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Research Article

Correlation of Nutritional Status and Blood Pressure of Apparently Healthy Primary School Pupils Aged 6–12 years in Zaria Local Government Area of Kaduna State

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Abstract

Anthropometric indices have become practical tools for evaluating the nutritional status of populations. Understanding the nutritional status of children has far-reaching implications for promoting the health of future generations. The necessity for routine blood pressure screening in children was debated in the past, the main argument against it being that essential hypertension is an adult disease and there was no evidence that screening apparently healthy children for hypertension is rewarding. Its value as a screening tool for hypertension in adults has long been documented. This study has been designed to assess the relationship between nutritional status and blood pressure among apparently healthy primary school pupils aged 6–12 years in Zaria Local Government Area, Kaduna State. The study was conducted on 219 pupils randomly selected from public and private schools using a table of random numbers. Blood pressure was measured after 5 minutes of rest in the sitting position with an aneroid sphygmomanometer and a cuff suitable to the pupil's arm circumference according to WHO standard procedures. Nutritional and growth status were determined using z-score for BMI-for-age and height-for-age (HA). Pearson correlation was used to determine the correlation coefficients between anthropometric indices and blood pressure parameters. Study findings revealed a z-score of < -3 in 4.34% (n=5) of boys and 1.92% (n=2) of girls as severe wasting while severe stunting was recorded to be 2.61% (n=3) in boys and 1.92% (n=2) in girls. Significant differences ($P \leq 0.05$) were not observed between severe thinness or stunting between boys and girls $P \leq 0.05$ level of significant. Pearson correlation revealed a positive correlation between weight and Systolic BPs, Diastolic BPs and mean arterial pressures of the subjects (r=0.77, 0.61, and 0.74 respectively). The study found out that severe malnutrition exists among the pupils, as significant percentages of the school children were thin and stunted. Blood pressure increased with age and was higher among pupils from private schools than among those from public schools.

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Keywords

Nutritional Status, Blood Pressure, Anthropometry, School Pupils, BMI-For-Age, Height-For-Age

1. Introduction

Anthropometric indices have become practical tools for evaluating the nutritional status of populations, particularly of children in developing countries and nutritional status is one of the best indicators of the global well-being of children [29]. One of the major global health problems faced by developing countries, today is malnutrition [40, 42]. Of course, Nigeria too, is not an exception to this problem of malnutrition [1]. A primary cause of ill-health and premature mortality among children, in developing countries is attributed to undernutrition [8, 11]. In developing countries, it is postulated that poverty and ignorance are primary causal factors of malnutrition [12]. There are several studies investigating the problem of under-nutrition among children in different parts of Nigeria [19]. However, limited information exists regarding under-nutrition among urban children in Nigeria [24]. Furthermore, most previous studies are focused on children under 5 years of age, in neglect of pre-adolescent group aged 6-12 years [13]. Also, information on body fat, physical fitness, anthropometric profiles, body weight disorders, and centripetal fat patterning exist, but reliable data on the nutritional status is hardly available [27]. Understanding the nutritional status of children has far-reaching implications for promoting the health of future generations [4]. Regardless of pupil/child age, blood pressure measurement should be part of the routine physical examination [14]. Its value as a screening tool for hypertension in adults has long been documented [15]. It is currently established as an important component of the routine paediatric physical examination and should be done annually after 3 years of age, or earlier in children with histories of neonatal problems, renal disease or familial risk factors [25, 26]. The necessity for routine blood pressure screening in children was debated in the past, the main argument against it being that essential hypertension is an adult disease and there was no evidence that screening apparently healthy children for hypertension is rewarding [17]. However, though long considered rare in children, hypertension is being diagnosed increasingly often and is known to exist in African children [18]. In most cases, it has underlying causes, where renal abnormalities were the most common cause of elevated blood pressure in children; also, hypertension is most common in children aged 6 - 12 years [10]. On the basis of expert opinion, organizations such as the American Academy of Paediatrics now recommend routine screening of asymptomatic adolescents and children during preventive care visits, as treatable causes of secondary hypertension such as coarctation of the aorta can potentially be identified [21]. However, there are limited data on the benefits or risks of screening and treating such underlying causes of hypertension in children. An increase of 2-3 mmHg in systolic and 1-3 mmHg in diastolic blood pressure has been shown for each 10 kg increase in weight in western population [22, 23]. Systolic blood pressure was also positively associated with lean mass, and weakly associated with trunk fat, with the association being robust in girls only [32].

2. Aim

The aims the study is to assess the relationship between nutritional status and blood pressure among apparently healthy primary school pupils aged 6–12 years in Zaria Local Government Area, Kaduna State.

3. Methodology

3.1. Study Area

Zaria is a major city in Kaduna State in Northern Nigeria, as well as being a Local government Area [16]. Formerly known as Zazzau, it was one of the original seven Hausa city-states [16]. Zaria local government is located between coordinates 11°04’ North and 7° 42’ east. It occupies a total area of 600 square kilometers with an estimated populations of 408,198 (2006 census) with total populations of 80,055 of enrolled primary schools pupils. The town is situated 65 km north of state capital Kaduna [2]. The climate of Zaria is characterised by tropical wet and dry seasons with an annual average temperature ranging from 20 ℃ and 39 ℃, respectively [7]. The annual average rainfall of this region is estimated at 1532.2 mm, of which approximately 89% falls in the months between April and October [3]. The dry season normally starts in November and ends in March [5]. The Hausas are the predominant people in the area. The major language spoken in the area is Hausa, although English is also widely spoken in schools, offices and markets [6]. Kaduna state is acclaimed as Nigeria’s “Centre of learning” because of its rich and diverse educational institutions which are predominantly situated in Zaria [7].

3.2. Sample Size Determination

$$n = \frac{Z2 \times (f) \times (1 - f)}{c^2} \quad (1)$$

$$\text{Sample size} = n / \{1 + (n/N)\} \quad (2)$$

N = Population Size = 80,055 Pupils
Z = Z-value of Area (i.e., 1.960 for a 95% confidence level) P<0.05
f = 17.3% estimated prevalence value of stunting, expressed as decimal number 0.173
C = Confidence interval of 5%, expressed as decimal (0.05)

$$n = \frac{Z2 \times (f) \times (1 - f)}{C^2} = \frac{1.9602 \times 0.173 \times (1 - 0.173)}{0.05^2} = 216.09 \quad (3)$$

$$\text{Sample Size} = n / \{1 + (n/N)\} = 219.85 / \{1 + (219.85/80055) = 219 \quad (4)$$

3.3. Sampling Technique

Stratified sampling technique was used for the study. Zaria Local Government Area, Kaduna State were divided into two zones; North and South zones. Two schools, one public and one private school were randomly selected from each zone using a table of random numbers from the total list of schools officially obtained from the Zaria Local Government Education Authority. Pupils, both male and female, were randomly selected from each of the schools.

3.4. Anthropometric Measurement

Anthropometric parameters/indices such as BMI and height-for-age were used to assess the nutritional status of the children. A portable weighing scale (Seca UNICEF model) and a height measuring tape (UNICEF model, Height Rod Wall; S0114400) were used to measure weight to the nearest 0.1 kg and height to the nearest 0.1 m, respectively. Body Mass Index BMI was then computed using the standard formula [BMI = weight (kg)/height^2 (m^2)].

3.5. Blood Pressure Measurement

Blood pressure was measured after 5 minutes of rest in the sitting position with an aneroid sphygmomanometer (Frank Industries Inc., 9643 Great Smoky Drive, Baton Rouge, LA 70814, USA) and a cuff suitable for the subject's (pupil's/child's) arm circumference according to World Health Organization (WHO) reference standard.

3.6. Data Analysis

Data were entered and analyzed using SPSS version 23. Frequency distribution table was used for discrete data while mean and standard deviation were used for continuous data. Nutritional and growth status were determined using Z-scores for BMI-for-age and height-for-age (HA) to identify the prevalence of wasting and stunting, respectively, using World Health Organization growth reference standards. Pearson correlation was used to determine the correlation coefficients between anthropometric indices and blood pressure parameters ($P \leq 0.05$).

4. Result

4.1. Anthropometry and Blood Pressure Parameters of Children Attending Private and Public Schools in Zaria, Kaduna State

There were significant differences ($P < 0.05$) in the mean weight, height, Mid Upper Arm Circumference MUAC, and BMI of the pupils when stratified by gender, but the children from the private schools were, on average, younger and taller than those from the public schools. There were also significant differences ($P < 0.05$) in the systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP), respectively, but all the anthropometric and blood pressure parameters were significantly higher in boys than in girls (Table 1).

Table 1. *Anthropometry and Blood Pressure Parameters of Apparently healthy Children attending Private and public Schools in Zaria Local Government Area of Kaduna State.*

Parameters	Private schools N=91		Public schools N=128		All schools N=219	
	Boys n=48	Girls n=43	Boys n=67	Girls n=61	Boys n=115	Girls n=104
Weight (kg)	27.05 ±0.27^a	27.57 ±0.57^a	27.09 ±0.78^a	24.71 ±0.59^d	26.92 ±0.48^b	25.96 ±0.32^c
Height (cm)	134.56 ±1.73^a	132.23 ±1.77^b	129.90 ±1.39^c	127.82 ±1.78^d	131.13 ±1.49^b	129.94 ±1.84^c
MUAC (cm)	170.25 ±1.73^a	170.26 ±1.09^a	167.94 ±2.85^b	167.68 ±1.23^b	168.55 ±1.34^b	169.05 ±0.84^a
BMI (kg/m^2)	14.73 ±1.39^b	15.24 ±2.00^a	15.93 ±2.24^a	14.86 ±1.69^b	15.46 ±2.00^a	15.06 ±1.86^a

Parameters	Private schools N=91		Public schools N=128		All schools N=219	
	Boys n=48	Girls n=43	Boys n=67	Girls n=61	Boys n=115	Girls n=104
SBP (mmHg)	93.13±1.73[a]	89.69±1.93[c]	91.33±1.09[b]	88.48±1.91[c]	91.85±1.52[b]	89.15±1.12[c]
DBP (mmHg)	59.41±1.51[a]	57.02±1.24[b]	57.76±1.85[b]	56.08±1.16[c]	57.14±1.54[b]	56.46±1.39[c]
MAP (mmHg)	69.99±1.69[a]	67.91±1.87[c]	68.28±0.28[b]	66.88±1.69[e]	68.71±1.78[d]	67.35±1.18[c]

Values are expressed as mean±SD. Values with different superscripts differs significantly at $p<0.05$. MUAC; Mid Upper Arm Circumference, BMI; Body Mass Index. SBP; systolic blood pressure, DBP; diastolic blood pressure. MAP; mean arterial pressure.

4.2. Prevalence of Wasting Among Children Attending Private and Public Primary Schools in Zaria, Kaduna State

Nutritional status of children attending private and public schools in Zaria Local government area was presented in Table 2. Among boys from the public schools, 5.97% were obese and 2.98% overweight, but there was no prevalence of obesity or overweight among the private school pupils. A total of 4.34% of boys, 1.92% of girls were severely underweight; 7.83% of boys and 13.46% of girls were moderately thin; and 31.30% of boys and 21.11% of girls were mildly thin respectively, among the primary school pupils in Zaria Local Government Area. There was a high prevalence of underweight/thinness in the public primary schools compared with the private schools. Among the normal children/pupils, 41.57% of boys and 65.12% of girls were found to be from private schools, while 58.21% of boys and 62.29% of girls were from the public school.

Table 2. *Prevalence of Wasting among Children attending Private and Public Primary Schools in Zaria Local Government Area, Kaduna State.*

NUTRITIONAL STATUS CLASSIFICATIONS	Private schools N=91		Public schools N=128		All schools N=219	
	Boys n=48	Girls n=43	Boys n=67	Girls n=61	Boys n=115	Girls n=104
	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)
SEVERE WASTING	2 (4.17)	0 (0.00)	3 (4.48)	2 (3.27)	5 (4.34)	2 (1.92)
MODERATE WASTING	7 (14.58)	8 (18.60)	2 (2.98)	6 (9.84)	9 (7.83)	14 (13.46)
MILD WASTING	19 (39.58)	7 (16.28)	17 (25.37)	15 (24.59)	36 (31.30)	22 (21.11)
NORMAL	20 (41.57)	28 (65.12)	39 (58.21)	38 (62.29)	59 (51.30)	66 (63.46)
OVER WEIGHT	0 (0.00)	0 (0.00)	2 (2.98)	0 (0.00)	2 (1.74)	0 (0.00)
OBESITY	0 (0.00)	0 (0.00)	4 (5.97)	0 (0.00)	4 (3.47)	0 (0.00)
TOTAL	48 (100)	43 (100)	67 (100)	61 (100)	115 (100)	104 (100)

Where F is the frequency of the pupils and the value in bracket (%) is the percentage

4.3. Prevalence of Stunting Among Children Attending Private and Public Primary Schools in Zaria, Kaduna State

Prevalence of stunting among children attending private and public schools in Zaria was presented in Table 3, according to the WHO growth reference standard, where 2.61% of boys and 1.92% of girls were severely stunted < -3 SD Z-Score), 13.04% of boys and 10.57% of girls were moderately stunted (≥ -3 to < -2 SD), and 18.26% of boys and 25.00% of girls were mildly stunted (≥ -2 to < -1 SD), respectively, among the pupils attending private and public primary schools

in Zaria Local Government Area. Among the moderately stunted pupils, about 22.39% were boys and 18.03% were girls from public schools. Also, among the mildly stunted pupils, about 18.75% and 18.60% of boys and girls, respectively, were found in the private schools, while 17.91% and 29.51% of boys and girls, respectively, were found in the public schools. The severely stunted group consists of 4.48% of boys and 3.28% of girls from the public primary schools. There were no severely and moderately stunted boys and girls in the private school.

Table 3. *Prevalence of Stunting among Children attending Private and Public Primary Schools in Zaria Local Government Area of Kaduna State.*

CLASSIFICATION OF STUNTING	Private school N=91		Public school N=128		All schools N=219	
	Boys n=48	Girls n=43	Boys n=67	Girls n=61	Boys n=115	Girls n=104
	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)
MILD	9 (13.43)	8 (13.11)	12 (27.90)	18 (41.86)	21 (18.26)	26 (25.00)
MODERATE	0 (0.00)	0 (0.00)	15 (31.25)	11 (25.58)	15 (13.04)	11 (10.57)
SEVERE	0 (0.00)	0 (0.00)	3 (6.25)	2 (4.65)	3 (2.61)	2 (1.92)
TOTAL	9 (13.43)	8 (13.11)	30 (62.50)	31 (31.00)	39 (33.91)	39 (37.50)

Where F is the frequency of the pupils and the value in bracket (%) is the percentage

4.4. Blood Pressure Pattern Among Children Attending Private and Public Primary Schools in Zaria, Kaduna

Blood pressure patterns among the primary schools pupils in Zaria Local Government Area, were shown in (Table 4), where 85.42% and 95.35% of the school children had normal SBP and DBP, respectively, in the private schools, while 82.09% and 85.25% of the school children had normal SBP and DBP, respectively, in the public primary schools. Indeed, the SBP of children in private schools was slightly higher than that of children in public schools. Furthermore, 8.96% of boys and 3.29% of girls from public schools were considered hypertensive using SBP classification, while 0.78% of girls from public schools were considered hypertensive using DBP classification. There were no children/pupils considered hypertensive using SBP classification in the private schools, but 5.49% of boys were found to be hypertensive using DBP classification in the private schools. Among the pre-hypertensive children/pupils, 9.89% and 29.67% were found to be pre-hypertensive using SBP and DBP classifications respectively, in the private schools, while 10.16% and 3.13% were considered pre-hypertensive using SBP and DBP classifications, respectively from the public schools.

Table 4. *Blood Pressure Pattern among Children Attending Private and Public Primary Schools in Zaria Local Government of Kaduna State.*

	SYSTOLIC BLOOD PRESSURE			DIASTOLIC BLOOD PRESSURE		
	NORMAL F (%)	PRE-HTN F (%)	HTN F (%)	NORMAL F (%)	PRE-HTN F (%)	HTN F (%)
PRIVATE SCHOOLS						
BOYS n=48	41 (85.42)	7 (14.58)	0 (0.00)	31 (64.58)	12 (25.00)	5 (10.42)
GIRLS n=43	41 (95.35)	2 (4.65)	0 (0.00)	28 (62.79)	15 (34.88)	9 (0.00)
ALL n=91	82 (90.10)	9 (9.89)	0 (0.00)	59 (64.83)	27 (29.67)	5 (5.49)
PUBLIC SCHOOLS						
BOYS n=67	55 (82.09)	6 (8.96)	6 (8.96)	42 (62.68)	25 (37.31)	0 (0.00)

	SYSTOLIC BLOOD PRESSURE			DIASTOLIC BLOOD PRESSURE		
	NORMAL F (%)	PRE-HTN F (%)	HTN F (%)	NORMAL F (%)	PRE-HTN F (%)	HTN F (%)
GIRLS n=61	52 (85.25)	7 (11.47)	2 (3.28)	41 (67.21)	19 (31.15)	1 (1.64)
ALL n=128	107 (83.59)	13 (10.16)	8 (6.25)	83 (64.84)	4 (3.13)	1 (0.78)
ALL SCHOOLS						
BOYS n=115	96 (83.48)	13 (11.30)	6 (5.22)	73 (63.47)	37 (32.17)	5 (4.35)
GIRLS n=104	93 (89.42)	9 (8.65)	2 (1.92)	69 (66.35)	34 (32.69)	1 (0.96)
ALL n=219	189 (86.30)	22 (10.05)	8 (3.65)	142 (64.84)	71 (32.42)	6 (2.74)

Where F is the frequency of the pupils and the value in bracket (%) is the percentage, PRE-HTN; Pre-hypertension, HTN; Hypertension,

4.5. Correlation of Anthropometric and Blood Pressure Parameters of Apparently Healthy Primary Schools Pupils in Zaria, Kaduna

There was a significant ($P < 0.05$) positive correlation between weight and systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) of the subjects (r = 0.77, 0.61, and 0.74, respectively). Height also had a significant ($P < 0.05$) positive correlation with blood pressure parameters: systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) (r = 0.71, 0.67, and 0.73, respectively). There was, however, a weak positive correlation between BMI and blood pressure (r = 0.39 and 0.46 for DBP and MAP, respectively), which was significant ($P = 0.05$), while the correlation between blood pressure parameters and MUAC of the subjects was strongly positive (r = 0.67, 0.61, and 0.67, respectively) as presented in Table 5.

Table 5. *Correlation Coefficient of anthropometric and Blood Pressure parameters of apparently Healthy Primary schools pupils in Zaria Local Government Area.*

Parameters	PRIVATE SCHOOLS						PUBLIC SCHOOLS						ALL SCHOOLS		
	BOYS n=48 r-value			GIRLS n=43 r-value			BOYS n=67 r-value			GIRLS n=61 r-value			n=219 r-value		
	SBP	DBP	MAP	SBP	DBP	MAP	SBP	DBP	MAP	SBP	DBP	MAP	SBP	DBP	MAP
Weight (Kg)	0.73*	0.80	0.81	0.81*	0.76	0.81	0.76*	0.62	0.72	0.81*	0.62*	0.73*	0.77*	0.61	0.74*
Height (cm)	0.73	0.82*	0.83*	0.79	0.79*	0.82*	0.67	0.62	0.72	0.73	0.60	0.69	0.71	0.67*	0.73
MUAC (cm)	0.65	0.52	0.07	0.72	0.63	0.68	0.67	0.62	0.68	0.77	0.58	0.69	0.67	0.61	0.67
BMI (kg/m^2)	0.51	0.53	0.55	0.72	0.62	0.68	0.61	0.58	0.62	0.63	0.43	0.53	0.52	0.39	0.46

Where: MUAC; Mid Upper Arm Circumference, BMI; Body Mass Index. The units of the Blood Pressure Parameters are expressed in (mmHg) and $P \leq 0.05$

5. Discussion

Malnutrition can either be overweight or underweight. Underweight is defined as low BMI-for-age below -2 SD of the median value of the NCHS/WHO international reference for BMI-for-age [31]. Stunting refers to a deficit in linear growth that has failed to reach genetic potential [32]. It is defined as low height-for-age below -2 SD of the median value of the NCHS/WHO international growth reference [32]. A number of reports show that there are existing problems of malnutrition among Nigerian children [33, 34]. A WHO report shows that 37.7% and 39.1% of preschool children are stunted and underweight, respectively, in Nigeria [41]. According to the National Micronutrient Survey (2024) report, there is a problem of stunting (24%) and underweight (22%) in south-eastern Nigeria [40]. There was a prevalence of 45% stunting and 43% underweight in the northwestern part of northern Nigeria, according to the National Demographic and Health Survey (2021) [35]. The findings of this present study reflect a seemingly low prevalence of malnutrition among primary school children living in Zaria Local Government Area, Kaduna State. About 4.34% of boys and 1.92% of girls were severely underweight, 7.83% of boys and 13.46% of girls were moderately underweight, and 31.30% of boys and 21.11% of girls were mildly underweight, while 1.74% and 3.47% of boys were overweight and obese, respectively, among the primary school pupils in Zaria Local Government Area (Table 2). Similarly, 33.91% of boys and 37.50% of girls were stunted, of whom 2.61% of boys and 1.92% of girls were severely stunted, 13.04% of boys and 10.57% of girls were moderately stunted, while 18.26% of boys and 25.00% of girls were mildly stunted (Table 3). Underweight was found to be higher than stunting. This finding is consistent with previous studies, [1-3] in which the prevalence of stunting (21.7%) and underweight (35.8%) was higher in girls compared with boys (13.8% stunting and 22.7% underweight). Underweight is used as a composite indicator to reflect both acute and chronic undernutrition, although it cannot distinguish between them [35]. The results of the present study indicate that about 40.18% of the schoolchildren were underweight, with 3.19% severely underweight, 10.50% moderately underweight, and 26.48% mildly underweight [37]. The key findings of this study showed an increase in blood pressure with weight among schoolchildren, with a higher mean ± SD systolic blood pressure of 91.85 ± 9.52 mmHg in boys than 89.15 ±9.12 mmHg in girls, and a strong positive correlation between anthropometric and blood pressure parameters. The finding of increasing blood pressure with age is not unusual; it has been documented in several studies and is known to occur steadily throughout the first two decades of life [36]. The increase in mean SBP and DBP was similar in both genders, with boys having higher SBP and DBP. However, the pattern changed with nutritional status, with girls having a lower mean blood pressure than boys (Table 1). This finding has been reported previously by [12, 17, 18] on adolescent hypertension in Western Nigeria. Similarly, other studies [17, 18, 38] on blood pressure among schoolchildren in Western Nigeria found that females who were heavier than their male counterparts had higher blood pressure than boys [28]. When our results were analysed by type of school attended, children from private schools were found to have higher blood pressure than those from public schools. This difference was statistically significant ($P < 0.05$) and could be attributed to variations in environment, lifestyle, and diet, as the private school pupils were mostly from the middle- and high-income groups [1]. Primary hypertension in children and adolescents is associated with excess weight, reduced physical activity, inadequate fruit and vegetable intake, and excessive sodium intake [9, 20]. Furthermore, since blood pressure is closely related to height and weight, subjects from private schools could be expected to have higher blood pressure given their bigger stature [39]. The finding of higher blood pressure in pupils from private schools and more affluent backgrounds is similar to that reported in Umuahia, southern Nigeria [30]. However, that the blood pressure readings in both studies were single-point cross-sectional measurements, which are insufficient to determine high or high-normal blood pressure for age, particularly in children, who may exhibit elevated blood pressure due to anxiety/excitement and are more prone than adults to 'white-coat' hypertension [32].

6. Conclusion

In conclusion, we found out that severe malnutrition exists among the pupils attending private and public primary schools in Zaria Local Government Area of Kaduna state, Nigeria, as a significant percentage of the school children are underweight and stunted. Blood pressure increased with age and was higher in apparently healthy primary school children from private schools than in those from public schools, while height and weight had a direct relationship with SBP, DBP and Mean Arterial Pressure (MAP), respectively. One child from a public school and five children from private schools in this study had persistent hypertension requiring referral for further investigation.

7. Recommendation

The values of the anthropometric parameters obtained from this study suggest that there is a need for improvement in the nutritional status of these children. As the quality of future human resources depends on today's children, improvement of their nutritional status should be given top priority.

The data should be used from the public health standpoint, as they provide information for instituting appropriate strategies to identify and combat factors associated with nutritional abnormalities in children. Routine blood pressure monitoring

in schoolchildren should be encouraged, starting at school entry to serve as a baseline assessment, and follow-up should be done where indicated.

In addition, blood pressure measurement should be incorporated as part of the routine clinical examination of children. Large multicentre epidemiological surveys with a uniform protocol are required in our setting to develop our own ranges of normal blood pressure values for children.

The recognition of the significant correlation and graded association between anthropometric measures and blood pressure in Nigerian adolescents in the present study may help target prevention towards high-risk individuals in this age group. A decrease in body weight is one of the most effective preventive measures not only in decreasing the overall cardiovascular risk but also in reducing blood pressure.

Therefore, attention should be paid to reducing adiposity in this population before cardiovascular risk becomes another burden. This is especially important in the light of evidence linking adolescent obesity with metabolic abnormalities and cardiovascular disease in adulthood.

Abbreviations

BMI	Body Mass Index
DBP	Diastolic Blood Pressure
HTN	Hypertension
MAP	Mean Arterial Pressure
MUAC	Mid Upper Arm Circumference
PRE-HTN	Pre-hypertension
SBP	Systolic Blood Pressure

Author Contributions

Ubangida Suleiman: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing

Olumuyiwa Adeyemi Owolabi: Conceptualization, Supervision, Writing – original draft, Writing – review & editing

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Hassan Hassan Murtala: Writing – review & editing

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Conflicts of Interest

The authors declare no conflicts of interest.

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