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Cardiovascular Risk and Physical Activity Score in Type II Diabetic Patients: The Case of Laquintinie Hospital in Douala (Cameroon)

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ABSTRACT

Diabetes is a major risk factor for cardiovascular disease (CVD). When combined with other risk factors such as obesity, high blood pressure, and dyslipidemia, it increases the risk of cardiovascular disease. This study evaluated the effect of physical activity on cardiovascular risk in patients with type 2 diabetes at Laquintinie Hospital in Douala. A total of 149 patients with type 2 diabetes who visited the endocrinology department at Laquintinie Hospital in Douala were enrolled in this study. They completed a questionnaire regarding their sociodemographic characteristics, family history, and physical activity levels. Anthropometric parameters (body weight, waist circumference, height) and blood pressure (systolic and diastolic) were measured, and several laboratory tests (blood glucose and lipid profile) were performed on an empty stomach for each patient. The mean age was 60 ± 12 years. The male-to-female ratio was 0.71. The cardiovascular risk factors associated with diabetes identified were primarily alcohol consumption (49.7%), physical inactivity (47%), hypertension (43%), and hypercholesterolemia (39.1%). The average duration of diabetes was 7.8 ± 6.4 years. Patients had hyperglycemia in 77% of cases. In this study, 48.0% of diabetic patients had a high cardiovascular risk ($\geq 20\%$). This cardiovascular risk was significantly higher in women compared to men ($p=0.048$) and in patients over 60 years of age compared to those under 60 ($p=0.001$). The latter group also had the highest prevalence of low physical activity levels ($p < 0.001$). Participants engaging in moderate-intensity PA had a lower cardiovascular risk compared to those engaging in high- and low-intensity PA (40.0% versus 56.0% and 48.8%, respectively). Cardiovascular risk remains high among older patients, particularly those who are sedentary and have low levels of physical activity.

Keywords: non communicable diseases; sedentarily; hospital; Douala; Cameroon

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INTRODUCTION

Noncommunicable diseases (NCDs) such as cardiovascular diseases (CVDs), cancers, diabetes, and respiratory diseases remain the leading causes of death worldwide, accounting for 74% of all deaths¹. Among these conditions, diabetes—characterized by hyperglycemia, with a global prevalence of 6.8% in 2021—has attracted significant attention and interest in recent years². In sub-Saharan Africa, the prevalence of diabetes among adults (aged 20–79) according to the International Diabetes Federation (IDF) is rising at an alarming rate, from 4.2%—affecting 25 million people—in 2024 to a projected 5% by 2050³. In this context, type 2 diabetes (T2D), among other types of diabetes, is the most common metabolic disorder worldwide and remains one of the leading cardiovascular risk factors in Africa³. In Cameroon, the prevalence of diabetes has risen sharply, ranging from 5.8% to 7.1% for prediabetes⁴. However, this figure is significantly higher than on other continents^{5,6}. However, according to the World Health Organization (WHO), this figure hovered around 7%⁷. Numerous studies have shown that cardiovascular mortality among patients with type 2 diabetes is twice as high as in the non-diabetic population^{8,9,10,11}. Obesity, hypertension and dyslipidaemia are not only very common in diabetic patients but also exacerbate all the vascular complications of diabetes^{12,13}. Consequently, regular physical activity has long been recommended for people with diabetes. Regular exercise can improve insulin sensitivity, lower blood pressure, increase HDL cholesterol levels, reduce triglyceride levels, promote weight loss, and improve weight maintenance^{14,15}, as well as reduce the risk of metabolic syndrome¹⁶ and type 2 diabetes^{17,18,19,20}. Given the need to reduce the incidence of complications and improve the management of diabetic patients, a study was conducted to assess cardiovascular risk and levels of physical activity (PA) among patients with type 2 diabetes attending Laquintinie Hospital in Douala, Cameroon. In order to reduce the potentially life-threatening cardiovascular risk faced by people with diabetes, a study was conducted to assess the actual level of physical activity among this group

MATERIALS AND METHOD

Context and types of study

A prospective, cross-sectional, analytical study was conducted between December 2021 and May 2022 in the Endocrinology Department at Laquintinie Hospital in Douala, involving patients with type 2 diabetes. The study included patients with type 2 diabetes being treated in the medical department; pregnant women and those who refused to participate in the study were excluded.

Data collection

A questionnaire was used to collect personal and sociodemographic details, as well as personal medical history, in the first section. The second section covered clinical data (duration of diabetes, hypertension, obesity, body mass index and complications) and laboratory results (blood glucose levels and lipid profile). A blood glucose level of over 1.26 g/l, as measured by a ONE TOUCH Verio glucose meter (Zug, Switzerland), was considered high. The PENTRA400 analyser classified cholesterol levels as normal if total cholesterol was less than 2 g/L, HDL cholesterol was greater than 0.40 g/L, LDL cholesterol was less than or equal to 1.6 g/L, and triglycerides were less than 1.3 g/L.²¹

Level of physical activity

The short International Physical Activity Questionnaire) (IPAQ)²² was used to assess the level of physical activity and walking during the 7 days prior to the questionnaire.

The metabolic equivalents per minute per week for each participant were calculated using the formula: Total Metabolic Equivalents per Minute per Week = Walking ($3.3 \times$ number of minutes per day \times number of days per week) + moderate-intensity activity ($4 \times$ number of minutes per day) + high-intensity activity ($8 \times$ number of minutes per day \times number of days per week).

Cardiovascular risk score

This risk was assessed using the Framingham equation²³, which took into account gender, age, total cholesterol, HDL cholesterol, blood pressure, BMI, smoking status and diabetes²⁴. The risk was classified as low when the 10-year risk of death from coronary heart disease was less than 10%, moderate when it was between 10% and 20%, and high when it was greater than 20%.

Data analysis

The analyses were carried out using the Statistical Package for the Social Sciences (SPSS Inc., Chicago, Illinois, USA) v.20.0. Qualitative variables were presented as percentages (%). Quantitative variables are presented as mean \pm standard deviation (SD). Quantitative variables were compared using a student's t-test and ANOVA, whilst the chi-square test was used to investigate associations between qualitative variables. Spearman's correlation test was used to assess the correlation between anthropometric parameters, cardiometabolic parameters, body mass index and energy expenditure. A significance level of $p < 0.05$ was used.

Ethics and professional conduct

Ethical approval and administrative authorisation were granted by the Institutional Ethics Committee for Human Health Research at the University of Douala (No. 2969 CEI-UDo/03/2022/M) and by the management of Laquintinie Hospital in Douala, respectively.

Participants were provided with an informed consent form and a background questionnaire to accompany the physical activity questionnaire. Blood samples were taken in strict confidence and on an anonymous basis.

RESULTS AND DISUCSSION

A total of 149 diabetic patients took part in this study, comprising 87 women and 62 men, giving a male-to-female ratio of 0.71.

Table I: General characteristics of the participants.

Settings	Terms	n (%)
Sex	Women	87(58.4)
	Men	62(41.6)
Occupation	Driver	6(4.0)
	Unemployed	3(2.0)
	Shopkeeper	16(10.7)
	Cultivator	2(1.3)
	Electrical technician	2(1.3)
	Teacher	6(4.0)
	Mechanic	2(1.3)
	Housewife	41(27.5)
	Retired	37(24.8)
	Technician	2(1.3)
	Family History	
Personal History of Hypertension	Diabetes	91(61.1)
	High blood pressure	54(36.2)
	Obesity	14(9.4)
	General	64(43)
Alcohol	Women	37(42.5)
	Men	27(43.5)
Tobacco		74(49.7)
		25(16.8)

n = staff % = percentage

Nearly 70% of participants had a family history of diabetes (61.1%). Furthermore, nearly half of the participants consumed alcohol (49.7%), compared with 16.8% who smoked.

Table II: Distribution of risk factors within the sample by gender and age group.

	General (%)	Women (%)	Men (%)	p value	< 60 years (%)	≥ 60 years (%)	p value
Diabetes Hist	91(61.1)	53(61.6)	38(60.3)	0.871	40(63,5)	49(58.3)	0.527
HTA Hist	54(36.2)	34(39.5)	20(31.7)	0.329	25(39,7)	28(33.3)	0.428
Obesity Hist	14(9.4)	8(9.2)	6(9.7)	0.963	8(12,7)	6(7.1)	0.256
Alcohol	73(49.0)	42(48.8)	31(59.2)	0.964	32(50,8)	40(47.2)	0.703
Tobacco	25(16.9)	15(17.4)	10(16.1)	0.833	10(15,9)	14(16.9)	0.872
High W C	92(69.7)	66(86.7)	26(46.4)	< 0.001	39(68,4)	52(70.3)	0.82
Overweight	54(38.3)	27(33.8)	27(44.3)	0.128	24(38,7)	29(37.2)	0.52
Obesity	46(32.6)	32(40.0)	14(23.0)	0.128	22(35,5)	24(30.8)	0.52
SBP ≥ 140	80(58.4)	50(62.5)	30(52.6)	0.248	21(38,1)	58(71.6)	< 0.001
DBP ≥ 90	51(37.2)	34(42.5)	17(29.8)	0.13	14(25,5)	36(44.4)	0.024
BGL ≥ 1,26	115(77.7)	65(76.5)	50(79.4)	0.676	50(80,6)	63(75.0)	0.42

HDL < 0,40	32(27.8)	22(33.8)	10(20.0)	0.1	19(35,8)	13(21.3)	0.085
LDL ≥ 1,60	28(24.3)	19(29.2)	9(18.0)	0.164	15(28,3)	13(21.3)	0.387
TRG ≥ 1,5	17(14.8)	8(12.3)	9(18.0)	0,394	8(15,1)	9(14.8)	0.959
TC ≥ 2	45(39.1)	31(47.7)	14(28.0)	0.032	21(39,6)	24(39.3)	0.976
Sedentary	70(47.0)	40(46.5)	30(47.6)	0.952	26(41,3)	43(51.2)	0.173

HTA = Hypertension, Hist = History, High W C = High Waist Circumference, SBP= Systolic Blood Pressure, DBP = Diastolic Blood Pressure, BGL =Blood Glucose Level, HDL =High density lipoprotein, LDL =Low density lipoprotein, TRG =Triglycerides, TC = Total Cholesterol

Blood glucose levels above 1.26 g/l (77.7%), a large waist circumference (69.7%) and a history of diabetes (61.1%) were the most common findings. Furthermore, systolic blood pressure ($p < 0.001$) and central blood pressure ($p = 0.032$) varied significantly by gender, whilst systolic blood pressure ($p < 0.001$) and diastolic blood pressure ($p = 0.024$) varied across age groups.

Concerning about average 10-year risk of developing CVD by gender and age group, furthermore 48% of participants were at high risk of cardiovascular disease, and so that women and patients over 60 years had a higher risk of developing CVD respectively 24.9% and 29.4%, with a significant difference observed between the age groups ($p < 0.001$).

Table III: Association between energy expenditure and anthropometric and cardiometabolic parameters in all participants

Settings	General		Women		Men		<60 years		≥ 60 years	
	R	p	R	p	R	p	r	p	r	P
Year	0,002	0,983	0,029	0,799	-0,045	0,739	-0,130	0,325	-0,196	0,086
Height (m)	-0,014	0,867	0,026	0,818	-0,116	0,398	-0,075	0,574	0,032	0,782
Mass (Kg)	-0,048	0,582	-0,055	0,633	-0,033	0,807	-0,077	0,563	-0,023	0,848
BMI (Kg/m ²)	-0,045	0,611	-0,066	0,568	0,007	0,959	-0,058	0,663	-0,032	0,782
W C (cm)	-0,006	0,944	-0,010	0,932	-0,001	0,996	0,065	0,646	-0,021	0,865
CF (bpm)	-0,074	0,406	-0,111	0,343	-0,026	0,857	-0,010	0,945	-0,113	0,334
SBP (mmHg)	0,099	0,265	0,179	0,123	-0,081	0,567	0,006	0,968	0,095	0,413
DBP (mmHg)	0,093	0,296	0,158	0,172	-0,047	0,738	0,057	0,690	0,086	0,461
BGL (g/l)	-0,081	0,345	-0,055	0,623	-0,142	0,292	-0,004	0,977	-0,110	0,332
HDL (g/l)	-0,001	0,994	-0,137	0,281	0,344*	0,021	0,165	0,252	-0,071	0,595
LDL (g/l)	-0,003	0,977	0,075	0,558	-0,237	0,117	-0,229	0,110	0,089	0,500
TRG (g/l)	-0,022	0,824	-0,155	0,220	0,343*	0,021	0,085	0,555	-0,052	0,696
CT (g/l)	0,144	0,135	0,207	0,101	-0,053	0,729	-0,189	0,190	0,289*	0,026

BMI = Body Mass Index, WC= Waist Circumference, CF = Cardiac Frequency, bpm= bitt per minute, SBP=Systolic Blood Pressure, DBP =Diastolic Blood Pressure, BGL =Blood Glucose Level, HDL =High density lipoprotein, LDL =Low density lipoprotein, TRG =Triglycerides, TC = Total Cholesterol,

HDL cholesterol levels ($p=0.021$; $r=0.344$) and triglyceride levels ($p=0.021$; $r=0.343$) were correlated with energy expenditure in men. The same was true of total cholesterol ($p=0.026$; $r=0.289$) in those aged over 60 (Table III).

Less than half of the sample had low levels of physical activity (47%). No association was found between gender and level of physical activity ($p>0.05$).

More than 40% of participants were at high cardiovascular risk and no significant differences were observed.

DISCUSSION

Type 2 diabetes is a recognised major cardiovascular risk factor with a significant impact on the adult population²⁵. Our study reported findings indicating a high cardiovascular risk among our patients.

The cardiovascular risk factors associated with diabetes that were identified were primarily alcohol consumption (49.7%), a sedentary lifestyle (47%), hypertension (43%), high cholesterol (39.1%), being overweight (38.3%), obesity (32.6%) and smoking (16.8%).

Furthermore, these various risk factors revealed, through the Framingham model (2008)²⁴, that 48% of diabetic patients had a high cardiovascular risk ($\geq 20\%$), whilst 23.5% of subjects had a moderate risk (10–20%) and 28.6% a low risk ($< 10\%$).

These results are similar to those obtained by Konaté & al. (2022)²⁵, who reported a similar distribution of cardiovascular risk factors.

However, the proportion of sedentary individuals was higher (58.5%) than in our study, and the rate of cardiovascular risk (33%) was lower than in our findings (48%). Nevertheless, these high percentages could be explained by the presence of already elevated fasting blood glucose levels, a high BMI – particularly where there is abdominal fat accumulation – and, above all, the advanced average age of our patients.

Diabetes is a condition whose prevalence increases with age. Our participants had an average age of 60 ± 12 years, which is similar to that reported by Sow & al. (2020)²⁶ in Bamako, where the average age was 60 ± 10 years.

This age group had a high cardiovascular risk (63.6%) compared with those under 60 ($p < 0.001$). This could be explained by the high proportion of people aged 60 and over in our study, as the risk increases significantly from the age of 45–50 onwards.

The predominance of women (58.4%) is consistent with the findings of the WHO (2002)²⁷ and Sow & al. (2020)²⁶. This high proportion of women in our study indicates a higher cardiovascular risk (57.6%) compared with men (33.3%) ($p < 0.048$).

Although regular physical activity is an integral part of the management of type 2 diabetes (T2D), few patients with diabetes achieve sufficient levels of physical activity. Nearly half

(47%) had a low level of physical activity. These results indicate a high proportion of sedentary lifestyles, which, as the disease progresses and age advances, do not encourage aerobic exercise, which has a beneficial effect on cardiovascular risk.

Furthermore, no significant correlation was found between energy expenditure expressed in METs and anthropometric and cardiometabolic parameters among our participants. The high rates of obesity and low levels of physical activity meant that physical activity did not have a protective effect on these parameters.

In men, however, HDL cholesterol levels ($p = 0.021$; $r = 0.344$) and triglyceride levels ($p = 0.021$; $r = 0.343$) were correlated with energy expenditure. The same was true for total cholesterol levels in those aged over 60 ($p = 0.026$; $r = 0.289$).

These findings are similar to those of Kraus & al. (2002)²⁸ and Bassuk (2005)²⁹, who highlighted the importance of the protective role of physical activity in our patients, albeit a modest one, on their lipid profile. According to Anspaugh (1996)³⁰, Rothenbacher (2006)³¹, and the American Heart Association (2011)³², physical activity—particularly aerobic exercise—improves serum lipid levels in patients with dyslipidaemia by lowering serum triglyceride, total cholesterol and LDL-C levels, and increasing HDL-C levels.

CONCLUSION

Moderate physical activity has a protective effect on cardiovascular risk in diabetic patients, thereby reducing the incidence of complications that could be life-threatening for these patients.

AUTHORS CONTRIBUTION

All authors contributed to the drafting of the manuscript

DISCLOSURE

No potential conflict of interest relevant to this article was reported.

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