Original Articles

PREVALENCE OF HYPERTENSION IN SCHOOL GOING CHILDREN

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Received for publication: May 5,1994; Accepted: November 21,1995

Objective: *To establish norms of blood pressure in children of different age groups, prevalence of hypertension and probable precipitating or aggravating factors.* ***Design:*** *Cross sectional study. Setting: Five thousand school children of Amritsar city.* ***Methods:*** *Three readings of blood pressure were recorded. Norms for each year age group from 5-17 years of age were established. Persistently hypertensive children were investigated. Influencing factors like family history of hypertension and obesity were taken into account.* ***Results:*** *The blood pressure increased with increase in age with a spurt in systolic blood pressure at the age of 12 years in both the sexes. There was no significant differences in the blood pressure of two sexes at various age groups except for systolic blood pressure at 5,6 and 16 years and for diastolic blood pressure at 9 and 13 years. Only 0.46% children were hypertensive. Children with obesity (n=342) and family history of hypertension (n=271) had hypertension in 3.5% (n=12) and 5.9% (n=16) cases, respectively as compared to other children in which the prevalence was only 0.23% and 0.14%, respectively.* ***Conclusions:*** *The norms for determining hypertension in this population were established and it's prevalence was 0.46%. Significant risk factors were obesity and family history of hypertension.*

Key words: *Hypertension, Obesity.*

HYPERTENSION is a common disease associated with high morbidity and mortality. The disease is a silent threat to the health of people all over the world. It is suggested that hypertension has its origin in childhood but goes undetected unless specifically looked for during this period(l). Thus, early detection of hypertension and its precipitating or aggravating factors is important if one is to evolve measures so that complications of hypertension can be prevented(2). The present study was designed to evaluate the normal range of blood pressure in different age groups, prevalence of hypertension and the precipitating or aggravating factors.

Subjects and Methods

This study was carried out in 5,000 school children of Amritsar city in the age group between 5 to 17 yr. Before recording the blood pressure, the procedure was fully explained to the children and sufficient time allowed for recovery from recent activity and apprehension. Blood pressure (BP) was recorded in sitting position in right arm by auscultatory method using a standard mercury sphygmomanometer with appropriate sized cuff covering about 2/3 of the upper arm and encircling it completely(3). BP readings were noted as per the recommendations of American Heart Association. Diastolic blood pressure was taken at the point of muffling of sounds. Three measurements were taken at interval of five minutes each and mean of these three readings was taken as systolic (SBP) and diastolic blood pressure (DBP)

respectively(4). Weight and height of each child was recorded and family history of hypertension obtained by a questionnaire filled by the parents. Obesity was calculated according to 'Davenport Index' *i.e.,* weight (gm)/ Height $(cm)^2$ >2.26. Statistical methods included calculation of age and sex specific means and standard deviation (SD) for systolic and diastolic blood pressure, correlation coefficient and 't' test for significant difference in blood pressure between groups.

The children whose BP levels exceeded +2 SD of the mean for age and sex were considered as hypertensive(4,5) and were evaluated by two subsequent measurements taken during two different visits at weekly intervals before labelling them as hypertensive. Children having persistently elevated BP on three occasions were subjected to the following investigations: urine complete and culture, blood urea, creatinine, electrolytes, X-ray skull and abdomen, intravenous pyelography and abdominal ultrasound.

Results

The present study consisted of 2957 boys and 2043 girls. The BP for each age group was taken and children with BP level > +2 SD for that age group were considered as hypertensive.

The rise in blood pressure was directly proportional to the increase in the age and it was statistically significant ($p < 0.001$) with a spurt of about 5 mm Hg in SBP at 12 yr in both the sexes as shown in *Tables I & II.* On the other hand there was no significant difference ($p > 0.10$) between the SBP as well as DBP of the two sexes at various age groups except for the significant difference ($p < 0.01$) between SBP of the both sexes at 5, 6 and 16 yr and between DBP at 9 and 13 yr of age.

Hypertension was observed in only 23 (0.46%) children. Initially, a total of 160 children were found to be hypertensive. The number dropped down to 40 when these children were re-evaluated after one week interval and to 23 during follow-up

TABLE I–*Mean Systolic and Diastolic Blood Pressure in Boys in Different Age-groups*

Age	Systolic blood pressure			Diastolic blood pressure	
(yr)	No.	Mean BP (mm Hg)	SD	Mean BP (mm Hg)	SD
5	245	94.1	3.1	62.0	3.0
6	165	96.3	3.8	64.4	3.2
7	228	98.5	4.7	66.5	2.6
8	224	100.4	4.0	68.0	3.1
9	304	101.5	4.0	69.1	3.1
10	345	103.2	4.1	71.0	2.6
11	330	106.3	3.3	72.2	3.8
12	310	110.7	4.2	73.3	3.3
13	218	112.0	5.0	75.0	3.1
14	200	114.5	4.9	76.2	3.4
15	180	116.5	5.5	76.9	3.4
16	108	118.7	5.0	77.8	3.3
17	100	120.6	5.2	78.7	4.5

Systolic and diastolic blood pressure of each age group were significantly different from the other ($p < 0.001$)

TABLE II–*Mean Systolic and Diastolic Blood Pressure in Girls in Different Age-groups*

Age	Systolic blood pressure			Diastolic blood pressure	
(yr)	No.	Mean BP (mm Hg)	SD	Mean BP (mm Hg)	SD
5	222	92.6	2.1	62.0	2.2
6	140	95.0	2.8	64.3	2.6
7	162	98.3	2.6	65.2	2.9
8	190	100.4	2.0	68.1	3.0
9	200	101.0	3.3	68.3	3.0
10	242	102.6	3.5	70.2	2.6
11	204	105.7	4.1	72.1	3.4
12	221	110.1	3.9	73.0	3.7
13	140	112.2	4.5	73.8	3.4
14	96	114.0	4.0	75.7	2.6
15	84	116.4	3.6	76.3	2.9
16	74	117.3	3.6	77.1	3.4
17	68	119.4	3.7	78.5	3.5

Systolic and diastolic blood pressure of each age group were significantly different from the other ($p < 0.001$).

at the end of two weeks. On subsequent examinations, these 23 children remained hypertensive; of these 16 were boys.

Obesity and family history of hypertension were found to be important influencing factors in the development of hypertension. Obese children (n=342) had hypertension in 3.5% (n=12) cases as compared to the normals (n=4658) in which the prevalence was only 0.23% (n=ll). Thus the prevalence of hypertension in obese children was about 15 times the normal. Similarly, children with family history of hypertension (n=271) had high BP in 5.9% (n=16) as compared to others (n=4729) in which the prevalence of hypertension was only 0.14% (n=7). Thus, the prevalence of hypertension in children with family history of hypertension was about 40 times than in children with no such history. Available investigations of these hypertensive children did not reveal any cause of hypertension. Four out of 23 hypertensive children had hypercholesterolemia.

Discussion

Hypertension is a potential risk factor for atherosclerosis of coronary, renal and cerebral vessels with fatal effects(6). It is, therefore, necessary to study the normal range of blood pressure values so as to demarcate the level over which children may be called hypertensive.

The findings of present study revealed that the rise in BP was directly proportional to the increase in age in both the sexes with a spurt of about 5 mm Hg in SBP at the age of 12 yr in both the sexes. Each age year group BP was significantly different from the other ($p < 0.001$). Similar observations have been made by other workers(4,7,8), who found a spurt in SBP between 13 to 15 yr age group. The Task Force Committee Report (5,9) found this

spurt between 5-6 yr in both the sexes. The spurt may possibly be due to certain hormonal and physical changes occurring in the body at adolescence.

There was no significant difference between the SBP as well as DBP of the two sexes in most age groups except for difference between the SBP at 5, 6 and 16 yr and between DBP at 9 and 13 yr of age. Similar observations have been made by other workers(l,4,7,10) who found significant difference between SBP(4,10) and DBP(1,4,7).

Children with BP > +2 S.D. of the mean were considered as hypertensive. The prevalence of hypertension in study population was 0.46% (n=23). The prevalence reported in various other studies ranged from 0.41 to 3.6%(1,4,7,11,12).

Obesity and family history of hypertension were found to be important influencing factors in the development of hypertension in the present study. Fifty two per cent of the asymptomatic hypertensive children were found to be obese as compared to 62.5%, 53% and 63% in various studies(4,13,14). Hypertension in obese children may occur due to: *(a)* increased cardiac output, *(b)* increased blood volume, (c) excessive sodium intake, *(d)* increased steroid production and *(e)* alteration in receptors for various pressor substances(15-17). An association between family history of hypertension and hypertension in children has also been found by various workers(13,14,18).

Investigations of these hypertensive children failed to document any underlying cause. Similar opinion is experienced by other workers(13,14). The hypertension in these asymptomatic children is, therefore, essential hypertension which is probably aggravated due to obesity and a positive family history.

It is therefore recommended that children must be screened to detect asymptomatic hypertension. Influencing factors like obesity should be checked and prevented by advising proper diet and regular exercise at home and schools. Parents should also he advised to take these measures.

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NOTES AND NEWS

HEALTH CHECKUP OF PRIMARY SCHOOL CHILDREN

The Department of Family Welfare, Ministry of Health and Family Welfare in collaboration with the Department of Education, Ministry of Human Resources, has launched a scheme to carry out Health Check-up of all Primary School Children in the country over a 1-week period in July 1996 (22nd-27th July). It will involve examination of about 10 crore children in 6 lacs Primary Schools. The health check-up will be done by about 12 lacs school teachers with the help of 1.5 lacs volunteers. The aims of the scheme are: (/) Basic health check-up of children in Primary schools and referral of those requiring medical attention, (B) Building up of awareness of various health needs among children and teachers, and in the community.

Professional bodies such as the Indian Medical Association, Indian Academy of Pediatrics, Indian Dental Association and Indian Society for Prevention of Blindness have been associated with the Government concerning formulation and planning of the scheme. They have assured the Government of every possible help by their members.

A training manual for Teachers has been prepared which gives information about common health problems of school children. The manual will be translated in various regional languages and given to every primary school teacher. The teachers and other workers will be trained in carrying out the health screening. Trainers will be identified from Government Institutions and members of the Professional Bodies and training will be conducted at District level.

District Implementation Committees will be formed and composed of the Administrative, Health and Education authorities, representatives of professional bodies, various NGO's and Media officers. Children detected to have any health problem will be referred to Health facilities in Government and private Sector.

Members of the IAP are requested to actively participate in the implementation of this very important national scheme.