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Study on Blood Pressure and Anthropometric Indices in Males at a Rural Site in Sunderban, West Bengal.

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Abstract: *Hypertension is recognised as a major cause of morbidity and mortality throughout the world. The risk of cardiovascular diseases, like coronary heart disease, cerebrovascular accidents, etc., rise significantly with elevated blood pressure. Although features of such target organ damage are evident in adults, in children overt symptoms of target organ changes are often absent.*

Among 385 male subjects between 5-60 years of age, the prevalence of hypertension in subjects ≤ 18 years of age was 16%. Prevalence of overweight was 8%. In the adult group (> 18 years of age) prevalence of pre-hypertension and hypertension were 40.2% and 12.4% respectively. The prevalence of obesity and overweight in this group was 24.5%. Out of them obesity was seen in 8.3%. The risk of prehypertension and hypertension was 5 times more in overweight and obese subjects compared to subjects with normal or lower than normal weight. There was a positive correlation between body weight and both systolic blood pressure (SBP) and diastolic blood pressure (DBP) [$R = 0.82$; $p < 0.0001$; extremely significant]. Waist circumference correlated extremely significantly with SBP [$R = 0.85$; $p < 0.0001$; extremely significant].

Hypertension and obesity may cause severe morbidity and mortality in men. So, both these parameters frequently should be investigated in children and adults. Prevention is only possible if treatment and awareness is started in children. We recommend any SBP above 120 mm of Hg or DBP above 80 mm of Hg in children is hypertension.

Keywords: *Hypertension, overweight, obesity, BMI, male*

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I. Introduction:

Blood pressure is defined as the lateral pressure exerted by the flowing blood on the wall of the blood vessels. From an epidemiologic perspective, there is no obvious level of blood pressure that defines hypertension. However, hypertension may be defined clinically, as that level of blood pressure at which the institution of therapy reduces blood pressure-related morbidity and mortality [1].

The cut-off values of blood pressure to define hypertension in adults is defined by JNC-7 and the recently published JNC-8 guidelines. In children and adolescents, hypertension generally is defined as systolic and/or diastolic blood pressure consistently >95th percentile for age, sex, and height [1]. Hypertension in adults is defined conventionally as a sustained increase in blood pressure of ≥ 140/90 mm Hg, because beyond this limit, the risk of hypertension-related cardiovascular disease becomes high enough to merit medical attention [2]. The risk of both fatal and nonfatal cardiovascular disease in adults is lowest with systolic blood pressures of <120 mm Hg and diastolic BP <80 mm Hg; these risks increase progressively with higher systolic and diastolic blood pressures [3

Elevated BP results from environmental factors, genetic factors, and interactions among these factors. The environmental factors that affect BP are diet, physical inactivity, toxins, and psychosocial factors [8, 9]. Elevated blood pressure is a very common, consistent and independent risk factor for development of cardiovascular and renal disease [9]. The risk of cardiovascular diseases, like coronary heart disease, cerebrovascular accidents, etc., rise significantly with elevated blood pressure [7, 8, 9, 10].

Currently, the definition of hypertension has undergone improved understanding with effective tackling of cardiovascular risk. The importance of target-organ damage is better appreciated. It is now known that every mm of Hg rise in blood pressure exerts deleterious effects on the vasculature of target organs.

Obesity is a major controllable contributor to hypertension [11]. Obesity is associated with increased morbidity, premature mortality and disability from cardiovascular disease, diabetes mellitus, malignancies and musculoskeletal disorders [12]. It is likely that the harmful effect of obesity is mediated, at least partly, by the association between blood pressure and body weight [9].

Global obesity rates have increased steadily in both developed and developing countries over the past several decades. This poses a huge medical and economic burden to the society [8]. Although obesity-associated morbidities occur more frequently in adults, significant consequences of obesity as well as the antecedents of adult disease are not uncommon in obese children and adolescents [10].

II. Aims and Objectives:

Anthropometric parameters correlate well with blood pressure and can provide an indirect measure of cardiovascular risk, including risk of hypertension [1, 6, 7, 8]. The aim of this study was to assess the relationship between obesity and blood pressure in the rural population of West Bengal.

III. Materials and Methods

The subjects were selected after informed consent, at a rural health camp organised in Sundarban area of West Bengal, India. Altogether 385 male subjects aged between 5-70 years were included in the study.

Exclusion Criteria:

1. History of known cardiopulmonary disorders..
2. Presence of any congenital anomaly.
3. Presence of known skeletal deformity.
4. Patient on anti-hypertensive medications.

Instruments Required:

1. Mercury Sphygmomanometer (Dynosure DOCTOR DT Mercurial Sphygmomanometer, MODEL DT 11, made in Japan, imported by Dynamic Tracom Private Limited).
2. Stethoscope (H. Mukherjee & Sons).
3. Weighing Machine (Virgo Manual Weighing Scale-V-9811Bblue2).
4. Stadiometer (Seca 213 Portable Stadiometer).

Procedure:

The height, weight, systolic blood pressure (SBP), diastolic blood pressure (DBP), waist circumference (WC), hip circumference (HC), mid-arm circumference (MAC), mid-thigh circumference (MTC) and Chest circumference of the participants were measured. Body mass index (BMI) was computed using height and weight.

Height was measured in standing position using a stadiometer. Weight was measured using a weighing-scale (manufactured by Doctor Beli Ram & Sons). Blood pressure was measured from the left upper arm in sitting position using an aneroid sphygmomanometer after a period of rest for at least 10 minutes. The mean of two separate readings was recorded. [10, 11]

Source of finance:

The study was funded by researchers.

Statistical methods:

The mean and standard deviation were calculated for each parameter. The prevalence of prehypertension, hypertension, overweight and obesity was calculated. The statistical correlation of hypertension, overweight and obesity with different anthropometric measurements was determined using Pearson's Correlation Coefficient using SPSS-20. [12]

IV. Observations and Results:

The results are summarised in Tables 1 and 2.

Table 1: Blood pressure and Anthropometric Measurements in male subjects aged 5-18 years: (n = 196)

	AGE	SBP	DBP	WEIGHT	HEIGHT	WAIST	HIP	MAC	MTC	CHEST	BMI
MEAN	11.4	96.8	63.4	26.0	136.1	59.1	67.9	18.5	32.0	64.2	14.0
SD	±4.05	±15.1	±10.7	±9.6	±19.5	±9.9	±11.4	±3.1	±4.3	±9.9	±5.2

Table 2: Blood pressure and Anthropometric Measurements in male subjects aged 18-70 years: (n = 189)

	AGE	SBP	DBP	WEIGHT	HEIGHT	WAIST	HIP	MAC	MTC	CHEST	BMI
MEAN	44.6	131.9	81.4	48.9	158.5	78.2	84.9	24.7	37.5	79.8	19.7
SD	±17.1	±16.3	±7.8	±10.8	±5.7	±10.1	±9.4	±2.8	±3.7	±8.0	±4.8

For this study, hypertension in children below 18 years was defined as blood pressure above 95th percentile with respect to age, sex and height. For adults, the normal blood pressure (SBP/DBP) was defined as

< 120/80 mm of Hg. Pre-hypertension was defined as SBP between 120 - 139 mm of Hg and/or DBP between 80 - 89 mm of Hg. Hypertension was defined as SBP ≥ 140 mm of Hg and/or DBP ≥ 90 mm of Hg, as outlined by JNC-7 [1].

There was a progressive increase in systolic and diastolic blood pressure with age ($R = 0.7$).

The prevalence of hypertension in subjects ≤ 18 years of age was 16%. Prevalence of overweight was 8%. Obesity was not noted in this group.

In the adult group (> 18 years of age) prevalence of pre-hypertension and hypertension were 40.2% and 12.4% respectively. The prevalence of obesity and overweight in this group was 24.5%. Out of them obesity was seen in 8.3%. The risk of prehypertension and hypertension was 5 times more in overweight and obese subjects compared to subjects with normal or lower than normal weight. There was a positive correlation between body weight and systolic blood pressure (SBP) ($R = 0.82$; $p < 0.0001$; extremely significant). Waist circumference correlated extremely significantly with SBP ($R = 0.85$; $p < 0.0001$; extremely significant).

V. Discussion:

Overweight and obesity are considered to be an escalating epidemic in both developed and developing countries [13]. The onset of obesity and cardiovascular disease is rooted in childhood and this calls for targeted interventions and health promotions in youth population [13].

Body Mass Index (B.M.I) is the most widely used anthropometric tool for the clinical assessment of obesity. It is defined as weight in kilogram divided by the square of the height in meters (W/H^2) [14]. In this study, BMI < 18.5 kg/m^2 was considered underweight, BMI within 18.5 - 24.9 kg/m^2 was considered healthy weight, BMI within 25 - 29.9 kg/m^2 was considered overweight and BMI ≥ 30 kg/m^2 was categorised as obesity, in accordance to international standards [7]. However, for Asian countries, lower cut-off values have been suggested by a WHO expert consultation for the purpose of public health action. The proposed values were 23 kg/m^2 for overweight and 27.5 kg/m^2 for obese [15].

Although, a BMI of 25 has generally been considered as the upper limit of normal, individuals with BMI at around 20, which is within normal range, have been found to have increased morbidity and mortality risks [14].

Both systolic and diastolic blood pressures show a graded relationship with the risk of cardiovascular disease. This risk is enhanced by coexistence of other risk factors like diabetes, smoking and dyslipidemia. Again, obesity bears a direct relationship with hypertension and dyslipidemia. Overweight individuals are an important target for intervention, because, it is they who ultimately become obese [14].

Screening for high blood pressure at regular intervals in all age groups can help in early diagnosis and management of hypertension in our community.

VI. Conclusion:

Blood pressure is an extremely important indicator of cardiovascular health. In this study, we found greater systolic and diastolic blood pressures in overweight / obese individuals. This correlates well with the high cardiovascular risk posed by increased adiposity.

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