Research Article

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2023.53.008426

Lipid Profile and Atherogenic Index in Hypertensives and Non-Hypertensives in a Rural Sub-Saharan Population: Case of Ferlo Senegal

Awa Ba Diop[1-3]*, Mor Diaw[2,3], Ababacar Cissé[3,4], Abdou Khadir Sow[2], Ibrahima Diouf[7], Fulgence Abdou Faye[1], Abdoul Aziz Ndiaye[1], Ndèye Fatou Ngom Gueye[1], Papa Ibrahima Ndiaye[5], Ousseynou Ka[1], Papa Ndiaye[6], Abdoulaye Ba[2,3], Abdoulaye Samb[2,3] and Lamine Gueye[1,3]

[1]Département de médecine, UFR de Santé et Développement durable, Université Alioune Diop de Bambey, Sénégal

[2]Laboratoire de Physiologie et Explorations Fonctionnelles. Faculté de Médecine, de Pharmacie et d'Odontologie. Université Cheikh Anta Diop de Dakar, Sénégal

[3]IRL 3189 Environnement, Santé, Sociétés CNRS/Université Cheikh Anta Diop/Université de Bamako/CNRST, Senegal

[4]Laboratoire de botanique de l'Institut Fondamental d'Afrique Noire (IFAN), Senegal

[5]Département de mathématiques, UFR des Sciences Appliquées et Technologies de l'Information et de la Communication (SATIC), Université Alioune Diop de Bambey, Sénégal

[6]Section de Santé Publique, UFR des Sciences de la Santé, Université Gaston Berger de Saint Louis, Sénégal

[7]Laboratoire de physiologie UFR Santé Université Assane Seck de Ziguinchor, Sénégal

***Corresponding author:** Awa Ba Diop, Laboratoire de Physiologie et Explorations Fonctionnelles, Département de Médecine, UFR Santé et développement durable, Université Alioune Diop de Bambey, Sénégal

ARTICLE INFO

Received: October 02, 2023

Accepted: November 12, 2023

Published: November 13, 2023

Citation: Awa Ba Diop, Mor Diaw, Ababacar Ciss, Abdou Khadir Sow, Ibrahima Diouf, Fulgence Abdou Faye, Abdoul Aziz Ndiaye, Ndèye Fatou Ngom Gueye, Papa Ibrahima Ndiaye, Ousseynou Ka, Papa Ndiaye, Abdoulaye Ba, Abdoulaye Samb and Lamine Gueye. Lipid Profile and Atherogenic Index in Hypertensives and Non-Hypertensives in a Rural Sub-Saharan Population: Case of Ferlo Senegal. Biomed J Sci & Tech Res 53(4)-2023. BJSTR. MS.ID.008426.

ABSTRACT

The plasma atherogenic index (AIP) constitutes a new marker to assess the risk of atherogenicity and cardiometabolic health. The AIP is a predictor of cardiovascular disease, particularly arterial hypertension, and stroke. The aim of this study was to evaluate the lipid profile and to determine the role of AI in the occurrence of stroke in a nomadic population in Sub-Saharan Africa (SSA) rural area.

Methods: It is a descriptive and analytical transversal study on 160 adults' subjects including 80 hypertensive living in Widou Thiengoli, situated in Ferlo, a rural area in northern of Senegal. A survey on the sociodemographic characteristics of the population was carried out using a questionnaire before carrying out anthropometric measurements (weight, waist circumference and height), cardiovascular (systolic and diastolic blood pressure) and biochemical (total cholesterol, HDL cholesterol and triglycerides).

Results: the comparison of the 2 groups showed that the risk of developing hypertension and stroke increased with age. Moreover HDL- cholesterol levels were much lower in hypertensive than controls. In addition, in the hypertensive group, a correlation between systolic mean arterial pressure and HDL cholesterol was found [$r = 0.22$ ($p = 0.0488$)]. Moreover, it's found that the AI is significatively higher in stroke patients and in hypertensive than in non- hypertensive subjects ($p < 0.0001$).

Conclusion: These results showed an abnormality in blood HDL cholesterol level in the study population and suggest that AI could play an important role in the occurrence and pathophysiology of stroke in SSA population.

Abbreviations: HTA: Hypertension; CVD: Cardiovascular Diseases; WHO: World Health Organization; LDL: Low-Density Lipoprotein; TC: Total Cholesterol; TG: Triglycerides; HDL: High-Density Lipoprotein; IRL: International Joint Laboratory; BMI: Body Mass Index; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; AI: Atherogenic Index

Introduction

Hypertension (HTA) and dyslipidemia are major risk factors for cardiovascular diseases (CVD) and are responsible for more than 80% of deaths and disabilities in low- and middle-income countries [1]. In Africa, between 50% and 88% of deaths occurring are due to cardiovascular diseases, according to the 2022 World Health Organization (WHO) Report on monitoring the fight against non-communicable diseases [2]. In Senegal, the World Health Organization (WHO) estimates that NCDs represent 42% of all deaths. Cardiovascular diseases represent the largest proportion with 17% of deaths [1]. However, despite the frequency of cardiovascular diseases, data on the prevalence of risk factors such as hypertension and dyslipidemia are rare. Only a few epidemiological surveys have been carried out in hospitals in the city of St Louis [3], and Dakar and in rural areas reporting dyslipidemia values ranging from 39.3% to 80% [4-6]. The STEPS study in 2015 reported a prevalence of 13.3% of hypertension and 10.1% of hypercholesterolemia among adults in Senegal [7]. Cardiovascular disease has been shown to be associated with hypertension and increased blood levels of low-density lipoprotein (LDL), total cholesterol (TC), and triglycerides (TG) [8].

On the other hand, low high-density lipoprotein (HDL) levels are a risk factor for mortality from cardiovascular disease. Epidemiological studies have established a strong association between hypertension and coronary heart disease and between hypertension and stroke [8-12]. Furthermore, there is no longer any doubt regarding the harmful effects of high blood pressure and increased total cholesterol. Considered alone or cumulatively, these abnormalities exponentially increase cardiovascular risk. Lipoproteins also play a fundamental role in the genesis of atherosclerosis; they strongly influence the impact of hypertension in the process [9]. Furthermore, the plasma atherogenic index (AIP) constitutes a marker to assess the risk of atherogenicity and cardiometabolic health. He is a predictor of cardiovascular disease, particularly arterial hypertension, and stroke [10]. Thus, dyslipidemia constitutes a major risk for the occurrence of myocardial infarction, stroke, heart failure, peripheral vascular disease, aortic dissection, and end-stage renal failure [12-15]. The objective of our study is to compare the serum levels of triglycerides, cholesterol, HDL, LDL and the atherogenic index in hypertensive and non-hypertensive people within a rural population of Ferlo in Senegal, more precisely in Widou Thiengoli.

Materials and Methods

This is a descriptive and analytical cross-sectional study carried out in collaboration with the International Joint Laboratory (IRL) 3189-Environment-Health-Society, CNRS-UCAD, during the period from August 2018 to July 2019 in Widou Thiengoli in Ferlo, a rural semi-desert sylvo-pastoral area in northern Senegal.

Study Population

- Inclusion Criteria: Any adult subject aged at least 18 years, hypertensive or not, living permanently in Widou Thiengoli.
- Exclusion Criteria: Subjects not meeting the inclusion criteria, pregnant women, people with diabetes or kidney disease were not included in the study.

Parameters Studied

A survey on the sociodemographic characteristics of the population was carried out using a questionnaire before carrying out anthropometric measurements (weight, waist circumference and height), cardiovascular (systolic and diastolic blood pressure) and biochemical (total cholesterol, HDL cholesterol and triglycerides). Subjects' body mass index (BMI) was calculated using the Quetelet equation, BMI (kg/m2) = Weight (Kg)/height2 (m2). According to the BMI classification, overweight is defined by a BMI between 25.0 - 29.9 kg/m2 and obesity for a BMI ≥ 30 Kg/m2. Hypertension is defined by the standards of the American Heart Association, as a systolic blood pressure (SBP) ≥ 140 mmHg and/or a diastolic blood pressure (DBP) ≥ 90 mmHg or any subject under antihypertensive treatment even if their arterial blood pressure under treatment is below the thresholds. Hypertension is classified as mild when the SBP is between 140-159 mmHg and/or the DBP is between 90-99 mmHg; it is moderate if SBP is between 160-179 mmHg and/or DBP between 100-109 mmHg, it is severe when SBP ≥ 180 mmHg and/or DBP ≥ 110 mmHg. Capillary blood was collected to determine the lipid profile, and the levels of total cholesterol, HDL cholesterol, and triglycerides were measured using the enzymatic method with a Lipid Pro Mission type measuring device. LDL cholesterol was calculated using the Friedewald formula: LDL-chol = Total Cholesterol - (HDL cholesterol + Triglycerides / 5). The atherogenic index (AI) was calculated using the following formula: Total Cholesterol / HDL Cholesterol [16].

Hypercholesterolemia is defined by a total cholesterol level > 200 mg/dL, LDL hypercholesterolemia at a level > 160 mg/dL, HDL hypocholesterolemia when the level is < 40 mg/dL, and hypertriglyceridemia > 150 mg/dL. The atherogenic index or Castelli index is an indicator of arterial and especially coronary risk, and it allows the measurement of the risk of atherosclerosis. The risk is minimal when the Total Cholesterol / HDL Cholesterol ratio is < 3.5; it is moderate if 3.5 < AI < 4.5, and the risk is considered high when the AI > 4.5. All biochemical measurements were performed after at least eight hours of fasting, in the morning of the day when all clinical measurements were first taken. The data were processed at the Laboratory of Physiology and Functional Explorations of the Faculty of Medicine, Pharmacy and Dentistry of Cheikh Anta DIOP University of Dakar (UCAD). Statistical analyses were conducted to analyze the data. The data were presented as mean ± standard deviation, percentages, and relative values. The study population was divided into hypertensive and non-hypertensive groups based on the classification criteria of a systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg. Chi-square tests were used to determine the relationship between hypertensive and non-hypertensive status and the outcomes of interest. One-way ANOVA with Newman-Keuls post hoc test was used to compare cardiovascular variables (SBP and DBP), biochemical variables (lipid profile), and BMI parameters between the two groups. Pearson's correlation test was utilized to examine the associations between cardiovascular and biological parameters. Data analysis was performed using GraphPad Prism 8 software.

Ethical and Financial Aspects of the Study

The study protocol was developed at the Laboratory of Physiology and Functional Explorations of the Faculty of Medicine, Pharmacy, and Dentistry of Cheikh Anta Diop University of Dakar (UCAD) in accordance with the guidelines outlined in the Declaration of Helsinki. It was approved by the Ethics Committee of the Doctoral School of the Faculty of Medicine at UCAD. Participants provided their informed consent, either written or oral, after being fully informed about the study's methods and objectives. This study received financial support from the International Research Laboratory (IRL) 3189- Environment-Health-Society, CNRS-UCAD, and the Human-Environment Observatory (OHMi) of Téssékéré.

Results

Socio-Demographic Characteristics of the Respondents

A total of 160 subjects were collected, including 80 suffering from high blood pressure. The population studied was characterized by the predominance of young subjects, more than half (58.8%) were under 50 years old while elderly subjects represented 41.3%. The mean age was 46.8 ± 16.9 years with extremes ranging from 20 to 92 years. The median was 45 years, and the mode was 30 years. The mean ages of the two groups of subjects were significantly different ($p < 0.0001$), 55.86 ± 16.08 years and 37.84 ± 12.31 years for hypertensives and non- hypertensives, respectively. Among the participants, 85.6% were married, including 58.1% monogamous. There were more married people in the hypertensive group with a significant difference ($p = 0.0432$). Only 2.5% were in school and did not go beyond primary school. No statistically significant difference was noted between the 2 groups (Table 1).

Table 1: Socio-demographic characteristics of the study population.

Variables	Categories	HBP (N=80)		NHBP (N=80)		P
		%	$_{95\%}$IC	%	$_{95\%}$IC	
Age	20-34 yrs	11.30%	[6.03-20.02]	47.50%	[36.92-58.30]	< 0.0001
	35-49 yrs	23.80%	[15.76-34.14]	35.00%	[25.45-45.92]	
	50-64 yrs	35.00%	[25.45-45.92]	13.80%	[7.85-22.97]	
	+ 65 yrs	30.0%	[21.06-40-77]	3.80%	[1.28-10.45]	
Marital Status	Married	80.00%	[69.95-87.30]	91.30%	[83.02-95.70]	0.0432
	Not married	20.00%	[12.70-30.05]	8.80%	[4.30-16.98]	
Level study	Educated	1.30%	[0.22-6.75]	3.80%	[1.28-10.45]	0.3687
	Uneducated	98.80%	[93.25-99.78]	96.30%	[89.55-98.72]	

Anthropometric and Cardiovascular Parameters

The overall mean BMI of 21.8 ± 4.07 kg/m2 was identical in hypertensive and non-hypertensive people with a median of 21.6 kg/m2. Overweight and obesity were slightly less common in the non-hypertensive group. People with overweight were 18.8% [$_{95\%}$ CI: 11.7-28.6] and 8.8% [$_{95\%}$ CI: 4.3-16.9] among hypertensives and non-hypertensives respectively and obesity was noted in 3.8% [$_{95\%}$ CI: 1.2-10.5] of hypertensive subjects and in 5.0% [$_{95\%}$ CI: 1.9-12.2] of non- hypertensive subjects. Overweight and obesity were more prevalent among women in both groups. Among hypertensives, 22.7% [$_{95\%}$ CI: 12.8-36.9] of women were overweight compared to 13.9% [$_{95\%}$ CI: 6.1-28.6] of men. In this same group, 6.8% [$_{95\%}$ CI: 2.4-18.2] of women were obese and no obesity was noted in men. The mean waist circumference was 75.9 ± 12.8 cm in the total population with a median of 74 cm. In non-hypertensives, it was 74.9 ± 11.1 cm with a median of 72 cm and in hypertensives, 76.8 ± 14.4 cm and a median of 77 cm. It should also be noted that hypertensive women had a waist circumference slightly higher than that of hypertensive men (77.2 ± 17.4 and 76.31 ± 9.58 cm respectively). On the other hand, among non-hypertensives, the waist circumference was higher among men (76.59 ± 10.03 cm) than among women (72.89 ± 12.09 cm), but the difference was not significant. However, a correlation was noted between BMI and waist circumference ($r = 0.5908$; $p < 0.0001$)

Arterial Pressure

The mean SBP was 142 ± 25.0 mmHg and the DBP was 88 ± 14.5 mmHg among the respondents, and the median was 134 mmHg and 85 mmHg for SBP and DBP, respectively. Mean SBP and DBP in hypertensive patients were higher (160 ± 21.7 mmHg / 98 ± 12.9

mmHg) than in non-hypertensive subjects (123 ± 8.3 mmHg / 78 ± 6.9 mmHg), p < 0.0001. There is a slight female predominance of hypertension, with 55% of women being hypertensive compared to 45% of men. Blood pressure increases with age and reaches its maximum in the age groups 50 to 64 and over 65 years. The proportion of hypertensives by age group was 11.3% (20-34 years), 23.8% (35- 49 years), 35.0% (50-64 years) and 30.0% (65 years and over). Hypertensive patients were classified into 3 grades according to the WHO classification of hypertension; 43.8% of hypertensives had grade 1 hypertension; 30.0% grades 2 and 26.3% grade 3. Table 2 shows the comparison between hypertensives and non-hypertensives in relation to the different anthropometric and cardiovascular risk factors.

Table 2: Comparison of anthropometric and cardiovascular risk factors between hypertensives and non-hypertensives.

Parameters	HBP (N=80), (mean /SD)	NHBP (N=80), (mean /SD)	P
SBP (mmHg)	160 ±21.7	123 ± 8.3	< 0.0001
DBP (mmHg)	98 ± 12.9	78 ± 6.9	< 0.0001
BMI (Kg/m²)	21,9 ± 4.2	21.6 ± 3.9	0.5465
Waist size (cm)	76,8 ± 14.4	74.9 ± 11.1	0.3533

Biochemical Parameters

Table 3 shows the distribution of lipid profiles between the hypertensive and non-hypertensive groups. The mean total cholesterol was 135.90 ± 33.85 mg/dl with a median of 132.00 mg/dl. This overall average was substantially equal to that observed in the two groups 136.90 mg/dl and 134.89 mg/dl in hypertensives and non-hypertensives respectively. The average total cholesterol was higher in women 140.7 ± 39.8 mg/dl than in men 131.1 ± 26 mg/dl. However, there was no significant difference between genders. None of the men suffered from high cholesterol. HDL cholesterol (HDL-C) was low in 95% [$_{95\%}$ CI: 90.4-97.4] with a mean of 32.23 ± 14.83 mg/dl, well below the values recommended by the WHO (≥ 60 mg/dl). There was no relationship between age and low HDL-C. In the hypertensive group, a correlation was observed between high blood pressure and low HDL cholesterol level (p = 0.0488; r = 0.22). In addition, there is a statistically significant correlation between the HDL-C level and the atherogenicity index p < 0.0001; r = -0.711; and as well as between the HDL-C level and the LDL-C/HDL-C ratio; p<0.0001; r = -0.6823. The proportion of LDL hypercholesterolemia was 7.5% in the 2 groups. About 11.3% of women compared to 3.8% of men had high LDL cholesterol. In the study population, mean LDL cholesterol was 83.5 ± 32.7 mg/dl and 78.3 ± 28.1 mg/dl in hypertensives and non- hypertensives, respectively. Hypertensive men had a significant LDL-C profile compared to normotensive men (p = 0.0227). There is no correlation between LDL-C and the other factors studied. Hypertriglyceridemia was found in 18.8% of the population with an overall average triglyceride of 113.91 ± 50.53 mg/dl. It was 112.7 ± 50 and 115.2 ± 50.4 in hypertensives and non- hypertensives respectively. Hypertriglyceridemia was 16.3% and 21.3% respectively between hypertensives and non-hypertensives, however without significant difference between the groups as well as between men and women. Mixed hypercholesterolemia was found in 16.9% [$_{95\%}$ CI 11.9 to 22.4] of the population, including 18.8% women and 15% men. It was noted in 13.8% of hypertensives compared to 20.0% in non-hypertensives.

Table 3: Lipid profiles of hypertensives and non-hypertensives**.**

Variables	HBP(N=80), (mean /SD)	NHBP(N=80), (mean /SD)	P
Chol total	136.9 ± 36.3	134.9 ± 31.5	0.7082
Chol-HDL	30.8 ± 15.9	33.6 ± 13.6	0.2509
Chol-LDL	83.5 ± 32.7	78.3 ± 28.1	1.0000
Triglycérides	112.7 ± 50.9	115.2 ± 50.4	0.7578
IA = chol T/C-HDL	5.1 ± 2.0	4.5 ± 1.7	0.066

Stroke Patients

Approximately 7.5% of the subjects surveyed suffered a stroke. All stroke cases had blood pressure above the recommended standard with a mean SBP of 167.2 ± 30.7 mm Hg and a mean DBP 97.2 ± 15.2 mm Hg.

Their average BMI was 22.3 ± 6.5 kg/m2, however 25.0% [$_{95\%}$ CI: 8.9-53.2] of them were overweight and/or obese. Only 8.3% [$_{95\%}$ CI: 1.5-35.4] of stroke cases had a high waist circumference with an average of 66.7 ± 24.3 cm. No hypercholesterolemia has been observed in stroke victims. Likewise, they had normal LDL- C levels with an average of 85.2 ± 18.1 mg/dl. On the other hand, they had a low HDL-C level with an average of 26.1 ± 8.3 mg/dl. Approximately 11.1% [$_{95\%}$ CI: 1.9-43.5] of stroke victims experienced hypertriglyceridemia, but no association between stroke risk and hypertriglyceridemia was noted.

Atherogenic Risk

The atherogenic index (AI) averaged 4.8 ± 1.8 with a median of 4.7. More than half of the participants had an AI > 4.5 (53.8% [95% CI: 46.03-61.30]). Among hypertensive subjects, 60.0% [$_{95\%}$ CI: 49.05-70.04] had an elevated AI compared to 47.5% [$_{95\%}$ CI: 36.92-58.30] in non-hypertensive patients. AI was higher in men (51%) than women (49%). On the other hand, the extreme values of this ratio were more marked in women 1.6 to 12.6 compared to 1.4 to 8.8 in men with AI values going against for women. Analysis of atherogenic index data showed that stroke patients had significantly higher AI (p < 0.0001) compared to non-hypertensive subjects. Among the stroke cases, 87.5% had an atherogenic index > 4.5; the values of this ratio varied between 3.1 and 7.9 (Table 3). The analysis showed a strong correlation between the atherogenic index and the HDL-chol level (p

 DOI: 10.26717/BJSTR.2023.53.008426

< 0.0001). Likewise, a negative correlation was noted between BMI and low HDL cholesterol level (r = -0.2006; p = 0.0110) and a statistically significant correlation with the atherogenicity index r = 0.2915; p = 0.0002. It was noted, in the hypertensive group, a strong correlation between high blood pressure and low HDL cholesterol level, the correlation coefficient "r" was 0.22 (p = 0.0488) (Table 4).

Table 4: Comparison of the high rate of atherogenicity index in hypertension and non-hypertension.

Variables	Non- Hypertensive	Hypertensive	Stroke patient	P
Atherogen Index	4.5 ± 1.7	5.1 ± 2.0	5.5 ± 1.6	< 0.0001
High atherogenic index (%)	47.5	60	87.5	
Total Cholesterol (mean-mg/dl)	134.9 ± 31.5	136.9 ± 36.3	136.2 ± 21.2	--
Hypercholesterol (%)	1.3	1.3	0	
HDL-C (mean-mg/dl)	33.6 ± 13.6	30.8 ± 15.9	26.1 ± 8.2	0.076
Hypochol-HDL (%)	95	95	100	
LDL-C (mean-mg/dl)	78.3 ± 28.1	83.5 ± 32.7	85.3 ± 18.1	-
Hyperchol-LDL (%)	7.5	7.5	0	
Triglycerid (mean-mg/dl)	115.2 ± 50.4	112.7 ± 50.9	124.5 ± 33.7	0.068
Hypertriglycerid (%)	16.3	21.3	11.1	

Discussion

The average BMI of this study was approximately equal between the two groups, it is comparable to the average found in the study carried out at Ferlo in 2014 (20.55 ± 4.04) and it is lower than the average BMI found in Dakar (24.04 ± 4.98) [17]. This same phenomenon was also noted in a population of the same nomadic ethnic group from North Benin [18]. It was also found that overweight and obesity were higher among hypertensives than among normotensive subjects. They were almost twice as high in women, compared to men (46.2% vs 25.2%, p < 0.0030), and moreover sex was significantly correlated with BMI (r = 0.1743; p = 0.0275). These results are comparable to those found in a population of the same ethnic group in Cameroon where overweight and obesity were rare among men but more common among women [19].

Numerous studies have shown the indisputable role of plasma cholesterol and its fractions in cardiovascular diseases caused by atherosclerosis [5,20-22]. The harmful role of its different fractions is expressed depending on whether there is an increase in LDL-cholesterol, a decrease in HDL-cholesterol and a total cholesterol/HDL-cholesterol ratio > 4.5 [23]. Atherosclerosis, a pathology of multifactorial origin, represents the main cause of mortality in industrialized countries, and the accelerating role of arterial hypertension (HTA) in this process is now a well-established notion [24]. Our results showed that total cholesterol levels in the subjects were almost normal and identical between hypertensives and non-hypertensives. This was also noted in a population of the same ethnic group in Benin [18]. The hypercholesterolemia rate of 1.9% was much lower than that found at the Saint Louis University Hospital in Senegal which was 60.9% [5] and that found at the Aristide Le Dantec Hospital in Dakar which was 30.9% [4].

This difference in results is explained by the difference in methodology and the types of population survey compared to hospital surveys. Furthermore, LDL cholesterol could promote circulatory disorders by reducing the size of the arteries. Thus, the higher the LDL level, the higher the risk of atherosclerosis [24]. However, the average LDL cholesterol of our study population was within the optimal values, there was no difference between hypertensives and non-hypertensives. These results were identical to those found in Benin. However, there was a significant difference between hyper- and normo- tense men. Unlike the Benin study where a significant difference was noted in women (p=0.001) [18]. The prevalence of hypercholesterolemia (7.5%) was much lower than that found in St Louis (66.2%) and Dakar (30.9%) (4.5).

The average triglycerides (113.91 ± 50.5 mg/dl) in our population were within normal values. It was the same in the same ethnic group from northern Benin (77.3 ± 18.9 mg/dl) [18], but it was lower than that found in a population of Cameroonian hypertensives (135.7 ± 49. 8 mg/dl) [25]. There were no differences between men and women or between the two study groups. On the other hand, the prevalence of hypertriglyceridemia in our study was 18.8% and it is higher than the results which were found in St Louis of Senegal (4.5%) and 0.51% in Dakar (4.5). On the other hand, it is estimated that the higher the HDL level, the lower the risk of atherosclerosis, since good cholesterol has protective properties for the vessels. Unfortunately, the HDL cholesterol concentration in our subjects was lower than the values recommended by the WHO. The prevalence of low HDL cholesterol was 95% in our study population in both men and women as well as in hypertensives and non-hypertensives. This prevalence was much higher than that found in St Louis (26.5%) and Dakar (7.3%). These results agree with those of Gomina et al, in 2011 where the concentration of HDL was low in the same ethnic group as our study population in both men and women [18].

In addition, a significant correlation was found in our study between low HDL level and high blood pressure. The Atherogenic risk in our population was higher than that found in subjects from northern Benin [18] and that reported by Hunter et al. (2010) in a black American population [26]. More than half of the hypertensive population (60%) and 87.5% of stroke patients had a high atherogenic index. A correlation has been noted between low HDL cholesterol levels and high levels of the atherogenic index. Decreased HDL concentration increases the risk of ischemic stroke. This relationship has been demonstrated in epidemiological investigations, such as the Framingham study [27]. In prospective American studies, an increase in HDL cholesterol of 0.01 g/L (0.026 mmol/L) is associated with a reduction in coronary risk of 2% in men and 3% in women [28]. In the PROCAM study (4,559 men aged 40 to 64, followed for 6 years), the predictive value of HDL cholesterol appears considerable. At the same total cholesterol level, an HDL cholesterol level below 0.35 g/L multiplies the vascular risk by 4 compared to subjects with HDL cholesterol greater than or equal to this value. Conversely, an HDL-cholesterol level greater than 0.55 g/L divides the risk by 2 when total cholesterol is greater than 2.50 g/L [22,23,29-31].

Limitations and Prospects

The results of this study would have been more comprehensive if Apo lipoproteins had been measured. But also, if renal function had been explored this would have made it possible to better understand the pathophysiology of hypertension in this population. It seems necessary to continue the study to better deepen knowledge on the risk factors determining the occurrence of cardiovascular diseases such as hypertension, in this rural population in Senegal and in sub-Saharan Africa in general.

Conclusion

Although not exhaustive, our results highlight lipid abnormalities in the sub-Saharan rural population. These abnormalities are much more common in hypertensive and stroke patients than in non-hypertensive patients. However, a significant decrease in HDL-C level could be the determining factor of atherogenic risk in this rural population, thus presenting a risk of atherosclerotic plaque formation that could lead to ischemic stroke, but it could also increase the risk of hypertension which can lead to hemorrhagic stroke.

These high-risk subjects and candidates for primary prevention must absolutely be identified and their level of cardiovascular risk quantified. They must be subject, in the same way as coronary patients, to immediate and intensive care, aimed at lowering their level of risk and reducing the number of cardiovascular events. Maintaining a good balance of HDL and LDL cholesterol levels is therefore essential to avoid cardiovascular problems. To achieve this, it will therefore be important to suggest that the rural sub-Saharan population change their dietary behaviour and engage in physical activity, which will reduce the risk of stroke.

References

1. (2014) OMS rapport WHO OMS Maladies non transmissibles : profils des pays 2014. Disponible.
2. (2023) OMS rapport OMS Bureau régional pour l'Afrique . Les décès dus aux maladies non transmissibles sont en hausse en Afrique. Disponible.
3. Pessinaba S, Mbaye A, Yabeta GAD, Kane A, Ndao CT, et al. (2013) Prevalence and determinants of hypertension and associated cardiovascular risk factors: data from a population- based, cross-sectional survey in Saint Louis, Senegal. Cardiovasc J Afr. Juin 24(5): 180-183.
4. Cissé F, Agne FD, Diatta A, Mbengue AS, Ndiaye A, et al. (2016) Prévalence des dyslipidémies au laboratoire de biochimie du CHU Aristide le Dantec de Dakar, Sénégal. Pan Afr Med J 25: 67.
5. Doupa D, Mbengue AS, Diallo FA, Jobe M, Ndiaye A, et al. (2014) Lipid profile frequency and the prevalence of dyslipidaemia from biochemical tests at Saint Louis University Hospital in Senegal. Pan Afr Med J 17: 75.
6. Bachar A, Nikièma S, Massimbo D, Nassour B, Leye M, et al. (2022) Evaluation des facteurs de risque cardio-vasculaire chez les imams: exemple des imams de Dakar (à propos de 67 cas). Pan Afr Med J 43: 81.
7. ANSD MEFP Sénégal (2017) Enquête Nationale sur les Facteurs de Risque des Maladies Non Transmissibles (2015) - Aperçu.
8. Li YH, Tseng WK, Yin WH, Lin FJ, Wu YW, et al. (2020) Prognostic effect of high-density lipoprotein cholesterol level in patients with atherosclerotic cardiovascular disease under statin treatment. Sci Rep 10(1): 21835.
9. Chen S, Cheng W (2022) Relationship Between Lipid Profiles and Hypertension: A Cross-Sectional Study of 62,957 Chinese Adult Males. Front Public Health 10: 895499.
10. Choudhury KN, Mainuddin A, Wahiduzzaman M (2014) Islam SMS. Serum lipid profile and its association with hypertension in Bangladesh. Vasc Health Risk Manag 10: 327-332.
11. Diaw M, Seck A, Attieh R, Sow AK, Ouedraogo V (2016) Evaluation of Vascular and Metabolic Complications in Obese Sub-Saharan African Subjects: Effect of Fat Mass.
12. (2017) HAS. Haute Autorité de Santé. Principales dyslipidémies : stratégies de prise en charge.
13. Hilgemann DW, Dai G, Collins A, Larricia V, Magi S, et al. (2018) Lipid signaling to membrane proteins: From second messengers to membrane domains and adapter-free endocytosis. J Gen Physiol 150(2): 367.
14. Hindy G, Engström G, Larsson SC, Traylor M, Markus HS, et al. (2018) Role of Blood Lipids in the Development of Ischemic Stroke and its Subtypes: A Mendelian Randomization Study. Stroke 49(4): 820-827.
15. SFEndocrino (2018) Le site de l'Endocrinologie, Diabétologie et des Maladies Métaboliques. 2018. Facteurs de risque cardiovasculaire et prévention / Dyslipidémies.
16. Reignier A, Sacchetto É, Hardouin JB, Orsonneau JL, Carrer DL, et al. (2014) Comparison of calculated LDL cholesterol (LDL-C) versus measured LDL cholesterol (LDL-M) and potential impact in terms of therapeutic management. Ann Biol Clin (Paris)(5): 593-598.
17. Duboz P, Touré M, Hane F, Macia E, Coumé M, et al. (2014) Vieillissement et pathologies chroniques au Sénégal. Comparaison entre des populations vivant en milieu rural (Ferlo) et urbain (Dakar). Bull Société Pathol Exot 108: 25-31.
18. Gomina AM, Djaliri KD, Akpona AS (2013) Profil des lipides sériques des peuls adultes nomades du Nord-Bénin. J Appl Biosci 62: 4620-4627.

19. Nyuyki CK, Ngufor G, Mbeh G, Mbanya JC (2017) Epidemiology of hypertension in Fulani indigenous populations-age, gender and drivers. J Health Popul Nutr 36: 35.
20. Oguejiofor OC, Onwukwe CH, Odenigbo CU (2012) Dyslipidemia in Nigeria: prevalence and pattern. Ann Afr Med 11(4): 197-202.
21. Dallongeville J (2006) Le métabolisme des lipoprotéines. Cah Nutr Diététique 41(1): 55-60.
22. Dallongeville J, Institut Pasteur de Lille (2003) Epidemiologie du Syndrome Métabolique et du risque cardiovasculaire.
23. Catapano AL, Graham I, De Backer G, Wiklund O (2016) ESC-EAS Guidelines for the management of dyslipidaemias.pdf. Eur Heart J 2999-3058.
24. Bonnet J (2005) Athérosclérose. EMC Elsevier Cardiol 11: 605-610.
25. Youmbissi TJ, Djoumess S, Nouedoui C, Ndobo P, Meli J (2001) Profil lipidique d'un groupe d'hypertendus camerounais noirs africains. Santé Trop 48(7).
26. Hunter GR, Chandler Laney PC, Brock DW, Lara Castro C, Fernandez JR, et al. (2010) Fat Distribution, Aerobic Fitness, Blood Lipids, and Insulin Sensitivity in African American and European-American Women. Obes Silver Spring Md 18(2): 274-281.
27. Tsao CW, Vasan RS (2015) Cohort Profile: The Framingham Heart Study (FHS): overview of milestones in cardiovascular epidemiology. Int J Epidemiol 44(6): 1800-1813.
28. Aguilar M, Bhuket T, Torres S, Liu B, Wong RJ (2015) Prevalence of the Metabolic Syndrome in the United States, 2003-2012. JAMA 313(19): 1973-1974.
29. BENADDA HM (2013) Impact de la dyslipidémie sur l'hypertension artérielle. ABOU BEKR BELKAID Tlemcen.
30. Goldstein J, Brown M (2015) A century of cholesterol and coronaries: from plaques to genes to statins. Cell J 161(1): 161-172.
31. Goldstein LB, Adams R, Alberts MJ, Appel LJ, Brass LM, et al. (2006) Primary prevention of ischemic stroke: A guideline from the American Heart Association/American Stroke Association. Stroke 37(6): 1583-1633.

ISSN: 2574-1241

DOI: 10.26717/BJSTR.2023.53.008426

Awa Ba Diop. Biomed J Sci & Tech Res