OPEN ACCESS

Saudi Journal of Medical and Pharmaceutical Sciences
Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article **Cardiology**

Initial Assessment of Cardiovascular Risk Factors in Patients with Dyslipidemia in General Practice Consultation in a Decentralized Area of Senegal

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DOI: https://doi.org/10.36348/sjmps.2025.v11i08.010 | **Received:** 12.06.2025 | **Accepted:** 16.08.2025 | **Published:** 19.08.2025

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Abstract

***Introduction*:** Cardiovascular risk factors (RDFs) are on the rise in developing countries, particularly in sub-Saharan Africa. Dyslipidemia, which is often found, can be linked to changes in eating habits. ***Material and Methods*:** We performed a prospective descriptive and analytical study to evaluate cardiovascular RDFs in patients who presented with dyslipidemia in general practice. ***Results*:** In the 58 patients included, the mean age was 54.15 years ± 13.85 years. The female sex was predominant with a sex *ratio* (M/F) of 0.41. High blood pressure was found in 68.96% of cases, diabetes mellitus in 32.75% of cases. The mean body mass index (BMI) was 27.65 kg/m2 with extremes of 17.57 and 49.99 kg/m2. The mean waist circumference was 95.94 cm with extremes of 62 and 170 cm. According to NCEP ATP III, 28 women had a waist circumference ≥ 88 cm or 48.27% and 3 men had a waist circumference ≥ 102 cm or 5.17%. The lipid abnormalities were distributed as follows: LDL cholesterol > 1.6 g/l (93.10%), HDL-cholesterol < 0.4 g/l (24.13%), total cholesterol > 2 g/l (96.55%), triglycerides > 1.5 g/l (32.14%). The most common electrical abnormalities on ECG were subepicardial ischemia (8.62%), right bundle branch block (5.17%) and left ventricular hypertrophy (5.17%). The overall cardiovascular risk was elevated in 30.62% of patients. Metabolic syndrome was reported in 82.75% of cases. ***Conclusion*:** Dyslipidemia may be the bedrock of latent elevated cardiovascular risk, especially if it is associated with other factors. Prevention involves screening and good awareness by the general practitioner.

Keywords: Dyslipidemia, General Medicine, Cardiovascular Risk.

INTRODUCTION

Cardiovascular disease is the leading cause of death worldwide [1]. An estimated 17.5 million deaths from cardiovascular disease are attributable to cardiovascular disease, or 31% of total global mortality [2]. Cardiovascular risk factors (RDFs) are on the rise in developing countries, particularly in sub-Saharan Africa. In 2019, more than one million deaths were attributed to CVD in sub-Saharan Africa, accounting for 5% of all CVD-related deaths worldwide and 13% of all deaths in Africa. Cardiovascular disease is the second leading cause of death in sub-Saharan Africa [3]. Dyslipidemia is a major risk factor that is often found. In Senegal, the STEP (System for the Surveillance of Risk Factors for Noncommunicable Diseases) study in 2024 revealed an overall prevalence of hypercholesterolemia of 26.6% [4]. The disruption of lipid balance can be linked to changes in eating habits with an increase in the consumption of processed foods or foods that are too fatty and too sweet from fast food.

Dyslipidemia is a "primary or secondary pathological change in serum lipid levels", it is a chronic metabolic anomaly characterized by a persistent elevation of triglycerides (TG), LDL-c and a decrease in HDL-c [5]. The medical risks associated with dyslipidemia are essentially atheromatous disease regardless of its location and later the cardiovascular complications that can result from it. It is correlated with

increased LDL-cholesterol, triglyceridemia, and decreased HDL-cholesterol [5].

The objective of this study was to identify cardiovascular risk factors associated with dyslipidemia in patients seen in general practice. To do this, we determined their socio-demographic characteristics, confirmed dyslipidemia and its profile and assessed the overall cardiovascular risk using the European Society of Cardiology (ESC) score.

MATERIALS AND METHODS

This was a prospective, descriptive and analytical study conducted from October 1, 2023 to March 31, 2024 in a general medicine consultation at the Abdou Aziz Sy Hospital in Tivaouane (Senegal).

- **Study Population**

Our study concerned all patients aged at least 30 years, received and followed in general medical consultations.

- **Inclusion Criteria**

We included all subjects with dyslipidemia, at least 30 years of age, who were admitted to the clinic during the study period after obtaining informed consent.

- **Non-Inclusion Criteria**

The following were not included in our study:

- Patients who had other cardiovascular risk factors not associated with dyslipidemia.
- Patients with dyslipidemia whose age was less than 30 years.

- **Exclusion Criteria**

- Patients lost to follow-up;

- **Data Collection and Analysis:**

A data collection sheet was drawn up in Excel and included the following parameters:

- Socio-demographic: Age, sex, geographical origin
- Personal medical, surgical, gynecological-obstetrical history,
- Clinical: Constants (Blood Pressure (BP), Heart Rate (HR), Weight, Height, Body Mass Index (BMI), Waist Circumference (TT), Hip Circumference (TH)) and Physical Signs.
- Paraclinical signs: complete blood count (CBC), fasting blood glucose (GAJ), uratemia, uremia, serum creatinine, cholesterolemia, electrocardiogram (ECG), echocardiography.
- Cardiovascular risk factors: age (>50 years in men and >60 years in women), smoking, high blood pressure, diabetes mellitus, dyslipidemia, waist circumference

For the descriptive analysis, data were presented as a percentage for qualitative variables and as a mean ± standard deviation for quantitative variables.

Input and processing were carried out on EXCEL and with the Graphpad Prism 8.0 software. The statistical and correlation tests used were the RR, the Pearson correlation coefficient. A p-value of less than 0.05 was considered significant.

- **Setting Parameters:**

The following rates were considered significant:

- LDL-cholesterol > 1.6 g/l;
- HDL-cholesterol < 0.4 g/l;
- Triglycerides> 1.5 g/l;
- history of cardiovascular events;
- High blood pressure (hypertension) if systolic blood pressure ≥ 140 and/or diastolic blood pressure ≥ 90mmHg in the office or known hypertensive diagnosis made using an ambulatory blood pressure measurement (ABPM)
- Diabetes mellitus if fasting blood glucose greater than or equal to 1.26g/l on two occasions, or if postprandial blood glucose >2g/l associated with signs of cardinal syndrome or orally induced hyperglycemia (OGTT) with blood glucose greater than 2g at 2 hours or HBA1C greater than 6.5%.
- Android obesity: body mass index (BMI) greater than 30kg/m2, waist circumference greater than 80 in women and greater than 94 in men.
- Metabolic syndrome defined according to the harmonised criteria joint commit 2009[6] if at least 3 of the 5 criteria are met:

+ Increased waist circumference (abdominal obesity): specific thresholds according to country/ethnicity
+ High triglycerides (≥150 mg/dL or 1.7 mmol/L) or specific treatment.
+ Reduced HDL-cholesterol:
<40 mg/dL (1.03 mmol/L) in males.
<50 mg/dL (1.29 mmol/L) in females.
or specific treatment.
+ High blood pressure: ≥130/85 mmHg or antihypertensive therapy.
+ High fasting blood glucose: ≥100 mg/dL (5.6 mmol/L) or antidiabetic therapy

- The overall cardiovascular risk of the subjects was assessed according to the 2021 recommendations of the European Society of Cardiology (ESC) [7].

RESULTS

Socio-Demographic Data

We included 58 subjects with hypercholesterolemia. The mean age of the subjects was 54.15 years ± 13.85 years with extremes of 30 and 83 years (Figure 1).

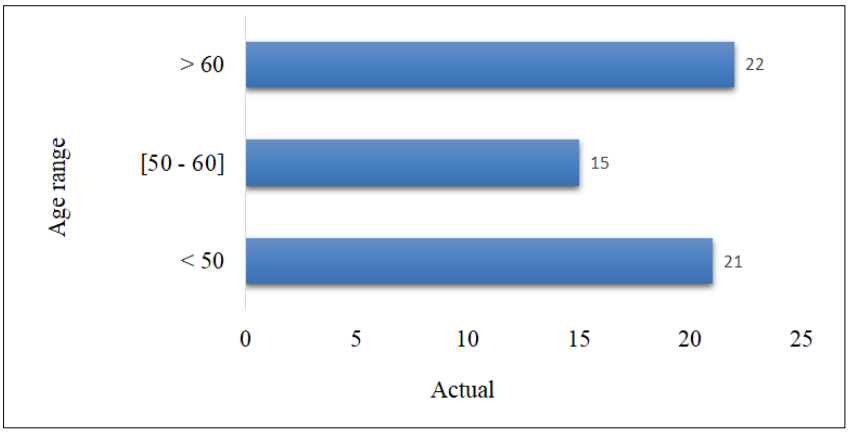

Figure 1: Distribution of subjects by age group

The female sex was predominant with a *sex ratio* (M/F) of 0.41 (Figure 2). All our subjects came from the city of Tivaouane, including 26 in rural areas and 32 in urban areas.

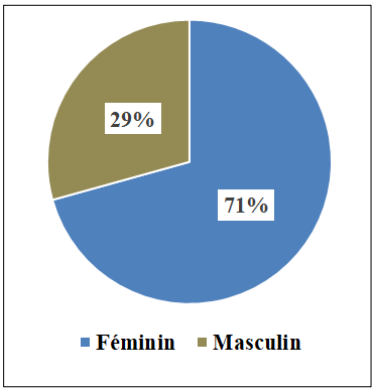

Figure 2: Distribution of subjects by sex

Among the pre-existing history; arterial hypertension was found in 45% of patients, type 2 diabetes in 13% of cases and the combination of diabetes and hypertension in 11% of cases. 6 subjects had fatty liver disease found on ultrasound, i.e. a prevalence of 11%, and only 1 case of stroke and another of erectile dysfunction were found. Table I shows the distribution of patients according to epidemiological and clinical profile at baseline.

Table I: Characteristics of socio-demographic data

Variables	Terms	Frequency
Background or field	HTA	25
	T2D	7
	HTA+T2D	6
	Fatty liver	6
	Arthrosis	4
	Lipoma	2
	Erectile dysfunction	1
	Chronic Gastritis	1
	Hemorrhoid	1
	Hyperthyroidism	1
	Hepatitis B	1
	Drop	1

An age-related risk factor was noted in 63.79% of patients. The women were over 60 years old in 12 cases or 20.69% and 13 men were over 50 years old (22.41%).

Anthropometric and Clinical Data:

High blood pressure was found in 68.96% of cases. It was mild (39.65%) and severe (27.7%). Diabetes mellitus was found in 32.75% of cases. Among them, 11 were women or 18.96% and 8 were men or 13.79%. The mean body mass index (BMI) was 27.65 kg/m2 with extremities of 17.57 and 49.99 kg/m2. Patients were overweight in 27.58% of cases and obese in 31.03% of cases. Obesity was severe (6.89%), moderate (5.17%) and mild (18.96%). The mean waist circumference was 95.94 cm with extremes of 62 and 170 cm. According to NCEP ATP III[8], 28 women had a waist circumference ≥ 88 cm or 48.27% and 3 men had a waist circumference ≥ 102 cm or 5.17%. Table II illustrates the distribution of patients according to anthropometric data.

Table II: Anthropometric and physiological parameters

Anthropometric parameters	Average	Median	Standard deviation	Maximum	Minimum
Waist	167,74	167	7,71	185	149
Weight	77,63	74	20,04	135	48
Body mass index	27,65	25,85	7,20	49,99	17,57
Waist circumference	95,94	85	17,05	170	62
Hip circumference	105,29	102	14,88	150	84
Waist/Hip	0,90	0,89	0,10	1,44	0,62
Heart rate	81,53	80	12,3	112	56
Systolic blood pressure	148,31	145,5	19,52	192	102
Diastolic blood pressure	93,39	94	11,3	120	68

Physical examination was normal in 81.36% of cases. The most dominant physical signs were subcutaneous lipoma (6.78%) and hepatomegaly (5.08%). Only one case of heart murmur and hemiplegia were found.

Paraclinical Data

The lipid abnormalities were distributed as follows: LDL cholesterol > 1.6 g/l (93.10%), HDL-cholesterol < 0.4 g/l (24.13%), total cholesterol > 2 g/l (96.55%), triglycerides > 1.5 g/l (32.14%) (Figure 3). All of our subjects had fasting blood glucose assay. Hyperglycemia was found in 31.03% of cases. In the study population, we found only one case of hyperuricemia. The most common electrocardiographic abnormalities were subepicardial ischemia (8.62%), right bundle branch block (5.17%) and left ventricular hypertrophy (5.17%).

Cardiovascular Risk Assessment

Subjects with two cardiovascular risk factors accounted for 40 cases or 68.96%. In 20% of cases, patients had more than 3 cardiovascular risk factors. Table III shows the distribution of cardiovascular risk factors by sex.

Table III: Gender Distribution of Cardiovascular Risk Factors

Cardiovascular risk factors	Male(n=17)	Female(n=41)
High blood pressure	10(17,24%)	29(50%)
Visceral obesity	3(5,17%)	28(48,27%)
Age >50 years (M) and >60 years (F)	13(22,41%)	15(25,86%)
Type 2 diabetes	8(13,79%)	11(18,96%)
LDL-cholesterol> 1.6 g/l	14(24,13%)	40(68,96%)
Hypo HDL-cholesterol	10(17,24%)	4(6,89%)
Total hypercholesterolemia	15(25,86%)	41(70,69)
01 Risk factor	0(0%)	1(1,58%)
02 Risk factors	2(3,44%)	1(1,58%)
≥03 Risk factors	15(25,86%)	39(67,24%)

The subjects' overall cardiovascular risk was assessed according to the 2021 recommendations of the European Society of Cardiology (ESC). Indeed, 30.62% (15) of patients had a high cardiovascular risk and 20.41% (10) had a very high risk. These data are illustrated in Figure 3.

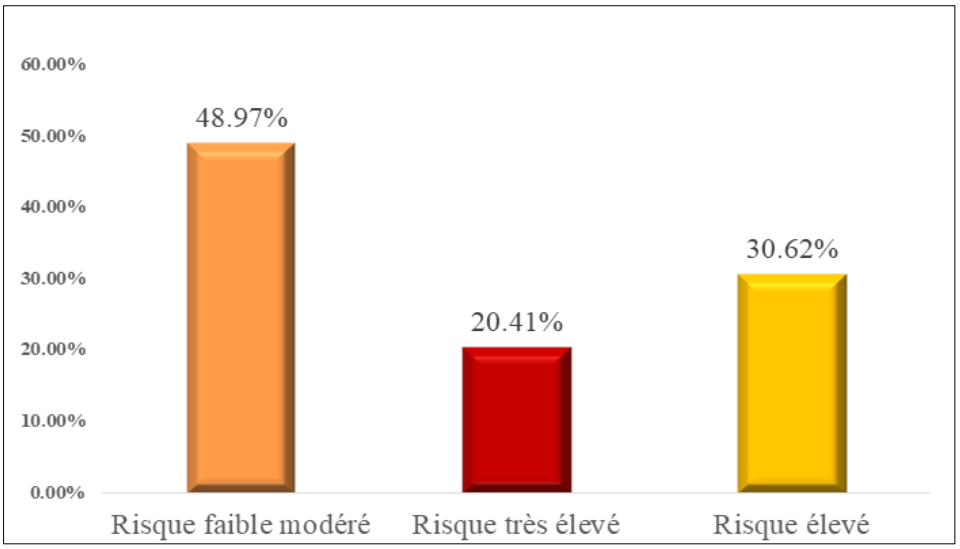

Figure 3: Cardiovascular risk assessment according to the European Society of Cardiology (ESC) criteria

Metabolic syndrome, assessed according to the harmonized criteria of Joint Commit 2009, was reported in 82.75% of cases, of which 70.83% were women and 29.17% were men. Of these patients, 14.58% had a very severe risk metabolic syndrome and 29.16% had a moderate-risk metabolic syndrome.

Analytical Study

Bivariate analysis was performed between the history and the different lipid profile parameters. The difference was statistically significant between history and LDL-cholesterol levels with a P-value approximately equal to 0.05 as shown in Table V.

Table V: Multivariate analysis between cholesterol parameters and subject history

	LDL		**P-value**	**TGR**		**P-value**	**HDL**		**P-value**
	<1.6g/l	>1.6 g/l		<1.5 g/l	>1.5 g/l		<0.4 g/l	>0.4g/l	
HTA	2	25		17	8		3	22	
T2D	1	6		4	3		2	5	
HTA+T2D	2	4		5	3		3	3	
Fatty liver	0	6		3	3		1	6	
Arthrosis	0	4	**0,0545**	1	1	0,5177	2	1	0,2088
Lipoma	0	2		2	1		0	2	
Erectile dysfunction	0	1		0	0		0	1	
Chronic Gastritis	0	1		0	1		1	0	
Hemorrhoid	0	1		1	0		0	1	
Hyperthyroidism	0	1		0	0		0	1	
Hepatitis B	0	1		1	1		1	0	
Drop	0	1		0	1		1	0	

Another analysis was performed between certain elements of metabolic syndrome and lipid profile parameters. This analysis showed a close correlation with a statistically significant difference between triglyceride and blood glucose levels (P-value = 0.0206). This significance was also noted between HDL-cholesterol levels and body mass index values (P-value = 0.0417) as illustrated in Table VI.

Table VI: Analytical study between cholesterol parameters and metabolic syndrome variables in our subjects

		LDL		**P-value**	**TGR**		**P-value**	**HDL**		**P-value**
		<1.6g/l	>1.6g/l		<1.5g/l	>1.5g/l		<0.4g/l	>0.4g/l	
BMI	<25kg/m2	5	20	0,0749	16	0	**0,0516**	6	19	**0,0417**
	>25kg/m2	0	33		25	2		8	25	
GAJ	<1,26g/l	2	37	0,1499	31	2	**0,0206**	8	32	0,2741
	>1,26g/l	3	16		41	0		6	12	
STEP	<140mmHg	0	18	0,1135	15	2		6	13	
	>140mmHg	5	35		26	0	0,0733	8	31	0,2395

DISCUSSION

The limitations of the study are the small sample size, which is linked to some loss of follow-up. Microalbuminuria, glycated hemoglobin, cardiac ultrasound have not been performed in patients because of the high cost of these examinations.

All international studies have shown that the frequency of the disease increases with age [9]. The average age of our patients was 54.15 years ± 13.85 years. It is similar to the results of the Sow *et al*., series, where an average age of 56.2 years was found [10]. The predominance of women is in line with the findings of the study by Dyane *et al*., in Morocco and Ndour Mbaye *et al*., in Saint Louis (Senegal) [11, 12]. In our study population, over 36.20% of patients are under 50 years of age. The appearance of dyslipidemia in young subjects is increasingly documented. Indeed, it is responsible for the occurrence of myocardial infarction in 66.7% of the young population according to the work of Joussein al. carried out in France. This study was carried out in elderly myocardial infarction patients, men under 45 years of age and women under 55 years of age, over a period of one year **[**13].

Dyslipidemia is associated with other markers of metabolic syndrome (MS). The latter is considered a major public health problem [14,15]. It is, in fact, at the crossroads of metabolic and cardiovascular diseases [16]. The person with SM is at increased risk of developing type 2 diabetes or developing coronary or cerebrovascular disease. The sensitivities for predicting diabetes with metabolic syndrome were 66.2 and 62.4% and those for cardiovascular disease with metabolic syndrome were 67.3 and 34.2%, respectively, according to the work of Michael *et al*., in the United States [17]. The prevalence of metabolic syndrome in our population was 82.75% with a female predominance. The components of metabolic syndrome most frequently associated with dyslipidemia were high blood pressure (27.37%), type 2 diabetes (23.16%), and visceral obesity (17.89%). This trend was found in the studies of Cissé [18], in Senegal and Guira *et al*., [19], in Burkina Faso.

Dyslipidemia is one of the major determinants of coronary artery disease. In our series, they are distributed as follows; 93.10% of hyper LDL-cholesterol, 24.13% of hypo HDL-cholesterol, 18.96% of hypertriglyceridemia and 96.55% of total hypercholesterolemia. The major role of dyslipidemia in the genesis of cardiovascular disease has been established by large studies carried out in population cohorts, including the Framingham cohort in the United States [20], and the PROCAM study in Europe [21]. The overall cardiovascular risk of the subjects was assessed according to the 2021 recommendations of the European Society of Cardiology (ESC) [7]. This evaluation shows that this risk was increased overall in our study population with 30.62% of cases of high cardiovascular risk and 20.41% of cases of very high cardiovascular risk. Dyslipidemia is increasingly known to be associated with cardiovascular risk factors. In sub-Saharan Africa, high blood pressure (hypertension) is the main cardiovascular risk factor associated with dyslipidemia followed by obesity. Hypertension was noted in 67.24% of our patients. These figures can be superimposed on those found (48.22%) by Cissé *et al*., in Senegal [22]. In our series, obesity is associated with hypercholesterolemia in 53.44% of cases. This close association has also been reported in the work of Asma Ezzaher *et al*., in Tunisia [23]. Type 2 diabetes is grafted onto dyslipidemia in 32.75% of the cases of our subjects, which is in line with the work of B. Djaouida *et al*., [21], who had identified, 57% of cases of type 2 diabetes associated with hypercholesterolemia. Weight increase and dyslipidemia confirm lipotoxicity induced by hypertriglyceridemia and lipid fractions of cholesterol. Hyperglycemia is indicative of glucotoxicity. These various anthropo-metabolic and hormonal risk factors grouped together in cardiometabolic syndrome are in favor of the genesis of type 2 diabetes and high blood pressure.

CONCLUSION

Cardiovascular disease is responsible for a heavy burden on populations, especially in developing countries. In our study conducted in Tivaouane, Senegal, the diagnosis of dyslipidemia remains important in the management of cardiovascular risk in the adult population. This is one of the key elements of metabolic syndrome, which by its frequency leads to increased morbidity and mortality. Prevention is then necessary and involves good awareness by the general practitioner.

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