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Research Article

Prevalence of Metabolic Syndrome Among Obese Children in Cote d'Ivoire

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Abstract

Objective: This study aimed to assess the prevalence of metabolic syndrome among school-aged children in three municipalities of Abidjan, Côte d'Ivoire, and to analyze its anthropometric and biological determinants. Methods: A cross-sectional survey was conducted among 1,251 children aged 5 to 15 years. Among them, 64 children (31 obese and 33 normal-weight) underwent biological testing. Anthropometric measurements (BMI, waist circumference, abdominal circumference), blood pressure, and biochemical parameters (blood glucose, triglycerides, HDL cholesterol) were collected. The diagnosis of metabolic syndrome was based on the NCEP ATP III criteria. Statistical analyses were performed using SPSS 20, employing Student's t-test, the chi-square test, and Pearson's correlation coefficients. Results: Obese children had significantly higher values for weight, BMI, waist circumference, and blood pressure compared to the control group ($p < 0.05$). The prevalence of metabolic syndrome was 25%, with a higher frequency among girls (20.3%) than among boys (4.7%). Abdominal obesity, hypertension, and low HDL cholesterol were the most common abnormalities. A positive correlation was observed between BMI and waist circumference ($r = 0.788$, $p = 0.001$), as well as between waist circumference and systolic blood pressure ($r = 0.493$, $p = 0.004$). Hyperuricemia was strongly associated with metabolic syndrome, suggesting its potential role as an early biomarker of cardiovascular risk. Conclusion: This study highlights a concerning prevalence of metabolic syndrome among obese children in Ivorian schools, particularly among girls. Abdominal obesity and hyperuricemia appear to be key factors in the development of cardiometabolic complications. These results underscore the urgent need for targeted prevention strategies, including early screening, the promotion of a balanced diet, and physical activity, in order to reduce the future burden of cardiovascular disease in Côte d'Ivoire.

Keywords

Prevalence, Metabolic Syndrome, Children, Obesity

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1. Introduction

Over the past few decades, developing countries have undergone profound socioeconomic change, characterized by rapid urbanization and a radical transformation in lifestyles [1, 2]. This transition has been accompanied by a shift in the epidemiological profile: chronic noncommunicable diseases are gradually replacing infectious diseases as the leading cause of morbidity. As early as the 1970s, this trend was conceptualized under the term "epidemiological transition" [3]. In practical terms, it manifests as the adoption of a high-calorie diet rich in fats, sugars, and salt, combined with a drastic reduction in physical activity, thereby creating an environment conducive to the rise of obesity and cardiometabolic risk factors [4, 5].

Today, developing countries have high prevalence rates of obesity [6], high blood pressure, diabetes, and dyslipidemias, particularly hypercholesterolemia [7]. According to the World Health Organization, nearly 80% of deaths attributable to chronic diseases occur in low- and middle-income countries, where the incidence of these conditions is rising at an alarming rate [6, 8]. This phenomenon, which was initially concentrated in urban areas [9], is now increasingly spreading to pediatric and adolescent populations [10].

Lipid metabolism disorders, among the most common inherited conditions in pediatrics, are a major determinant of long-term cardiovascular health. The epidemic of obesity and overweight among school-age children and adolescents has now emerged as a major public health issue [11]. Furthermore, cardiovascular diseases remain one of the leading causes of mortality worldwide, closely linked to the rise in risk factors such as obesity, insulin resistance, dyslipidemia, and hypertension [12-15]. The frequent co-occurrence of these conditions in the same individual has led to the emergence of the concept of metabolic syndrome, now recognized as a marker of high cardiovascular risk [16-18].

By its very nature, this syndrome represents a clinical and pathophysiological interface between obesity, diabetes, and cardiovascular disease. Its steadily increasing prevalence makes it a major public health problem, both in terms of frequency and severity [19]. In the general pediatric population, its prevalence ranges from 7.2% to 15.2%; it can reach 38.7% among moderately obese adolescents and climb as high as 49.7% among those with severe obesity [15, 16, 18].

In this context, this study aims to assess the prevalence of metabolic syndrome among a group of children living in three municipalities of the city of Abidjan, in Côte d'Ivoire. The objective is to provide insights into the extent of this phenomenon and its implications for the future health of the Ivorian population.

2. Materials and Methods

2.1. Materials

This study was conducted in six schools—three public and three private—in three municipalities of the city of Abidjan, Côte d'Ivoire.

Children aged 5 to 15 years at the time of the survey were included in this study. Any child for whom parental/guardian consent was not provided, any child absent during the survey period, and any child present but suffering from a chronic or acute illness was excluded from the study. At the conclusion of the survey, 1,251 children were recorded across all the schools visited.

Biological analyses were conducted on 64 children, including 31 obese children and 33 children of normal weight, who served as the control group. The parents of these 64 children were contacted again to obtain their consent prior to blood collection.

The technical equipment consisted of survey materials, blood collection supplies, and materials for blood storage and analysis.

2.2. Methods

Anthropometric measurements included body weight, height, waist circumference, and body mass index.

Weight and height were measured according to World Health Organization standards [20]. Weight (in kg) was measured with participants barefoot and wearing light clothing using a Sohenle electronic scale with an accuracy of 0.5 kg. Height (in meters) was measured using a height rod with an accuracy of 0.1 cm. Participants stood barefoot with their feet together and flat on the floor, their backs, buttocks, and heels pressed against the vertical board of the height rod, and their heads held in a horizontal position so that their line of sight was perpendicular to their bodies. Waist circumference was measured using a flexible tape measure. To measure waist circumference, the child stands upright, and the tape is wrapped around the abdomen just above the navel after exhaling normally. When taking this measurement, make sure the tape measure is neither too loose nor too tight, that it lies flat against the waist, and, most importantly, that the measurement is taken horizontally, especially around the back.

Children with a waist circumference (WC) above the 90th percentile are classified as having abdominal obesity according to French guidelines [21].

Body Mass Index (BMI) in kg/m^2 was calculated by dividing weight in kilograms by height squared in square meters. BMI is the measure used to classify children according to their nutritional status.

Blood pressure was measured using a mercury sphygmomanometer equipped with a cuff suitable for children, after 5 minutes of rest in the supine position. Children were considered hypertensive if their blood pressure exceeded the 95th percentile for their height, sex, and age [22].

2.2.1. Collection of Blood Samples From the Children Studied

Based on the information obtained from the survey, 64 children were selected for biological testing. Of these 64 children, 31 were obese and 33 were of normal weight (controls). For each child, a fasting venous blood sample (taken 12 hours after the last meal) was collected from the antecubital fossa in the morning. The blood, collected in 5-ml Vacutainer tubes (with red and purple caps), was immediately transported to the medical testing laboratory of the Biochemistry Department at the Treichville University Hospital Center (CHU) (Abidjan, Ivory Coast). Once at the laboratory, the blood samples collected in the red-capped tubes were centrifuged at 3,000 rpm for 5 minutes to obtain serum. The resulting serum aliquots were stored by freezing (-20 ℃) in sealed microtubes until analysis. Every precaution was taken to ensure that all procedures were performed away from sunlight to prevent the alteration of certain biochemical parameters. The following parameters were determined: HDL cholesterol, LDL cholesterol, total cholesterol, plasma triglycerides, uric acid, and fasting blood glucose.

2.2.2. Diagnosis of Metabolic Syndrome

In this study, the definition used is that of the NCEP ATP III (National Cholesterol Education Program Adult Treatment Panel III), according to which at least three of the following five criteria must be met to diagnose metabolic syndrome:

1) Abdominal obesity: A waist circumference (WC) above the 90th percentile, according to French guidelines [21].
2) Low HDL cholesterol: HDL cholesterol below the 10th percentile, or 1.03 mmol/L, using the 10th percentile mean according to the National Cholesterol Education Program (NCEP) Report of the Expert Panel on Blood Cholesterol Levels in Children and Adolescents [23].
3) Hypertriglyceridemia: plasma triglycerides above the 90th percentile, i.e., >1.24 mmol/L (corresponding to the age-adjusted 90th percentile mean) [23].
4) Hypertension: systolic blood pressure (SBP) > 95th percentile or diastolic blood pressure (DBP) > 95th percentile [24].
5) Impaired glucose tolerance: fasting blood glucose > 6.1 mmol/L (1.09 g/L) [19].

For the diagnosis of metabolic syndrome in children, if three of the five criteria are present, metabolic syndrome is confirmed.

2.2.3. Statistical Analyses

The data were entered using a double-entry procedure into a Microsoft Excel spreadsheet, then verified and cleaned using EpiInfo version 3.2.5 to eliminate discrepancies. Statistical analysis was performed using SPSS version 20.0. Quantitative variables were described by their mean accompanied by the standard deviation (SD) or the 95% confidence interval (95% CI), depending on the suitability of the data distribution. Qualitative variables were expressed as proportions (numbers and percentages). Age was converted to decimal years using the Ireton method [25]. Comparisons of means between two independent groups were performed using Student's t-test. Comparisons of proportions were performed using Pearson's χ^2 test. The significance level was set at $p < 0.05$ for all tests. Correlations between the various parameters constituting metabolic syndrome were estimated using Pearson's linear correlation coefficient (r). Graphs were generated using Microsoft Excel.

3. Results

3.1. Distribution of Children by Sex and Nutritional Status

The study population consisted of 64 children, including 33 children of normal weight and 31 obese children. The mean age is 9.50 ±1.91 years, ranging from 5 to 15 years. The mean weight is 37.76 ±12.76 kg. Table 1 presents the main anthropometric characteristics, blood pressure, and blood glucose levels of normal-weight and obese children. Weight, BMI, waist circumference, and abdominal circumference, as well as blood pressure, were significantly higher in obese children compared to normal-weight children ($p < 0.05$). Regarding blood glucose levels, there was no significant difference between normal-weight and obese children ($p > 0.05$).

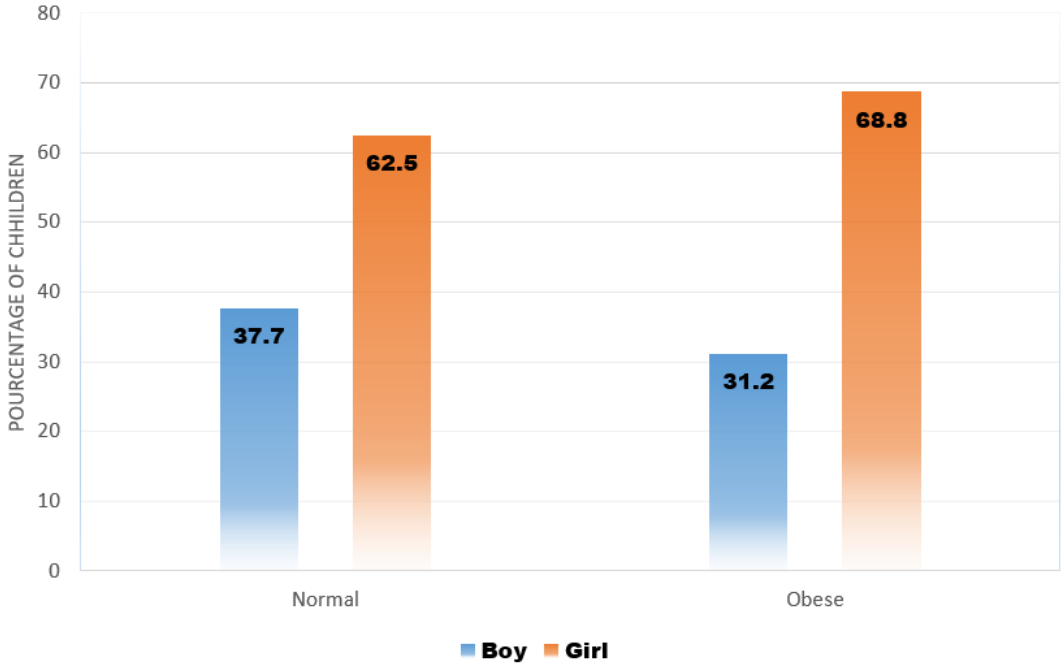
Figure 1 provides information on the nutritional status of children by sex. Among normal-weight children, 37.7% are boys and 62.5% are girls. Among obese children, 31.2% are boys and 68.8% are girls.

Table 1. *Anthropometric and biological characteristics and blood pressure in normal-weight and obese children.*

	Normal weight n = 33	Obese n = 31	P
Age (years)	9,19 ±1,85	9,79 ±1,94	0,201
Weight (kg)	29,13 ±6,56	45,87 ±11,85	0,012
Height (m)	1,34 ±0,11	1,43 ±0,11	0,081
BMI (kg/m^2)	16,37 ±1,7	22,25 ±3,15	0,012

	Normal weight n = 33	Obese n = 31	P
Waist Circumference (cm)	62,55 ±5,26	73,66 ±7,94	0,005
Abdominal Circumference (cm)	60,54 ±3,88	74,27 ±8,7	0.004
Systolic Blood Pressure (mm Hg)	10,83 ±8,4	11,98 ±8,36	0,006
Diastolic Blood Pressure (mm Hg)	6,14 ±4,2	7,62 ±16,30	0,012
Blood Glucose (g/L)	0,72 ±0,12	0,80 ±-0,19	0,081

Results are expressed as mean ± standard deviation. BMI: Body Mass Index; Systolic BP: Systolic Blood Pressure; Diastolic BP: Diastolic Blood Pressure; P: significance threshold



p = 0,021

Figure 1. *Nutritional status of children by sex.*

With regard to blood glucose levels, 9.4% of obese children and 6.2% of normal-weight children have high blood glucose levels; 18.8% of normal-weight children and 12.5% of obese children have low blood glucose levels; and 75% of normal-weight children and 78.1% of obese children have normal blood glucose levels. No significant difference was observed between normal-weight children and obese children (p = 0.895).

3.2. Anthropometric and Biological Characteristics of Obese Children by Sex

The criteria for metabolic syndrome were assessed in the 31 obese children. This population of obese children consisted of 58.07% girls and 41.93% boys, with a mean age of 9.84 ±1.93 years. By gender, the mean age was 10.12 ± 2.39 years for girls and 9.33 ±1.29 years for boys. The mean BMI was 23.47 ± 2.76 kg/m^2 for girls and 20.55 ± 2.93 kg/m^2 for boys. The average weight is 49.34 ±11.6 kg for girls and 41.14 ±10.89 kg for boys. The average height is 1.44 ± 0.1 m for girls and 1.40 ± 0.11 m for boys. BMI, waist circumference, and abdominal circumference are 23.44 ± 3 kg/m^2, 75.41 ± 7.7 cm, and 82.35 ± 16.9 cm for girls, and 20.60 ± 2.76 kg/m^2, 71.73 ±8.31 cm, and 68.47 ±14.06 cm for boys. Blood pressure was 12.10 ± 7.7 mmHg for systolic pressure and 8.23 ± 16.9 mmHg for diastolic pressure in girls. In boys, it was 11.77 ± 9.73 mmHg for systolic pressure and 6.82 ± 14.64 mmHg for diastolic pressure. As for blood glucose, triglycerides, total cholesterol, HDL cholesterol, LDL cholesterol, and uric acid levels, they are 0.82 ± 0.14 g/L, 1.26 ± 0.32 g/L, 2.11 ± 0.25 g/L, 0.44 ± 0.1 g/L, 1.48 ± 0.33 g/L, and 63.45 ± 13.7 mg/L in girls, and 0.86 ± 0.23 g/L, 1.34 ± 0.88 g/L, 2.17 ± 0.27 g/L, 0.47 ± 0.11 g/L, 1.55 ± 0.32 g/L, and 48.02 ± 15.35 mg/L for boys (Table 2).

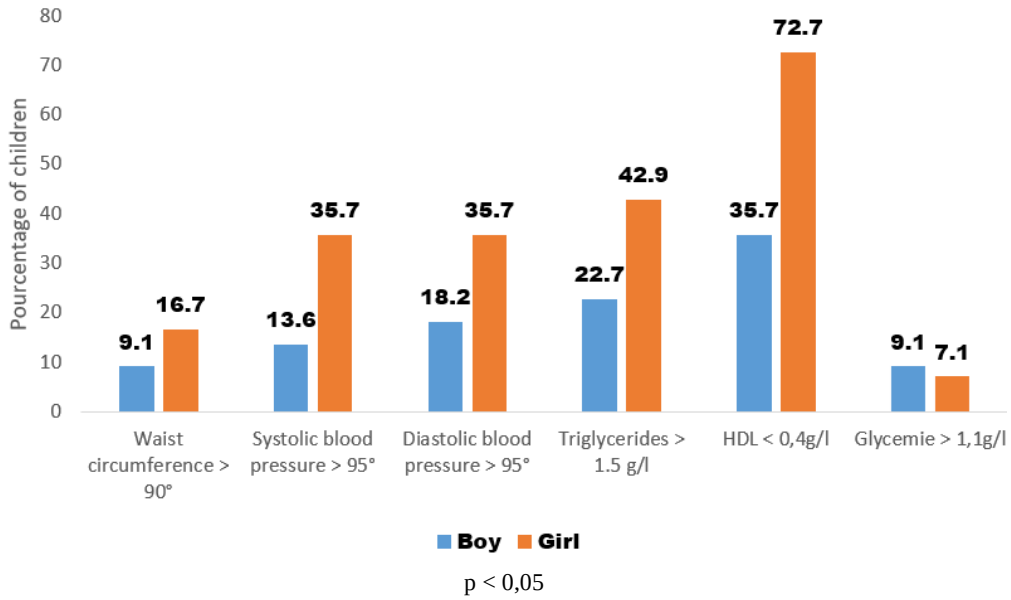
3.3. Prevalence of Metabolic Syndrome Criteria in Obese Children

Figure 2 shows the prevalence of metabolic syndrome criteria in obese children. Abdominal obesity is observed in 16.7% of girls and 9.1% of boys. The prevalence of hypertension among obese children is twice as high in girls as in boys (35.7% vs. 13.6%). As for triglyceride levels, they are higher in girls (42.9%) than in boys (22.7%). Low HDL-cholesterol levels were observed in 72.7% of girls and 35.7% of boys, respectively. All of these values showed a significant difference between girls and boys ($p < 0.05$). Elevated blood glucose levels were observed in 7.1% of girls compared with 9.1% of boys, with no significant difference.

Table 2. *Anthropometric and Biological Characteristics in Obese Children by Sex.*

	Obese girl n = 17	Obese boy n =14	P
Age (years)	10,12 ±2,39	9,33 ±1,29	0,215
Weight (kg)	49,34 ±11,6	41,14 ±10,89	0,008
Height (m)	1,44 ±0,1	1,40 ±0,11	0,051
BMI (kg/m^2)	23,44 ±3	20,60 ±2,76	0,004
Waist Circumference (cm)	75,41 ±7,7	71,73 ±8,31	0,361
Abdominal Circumference (cm)	82,35 ±16,9	68,47 ±14,06	0,001
Systolic Blood Pressure (mm Hg)	12,10 ±7,7	11,77 ±9,73	0,038
Diastolic Blood Pressure (mm Hg)	8,23 ±16,9	6,82 ±14,64	0,001
Blood Glucose (g/L)	0,82 ±0,14	0,86 ±0,23	0,565
Triglycerides (g/l)	1,26 ±0,32	1,34 ±0,88	0,061
Total Cholesterol (g/L)	2,11 ±0,25	2,17 ±0,27	0,251
HDL cholesterol (g/l)	0,44 ±0,1	0,47 ±0,11	0,381
LDL Cholesterol (g/l)	1,48 ±0,33	1,55 ±0,32	0,061
Uric Acid (mg/L)	63,45 ±13,7	48,02 ±15,35	0,001

Results are expressed as mean ±standard deviation; BMI: Body Mass Index; Systolic BP: Systolic Blood Pressure; Diastolic BP: Diastolic Blood Pressure; P: significance threshold



$p < 0,05$

Figure 2. *Metabolic syndrome parameters observed in obese boys and girls.*

3.4. Prevalence of Metabolic Syndrome in Obese Children

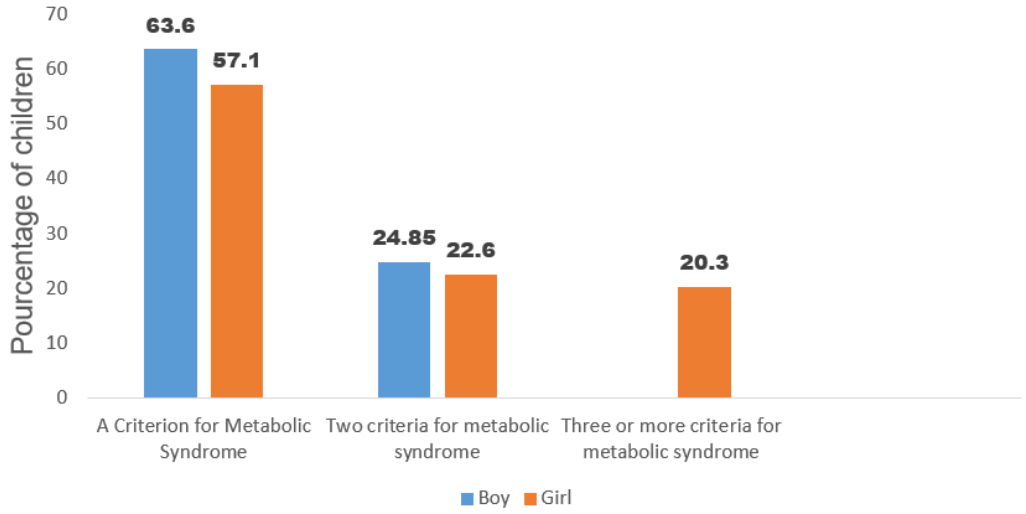
Figure 3 shows the prevalence of metabolic syndrome in obese girls and boys. Metabolic syndrome was observed in 20.3 per cent of obese girls, compared with 4.7 per cent of obese boys in the study. Two criteria for metabolic syndrome are observed in 22.6 per cent of girls and 24.85 per cent of boys. The proportions of girls and boys meeting one criterion for metabolic syndrome are 57.1 per cent and 63.6 per cent, respectively. Overall, metabolic syndrome is more prevalent among girls than among boys ($p < 0.05$).

3.5. Correlation Between Metabolic Syndrome Criteria

Table 3 shows the correlation between BMI and waist circumference, between BMI and low HDL, between waist circumference and systolic blood pressure, between waist circumference and low HDL, and between triglycerides and low HDL. There is a statistically significant positive correlation between BMI and waist circumference ($r = 0.788$, $p = 0.001$) and between waist circumference and systolic blood pressure ($r = 0.493$, $p = 0.004$). Weight gain promotes the development of high blood pressure and abdominal obesity. The correlations between BMI, waist circumference and triglycerides with low HDL are inversely proportional. BMI and low HDL ($r = -0.307$, $p = 0.008$), waist circumference and low HDL ($r = -0.156$, $p = 0.394$), and triglycerides and low HDL ($r = -0.168$, $P = 0.006$).

3.6. Comparison of Metabolic Syndrome Parameters Between Obese and Normal-weight Children

This study compares waist circumference, blood pressure and blood glucose levels between normal-weight and obese children. Table IV shows that 28.1 per cent of obese children have abdominal obesity, whilst none of the normal-weight children have abdominal obesity ($p = 0.0001$). For systolic blood pressure, amongst children with readings above the 95th percentile, 53.1 per cent are obese and 3.1 per cent are of normal weight. For diastolic blood pressure, 53.1 per cent of obese children have diastolic blood pressure readings above the 95th percentile and 6.2 per cent of normal-weight children have a reading above the 95th percentile ($p = 0.001$). Hyperglycaemia is observed in 6.2 per cent of normal-weight children and 9.4 per cent of obese children ($p = 0.894$) (this sentence needs reviewing; I think the opposite is correct, i.e. 9.4 per cent of normal-weight children and 6.2 per cent of obese children). With the exception of blood glucose levels, the other parameters of metabolic syndrome were significantly higher in obese children than in normal-weight children ($p > 0.05$).



$p < 0,05$

Figure 3. *Prevalence of metabolic syndrome among obese boys and girls.*

Table 3. *Correlation between the criteria for metabolic syndrome.*

		Waist circumference	BMI	Systolic blood pressure	Low HDL	Triglyceride
Waist circumference	r =	1,00	0,788	0,493	-0,156	0,230

		Waist circumference	BMI	Systolic blood pressure	Low HDL	Triglyceride
	P =		0,0001	0,004	0,394	0,206
BMI	r =	0,788	1,00	0,705	-0,307	0,321
	P =	0,0001		0,0001	0,088	0,074
Systolic blood pressure	r =	0,493	0,705	1,00	-0,389	0,148
	P =	0,004	0,0001		0,028	0,419
Low HDL	r =	-0,156	-0,307	-0,389	1,00	-0,168
	P =	0,394	0,088	0,028		0,357
Triglyceride	r =	0,230	0,321	0,148	-0,168	1,00
	P =	0,206	0,74	0,419	0,357	

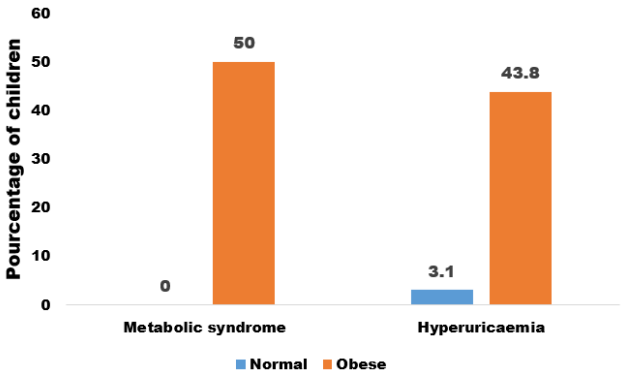
r = correlation coefficient; p = two-tailed significance.

Table 4. *Comparison of metabolic syndrome parameters in normal-weight and obese children.*

	Normal (%)% n = 33	Obese (%)% n = 31	P
Waist circumference > 90	0	28,1 (9)	0,001
Waist circumference < 90	100 (31)	71,9 (23)	
Systolic blood pressure > 95	3,1 (1)	53,1 (17)	0,001
Systolic blood pressure < 95	96,9 (30)	46,9 (14)	
Diastolic blood pressure > 95	6,2 (2)	53,1 (17)	0,001
Diastolic blood pressure < 95	93,7 (29)	46,9 (14)	
Blood glucose > 1.10 g/l	6,2 (2)	9,4 (3)	0,291
Blood glucose < 1.10 g/l	93,7 (29)	90,6 (28)	

3.7. Hyperuricaemia, Obesity and Metabolic Syndrome in Children

Figure 4 provides information on the relationship between hyperuricaemia, obesity and metabolic syndrome. 43.8 per cent and 50 per cent of obese children have hyperuricaemia and meet the criteria for metabolic syndrome, respectively, compared with 3.1 per cent and 0 per cent of normal-weight children. No normal-weight children met the criteria for metabolic syndrome. These figures differ significantly between normal-weight and obese children. Hyperuricaemia may predict the onset of metabolic syndrome in obese children.



p < 0,05

Figure 4. *Comparison of metabolic syndrome and hyperuricaemia in normal-weight and obese children.*

4. Discussion

This study highlights a close and consistent relationship between body mass index (BMI) and waist circumference, consistent with findings reported in the international literature [26, 27]. Our results reveal a statistically significant difference between BMI and levels of systolic blood pressure (SBP) and diastolic blood pressure (DBP). Furthermore, highly significant positive correlations were found between waist circumference and systolic hypertension, between waist circumference and BMI, and between BMI and systolic hypertension. Conversely, negative correlations were identified between systolic hypertension and low HDL, between triglycerides and low HDL, between BMI and low HDL, and between waist circumference and low HDL. The association between obesity and hypertension in children, which is well documented in industrialized countries [28, 29], is thus reflected in our cohort.

Our study reveals a risk of developing hypertension—both systolic and diastolic—among obese girls. These findings are consistent with those reported by Samuel et al. [30] in Mexico, although they differ from an Algerian study conducted among obese adolescents, in which the prevalence of hypertension was twice as high among boys as among girls [31].

These discrepancies underscore the importance of ethnic, geographic, and methodological factors in Assessment of blood pressure profiles in obese children. With regard to carbohydrate metabolism, the children in our cohort appear to be relatively unaffected by hyperglycemia. This observation is consistent with the findings of Bougnère et al. [32], who reported a prevalence of hyperglycemia of only 10 to 15% among obese children. Type 2 diabetes, meanwhile, remains rare at this stage of development. It is recognized that only children with a strong genetic predisposition—particularly those of Asian descent and, to a lesser extent, those of African descent—may develop this condition in the context of obesity. Among children of European or North African descent, obesity is generally not associated with diabetes before adulthood [33]. In our population, only 6.2% of normal-weight children and 9.4% of obese children had elevated fasting blood glucose levels. This low prevalence of hyperglycemia in children is comparable to that reported by Druet et al. [33, 34] in European studies on glucose tolerance and type 2 diabetes in children and adolescents.

After low HDL cholesterol, the highest prevalences among obese children were for hypertriglyceridemia and hypertension, while the lowest prevalences were for waist circumference and hyperglycemia. Metabolic syndrome (MS) was identified in 25% of the children in our sample.

This prevalence is comparable to that reported in Turkey (27.2%) [35], but remains lower than the rates observed among American or Indian adolescents, where MS reaches 36% [13]. These disparities should be interpreted with caution, given the heterogeneity of pediatric definitions of metabolic syndrome and differences in socioeconomic contexts among populations [13].

A key finding of our study is the increase in the prevalence of metabolic syndrome with rising BMI, a relationship that is even more pronounced among obese children with hyperuricemia. These results corroborate the findings of Gao et al., who demonstrated that hyperuricemia is an independent risk factor for the components of metabolic syndrome [36]. Uric acid may also predispose individuals to obesity, metabolic syndrome, type 2 diabetes, hypertension, and cardiovascular disease [37]. From a pathophysiological perspective, uric acid directly stimulates the renin-angiotensin system and induces renal vasoconstriction, thereby contributing to elevated blood pressure [38]. Weight loss has a beneficial effect in obese individuals with hyperuricemia, particularly regarding associated comorbidities, an effect comparable to that observed after bariatric surgery.

The most compelling evidence supporting the causal role of serum uric acid in the development of metabolic syndrome comes from experimental animal studies, which demonstrate that lowering serum uric acid levels can prevent or alleviate the components of the syndrome [39]. Hyperuricemia and metabolic syndrome are therefore frequently associated, and hyperuricemia appears to be a reliable predictor of hypertension. Consequently, the prevalence of hypertension is significantly higher in individuals with hyperuricemia associated with overweight or obesity, which are recognized risk factors for hypertension [40].

The association between obesity and serum uric acid levels is now well established. For example, the CARDIA (Coronary Artery Risk Development in Young Adults) study showed that women with a BMI exceeding 23.5 kg/m^2 were 5.7 times more likely to have hyperuricemia than those with a BMI below 20.8 kg/m^2 [41].

In conclusion, the results of this study demonstrate that pediatric obesity is a major risk factor for metabolic syndrome, associated with a characteristic dyslipidemic profile in obese children. These findings underscore the need for early, multidisciplinary management of childhood obesity to prevent the early onset of metabolic and cardiovascular complications in adulthood

5. Conclusion

This study conducted in Abidjan reveals a high prevalence of metabolic syndrome among obese children, with a significant predominance among girls. Increases in body mass index and waist circumference are closely associated with high blood pressure and abnormal lipid profiles, confirming the key role of abdominal obesity in the development of early cardiometabolic complications. Hyperuricemia appears to be a potential biomarker of cardiovascular risk in children, while the low prevalence of hyperglycemia suggests a gradual progression toward type 2 diabetes, likely in adulthood. These results are consistent with international data and underscore the imperative for systematic monitoring of metabolic status in school settings. The implementation of integrated prevention

strategies—combining early screening, community-based interventions, promotion of physical activity, and nutrition education—appears essential. Finally, the recognition of pediatric metabolic syndrome as a public health priority justifies its inclusion in national policies to combat chronic no communicable diseases.

Abbreviations

UHC	University Hospital Center
MS	Metabolic Syndrome
WC	Waist Circumference
HT	Hypertension
BMI	Body Mass Index
DBP	Diastolic Blood Pressure
SBP	Systolic Blood Pressure
DC	Developing Country

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Fossou Assamala Francoise: Methodology, Resources, Funding acquisition
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Allo Yapo Fulgence: Data curation
Batai Nemahiouon Francis: Writing – review & editing
Kanga Akoua Jeanne: Resources
Doubran Djoman Prisca Joelle: Formal Analysis
Ahui Bitty Marie Louise: Supervision

Conflicts of Interest

The authors declare no conflicts of interest.

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