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PATTERN OF BLOOD PRESSURE IN URBAN NIGERIAN ADOLESCENTS - EXPERIENCE FROM SOUTH-EASTERN NIGERIA

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ABSTRACT

The pattern of blood pressure in a cross - section of urban apparently healthy Nigerian adolescents aged 13 to 18 years as well as the prevalence of elevated blood pressure (hypertension) in the group is presented.

Four hundred and forty three (443) students attending two secondary schools in the city of Calabar formed subjects for the study. They had their blood pressures measured, Heights, weights were also measured using standard methods and Body Mass Index (B. M. I) calculated.

Both systolic and diastolic blood pressures were found to rise with age with females having higher values. There were positive correlations of blood pressure with anthropometric parameters (weight, height and B.M.I) in most age groups. Some of the correlations were statistically significant illustrating the relationship between blood pressure and body mass.

As regards elevated blood pressure (Hypertension), the prevalence was 1.6% for adolescents 13 to 15 years, while 3.6% was found for those 16 to 18 years. Though the prevalence was higher in males, the difference was not statistically significant ($P > 0.05$).

Hypertension is thus a significant health problem in urban Nigerian adolescents. The need for early detection and treatment cannot be over-emphasized as it has been long recognized that what constitutes hypertension in adults may have its onset in childhood and adolescence. A group reference level of blood pressure that should define hypertension in adolescents is thus desirable. Routine or periodic blood pressure screening within the school system is also recommended.

Larger studies on adolescent blood pressure are suggested to facilitate the establishment of a group reference level which will serve as a guide as to what should constitute hypertension in Nigerian adolescents.

Key Words: Blood Pressure, adolescents, Nigeria.

INTRODUCTION

The morbidity and mortality caused by high blood pressure in adulthood still remains of great health concern particularly in developing countries (Fed. Min. Health 1992, Ikeme 1993). It has long been recognized that what constitutes essential hypertension in adults may have its onset in childhood and adolescence(WHO 1987, NIH 1993). Longitudinal studies have also adequately documented the phenomenon of trackling which further corroborates this finding. (Suh et al., 1994 Adams-Campbell 1992).

There is paucity of information on blood pressure in adolescents as a group especially in developing countries. The few studies available in Nigeria seem to emanate from a single geographical zone(Ayoola 1979,

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Akinkugbe et al 1999). Other studies on blood pressure in the younger age groups had often involved lumping adolescents with younger children in whom recommendation for determination of diastolic blood pressure differs. This makes comparative analysis difficult. It is universally agreed that phase I is the index of systolic blood pressure for all groups. As regards diastolic blood pressure, the Second task force on Blood pressure in children, has recommended fourth phase for persons aged 12 years and below and fifth phase for those 13 years and above (WHO 1987).

Routine measurement of blood pressure in children and adolescents is not yet practiced in developing countries including Nigeria. This is despite the fact that the link between childhood and adolescent blood pressure to hypertension in adulthood has been well documented. Preventive measures instituted early might lead to a reduction in the current morbidity and mortality attributable to adult high blood pressure.

This study is therefore designed to establish the pattern of blood pressure in a cross section of urban adolescents in our environment as well as the prevalence of elevated blood pressure in the group and make suitable recommendations therefrom.

SUBJECTS AND METHODS:

The study involved students attending two secondary schools in Calabar, a city in South-Eastern Nigeria with a population of 320,000 (1991 census). The schools were Hope Waddel Training Institution and Edgerly Memorial Girls' Secondary School both attended by adolescents from families that cut across all socio-economic strata.

Adolescents aged 13 to 18 years formed subjects of the study. The schools have six classes each with several arms per class. Two arms were selected by balloting and then using the table of random numbers, twenty one students were selected per arm giving a total of forty two per class and two hundred and fifty two per school (252).

The exercise was explained to the principals of the selected schools and informed consent obtained from them. The procedure was also explained to the subjects.

Several visits were made to each school and all examinations carried out between 0900 to 1300 hours, in the sick bays. During the visits, demographic data including age were obtained from each subject.

Age was cross checked with school records (No disparity was detected in all cases). Subjects then had their heights and weights measured.

Height was measured with subjects wearing no shoes and standing erect against a wall mounted scale. Weight was taken with subjects wearing light clothes and no shoes using a calibrated bathroom scale. The scale was readjusted to zero before each measurement. All measurements for height and weight were single measurements made on one occasion. To obtain the mean for heights and weights, all readings for height or weight for a particular age division were added up and divided by the total number of subjects recruited in that age division.

Body Mass Index (B.M.I) was calculated using the formula

$$\text{BMI. (Quetelet's index)} = \frac{\text{Weight(kg)}}{\text{Height(m)}^2}$$

Blood pressure recordings were taken on the right arm of each subject. They were seated with the arm resting on a table. Standard mercury sphygmomanometers and appropriate cuffs were used. Each reading was taken two times and approximately five minutes was allowed between the two readings. The mean of these was taken as the systemic arterial blood pressure. Korotkoff sound I (Phase 1) and V (Phase V) were taken respectively as systolic and diastolic levels.

Elevated blood pressure (hypertension) was defined as systolic and or diastolic blood pressure greater than or equal to the 95th percentile for age and sex.

Statistical Analysis

Results are expressed as group mean ± standard deviation (S.D). The significance of difference in prevalence of hypertension between the sexes was evaluated by Chi square (^{2}) test and $P < 0.05$ was fixed as the level of statistical significance.

RESULTS

A total of 502 adolescents aged 13 to 18 years were examined and full results were obtained from 443 of them.

Table 1: - Shows the mean systolic and diastolic blood pressure in adolescent males and females. There was progressive increase with age in both systolic and diastolic pressure in both males and females. Females however had higher values for both.

Table II: - Shows the mean values of

TABLE 1 - Mean ± S.D systolic and diastolic blood pressure for males and females.

	MALES			FEMALES		
Age	**No. of Subjects**	**Mean systolic B.P (mmHg)**	**Mean Diastolic B.P (mmHg)**	**No. of Subjects**	**Mean systolic B.P (mmHg)**	**Mean diastolic B.P (mmHg)**
13	54	95.8 ± 11.6	63.8 ± 7.6	49	108.6 ± 13.4	70.0 ± 9.4
14	37	102.7 ± 11.2	68.1 ± 8.5	55	114.5 ± 10.1	70.3 ± 8.9
15	37	105.9 ± 13.0	69.5 ± 8.5	43	116.3 ± 12.6	71.3 ± 8.7
16	36	108.2 ± 12.5	70.1 ± 8.2	40	115.0 ± 10.7	73.6 ± 8.3
17	39	113.0 ± 14.6	73.0 ± 8.4	24	118.3 ± 12.7	75.6 ± 7.4
18	18	109.0 ± 14.6	73.1 ± 9.3	11	114.3 ± 9.0	74.3 ± 6.7

S.D = Standard Deviation

TABLE II - Mean ± S.D values for anthropometric measurements for males and females

	MALES				FEMALES			
Age	**No. of Subjects**	**Mean Height (m)**	**Mean Weight (kg)**	**Mean B.M.I (kg/m^2)**	**No of Subjects**	**Mean Height (m)**	**Mean Weight (kg)**	**Mean B.M.I (kg/m^2)**
13	54	1.47 ± 0.66	34.4 ± 5.8	15.7 ± 2.0	49	1.52 ± 0.08	38.5 ± 6.2	16.6 ± 1.9
14	37	1.52 ± 0.08	38.7 ± 7.4	16.6 ± 1.9	55	1.57 ± 0.05	44.0 ± 5.0	17.9 ± 1.7
15	37	1.59 ± 0.9	44.0 ± 6.6	17.5 ± 1.6	43	1.57 ± 0.07	48.1 ± 8.1	19.4 ± 2.7
16	36	1.67 ± 0.07	52.4 ± 1.7	18.7 ± 2.0	40	1.59 ± 0.06	49.6 ± 7.1	19.6 ± 2.5
17	39	1.70 ± .06	57.7 ± 5.3	19.8 ± 1.6	24	1.58 ± 0.06	50.8 ± 5.9	20.2 ± 2.4
18	18	1.68 ± .07	55.9 ± 7.3	19.8 ± 2.4	11	1.57 ± 0.03	53.6 ± 4.1	22.3 ± 2.1

S.D = Standard Deviation

TABLE III - Pearson Correlation Coefficient between blood pressure and anthropometric indices

MALES						FEMALES				
Age	**No of subjects**	**B. P**	**Weight (kg)**	**Height (m)**	**Body Mass Index (kg/m²)**	**No of subjects**	**B.P**	**Weight (kg)**	**Height (m)**	**Body Mass Index (kg/m²)**
13	54	S.B.P D.B.P	0.5772* 0.5800*	0.3325* 0.4330*	0.5134* .5643*	49	S.B.P D.B.P	0.3786* 0.4705*	0.3157* 0.2116	0.4283* 0.3950*
14	37	S.B.P D.B.P	0.3389* 0.4161*	0.4084* 0.4676*	0.1379 0.2737	55	S.B.P D.B.P	0.1593 0.1294	.3058* .1773	0.0168 0.0302
15	37	S.B.P D.B.P	0.4933* 0.2019	0.5597* 0.2993	0.2077 0.0870	43	S.B.P D.B.P	0.2521 0.0656	0.0476 0.0763	0.2678 0.0469
16	36	S.B.P D.B.P	0.4239* 0.1253	0.2629 0.2010	0.0275 -0.0024	40	S.B.P D.B.P	0.2588 0.1668	0.1651 -0.1571	0.1753 0.2143
17	39	S.B.P D.B.P	0.3402* 0.0299	0.1719 0.2693	0.2434 -0.1965	24	S.B.P D.B.P	0.2185 -0.0322	-0.2889 -0.1336	0.4757* 0.1543
18	18	S.B.P D.B.P	0.5684* 0.4218	0.4445 0.3927	0.3042 0.1921	11	S.B.P D.B.P	0.3668 0.0082	0.0012 0.0624	0.2239 -0.1736

SBP - Systolic Blood Pressure

DBP - Diastolic Blood Pressure

* - Statistically Significant.

TABLE IV - Prevalence of elevated blood pressure.

Age group (Year)	Males n = 221	Females n = 222	% Male	% Female	Total (Male + Female)	% Total n = 443
13 - 15	4	3	1.8	1.4	7	1.6
16 - 18	9	7	4.0	3.1	16	3.6

Anthropometric measurement (weight, height and Body Mass Index) for adolescent males and females. There was also a progressive increase with age for all parameters for both sexes. Females also had higher values and were taller and heavier up to age 15.

Table III: - Shows Pearson Correlation Coefficient between blood pressures and anthropometric indices. There were positive correlations of both systolic and diastolic blood pressures with weights, heights and body mass index in many groups. They are statistically significant in some.

Table IV: - Shows the prevalence of elevated blood pressure. The prevalence was 1.6% in adolescents 13 to 15 years while 3.6% was found in those 16 to 18 years. The prevalence was higher in males than in females. This difference was however not statistically significant.

Figure I: - Shows the graphic representations of blood pressure in males and females. Systolic and diastolic blood pressures were higher in females than males.

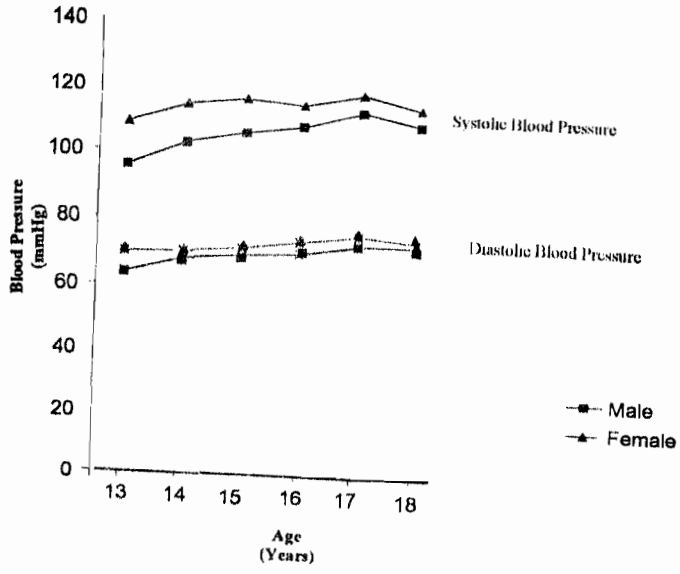

Fig. 1 Graphic Representation Of Blood Pressure In Adolescent Males And Females

DISCUSSION

The study has shown that blood pressure rises with age in urban adolescents of both sexes and corroborates findings from other studies (WHO 1987, Ayoola 1979, Akinkugbe et al 1999). The girls tended to be taller and heavier than the boys and this was attributed to the earlier onset of puberty in the girls. They also had higher blood pressure readings than boys, a finding which points to the association between body mass and blood pressure. This association has been reported by earlier workers (Ayoola 1979, Akinkugbe et al 1999).

Positive correlations were found between systolic and diastolic blood pressures, weight, heights and body mass index in most age groups. These were significant in some cases and further illustrate the relationship between high blood pressure and body mass (Ayoola 1979, Akinkugbe et al 1999, Voors et al 1977).

As regards elevated blood pressure (hypertension), the prevalence in adolescents aged 13 to 15 years was 1.6% while in those 16 - 18 years its was 3.6%. Males had a higher prevalence in both groups but this difference was not statistically significant.

The findings are similar to those of other studies in adolescents in other urban centres in parts of the country. In Ile-Ife a prevalence of 3.4% was reported for male adolescents while 3.1% was recorded for females. (Ayoola 1979). In a similar study done in Ibadan, 3.2% of adolescents were found to have elevated systolic blood pressure while 4.1% had elevated diastolic blood pressure (Akinkugbe et al 1999).

These findings point to the fact that hypertension poses a significant health problem in urban adolescents. It appears to be multifactorial in origin and may partly depend on Body Mass Index as well as increased exposure to Western - type life style (Ekpo et al 1990). The use of adult criteria to define hypertension in adolescents may have hitherto under estimated the true prevalence in them. A group reference level is thus now desirable.

As hypertensive adolescents tend to suffer high morbidity, the need for early detection and treatment of adolescent hypertensives cannot be overemphasized. Routine or periodic blood pressure screening within the school system is recommended as an effective means of early detection. A group reference level should be adopted for use to determine blood pressure elevation as the use of adult criteria underestimates the true prevalence of adolescent hypertension.

Larger studies involving all regions of the country are therefore necessary to establish normograms for adolescents in Nigeria.

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