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Lipid Profile of Type 2 Diabetic Patients at Sylvanus Olympio University Hospital in Lome

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Abstract

Introduction: Dyslipidemia is a significant cardiovascular risk factor in patients with type 2 diabetes. The objective of this study was to determine the prevalence of dyslipidemia among type 2 diabetics at the Sylvanus Olympio University Hospital in Lome and establish their lipid profile. **Methods:** A cross-sectional, descriptive study conducted over a 12-month period (July 1, 2022, to June 30, 2023) among type 2 diabetic patients seen in internal medicine consultations at the Military Medical-Surgical Clinic of the Sylvanus Olympio University Hospital in Lome. The data studied were demographic data and lipid profiles. **Results:** A total of one hundred and thirty-one patients were included, with a female predominance (59.54%). The mean age was 58.72 years (39 - 85 years). The mean blood glucose level was 1.97 g/l (0.65 - 4.50 g/l) and the mean glycated hemoglobin was 9.07% (5% - 15.1%). Dyslipidemia was found in 89 patients (67.94%). Low HDL cholesterol was predominant (39.69%), followed by hypertriglyceridemia (27.48%). High LDL cholesterol was found in 20.61% of cases and mixed dyslipidemia in 16.03%. The other cardiovascular risk factors identified were: hypertension (73.28%), obesity (29.01%), alcohol consumption (25.19%), and physical inactivity (12.21%). **Conclusion:** Dyslipidemia is frequent in our type 2 diabetic patients, predominantly characterized by low HDL cholesterol and hypertriglyceridemia.

Keywords

Dyslipidemia, Type 2 Diabetes, Togo

1. Introduction

Diabetes is a chronic condition that affects an increasing number of people worldwide. In 2024, according to the International Diabetes Federation, about 590 million adults worldwide were living with diabetes. This figure is projected to rise to 853 million by 2050, with more than four out of five adults with diabetes residing in low- and middle-income countries [1]. Diabetes is associated with a significantly increased risk of premature atherosclerosis, especially coronary artery disease and peripheral arterial disease [2] [3]. Dyslipidemia is frequently observed in patients with diabetes [4]. There is an association between atherosclerotic cardiovascular disease and serum cholesterol and triglyceride levels in patients with both type 1 and type 2 diabetes [5] [6]. Type 2 diabetic dyslipidemia is characterized by both quantitative and qualitative abnormalities of lipoproteins, typically including a moderate hypertriglyceridemia, a variable decrease in HDL cholesterol (HDL-C) levels, and an accumulation of cholesterol-enriched remnant lipoproteins. The level of LDL cholesterol (LDL-C) is not substantially different from that observed in the general population; however, LDL particles are particularly atherogenic due to qualitative modifications, notably the presence of an excess of small, dense LDL and glycation of apolipoprotein B within LDL particles. These qualitative modifications of LDL increase their susceptibility to oxidation, reduce their plasma clearance, and enhance their retention within the arterial wall, thereby contributing to an elevated risk of cardiovascular disease, particularly in patients with type 2 diabetes [7]. Very few studies have been conducted on dyslipidemia in diabetic patients in Togo. We conducted this study with the objective of determining the prevalence of dyslipidemia and establishing the lipid profile in type 2 diabetic patients at the Sylvanus Olympio University Hospital in Lome.

2. Materials and Methods

A cross-sectional descriptive study was conducted over a 12-month period, from July 1, 2022 to June 30, 2023, involving patients with type 2 diabetes (T2D) who attended internal medicine consultations at the Military Medical-Surgical Clinic of the Sylvanus Olympio University Hospital in Lome. All patients with type 2 diabetes, irrespective of sex, who underwent lipid profile testing and who voluntarily consented to participate in the study were included.

The variables studied included: age, sex, weight, height, body mass index (BMI), family history of diabetes, duration of diabetes, cardiovascular risk factors associated with diabetes, and biological tests (blood glucose, glycated hemoglobin, and lipid profile).

Body mass index (BMI) was calculated using the Quetelet formula. The World Health Organisation classification was used, and patients were considered to have grade 1 (moderate) obesity if the BMI was between 30.0 and 34.99 kg/m^2, grade 2 (severe) obesity if the BMI was between 35.0 and 39.99 kg/m^2, and grade 3 (morbid) obesity if the BMI was ≥40.0 kg/m^2.

Dyslipidemia was defined as a serum triglyceride level greater than 1.5 g/L, and/or

a high-density lipoprotein cholesterol (HDL-C) level below 0.40 g/L in men and 0.50 g/L in women, and/or a low-density lipoprotein cholesterol (LDL-C) level greater than 1.5 g/L. Diabetes control was evaluated based on glycated hemoglobin. Diabetes was considered controlled if glycated hemoglobin (HbA1c) was ≤7%, and uncontrolled if HbA1c was >7%.

The collected data were analyzed and processed using Epi Info 7.2.6.0 statistical software. Quantitative variables were expressed as means, and qualitative variables as numbers and percentages. The results were tested using the chi-square test. Any difference of less than 0.05 was considered statistically significant.

Free and informed consent was obtained from patients prior to their inclusion in the study. They were assured that refusal to participate in the study would not negatively impact their medical care or follow-up in the department. Each patient's data was collected anonymously and handled with complete confidentiality.

3. Results

General characteristics of the study population

A total of 131 patients with type 2 diabetes were enrolled in the study. The majority were female (59.54%) with a sex ratio of 1.47. The mean age was 58.72 ± 9.94 years (range: 39 - 85 years). The majority of patients were over 50 years of age (74.04%), and 81.68% had diabetes for more than 5 years. A family history of diabetes was reported in more than half of the patients (57.25%). The mean BMI was 27.82 ± 4.18 kg/m^2 (range: 16.42 - 40.89 kg/m^2). The mean blood glucose was 1.97 ± 0.90 g/L (range: 0.65 - 4.50 g/L). The mean glycated hemoglobin (HbA1c) was 9.07% ± 2.47 (range: 5% - 15.1%) (Table 1). Diabetes was uncontrolled in the majority of patients (70.99%). Cardiovascular risk factors associated with diabetes were dominated by hypertension (73.28%) (Table 2).

Lipid profile of patients

Eighty-nine diabetic patients (67.94%) had at least one form of dyslipidemia. It was predominantly low HDL-cholesterol (39.69%), followed by isolated hypertriglyceridemia (27.48%) (Table 3). Dyslipidemia was more frequent in women

Table 1. General characteristics of patients with type 2 diabetes (n = 131).

	Overall population	Male	Female	p-value
Sample size	131	53	78	
Mean age (years)	58.72 (9.94)	59.51(10.75)	58.18 (9.39)	0.45
Mean BMI (kg/m^2)	27.82 (4.18)	27.17 (3.82)	28.28 (4.38)	0.17
Mean blood glucose (g/L)	1.97 (0.90)	2.16 (1.00)	1.84 (0.80)	0.04
Mean HbA1c (%)	9.07 (2.47)	9.70 (2.69)	8.64 (2.23)	0.01
Family history of diabetes	75	29	46	0.63

BMI: Body mass index. Values in parentheses represent standard deviations (SD).

Table 2. Cardiovascular risk factors associated with diabetes according to sex.

	Overall population	Male (%)	Female (%)	p-value
Hypertension	96	37 (38.54)	59 (61.46)	0.46
Obesity	38	11 (28.95)	27 (71.05)	0.08
Alcohol consumption	33	21 (63.64)	12 (36.36)	0.002
Physical inactivity	16	2 (12.50)	14 (87.50)	0.02

(59.56%), but the difference was not statistically significant ($p > 0.59$). The mean HDL-cholesterol level was 0.51 g/L ± 0.16 (range: 0.14 - 0.97 g/L), the mean LDL-cholesterol level was 1.23 g/L ± 0.47 (range: 0.27 - 2.55 g/L), and the mean triglyceride level was 1.28 g/L ± 0.70 (range: 0.39 - 5.39 g/L). No significant correlation was found between dyslipidemia and age (p-value = 0.5), diabetes duration (p-value = 0.4), glycemic control (p-value = 0.05), or history of hypertension (p-value = 0.07).

Table 3. Lipid profile of type 2 diabetic patients according to sex.

Type of dyslipidemia	Overall population (%)	Male (%)	Female (%)	p-value
Low HDL-cholesterol	52 (39.69)	21 (40.38)	31 (59.62)	0.99
Hypertriglyceridemia	36 (27.48)	13 (36.11)	23 (63.89)	0.53
High LDL-cholesterol	27 (20.61)	13 (48.15)	14 (51.85)	0.36
Mixed dyslipidemia	21 (16.03)	8 (38.10)	13 (61.90)	0.81

4. Discussion

We conducted a cross-sectional, descriptive study to determine the prevalence of dyslipidemia and to establish the lipid profile of patients with type 2 diabetes in a hospital environment. Eighty-nine diabetic patients (67.94%) had at least one form of dyslipidemia, with a female predominance (59.56%). The prevalence of dyslipidemia among patients with type 2 diabetes varies across studies but remains generally high. Kerekou *et al.* in Benin reported a prevalence of 59.37%, with a female predominance [8]; Mbaye *et al.* in Senegal reported 43.10% [9]; Trabelsi *et al.* in Tunisia found 79.00% [10]; and Sawadogo *et al.* in Burkina Faso reported 78.72% [11]. Furthermore, a national cross-sectional study based on a medical record audit of 2473 Canadian men and women with type 2 diabetes found that dyslipidemia was present in 55% of cases diagnosed within the previous two years. This percentage increased to 66% among individuals who had been living with diabetes for 15 years or more [12]. The high prevalence of dyslipidemia among patients with type 2 diabetes can be explained by several factors. First, type 2 diabetes frequently coexists with other conditions such as hypertension and obesity, which are themselves recognized risk factors for dyslipidemia. Given the high prevalence of hypertension (60.8%) [13], overweight, and obesity [14] among individ-

uals with type 2 diabetes in Africa, it is plausible that the accumulation of these metabolic abnormalities may further exacerbate the risk of dyslipidemia in this population. Moreover, studies conducted in Africa have reported a high consumption of processed foods rich in saturated fats, along with the adoption of a sedentary lifestyle [15], both of which are well-established contributing factors to dyslipidemia. A lack of awareness regarding dyslipidemia has been reported in the African population [16]. This lack of awareness may lead to underdiagnosis and inadequate care of dyslipidemia in individuals with type 2 diabetes in Africa.

In our study, dyslipidemia was predominantly characterized by low HDL-cholesterol levels (39.69%), followed by isolated hypertriglyceridemia (27.48%). High LDL-cholesterol accounted for 20.61%, while mixed dyslipidemia represented 16.03% of dyslipidemia cases. The lipid profile observed in our patients is not unexpected. Dyslipidemia in type 2 diabetes encompasses several quantitative, qualitative, and functional abnormalities of lipoproteins, each of which is particularly atherogenic [17]. Type 2 diabetes is not often associated with high total cholesterol or LDL-cholesterol (LDL-C) levels. However, it is frequently characterized by high triglyceride levels and low HDL-cholesterol (HDL-C) concentrations, as observed in our study [18] [19]. Insulin resistance appears to play a major role in the pathophysiology of lipoprotein metabolism abnormalities observed in type 2 diabetes [7] [20] [21]. Hypertriglyceridemia, which is particularly common in patients with type 2 diabetes mellitus (T2D), is primarily due to an increased concentration of very-low-density lipoproteins (VLDL), mainly large VLDL particles ($VLDL_1$), and, to a lesser extent, intermediate-density lipoproteins (IDL) [7] [17]. The reduction of HDL-C is associated with an increase in its catabolism, partly promoted by an increase in hepatic lipase activity, an enzyme involved in HDL catabolism [22]. HDL in patients with type 2 diabetes is dysfunctional and has lost its anti-atherogenic properties [17]. The antioxidant properties of HDL are reduced in type 2 diabetes. This appears to be a consequence of hyperglycemia and the triglyceride enrichment of HDL. Furthermore, HDL in patients with type 2 diabetes has lost its endothelium-dependent vasodilatory effect, as well as its ability to activate endothelial nitric oxide synthase [23] [24]. Although plasma LDL-cholesterol (LDL-C) levels are usually normal in type 2 diabetes, significant alterations in LDL metabolism have been observed [25]. Thus, despite normal plasma levels, LDL in diabetic patients exhibits a slower catabolism, that is, an increased plasma residence time, which may render them more atherogenic [26]. Another important qualitative change observed in the patient with type 2 diabetes is an increase in oxidized LDL. These are particularly atherogenic as they promote monocyte chemotaxis, the endothelial production of adhesion molecules such as ICAM-1 (InterCellular Adhesion Molecule-1), and the release of cytokines (tumor necrosis factor [TNF]-α, interleukin [IL]-1, etc.) by macrophages, thereby sustaining the inflammatory reaction that favors the development of atherosclerosis [27]. Several recent data suggest that certain adipokines, particularly adiponectin and retinol-binding protein 4 (RBP4), may play a direct role in the pathophysiology of dyslipidemia asso-

ciated with type 2 diabetes (T2D). In T2D and metabolic syndrome, a significant decrease in plasma adiponectin levels has been observed. There is a strong association between plasma adiponectin concentrations and lipid levels [17] [28].

The correlation between dyslipidemia and glycemic control was borderline ($p = 0.05$). This borderline result could be explained by the small sample size, which reduces statistical power.

Limitations of our study

The single-center nature of the study limits the extrapolation of the results. Furthermore, it is a cross-sectional study, which does not allow for the establishment of causal links.

5. Conclusion

Dyslipidemia is common in patients with type 2 diabetes. It is predominantly characterized by low HDL-cholesterolemia and hypertriglyceridemia. Screening for dyslipidemia in diabetic patients should be systematic. The direct involvement of dyslipidemia in the increased cardiovascular risk represents a major challenge in the care of type 2 diabetes. Diabetes was poorly controlled in the majority of patients. Given the results, it is important to intensify antidiabetic treatment in these patients to prevent complications. Cardiovascular risk factors associated with diabetes were dominated by hypertension.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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