



Pre-Hypertension and Hypertension in Adolescence: How much does it occur in a Nigerian Community?

Pre-Hypertension et hypertension chez des adolescents: À quelle fréquence surviennent- t'elle dans une communauté de Nigerians

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ABSTRACT

BACKGROUND: Hypertension is an important worldwide public-health challenge because of its high frequency and concomitant risks of cardiovascular and kidney disease. Previous studies have documented that hypertension may begin in adolescence, perhaps even in childhood.

OBJECTIVES: This study set out to determine the prevalence of pre-hypertension and hypertension in adolescence in a Nigerian community.

METHODS: A cross-sectional screening of blood pressure of secondary school students was conducted in Sagamu local government area of Ogun State, Nigeria. Total sample of 1638 adolescents aged between 12 and 18 years were chosen from stratified schools and from various classes of selected schools. Their blood pressure was assessed.

RESULTS: The prevalence of pre-hypertension in this population ranged from 0–10.5% in male students and 0–2.9% in female students across the age. In the whole population the prevalence of systolic and diastolic pre-hypertension were 1.6% and 0.5% respectively for male adolescents while that of female students were 0.4% and 0.5% respectively. The low prevalence of 0.1% was observed for systolic and diastolic hypertension in male and 0.1% for female systolic hypertension. Furthermore, pre-hypertension prevalence was increased with age.

CONCLUSION: In conclusion, our data demonstrated a low prevalence of pre-hypertension and hypertension in Nigerian adolescents living in Sagamu local government area of Ogun state, south west Nigeria. *WAJM 2012; 31(2): 71–75.*

Keywords: Pre-hypertension, hypertension, prevalence, adolescents.

RÉSUMÉ

CONTEXTE: L'hypertension est un important dans le monde entier problème de santé publique en raison de sa fréquence élevée et les risques concomitants de maladies cardiovasculaires et rénales. Des études antérieures ont démontré que l'hypertension peut commencer à l'adolescence, voire dans l'enfance.

OBJECTIFS: Cette étude visait à déterminer la prévalence de la pré-hypertension et l'hypertension à l'adolescence dans une communauté nigériane.

MÉTHODES: Une projection transversale de la pression artérielle des élèves du secondaire a été menée dans la zone Sagamu gouvernement local de l'Etat d'Ogun, au Nigeria. Total de l'échantillon de 1638 adolescents âgés entre 12 et 18 ans ont été choisis dans les écoles et les stratifiés de différentes classes d'écoles sélectionnées. Leur pression artérielle a été évalué.

RÉSULTATS: La prévalence de la pré-hypertension dans cette population variait de 0 à 10.5% chez les étudiants masculins et 0 à 2.9% dans étudiantes à travers le temps. Dans toute la population de la prévalence de la tension systolique et diastolique de pré-hypertension ont été de 1.6% et 0.5% respectivement pour les adolescents de sexe masculin alors que celui des élèves de sexe féminin ont été de 0.4% et 0.5% respectivement. La faible prévalence de 0.1% a été observée pour l'hypertension systolique et diastolique chez les hommes et 0.1% pour l'hypertension systolique femelle. Par ailleurs, pré-hypertension prévalence a été augmenté avec l'âge.

CONCLUSION: En conclusion, nos données montrent une faible prévalence de la pré-hypertension et l'hypertension chez les adolescents nigériens vivant dans la zone Sagamu gouvernement local de l'Etat d'Ogun, au sud ouest du Nigeria. *WAJM 2012; 31(2): 71–75.*

Mots clés: Pré-hypertension, l'hypertension, la prévalence, les adolescents.

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Abbreviation: BP, Blood pressure; SBP, Systolic blood pressure; DBP, Diastolic blood pressure; JNC-7, Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure

INTRODUCTION

Hypertension is a major risk factor for the development of serious disease including stroke, myocardial infarction, coronary heart disease, cardiac failure, chronic renal failure and nephropathy.¹⁻³ Previous studies have documented that hypertension may begin in adolescence, perhaps even in childhood.^{4, 5} Elevated blood pressure (BP) acquired in childhood tends to track into adulthood and factors that affect BP in childhood are likely to further increase the burden of hypertension-related diseases in adults.^{6, 7} Children with elevated BP can develop target organ damage, for example, increased carotid intima-media thickness⁸ or ventricular hypertrophy.⁹

The prevalence of hypertension in children and adolescents appears to be increasing. The prevalence of between 2% and 5% in children has been reported.^{10, 11} Hypertension and pre-hypertension in American children and adolescents are on the rise.¹² Prevalence after three screenings was 81.1% - normal, 15.7% - pre-hypertension, and 3.2% - hypertension for American adolescents.¹³ In Turkish adolescents, 14.1% had pre-hypertension, 5.4% hypertension, and 1.6% had malignant hypertension.¹⁴ The prevalence of hypertension in Italian children and adolescents was reported to be between 6.5 to 11.1%.¹⁵⁻¹⁷ For Polish children and adolescents 2% and 6% prevalence of hypertension and pre-hypertension respectively was reported.¹⁸

Epidemiological studies carried out in Brazil in the last decades have demonstrated that the prevalence of systemic arterial hypertension in children and adolescents varies from 0.8 to 8.2%¹⁹ with pre-hypertension prevalence of 8.6% in adolescents.²⁰ In India, 6.16% of adolescents had high blood pressure at the end of fourth screening²¹ while childhood hypertension prevalence of 1.7% was reported in Iraqi.²² Prevalence of the essential arterial hypertension was 0.37% and of borderline arterial hypertension 0.56% for Serbian children and adolescents.²³ In Africa, high prevalence of arterial hypertension of 9.6% was reported in Tunisian children²⁴ while in Seychelles children, the prevalence of elevated BP was 9.1% in boys and 10.1% in girls.²⁵

In Nigeria, Ansa *et al.*,²⁶ reported the hypertension prevalence of 1.6% for adolescents 13 to 15 years, while 3.6% was found for those 16 to 18 years. With this background, there is paucity of information about prevalence of hypertension and pre-hypertension in Nigerian adolescents. Therefore, the aim of this study was to determine the prevalence of pre-hypertension and hypertension of secondary school adolescents living in Sagamu.

SUBJECTS, MATERIALS AND METHODS

Study Location

Sagamu is a city 12°162 N 6°332 E and the headquarters of the local government area (LGA) of the same name in southwestern Nigeria located in Ogun State. The LGA has an area of 614 km² and a population of 253,412 at the 2006 census. The Sagamu region is underlain by major deposits of limestone, which is used in the city's major industry, the production of cement. Sagamu is the part of the Yoruba cultural region of southwestern Nigeria. Sagamu has experienced both population and economic growth since the 1950s due to its position between the cities of Ibadan and Lagos. A petroleum company and teaching hospital are located in the area.

Subjects

The participants for this study were 1638 (790 male and 848 female) apparently healthy students from 11 schools (8 public and 3 private) in Sagamu local government area of Ogun state, Nigeria. Their age ranged between 12 and 18 (14.96±1.84) years.

Design

A cross-sectional screening of blood pressure of secondary school students was conducted and participants were drawn from the selected schools by probability proportional to size from various arms of the classes. The protocol for this research was approved by joint Institutional Review Committee of University of Ibadan and University College Hospital, Ibadan. Informed consent was sought from the participants and their parents; permission was sought from local education authority and

the principals of the selected schools. The nature, purpose and procedure of the study were explained to the participants in detail. The bio data of each participant was taken: this included age (as at last birth day) and sex.

Blood Pressure Measurement

Blood pressure (Systolic and Diastolic) was measured according to American Heart Association guidelines using an aneroid sphygmomanometer (Frank Industries Inc., 9643 Great Smoky Drive, Vacon Rouge LA 70814, USA) and a cuff (12 × 22 cm) suitable to the subject's arm circumference. The cuff bladder width and length covered at least 40% and 80% of the circumference of the arm respectively. Trained personnel and researcher measured blood pressure after 5 minutes of rest in the sitting position.²⁷ The measurement was taken in a single visit. Aneroid manometers have been shown to be quite accurate when calibrated on a semiannual basis.²⁸

Determination of Pre-hypertension and Hypertension

The fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents²⁸ was used to determine pre-hypertension and hypertension. Hypertension is defined as average Systolic BP (SBP) and/or diastolic BP (DBP) that is ≥95th percentile for gender, age, and height on ≥3 occasions. Pre-hypertension in children is defined as average SBP or DBP levels that are ≥90th percentile but <95th percentile (or BP levels ≥120/80 mmHg if this was lower than the 90th percentile). Normotensive is defined as mean systolic BP and diastolic BP <90th percentile for age, height and sex. For adolescents who were 18 years old, the seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7)²⁹ was used (Normal <120/80 mmHg; pre-hypertension ≥120/80 but <140/90 mmHg; hypertension ≥140/90 mmHg).

Data Analysis

Statistical package for social sciences (SPSS) version 15 was used to analyze the data. Descriptive statistics of mean, standard deviation and

percentage were used to examine the data. Based on the fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents and JNC-7 cutoff point, prevalence of pre-hypertension and hypertension was calculated. When inferential statistics are used p-value less than 0.05 was considered to be significant.

RESULTS

Pattern of Blood Pressure

Table 1 presents mean values of systolic and diastolic blood pressure of the participants. The systolic and diastolic BP increased with age in both genders with exception of females' at ages 13 and 18 years for SBP and DBP respectively. The females had higher value of SBP than males at ages 12–16 years while the males took over between ages 17 and 18 years. Also, the females had higher value of DBP than the males between ages 12 and 17 years.

Prevalence of Pre-hypertension and Hypertension

Tables 2 and 3 show the age- and sex-specific point prevalence of systolic and diastolic pre-hypertension and hypertension. In males, systolic pre-hypertension seem to be prevalent between ages 17 and 18 years while diastolic pre-hypertension was prevalent between ages 16 and 18 years. There was low prevalence of both systolic and diastolic hypertension with exception at ages 15 and 18 years for diastolic and systolic hypertension respectively. In females, systolic pre-hypertension seem to be prevalent at ages 15 and 18 years while diastolic pre-hypertension was prevalent at age 13 years and between ages 15 and 17 years. There was low prevalence of systolic hypertension at age 14 years. Figure 1 showed no association between age and hypertension.

DISCUSSION

In this cross-sectional, school-based study of secondary school students, we set out to determine the prevalence of pre-hypertension and hypertension in adolescence in a Nigerian community. In the whole population the

Table 1: Mean (SD) Systolic and Diastolic Blood Pressure of the Participants (N=1638)

Age (year)	Systolic Blood Pressure (mmHg)		Diastolic Blood Pressure (mmHg)	
	Male	Female	Male	Female
12	71.33(8.80)	75.45(11.63)	42.05(6.94)	44.34(8.71)
13	72.48(8.99)	75.16(12.12)	43.37(7.11)	44.84(9.44)
14	75.71(12.36)	79.26(12.98)	45.63(7.54)	46.98(8.27)
15	79.69(12.05)	83.86(13.01)	47.83(9.43)	49.71(8.81)
16	83.49(13.15)	84.99(14.13)	50.34(9.33)	50.83(8.84)
17	87.73(14.83)	86.60(14.03)	51.48(9.04)	52.34(9.44)
18	96.40(14.76)	87.71(12.87)	56.58(9.10)	51.71(8.34)
12–18	81.28(14.77)	81.53(13.76)	48.44(9.6)	48.50(9.26)

Table 2: Percentage of Male Pre-Hypertension and Hypertension

Age (year)	Number	Pre-hypertension		Hypertension	
		SBP	DBP	SBP	DBP
		% (n)	% (n)	% (n)	% (n)
12	83	0(0)	0(0)	0(0)	0(0)
13	101	0(0)	0(0)	0(0)	0(0)
14	126	0(0)	0(0)	0(0)	0(0)
15	129	0(0)	0(0)	0(0)	0.8(1)
16	149	0(0)	1.3(2)	0(0)	0(0)
17	88	1.1(1)	1.1(1)	0(0)	0(0)
18	114	10.5(12)	0.9(1)	0.9(1)	0(0)
12–18	790	1.6(13)	0.5(4)	0.1(1)	0.1(1)

Table 3: Percentage of Female Pre-Hypertension and Hypertension

Age (year)	Number	Pre-hypertension		Hypertension	
		SBP	DBP	SBP	DBP
		% (n)	% (n)	% (n)	% (n)
12	99	0(0)	0(0)	0(0)	0(0)
13	106	0(0)	0.8(1)	0(0)	0(0)
14	162	0(0)	0(0)	0.6(1)	0(0)
15	140	0.7(1)	0.7(1)	0(0)	0(0)
16	157	0(0)	0.6(1)	0(0)	0(0)
17	94	0(0)	1.1(1)	0(0)	0(0)
18	70	2.9(2)	0(0)	0(0)	0(0)
12–18	848	0.4(3)	0.5(4)	0.1(1)	0(0)

prevalence of systolic and diastolic pre-hypertension were 1.6% and 0.5% respectively for male adolescents while that of female students were 0.4% and 0.5% respectively. Our main finding was that pre-hypertension, (as defined by the fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents and JNC-7 criteria), is evidence affecting 0–10.5% of male students and 0–2.9% of female students across the age.

Furthermore, pre-hypertension prevalence was higher in older age.

Comparison of the prevalence of pre-hypertension and hypertension with other studies is limited due to differences in the procedures used for blood pressure measurement, number of measurement used and distinct reference criteria to define pre-hypertension and hypertension across studies. However, the prevalence of pre-hypertension in the present study seems low compared with

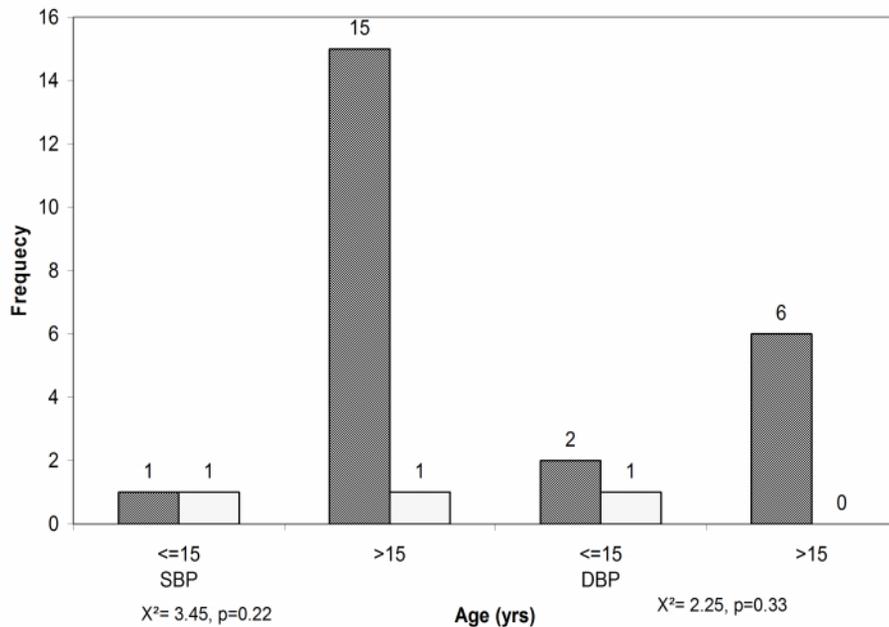


Fig. 1: Association of Age, Pre-hypertension and Hypertension of the Study Population

other studies that used single measurement like ours. Prevalence reported ranged between 8.6% and 15% in the whole population.^{13, 20, 30} The prevalence of systolic and diastolic hypertension was low in the present study (Table 2 and 3). An attempt to compare our findings with previous studies consistently showed that prevalence of hypertension in adolescents from Sagamu is low.^{24, 30} The prevalence of hypertension ranging from 1.0%–5.0% has been reported worldwide.^{13, 31} The differences in the prevalence of pre-hypertension and hypertension in the present study and other studies might be due to instrument used in taken the blood pressure. The present study used aneroid sphygmomanometer while other studies used oscillometric. It has been suggested that oscillometric tends to overestimate blood pressure.¹³

As this study was a cross-sectional and no known previous pre-hypertension and hypertension prevalence studies have been carried out in Sagamu, changes in the prevalence of adolescent pre-hypertension and hypertension overtime cannot be ascertained. However, the prevalence of pre-hypertension when adjusted for age and gender in this study is a little bit raised (0–10.5%). This might have been attributed to increase prevalence of overweight. The previous study has shown evidence of overweight

in this population.³² Classification as either at-risk for overweight or overweight has been shown to have independent association with pre-hypertension. This was true not only for the larger at-risk population defined as pre-hypertensive in the study but also for several pre-hypertensive sub-groups including students who were pre-hypertensive at first screening only and students who were initially hypertensive but later fell into the pre-hypertensive category.¹³

The finding in our study which indicates that older adolescents have higher prevalence of pre-hypertension is similar with the findings of Moura et al.³³ This is expected as pre-hypertension and hypertension is more common and tends to be more prevalent in older adolescents and adults.³³ This observation was supported as the blood pressure increases with age as observed in the present study (Table 1). However, when age was group into two in order to look for association of age with hypertension, no association was found. This was similar to previous finding²¹.

Strengths and Limitations

The major strength of this study is the large sample size compared with previous study from Nigeria. However, the result of this study should be interpreted with caution because of some

limitations. The standard device for blood pressure measurements has been the mercury manometer whereas all blood pressure measured in this study was done with aneroid sphygmomanometer. The aneroid sphygmomanometers tend to underestimate blood pressure. However, aneroid manometers have been shown to be quite accurate when calibrated on a semiannual basis.²⁸ Blood pressure values are also based on only single visit blood pressure reading in this study whereas hypertension should be based on readings taken on several visits. Most other epidemiological studies of children blood pressure also relied on readings taken on a single occasion.^{13, 25}

Conclusion

In conclusion, our data demonstrated a low prevalence of pre-hypertension and hypertension in Nigerian adolescents living in Sagamu local government area of Ogun state, south west Nigeria.

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