovascular events.

The general objective of this study is to measure the prevalence of lipid abnormalities in type 2 diabetics in Mauritania.

**The specific objectives**

- To determine the different lipid profiles observed in this population.
- Isolate the diabetic parameters (fasting glucose, glycated hemoglobin, and duration of diabetes evolution) most associated with micro vasculature and macro vascular disease.
- Analyze the results of the survey, which will be discussed and commented upon.
- Finally give recommendations for the management of dyslipidemias in the diabetic.

**Patients and Methods**

It is a cross-sectional study; prospective from January to November 2014 at the Department of Internal Medicine of the National Hospital of Nouakchott. This study concerned 87 patients. Included in this study were all type 2 diabetic patients of both sexes at least 40 years old, pre-existing or diagnosed during hospitalization. In patients who agreed to participate in this study. All patients had a complete lipid balance. Not included: patients with type I diabetes and patients with type 2 diabetes who were not hospitalized in the service.

- Parameters studied: the interrogation data; Civil status, age of the patient, sex, geographical origin, marital status, socio-economic status, race, occupation, level of education, medical insurance.
- Background: risk factors; hypertension, smoking, alcohol consumption, physical inactivity, obesity,
- Existence of coronary artery disease or other cardiac complications, diabetes, duration of progression, management.
- The age of diabetes, ischemic stroke and / or arteriopathy of the lower limbs (intermittent claudication), Diabetic retinopathy, Diabetic nephropathy, Diabetic neuropathy.
- Present symptoms: chest pain or palpitations, dyspnea.
- Physical examination: state of consciousness, constants, blood pressure, heart rate, weight, height, body mass index (BMI) or Quetelet index, BMI = Weight / Size<sup>2</sup> (Kg / m<sup>2</sup>), Glycosuria, Acetonuria.

**Table I** Table of reference values used for biological parameters

Parameters	Common values
Fasting blood sugar	0,7 à 1,10g /l
Glycated hemoglobin	< 7%
Total cholesterol	<2 g /l
LDL-cholesterol	Related to the risk level*
HDL-cholesterol	> 0,4 g/l
Triglyceride	< 1,5 g /l
Proteinuria	> 300mg/24 h
microalbuminuria	30-300mg/24h
Urea	0,15 - 0,45g/l
Creatinine	7 - 11 mg/l

The usual basic values of LDL-c were 2.2 g / l with a decrease of 0.3 g / l per added risk factor.

The following table shows the objectives of LDL-c to be achieved depending on the level of risk.

Category Of Risque	Objectives Achieve (in g/l)	LDL-c To
0 FDR	LDL-c < 2,2	
1 FDR	LDL-c < 1,9	
2 FDR	LDL-c < 1,6	
3 FDR	LDL-c < 1,3	
Diabetic with High Cardiovascular Risk	LDL-c < 1	

- Cardiovascular high-risk diabetes: Renal involvement (elevated serum creatinine or proteinuria).

Or at least two of the following risk factors: male 50 years of age or older, female 60 years of age or older, family history of early coronary disease, IDM or sudden death before age 55 in father or first degree relative male or female IDM or sudden death before the age of 65 of a mother or a first-degree female parent, current or stopped smoking for less than 3 years, permanent or untreated high blood pressure, HDL-cholesterol <0.40 g / l (1.0 mmol / l), regardless of sex, microalbuminuria (300 mg / 24 hours). At the end of this examination, patients were classified according to the level of risk: Patients considered to be at high cardiovascular risk including diabetes mellitus that has been evolving for more than 10 years and at least two of the risk factors mentioned above. In this case, the LDL-cholesterol objective is strictly less than 1 g / l.

- Patients considered at low or moderate cardiovascular risk
- Patients with no additional risk factors, lacking signs of microangiopathy and whose diabetes has been evolving for less than 5 years: LDL-cholesterol target <1.9 g / l
- Patients with at most one additional risk factor for diabetes: LDL-cholesterol target <1.6 g / l
- Patients with at least two additional risk factors for diabetes in the last 10 years: LDL-cholesterol <1.3 g / l.
  - Treatment: diabetes and dyslipidemia as well as associated conditions: diet alone, diet and ADO, diet and insulin therapy, statins or fibrates, other treatments.
  - We followed the patients during the hospitalization, and we considered the following parameters: duration of hospitalization, discharge (exeat, exit against medical advice, death).
  - The parameters studied were recorded on a computerized survey form using the SPSS software version 20 (Statistical Package For Social Sciences) Windows. The statistical analysis of the data was carried out using the same software.

**RESULTS**

In our population of 87 patients who met the inclusion criteria, 39 (44.8%) were male and 48 (55.2%) female with sex ratio 1.2 in favor of women.

The age of the population was between 40 - 90 years with mean 65 years.

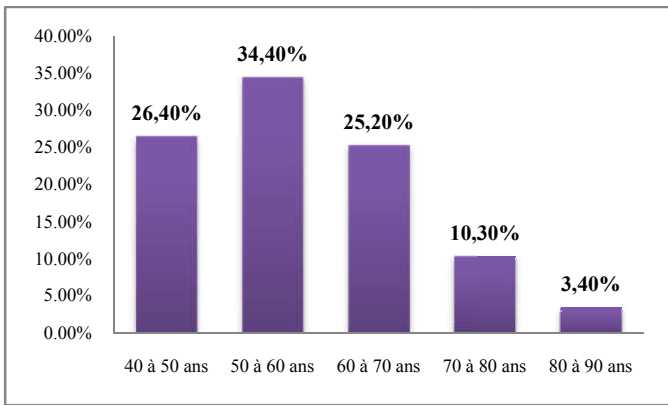


Figure 1 Patient Distribution by Age

**Weight and Body Mass Index**

The weight of patients was 45 - 100 kg with an average of 72, 5kg

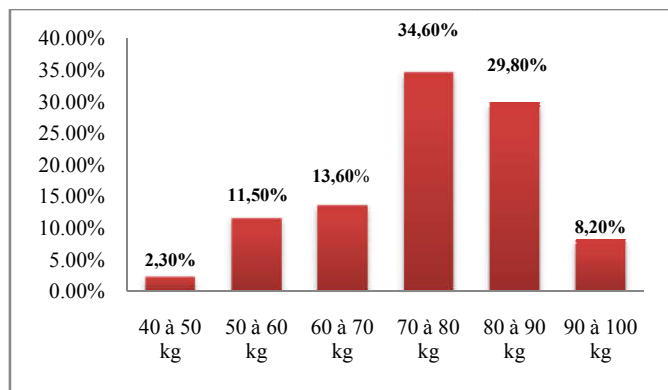


Figure 2 Distribution of Patients by Weight

**The Body Mass Index (BMI)**

BMI was between 15.7 and 39.0 kg / m<sup>2</sup> with an average of 27.35kg / m<sup>2</sup>.

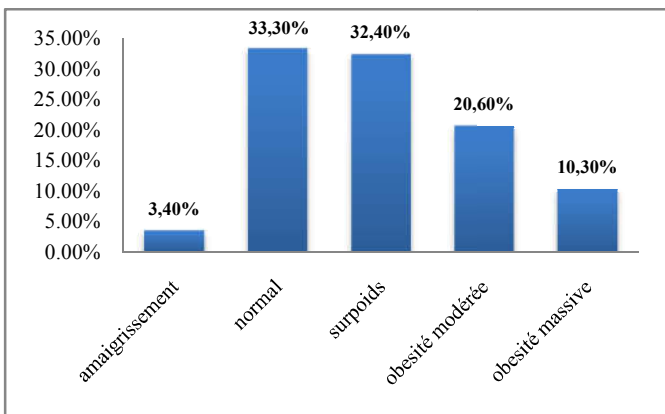


Figure 3 Patient distribution by BMI

Regular physical activity (at least 30 minutes) is only found in 21.8% of our patients.

Family diabetes in 41 patients was approximately 47.2%. Familial dyslipidemia could not be investigated because it is unknown to patients. The majority of patients were white Maures 40 patients, 46% followed by Black Maures 22 patients, 25% followed by Pular with 19 patients, 21%, Wolof 4 patients, 5%, and Soninke 2 patients or 3%.

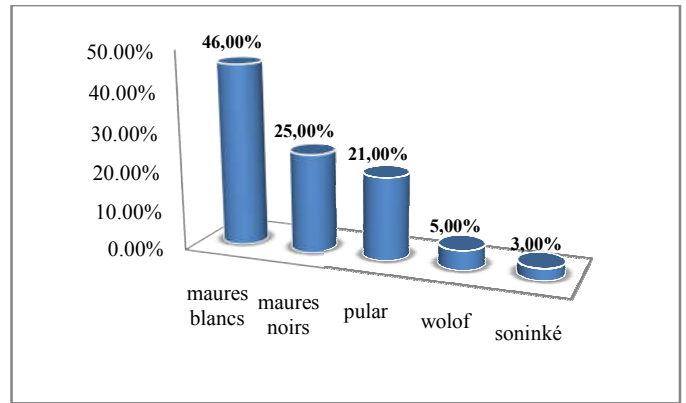


Figure 4 Distribution of Patients by Ethnicity

The illiterate patients numbered 32, that is to say, 37%, the Koranic school, 34% of whom were enrolled. There were 26 patients: 15 at the primary level, 10 at the secondary level, 11% and 1% at the tertiary level.

Sixty-three percent of patients were without a job; by tale 27% of patients performed free work (traders, farmers' breeders ...) and 10% were public servants, ie 9 patients. Half of the patients, 43 cases or 49% were from Nouakchott and Trarza is the second best presented region, with 17 patients, or 19%.

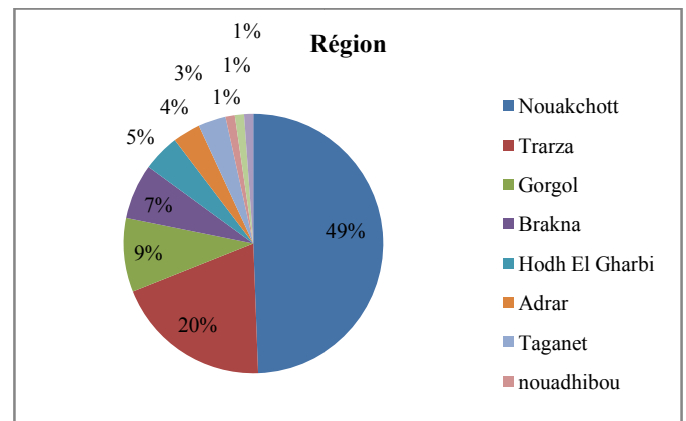


Figure 5 Patient Distribution by Region of Origin

Sixty patients were married, ie 69%, followed by divorced 13 patients, or 15%; then widows 11 patients, ie 12% and singles 3 patients, or 4%. Three-quarters of the patients did not have insurance or medical care and the socio-economic level was low for more than three-quarters.

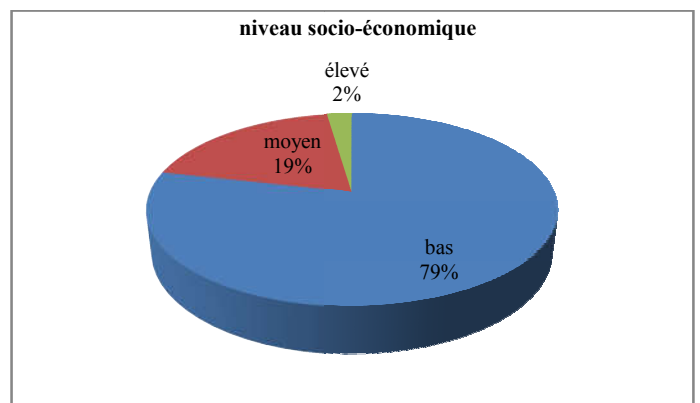


Figure 6 Distribution of Patients by Socio-Economic Level

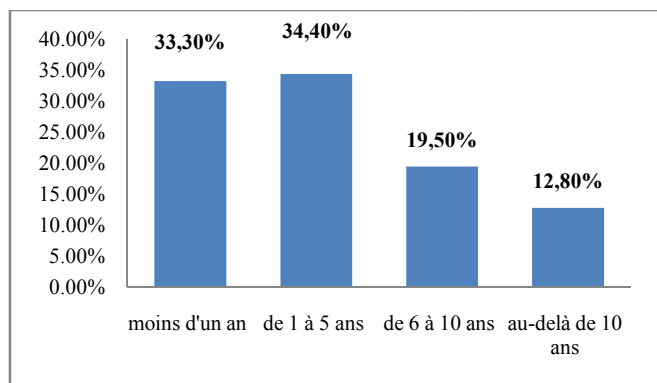


Figure 7 Distribution of Patients by Age of Diabetes

Diabetes had less than 5 years of age in 59 patients (29 less than one year, 30 between 1 and 5 years), between 6 and 10 years, 17 patients, ie 19%, and more than 10 years, 11 patients, or 12%.

Fasting blood glucose was between 0.18 g / l and 7.15 g / l with an average of 3.66 g / l.

20 patients had blood glucose levels between 1.26 - 2 g / l or 22.9%.

46 patients had blood glucose levels > 2 g / l or 52.8%.

It varied between 5.1% and 17.8% with an average of 11.45%.

Analytical study of the risk factors associated with diabetes and dyslipidemia: age and sex; In the male patients 25 patients, ie 64.1% had an age > 50 years and in the female patients 15 patients, 31.2% had an age > 60 years. In total, age represents a risk factor in 40 patients, a frequency of 45.9%.

The concept of early coronary artery disease was found in the history of 17 patients, ie 19.5%.

Among our patients 20 were current smokers or stopped for less than 3 years or about 22.9%, with an average number of pack-years of 6 and extremes of 2 and 10 years. Fourteen patients are known to be hypertensive and under treatment, or approximately 16.1% of our population. A micro albuminuria between 30 and 300 mg / 24h was found in 19 patients, ie 21.8% of our population, and 6 patients had proteinuria > 300 mg / 24h, ie 7.1%. Stroke, in 4 patients of our population is about 0.05%. According to the Cardiovascular Risk our patients were classified into 3 categories:

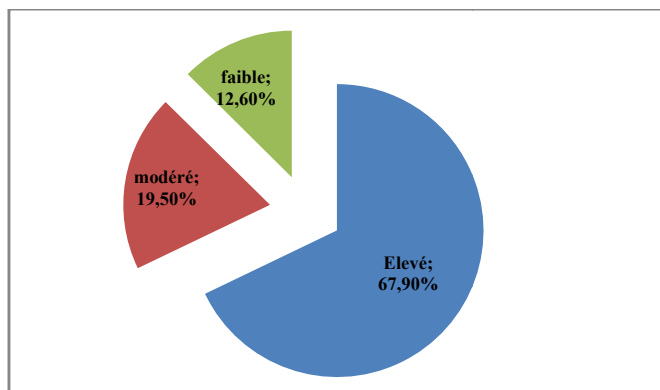


Figure 8 Patient Distribution by Cardiovascular Risk Level

The prevalence of dyslipidemia in our patients is 32.2% ie 28 patients, The mean value of total cholesterol was 1.96 g / l with

extreme values of 0.58 and 3.35 g / l. Hypercholesterolemia (total cholesterol > 2 g / l) was found in 13 patients 14.9 %.

The mean value of hypertriglyceridemia was 2.45 g / l with extremes of 0.56 and 4.35 g / l. Hypertriglyceridemia was observed in 15 patients (17.2%). The mean value of LDL-c was 1.37 g / l, the extremes being 0.20 and 2.54 g / l. An increase in LDL (LDL-c > 1.10 g / l) was found in 17 patients (19.5%). Average HDL-c was 0.40 g / l with extremes of 0, 10 and 0.70 g / l. The rate of HDL-c was decreased in 55 patients (63.2%). The classification of the dyslipidemias made it possible to find within this population three large lipid profiles and they concerned 28 patients or 35.9%: Pure hypercholesterolemia, patients with high LDL-c levels, with HDL and triglycerides being normal, in 8 patients, ie 28.5%. A high rate of TG associated or not with low HDL, in 15 patients; or 53.6%. Mixed dyslipidemias, LDL-c and high triglyceride levels, associated or not with low HDL levels, involved 5 patients (17.9%).

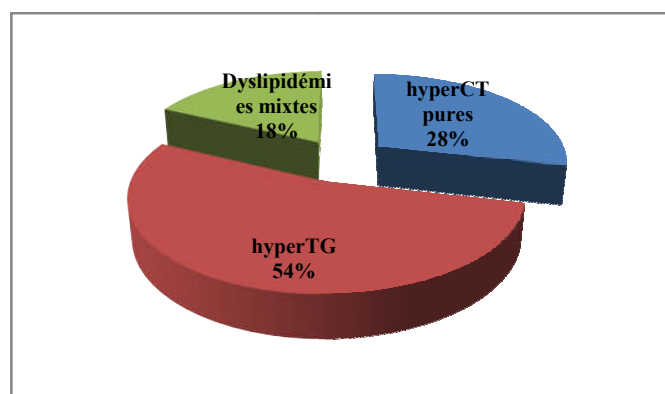


Figure 9 Distribution of dyslipidemic patients according to the profile found

The majority of the population with dyslipidemia was female with a sex ratio of 1.60% in favor of women, 17 female and 11 male. The age group 50-60 was the best represented. This group alone accounted for 16 patients, ie 57.2%; followed by the 60-70 age group with 6 patients, ie 21%. In hypertensive patients, 8 were dyslipidemic, ie 57.6%. Diabetes had been evolving in the majority of patients for 1 to 5 years, and 10 of them had dyslipidemia (33.2%). Cardiovascular disease:

Among the population with dyslipidemia, 7 patients had cardiovascular disease:

- Heart failure in 3 patients
- A history of stroke in 4 patients

Among this dyslipidemic population 3 have diabetic retinopathy and 10 have renal insufficiency

## DISCUSSION

The average age of our patients was 65 years with extremes of 40 and 90 years. The age group of 50-60 years was the best represented, according to the study carried out, by Aminata DIACK in Dakar 2007 on a series of 318 patients average age found 62.5 years (2). Indeed, Chaowalit *et al.* in a series of 3014 patients had an average age of 75 years (3); while Sozzi FB *et al* in Rotterdam (the Netherlands) had an average age of 67 years (4). These studies included diabetics who were at least 18 years old for the first and 50 years for the second. The finding is that the average age found in our study is lower than

that of the two European authors. The fact that life expectancy in Africa is lower than that of Europeans could explain this difference. Women were the most represented 55.2% with a sex ratio (F / H) of 1.2. Dembele in Mali found similar results in 112 diabetics hospitalized in Bamako with a female prevalence of 63.39% (5). The proportion of women in our study is also higher than that found by Sozzi *et al* in Rotterdam (Netherlands), which was 36% (4).

This female predominance can be explained by a recruitment bias because, in Mauritania, women attend more health facilities than men. 50% of our patients came from Nouakchott. This high prevalence can also be explained by recruitment bias and the lack of development of health facilities in remote areas of Nouakchott.

The mean venous blood glucose was 3.66 g / l. The average glycated hemoglobin was 11.45%. The analysis of these data shows that our patients were not well balanced in terms of glycemia. This is especially true given that 26 patients had acetonuria, ie 29.8%.

All patients required insulin therapy at admission due to the importance of their imbalance. This may be related to diet variance, poor adherence to treatment, ignorance of patients, lack of resources or poor follow-up of patients.

The mean duration of diabetes in our study was 14 years. Several cross-sectional studies of the circumstances of onset of diabetes and its clinical forms have shown that the onset of the disease was estimated to average 10 years before the disease was discovered (2, 5, 6, 21, 22, 23). Age represented a risk factor in 40 patients of our population (45.9%). In our study, men (62.5%) were more likely to report this factor than women (37.5%).

Heredity was of equal representation in both sexes. HTA was found in 16% of our patients. In the literature, hypertension is commonly associated with diabetes (7). This agrees well with our results. The fact that HTA occurs most often with age and age of diabetes could explain its frequency in our study where age was greater than or equal to 40 years and the average duration of diabetes evolution equaled 14 years. The overall prevalence of dyslipidemia in our population was 32.1% with three essential profiles. Hypertriglyceridemia was the most frequent (53.6%) followed by pure hypercholesterolemia (28.5%), and mixed dyslipidemia found in the last position with 17.9%. Our findings on prevalence are lower than those observed in the study of Yaméogo NV (8) (in-depth study in physiology at Cheikh Anta Diop University) with (44.90%) and in the study by Lokrou A *et al* in a series of 132 patients in Côte d'Ivoire, which reported 47.4% (9). In the series of hypertriglyceridaemia, hypertriglyceridaemia was also the best represented (37.5%), followed closely by hypercholesterolemia (33.3%).

These results are consistent with those reported in the literature (10, 11, 12). The prospective study of Framingham showed a predominance of hypertriglyceridemia in the diabetic population (13). Dyslipidemias were more pronounced in the 50-60 age group, with no significant differences between the two sexes. In our study, most patients with dyslipidemia were overweight (78.5%), with a significant difference which agrees given the role of lipids in the genesis of obesity. Lokrou A in

Ivory Coast found him obese in 31.7% of patients (9). Cardiovascular: was the most affected with 23 patients (26.4%). In the literature, atherosclerosis is estimated to contribute nearly 65% to diabetic mortality: -40% are related to coronary artery disease,

- 15% related to cardiovascular diseases
- 10% to stroke

In other words, these macro-vascular complications constitute the first three pathologies suffered by patients with type 2 diabetes (10, 11). Impairment of other organs; it was dominated by that of the kidney with 19 patients (21.8%). Renal involvement in diabetes is well known (12, 14, 15, 16, and 17) and is a frequent complication, but there are other more important factors, namely hypertension, and glycemic imbalance). In addition, another microangiopathic complication was found in our patients; retinopathy was found in 3.4% of patients. Less frequent compared to the literature (12, 19, 20). This retinopathy could also be related to the age of diabetes.

## CONCLUSION

The association of dyslipidemia and diabetes is very common and greatly increases cardiovascular risk. Type II diabetes has become a public health problem. This is related to its frequency (90% of diabetics), its clinical latency, but also to its formidable cardiovascular complications which contribute to increase the morbidity and mortality of the disease. These cardiovascular complications are caused by a macro-angiopathy. This is the consequence of early atherosclerosis, characteristic of diabetic disease. Lipid abnormalities are recognized as important risk factors in the formation of atheroma plaque. There are factors specific to diabetic disease that contribute to the development of dyslipidemia

## Recommendations

At the end of our study, we can see that dyslipidemia is frequent in type II diabetics in Mauritania. This dyslipidemia must be detected early because the prevention of accelerated atherosclerosis in diabetics inevitably involves an early, correct and adapted management of lipid abnormalities and other cardiovascular risk factors.

In order to improve the management of diabetics and reduce the incidence of cardiovascular events, we propose some recommendations:

- Assessment of overall cardiovascular risk prior to preventive management. The objective is to adapt this management to the level of risk of each individual.]
- The systematic realization of a lipid balance following the discovery of diabetes.]
- The improvement of therapeutic education, which should focus more on the prevention of cardiovascular risk factors and their pathological impact]
- Management of dyslipidemic patients.]
- In the case of dyslipidemia, strict monitoring of diet and physical activity is necessary, and lipid-lowering agents should be readily available.

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