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Prevalence of Dyslipidemia among Patients Received at the Biochemistry Unit of the Charles de Gaulle Pediatric University Hospital in Ouagadougou

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Abstract

Introduction: Cardiovascular disease represents a major public health burden worldwide. Research and management of risk factors contribute to the prevention of these diseases. The aim of this study was to assess the prevalence of dyslipidemia in the biochemistry unit of the Charles De Gaulle Pediatric University Hospital (CHUP-CDG) in Ouagadougou. **Material and Methods:** This was a descriptive and analytical cross-sectional study, with retrospective data collection from January 1, 2020 to December 31, 2022. Patients of all ages who performed a lipid panel in the CHUP-CDG biochemistry unit during the study period have been included. **Results:** A total of 2872 patients have been included. The mean age of the study population was 27.72 ± 19.51 years and the M/F sex ratio was 0.81. Among the patients, 22.84% had at least one dyslipidemia. The prevalences of hypercholesterolemia, hypo-HDL cholesterolemia and hyper-LDL cholesterolemia were 11.57%, 49.19% and 57.50% respectively. Hypertriglyceridemia and mixed hyperlipidemia were present in 9.04% and 2.08% of patients. Hypercholesterolemia was significantly more frequent in the female sex ($p = 0.0077$); hyper-LDL cholesterolemia ($p = 0.0255$) and mixed hyperlipidemia ($p < 0.00001$) in patients over 45 years of age. **Conclusion:** The relatively high prevalence of dyslipidemia in

the study indicates a worrying situation. It would therefore appear essential to extend the search for risk factors nationwide, particularly those that can be modified, in order to reduce morbidity and mortality linked to cardiovascular disease.

Keywords

Dyslipidemia, Lipid Profile, Lipid Abnormalities, Prevalence, Burkina Faso

1. Introduction

Dyslipidemia is a major risk factor for cardiovascular disease (CVD), the leading cause of death worldwide. According to the WHO, 17.9 million people die every year from cardiovascular diseases [1]. These include a range of disorders of the heart and blood vessels, mainly coronary heart disease, cerebrovascular disease and rheumatic heart disease. Almost 80% of deaths occur in low- and middle-income countries. These countries are marked by the phenomenon of epidemiological transition, which consists of a shift from infectious diseases and malnutrition to non-communicable diseases, foremost among which are CVD and cancers [2]. In Burkina Faso, non-communicable diseases were responsible for 19018 deaths in 2019 [3]. CVD are favored by behavioral (smoking, physical inactivity, poor diet, alcohol), metabolic (hypertension, overweight/obesity, hyperglycemia, dyslipidemia) and environmental (air pollution) risk factors [1]. In the context of a disease prevention approach, all risk factors must be identified, and their correction must be aimed at reducing the incidence of the disease (notion of reversibility).

Among the risk factors for CVD, dyslipidemia ranks high. These are primary or secondary pathological changes in serum lipids. They constitute a heterogeneous group of diseases characterized by plasma lipid abnormalities: an increase in plasma total cholesterol (TC), an increase in low-density lipoprotein cholesterol (LDL-c), an increase in triglycerides (TG) and/or a reduction in high-density lipoprotein cholesterol (HDL-c) levels [4]. Clinical manifestations of dyslipidemia are rare. They are most often characterized by dermatological signs such as xanthomas, xanthelasma or gerontoxon. Lipid profile testing, or lipid abnormality testing (LAT), can detect disorders of lipid metabolism. LAT takes into account a number of the body's biological parameters, by performing a lipid profile, initially as a standard check-up, and then, depending on the results, as part of a broader check-up. The standard lipid profile consists of determining blood TC, HDL-c, LDL-c and TG concentrations.

As previously mentioned, dyslipidemia, as a metabolic factor in the onset of CVD, must be detected in patients and managed appropriately. In Burkina Faso, despite the abundance of data on CVD risk factors [5] [6] [7] [8], the prevalence of dyslipidemia remains disparate and mostly concerns specific populations [9] [10] [11] [12]. In this context, the present study was conducted, with the aim of

establishing the prevalence of dyslipidemia in patients received between January 1, 2020 and December 31, 2022 in the biochemistry unit of the Charles De Gaulle Pediatric University Hospital (CHUP-CDG); with the aim of contributing to the prevention of CVD.

2. Materials and Methods

2.1. Study Site

The study was carried out in the biochemistry unit of the CHUP-CDG laboratory department. CHUP-CDG, located in the city of Ouagadougou (Burkina Faso), is the reference hospital for the treatment of pediatric pathologies (children aged 0 to 15). One of its missions is to care for children living with HIV.

As for the laboratory department, it receives both children and any other person of any age, come from another health establishment to have laboratory tests carried out on an outpatient basis.

2.2. Type, Period of Study and Sampling

This was a descriptive and analytical cross-sectional study, with retrospective data collection over a 3-year period, from January 1, 2020 to December 31, 2022.

Sampling was exhaustive. Patients who had undergone at least one standard lipid profile in the CHUP-CDG biochemistry unit during the study period and whose data, extracted from the biochemistry unit registers, could be used, were included. We analyzed the records of the biochemistry unit and selected patients of all ages who had one or more lipid parameters measured during the chosen study period. Patients whose socio-demographic data were missing were not included.

2.3. Biological Samples

Lipid analysis was carried out on venous blood samples taken in dry tubes from 12-hour fasting patients. The samples were centrifuged at 3500 rpm for 5 minutes, and the serum was used for the assays.

2.4. Assay Methods and Operational Definitions

Lipid profiles, including TC, HDL-c, LDL-c and TG, were determined by enzymatic methods. Dyslipidemia was defined in patients over 15 years of age by the isolated or concomitant presence of: hypercholesterolemia CT > 5.17 mmol/L (2 g/L); hypo-HDL cholesterolemia HDL-c < 1.03 mmol/L (0.4 g/L) in men and HDL-c < 1.30 mmol/L (0.5 g/L) in women; hyper-LDL cholesterolemia LDL-c > 2.58 mmol/L (1 g/L); and/or hypertriglyceridemia TG > 1.69 mmol/L (1.5 g/L) [13].

In children aged 0 - 15, dyslipidemias were defined as: hypercholesterolemia TC > 4.5 mmol/L (1.74 g/L); hypo-HDL cholesterolemia HDL-c < 1.1 mmol/L (0.43 g/L); hyper-LDL cholesterolemia LDL-c > 2.9 mmol/L (1.12 g/L) and hypertriglyceridemia TG > 1.7 mmol/L (1.50 g/L) [14].

For TC and TG assays, the term hypercholesterolemia was used in the presence of an isolated increase in TC; the term hypertriglyceridemia if an isolated increase in TG; and the term mixed hyperlipidemia in the presence of a concomitant increase in TC and TG.

2.5. Data Collection and Analysis

The following variables were collected: socio-demographic variables including gender, age and lipid panel prescribing department; biological variables including TC, HDL-c, LDL-c and TG. Data were analyzed using Excel software version 2019. Numbers and percentages were calculated for the different modalities of the variables. Comparisons were made using the chi-squared test, with the significance threshold set at 0.05.

2.6. Ethical and Deontological Aspects

Confidentiality, medical ethics and CHUP-CDG internal regulations were respected throughout the study. Prior authorization for data collection was obtained from CHUP-CDG management.

3. Results

A total of 2872 patients have been included in the study.

3.1. Sociodemographic Characteristics of the Study Population

3.1.1. Gender

The study population comprised 1586 women (55.22%) and 1286 men (44.78%), giving a M/F sex ratio of 0.81.

3.1.2. Age

The mean age of the study population was 27.72 ± 19.51 years. The 0 - 15 age group comprised 952 patients (33.15%), the 16 - 45 age group 1256 patients (43.73%) and the over-45 age group 664 patients (23.12%).

3.1.3. Prescribing Department

In the case of 1752 patients (61.00%), the test report had been ordered internally, by one of the CHUP-CDG clinical departments. For 39.00% of patients, the test report came from other care structures.

3.2. Lipid Balance Characteristics of the Study Population

3.2.1. Numerical Characteristics

The numerical characteristics of the lipid balance parameters are presented in Table 1. The mean TC value was 4.24 mmol/L and 0.99 mmol/L for TG.

3.2.2. Prevalence of Dyslipidemia

Among patients, 317/2740 (11.57%) had hypercholesterolemia, 302/614 (49.19%), hypo-HDL cholesterolemia, 322/560 (57.50%) hyper-LDL cholesterolemia, 231/2554 (9.04%) hypertriglyceridemia and 51/2455 (2.08%) mixed hyperlipidemia (Figure 1).

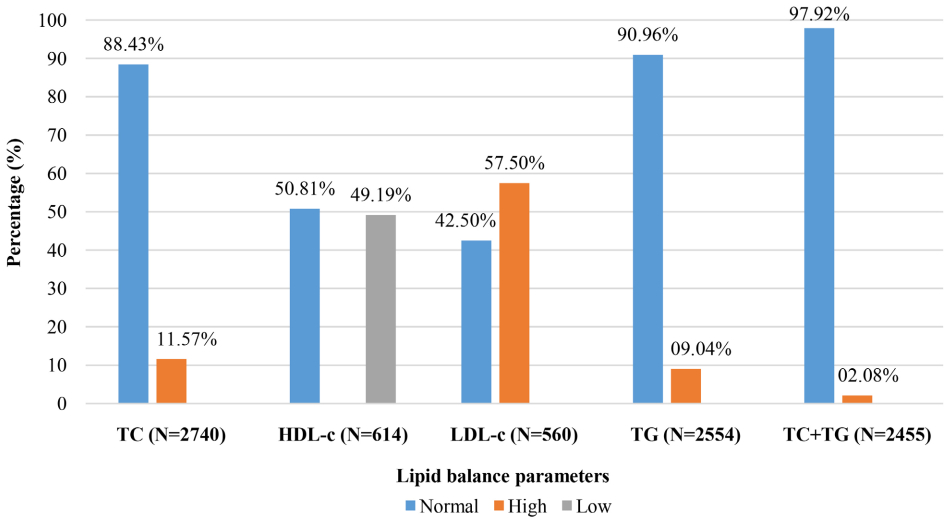

Figure 1. Distribution of study population according to lipid profile interpretation.

Table 1. Numerical characteristics of lipid balance parameters.

Parameters	Average ± Standard deviation	Minimum	Maximum
TC (mmol/L)	4.24 ± 1.33	0.40	12.20
HDL-c (mmol/L)	1.40 ± 0.68	0.10	6.70
LDL-c (mmol/L)	3.30 ± 1.45	0.41	8.07
TG (mmol/L)	0.99 ± 0.74	0.11	8.50

A total of 857 patients had at least one dyslipidemia, *i.e.* hypercholesterolemia, hypo-HDL cholesterolemia, hyper-LDL cholesterolemia and/or hypertriglyceridemia. The overall prevalence of dyslipidemia in the study population was therefore 22.84%.

3.3. Prevalence of Dyslipidemia According to Sociodemographic Characteristics

3.3.1. By Gender

Figure 2 shows the distribution of dyslipidemias according to gender in the study population. Thus, 13.02% of female patients and 9.74% of male patients had hypercholesterolemia. In addition, 58.78% of male patients and 48.92% of female had hypo-HDL cholesterolemia. Hypercholesterolemia was significantly ($p = 0.0077$) more frequent in female patients, while hypo-HDL cholesterolemia was significantly more frequent in male patients ($p = 0.0197$).

Hyper-LDL cholesterolemia, hypertriglyceridemia and mixed hyperlipidemia were not influenced by gender.

3.3.2. According to Age

The prevalence of dyslipidemia according to age is shown in **Figure 3**. All types of dyslipidemia were influenced by patient age. Thus, hypercholesterolemia (21.58%) and hypertriglyceridemia (18.14%) were significantly ($p < 0.00001$) more frequent in patients aged 0 to 15. Hypo-HDL cholesterolemia was significantly

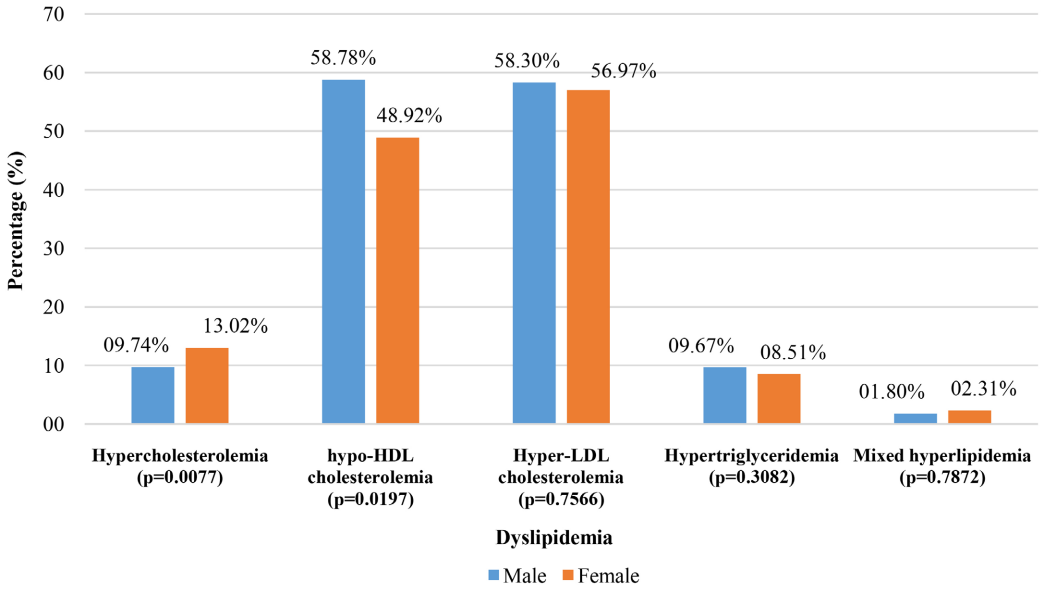

Figure 2. Prevalence of dyslipidemia according to gender.

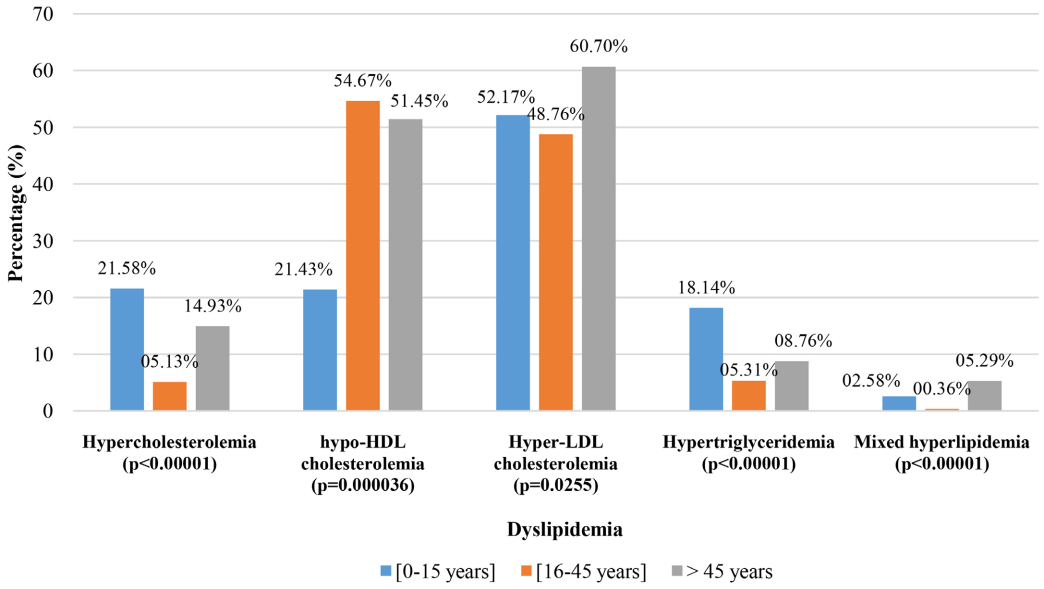

Figure 3. Prevalence of dyslipidemia according to age.

more frequent in patients aged 16 to 45 ($p = 0.000036$). Hyper-LDL cholesterolemia ($p = 0.0255$) and mixed hyperlipidemia ($p < 0.00001$) were significantly more frequent in patients aged over 45.

3.3.3. By Department

Among patients, 9.47% of inpatients and 15.18% of outpatients had hypercholesterolemia; while 1.18% of inpatients and 4.04% of outpatients had mixed hyperlipidemia (**Figure 4**). Outpatients had significantly more cases of hypercholesterolemia ($p < 0.00001$) and mixed hyperlipidemia ($p < 0.00001$) (**Figure 4**).

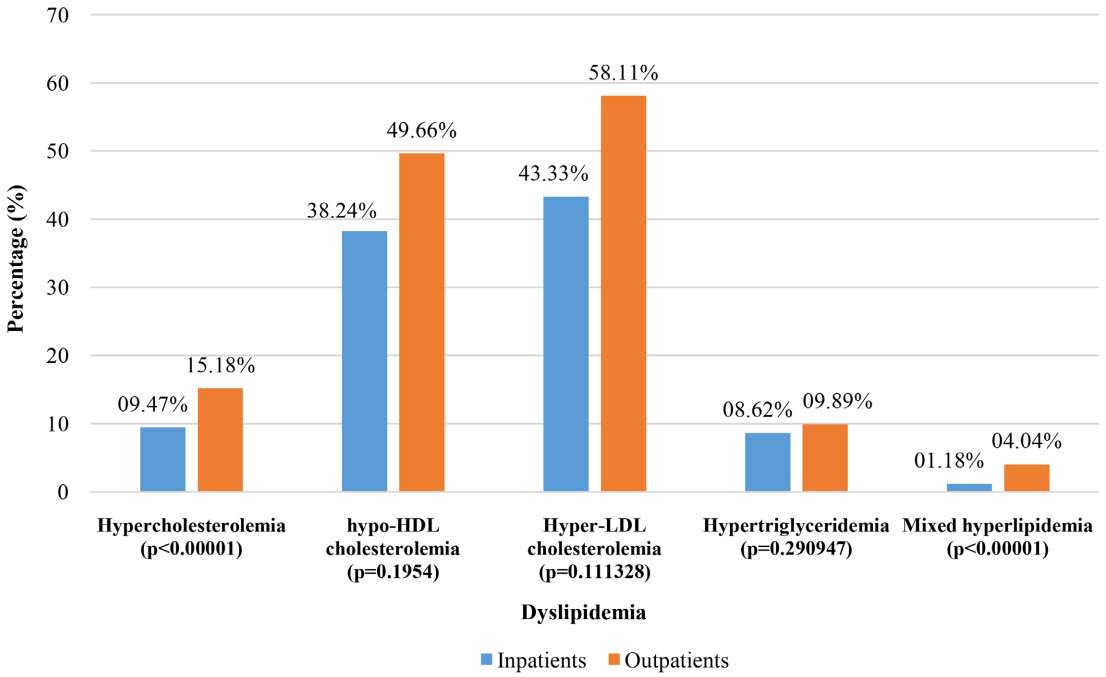

Figure 4. Prevalence of dyslipidemia according to prescribing department.

4. Discussion

Dyslipidemias are a leading factor in the genesis of CVD, which is a major concern worldwide. The aim of the study was to determine the prevalence of dyslipidemia in patients received at the CHUP-CDG biochemistry unit.

The main limitation of the study, due to its retrospective nature, was the missing data. In fact, not all patient data was properly archived. In addition to this, we found that many practitioners prescribed only TC and TG, without adding HDL-c and LDL-c measurements. Yet the standard lipid profile includes the determination of these four parameters, combined with an assessment of serum appearance. The main reason given for this is the need to rationalize prescribing, due to patients' limited financial resources. However, this does not provide an adequate analysis of the lipid profile, as the TC may be normal, albeit with abnormalities in the distribution of the various fractions.

During the course of the study, numerous cases of lipid disorders were identified (**Figure 1**). The overall prevalence of dyslipidemia was 22.84%, with 11.57% hypercholesterolemia, 9.04% hypertriglyceridemia and 2.08% mixed hyperlipidemia. These data differ from those of other African studies on the subject. Cissé *et al.* reported 39.30% dyslipidemia, 30.89% hypercholesterolemia and 7.22% mixed hyperlipidemia in Senegal [15].

Similarly, Tiahou *et al.* reported 39% dyslipidemia, 31.19% hypercholesterolemia and 21.08% mixed hyperlipidemia in Côte d'Ivoire [16]. This difference could be explained by the pediatric context of CHUP-CDG, which included a large number of children (33.15% of the study population), with a relatively low mean age compared with other studies. Hypertriglyceridemia data were similar

to those reported in Chad [17]. In contrast, 0.51% hypertriglyceridemia was found in Senegal [15] and 16.51% in Côte d'Ivoire [16]. On the one hand, these disparate data may be linked to the socio-demographic characteristics of the different populations studied. On the other hand, the pathophysiology of hypertriglyceridemia involves causes such as obesity, metabolic syndrome or diabetes mellitus [18], which are mostly found in adulthood

In addition, 49.19% of hypo-HDL cholesterolemia and 57.50% of hyper-LDL cholesterolemia were reported. Compared with other African studies [15] [16] [17], these figures are significantly higher. This is probably due to the context in which these parameters were prescribed in the study. In fact, only less than a quarter of patients who had a TC measurement also had HDL-c and LDL-c measurements (**Figure 1**). Prescribers most often request both TC and TG as first-line tests. In the presence of hypercholesterolemia, HDL-c and LDL-c are then added to the workup. However, pathophysiologically, hypercholesterolemia is accompanied by hypo-HDL-cholesterolemia and hyper-LDL-cholesterolemia [19], which explains the high figures found in the study.

Hypercholesterolemia was significantly ($p = 0.0077$) more frequent in women (**Figure 2**). Several studies have highlighted the female predominance of hypercholesterolemia [15] [20] [21]. Factors such as hormonal status in women; but also overweight/obesity, sedentary lifestyle and psychosocial factors, more frequently encountered in women, could be at the root of this. In addition, hypercholesterolemia ($p < 0.00001$) and hypertriglyceridemia ($p < 0.00001$) were significantly more frequent in patients aged 0 to 15. In this age group, this finding could be explained by the pathologies frequently associated with dyslipidemia at CHUP-CDG, namely HIV and nephrotic syndrome [22] [23]. Hypo-HDL cholesterolemia was more frequently found in males ($p = 0.0197$), as is also the case in some studies [20]. Further information on certain habits in men, such as smoking and alcohol consumption, is required. Furthermore, taking age into account (**Figure 3**), hypo-HDL cholesterolemia was more frequent in patients aged 16 to 45 ($p = 0.000036$), potentially the age group most likely to indulge in these habits [24]. Hyper-LDL cholesterolemia ($p = 0.0255$) and mixed hyperlipidemia ($p < 0.00001$) were significantly more frequent in patients over 45 years of age.

The fact that mixed hyperlipidemia was more frequent in outpatients corroborates these data, insofar as outpatients were predominantly over 16 years of age in the study. The relationship between age and the onset of dyslipidemia has been established by several studies. They concluded that TC and LDL-c levels increased with age, as did the incidence of cardiovascular disease [25]. The mechanisms involved could be linked to the various age-induced changes in the body. These include changes in the sinusoidal endothelium of the liver (a key organ in lipid metabolism); insulin resistance induced by free fatty acids; growth hormone deficiency; androgen depletion in men, all of which are age-related [25].

5. Conclusion

Relatively high prevalences of dyslipidemia were found during the study, which involved patients of all ages received in the CHUP-CDG biochemistry unit. In order to ensure adequate primary prevention of CVM, a nationwide search for risk factors, especially those that are modifiable, should be undertaken. This would undoubtedly help reduce the morbidity and mortality associated with cardiovascular disease.

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Conflicts of Interest

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

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