

Pattern of Systemic Hypertension Amongst High School Children in Conakry

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ABSTRACT

The aim of this study was to determine the prevalence of high blood pressure among students between the ages of 14 and 18 in Conakry and to identify associated risk factors. This was a prospective study carried out in four out of the five councils in the town of Conakry in the month of April 2005. A group of 400 students (193 boys and 207 girls, M/F = 0.9:1) were elected using a random sample of 50 students per school all aged between 14 and 18 years. The mean age was 16.7 ± 1.3 years. Blood pressure was checked after 5 minutes of rest in a sitting position. High blood pressure was defined as systolic and diastolic blood pressure greater than 97.5 percentile based on three consecutive measurements and confirmed 24 hours later. The parameters studied among the hypertensive children were age, sex; personal and family history and body mass index. Eight students were diagnosed with hypertension: 6 girls (2.8%) and 2 boys (1.4%). Among them 4 (50%) were 18 years old, 2 (25%) were 17 years old and the other two were aged 15 (12.5%) and 16 (12.5%) respectively. A positive paternal family history of hypertension was present in four children (50%) with hypertension. A positive paternal family history of two cases (25%) of sickle cell disease and one (12.5%) case of diabetes were also documented. Five (62.5%) cases of a positive maternal history of hypertension was also recorded. In one case of 8 (12.5%), a positive paternal and maternal history of hypertension was present. Body mass index was 24.8 kg/m^2 on the average among those with high blood pressure and 19.9 kg/m^2 among those with normal blood pressure.

In conclusion, hypertension exists in the African children and adolescents living in urban areas in Guinea. The integration of early screening and relevant dietary education will lead to prevention of renal diseases

Keywords: *Hypertension, children, Conakry*

INTRODUCTION

Systemic hypertension is probably the most important public health problem. The prevalence of hypertension depends on both the racial composition of the population studied and the criteria used to define the condition. Patients with hypertension die prematurely, the most common cause of death been heart disease, stroke, and renal failure [1].

The Seventh Joint National Committee (JNC 7) changed the nomenclature from "high normal blood pressure" to "prehypertension" and widened the range to 120 to 139 and/or 80 to 89 mm Hg [2].

The estimated total number of adults with hypertension in 2000 was 972 million (957-987 million); 333 million (329-336 million) in economically developed countries and 639 million (625-654 million) in economically developing countries. The number of adults with hypertension in 2025 was predicted to increase by about 60% to a total of 1.56 billion (1.54-1.58 billion) [3]. Hypertension is an important public-health challenge worldwide.

Prevention, detection, treatment, and control of this condition should receive high priority. High blood pressure in the child may mark the beginning of essential hypertension [4].

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Across the globe, it is estimated that 1 to 3% of children are hypertensive of whom 15% are 8 years old and 16% 22 years old [5]. In the Sub-Saharan Africa, the prevalence rate of hypertension in schools is between 5 to 6% [6].

More work on blood pressure in children in sub-Saharan African and other developing countries is needed to prevent high blood pressure from becoming a major burden in many of these countries [7].

The aim of our study is to determine the prevalence of high blood pressure among students between the ages of 14 and 18 years enrolled in Conakry and to identify some associated risk factors.

MATERIAL AND METHODS

This prospective study was carried out in April 2005 in high schools and colleges in Conakry.

The selection of subjects was by a random sampling technique from 4 out of 5 councils in Conakry. The schools from which the random selection was done include:

- Dixinn council, the *Sainte-Marie* College (686 students) and High School (650 students);
- Kaloum council, the *Boulbinet* college (960 students) and the *Lycee du 2 Octobre* (1,350 students);
- Matoto council, the *Yimbaya* college (6,720 students) and High School (8,640 students and
- Ratoma Council, the *Sonfonia* College (2,080 students) and High School (1,350)

In these high schools and colleges, 400 students elected by a random sample of 50 students per school aged between 14 and 18 years. They were selected from a list based on the students present on the day of the study. The group studied comprised 207 girls and 193 boys (male/female sex ratio=0.93). The mean age was 16.7 ± 1.3 years. Students under 14 years and above 18 years were excluded from the study.

Blood pressure was checked after 5 minutes of rest in a sitting position. Three successive measurements were taken from the right arm. If the average value of these three measurements exceeded 97.5 percentile, a second measurement was done 24 hours later to confirm the diagnosis of high blood pressure. The confirmation of hypertension depended on the average value of three measurements above 97.5 percentile.

The blood pressure was measured with a pediatric cuff, taken care that a cuff covering two

thirds of the length of the arm and surrounding its entire circumference was used. Hypertension was diagnosed using the normogram of Andre *et al* [8], although this was developed amongst Caucasians. There is no similar reference normogram produced amongst Africans.

The parameters studied among hypertensive children, as sought by our questionnaire, were as follows: age, sex; personal medical history of sickle cell anemia, acute articular rheumatism, urinary infection, pyoderma, nephrotic syndrome, hypertension, gross hematuria), family history (hypertension and diabetes in parents). The search for proteinuria and/or hematuria through the urinary band among hypertensive children was not carried out.

Body mass index was defined by the formula; Weight/Height kg/m^2 ; the figures between 19 and 23 were considered normal. Overweight corresponded to a body mass index between 25 and 30 and morbid obesity to a body mass index above 30. Blood pressure was considered normal when the systolic and diastolic pressure was less than 97.5 percentile. High blood pressure corresponded to a systolic and diastolic blood pressure above 97.5 percentile, confirmed by a new measurement on both arms 24 hours later. Data was analyzed using the Epi info version 6 software.

RESULTS

During the first measurement, 5.75% of the students in college and high school were hypertensive and only 2% were confirmed with the second reading 24 hours later.

Table 1: High blood pressure prevalence among African teenagers

Hypertension	N	%
Yes	8	2
No	392	98

The eight hypertensive students comprised 6 girls and 2 boys. Among them 4 (50%) were 18 years old, 2 (25%) were 17 years old and the other two were aged 15 years (12,5%) and 16 years (12,5%) respectively. High blood pressure prevalence stood at 2.8% for girls and 1.4% for boys.

Table 2: Clinical data among persons with high blood pressure and normal blood pressure

Parameters	Hypertension		Normotension	
	Mean	Range	Mean	Range
SBP	138.25 ± 18.25	108 - 165	112.81 ± 11.93	78 - 145
DBP	74.88 ± 17.46	56 - 105	62.59 ± 8.45	40 - 93
Pulse	87.63 ± 12.31	68 - 103	82.89 ± 12.45	52 - 130
height	1.61 ± 0.05	1.55 - 1.68	1.65 ± 0.08	1.39 - 1.95
Weight	64.25 ± 15.52	50.1- 98.6	54.49 ± 11.06	29.9 - 121.9
BMI	24.89 ± 5.96	17.75 - 37.57	19.91 ± 3.2	11.32 - 34.12

SBP: Systolic Blood Pressure

DBP: Diastolic Blood Pressure

BMI: Body Mass Index

Table 3: Studies of high blood pressure prevalence among African children and adolescents.

Study (réf)	Population n (âge)	Community		Prevalence of hypertension	
		urban	rural	boys	girls
Bertrand E and al [8] (Ivory Coast)	15.756 (11-18)	+		2.29	1.57
Adams C LL and al [10] (Nigeria)	254 (6-17)	+		1.3	2
Ye D and al [6] (Burkina faso)	1470 (4-25)	+		0.47	
Kane A and al [14] (Senegal)	465 (< 18 ans)		+	1.5	
Our series (Guinea)	400 (14-18)	+		1.4	2.8

Clinical complaints among hypertensive students were limited to episodic headaches (2 cases).

Personal medical histories among confirmed persons with high blood pressure were: Unexplained oedema (2 cases), urinary infections (3 cases), pyoderma (2 cases) and sickle cell anemia (2 cases).

As regards family history, paternal history showed 4 occurrences of high blood pressure, one occurrence of diabetes and two occurrences of sickle cell anemia. Maternal history showed 5 occurrences of high blood pressure. High blood pressure was present in both parents once only.

Mean body mass index was 24.8 kg/m² among persons with high blood pressure and 19.9 kg/m² among persons with normal blood pressure.

DISCUSSION

The prevalence of high blood pressure in our study is comparable to similar studies in other parts of Africa (see Table 3).

A comparative study of high blood pressure prevalence among students aged between 11 and 18 years in Ivory cost (African children vs European children) did not reveal any considerable statistical

difference between the two groups (n=15,756) studied by age group [9]. However, the authors defined normal pressure as a blood pressure value less than or equal to 150/90 mmHg while high blood pressure was defined using the manometric measurement method by a value greater than or equal to 155/95 mmHg. In that study, 2.29% of boys and 1.57% of girls were hypertensive. The authors did express doubts about the validity of the results since the two groups were not selected using the same methodology.

In a study conducted in Nigeria in the urban setting, high blood pressure prevalence was 2% among girls and 1.3% among boys [10]. In that study, high blood pressure was defined by values equal to or greater than 140/90 mmHg.

Another study carried out in the school milieu in Ouagadougou (primary and secondary schools) among 1,470 children with an average age of 13.8 years (4-25 years) revealed the presence of diastolic high blood pressure among 3.26% and a systolic-diastolic high blood pressure in 6 children (0.47%) [6].

The white collar effects could be responsible for 20-30% of false high blood pressure in the adult and close to 40% among children aged between 13 and 15 years [11]. Measurements taken out of the doctor's office and the repetition of measurements help to reduce the risk of error occurring. Accordingly, Sinaiko et al, reported a high blood pressure prevalence rate among high school Americans of 4.2% during the first blood pressure measurement and 1.1% during the second [12].

In our study, six out of the eight persons with high blood pressure were girls. Our study is similar to these studies. In general adult population, high blood pressure frequency is higher in men than in women until the age of 60 after which the proportion of women with high blood pressure increases.

Overweight is a risk factor among Caucasus children. Rocchini et al show a direct relation between weight and blood pressure as early as the age of 5, and this relation is significant at adolescence [13]. Among African children and adolescents living in rural areas in Senegal, obesity prevalence was 3 and 2.4% respectively [14] and authors did not find any significant relation between blood pressure and body mass index values whereas such a relation exists among children in the Caucasus.

In another study carried out on 1,470 African children living in urban areas in Burkina Faso, overweight prevalence was 1.90% and that of morbid

obesity was 0.28% [6]. Only one obese child was hypertensive.

Metabolic syndrome frequency in the African American child living in the urban area was recently evaluated among 385 enrolled adolescents. Metabolic syndrome prevalence was 5.6% and a body mass index equal to or greater than 95 percentile was detected among 13.8% of them [15]. Dietary advice and physical exercise program among African Americans helped to reduce overweight and drastically lowered systolic blood pressure. In our study, hypertensive adolescents had an average body mass index that was higher than average body mass index among adolescents with normal blood pressure. The small number of hypertensive persons made it difficult to arrive at a considerable difference in body mass index. As pointed out earlier on in the literature review, our study conducted in the urban area suggests that this mode of life encourages the appearance of overweight as early as in adolescence.

Children with hypertensive parents have the tendency of having higher blood pressure than children whose parents have normal blood pressure. The risk of developing high blood pressure when one parent is hypertensive is increased by a factor of 2.5. If both parents are hypertensive, this risk is increased by 3.8 [16, 17]. Hypertension heredity is therefore a non-negligible risk factor. In our study, all the eight hypertensive adolescents had at least one parent who was also hypertensive. In one case, both parents were hypertensive.

CONCLUSION

Hypertension exists in African children and adolescents living in urban areas in Guinea. The integration of early hypertension screening and dietary improvement program in schools will lead to prevention of cardiovascular diseases.

REFERENCES

1. Rudijanto A: Hypertension: diagnostic problem, challenge and dilemmas. *Acta Med Indones.* 2006; 38(4): 217-223.
2. Julius S: Should the results of TROPHY affect the JNC 7 definition of prehypertension? *Curr Hypertens Rep.* 2007 Jun; 9(3): 202-205.
3. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK and He J.: Global burden of hypertension: analysis of worldwide data. *Lancet.* 2005 Jan 15-21; 365(9455): 217-223.

4. Broyer M, André J-L: Nouveaux regards sur l'hypertension artérielle de l'enfant. *Arch Fr Pediatr*. 1980; 37: 429-432.
5. OMS: Etude de la tension artérielle de l'enfant. *S R T* 1985; 175: 1-35.
6. Ye D., Drabo YJ, Ouedraogo D., Samandoulougou A and Sawadogo A: Obésité, hypertension et diabète sucré en milieu scolaire à Ouagadougou. *Dakar Med*. 2001; 46 (2): 112-115.
7. Agyemang C, Redekop WK, Owusu-Dabo E, Bruijnzeels MA: Blood pressure patterns in rural, semi-urban and urban children in the Ashanti region of Ghana, West Africa. *BMC Public Health*. 2005; 5: 114.
8. André J-L, Deschamps JP and Gueguen R: La tension artérielle chez l'enfant et l'adolescent. Valeurs rapportées à l'âge et à la taille chez 17067 sujets. *Arch Fr Pediatr* 1980; 37: 477-482.
9. Bertrand E, Ravinet L and Coly M: Détermination de la pression artérielle normale chez 15.756 élèves Africains âgés de 11-18 ans en Côte d'Ivoire. Etude comparative entre un groupe d'Africains et un groupe d'Européens. *Arch Mal Coeur Vaiss*. 1981; 74: 15-25.
10. Adams-Campbell L L and al: An epidemiological assessment of blood pressure determinants in an adolescent population of Nigerians. *J Hypertens*. 1987; 5 (5): 575-580.
11. Task force of blood pressure controle of children. Second repport. *Pediatrics*. 1987; 79: 1-25.
12. Sinaiko AR: Hypertension in children. *N Engl J Med*. 1996; 335 (26): 1968-1973.
13. Rocchini A. P. Pediatric hypertension 2001. *Curr Opin Cardiol*. 2002; 17 (4): 385-389.
14. Kane *et al*: Pression artérielle et indice de masse corporel chez les enfants et adolescents de la zone rurale de Thiadiaye, Sénégal. *Dakar Méd*. 1998; 43 (1):83-89
15. Engels HJ, Gretebeck RJ, Gretebeck KA and Jimenez L: Promoting healthful diets and exercise: efficacy of a 12-week after-school program in urban African Americans. *J Am Diet Assoc*. 2005; 105 (3): 455-459.
16. Munger RG, Prineas RJ and Gomez-Marín O.: Persistent elevation of blood pressure among children with a family history of hypertension: the Minneapolis Children's Blood Pressure Study. *J Hypertens*. 1988; 6 (8): 647-653.
17. André J-L: Epidémiologie de l'Hypertension artérielle. *P Pédi*. 1993; 9 (21): 193-194.