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Original article

Prevalence and predictors of pre hypertension and hypertension among school going adolescents (14–19 years) of Tripura, India

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ABSTRACT

Background: Uncontrolled hypertension during adolescence is an established risk factor for future development of cardiovascular disease (CVD). The study determined prevalence of pre hypertension and hypertension and the predictors of high blood pressure among adolescents.

Methods: The study included 530 Tripuri tribal and 363 Bengali adolescents from Tripura, India. Anthropometric measurements, adiposity status, systolic blood pressure (SBP) and diastolic blood pressure (DBP) of the subject were evaluated. Subjects were classified as normotensive, pre hypertensive and hypertensive using National high blood pressure education program (NHBPEP) criteria. Multiple logistic regression was applied to study the strength of association between blood pressure and socioeconomic correlates.

Results: Prevalence of normotension, pre-hypertension and hypertension was 89.47%, 7.73% and 2.80% respectively. Overweight or obese subjects were highly susceptible for pre-hypertension and hypertension. SBP showed significant positive correlation with body mass index (BMI), waist-hip ratio (WHR), waist circumference (WC) and waist-height ratio (WHtR). While DBP correlated significantly with BMI, WHR and body fat of subjects. Risk factors like age, parental literacy status, socioeconomic class, physical activity level, WHR, WC, WHtR; and percentage body fat showed significant association with hypertension.

Conclusion: Prevalence of pre hypertension and hypertension varies according to ethnicity, locality, adiposity and socioeconomic correlates of the subjects.

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1. Introduction

Hypertension (HTN) is one of the emerging causes of death in both developed as well as the developing nations [1]. The true incidence of hypertension among children and adolescents is largely unknown, partly because child hypertension was rare until recently and partly because relatively less number of epidemiological research have been performed. However, recent researches have reported the increasing trends of prevalence of high blood pressure among adolescents [2,3]. Regional and ethnic variation in the prevalence of hypertension among adolescents is also observed in various studies conducted in different corners of the world [4–6].

Hypertension is known to be a leading risk factor for cardiovascular disease (CVD). It exerts a significant public health burden on cardiovascular well being status and health care system

in India [7]. Hypertension is a significant public health problem in both urban and rural areas of India [8]. The Registrar General of India has reported that the prevalence of hypertension in urban and rural populations of India is 25.0% and 10.0%, respectively [9].

The causes of hypertension are attributed to obesity, change in dietary pattern, diminished physical activity and expanding stress. Comparable information is missing from India; little studies in school children suggest a prevalence ranging from 2–5%. Identifying and modifying risk factors reduces the incidence and complications in adolescents and adults [10]. Possibilities of hypertension development in adulthood may start very early in life, and children maintain their position in the blood pressure distribution over time [11].

Recently India endorsed the Sustainable Development Goal for health to set a target to decrease premature deaths from non communicable diseases (NCDs) by one-third by 2030 [12]. Prevalence of hypertension varies across countries and states. This multifactorial disease is influenced by genetic, racial, geographic, cultural and dietary patterns of subjects. It is important to identify prevalence of pre hypertension and

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hypertension and their correlates in different groups of population early in life, so that timely intervention can reduce the future burden of cardiovascular disease in a population.

Tripura, a North-eastern state of India is unique in having both indigenous tribal and nontribal population residing across the geographical areas of the state. Tripuri tribes are the largest group of tribal population of Tripura and are considered to be a part of the Tibeto-Burmese ethnic group and physically they exhibit mongoloid features. The major non-tribal population of Tripura consists of Bengali population. There are few reports on growth and lung function pattern of adolescents from Tripura [13,14]. Studies on pre-hypertension and hypertension status of adolescents from Tripura are scanty. Therefore this study was undertaken to determine the prevalence of pre-hypertension and hypertension among adolescents of Tripuri tribes and Bengali population of Tripura. The study also determined the associated risk factors of pre-hypertension and hypertension among apparently healthy subjects residing in Tripura, north-eastern India.

2. Materials and methods

Ethnic Tripuri (n=530) and non-ethnic Bengali (n=363) subjects (age 14–19 years) were recruited through random sampling from different urban (n=13) and rural school (n=18) of Tripura, India. A total of 31 schools from both rural and urban areas of the State representing all the districts of Tripura were randomly selected with respect to the proportional probability of school in the stratum. In this way, total number of urban and rural schools selected for this purpose was 13 and 18 schools respectively. The students from class VI to XII were selected by random sampling. The number was proportional to the population of students in that age group. The study was conducted between May 2012 to March 2015. Verbal consent was taken from the subjects to participate in the study, after obtaining permission from the respective school authority. This was followed by obtaining written consent from parents of each willing subject. They were evaluated as per standard proforma which included a questionnaire to evaluate health and socio-demographic status of the subject [15]. The experimental protocol was explained to all the willing subjects. The research protocol was approved by the Institutional Human Ethical Committee of the Tripura University. Sample size of the study was calculated according to the World Health Organization (WHO) method for sample size calculation in health studies taking 95% confidence [16]. As there was very limited information regarding prevalence of pre hypertension and hypertension among adolescents from two different major community such as ethnic Tripuri and non-ethnic Bengali community of Tripura, a 35% prevalence was estimated according to different published report from Tripura and other parts of India

and with 95% confidence, the sample size calculated was 350, however the observed sample was higher than this number.

The present study involved both urban and rural schools covering all the districts of Tripura and the number of rural schools included is higher than urban schools which is dominating with tribal student compared to Bengali student. On that basis the total number of subjects included is 530 for tribal and 363 for nontribal. An exclusion criterion was also followed for final sample size. Subjects with anti-hypertensive medication and known to have chronic heart, renal or hepatic disease were excluded. Initially we have approached a total of 1010 subject for this study. Out of this a total of 51 (5.05%) subjects were excluded due to application of different exclusion criteria. We didn't have parental consent from 66 (6.53%) subjects and excluded them from this study. Finally we have reached to final sample size of 893 for this study.

Socioeconomic status of the subjects was determined by using updated Kuppuswami's classification of socioeconomic status with some modification [17]. Subjects were classified into four different socioeconomic categories depending on economic criteria in terms of family income per month as reported by the head of the family.

Anthropometric measurements of the subjects were recorded following standard methods [18]. The weight and height were measured to the nearest 0.1 kg and 0.1 cm respectively. Instrument used for this purpose was stadiometer (Bio + Plus^(R)) for height and human weighing machine (Libra^(R)) for weight measurement. Waist circumference (WC) was measured by using measuring tape to the nearest 0.1 cm at the high point of the iliac crest at minimal respiration when the participant was in a standing position [19]. Body Mass Index (BMI) was calculated by using the formula weight (kg)/height² (m²). Waist to hip ratio (WHR) and waist to height ratio (WHtR) of the subjects was calculated. The percentage of body fat was estimated by using the method of Durnin and Rahaman [20].

All subjects were requested to sit in a room and the procedure for the measurement of blood pressure was explained. After 5 min of rest two consecutive readings of blood pressure were taken at interval of 5 min and their mean values were used for analysis. Throughout the study same mercury sphygmomanometer (Brand/model- Doctor Japan: Life Line) was used. Systolic blood pressure (SBP) was indicated by onset of Korotkoff sounds and Diastolic blood pressure (DBP) was indicated by disappearance of sounds. Subjects were classified into three blood pressure category according to National high blood pressure education program (NHBPEP) criteria [21]. They were also classified into different body weight category according to their body adiposity measures [22].

The data were evaluated using SPSS 16.0. The *t*-test, chi-square test, Pearson's correlation and logistic regression were applied for statistical analyses. *P* < 0.05 was considered statistically significant.

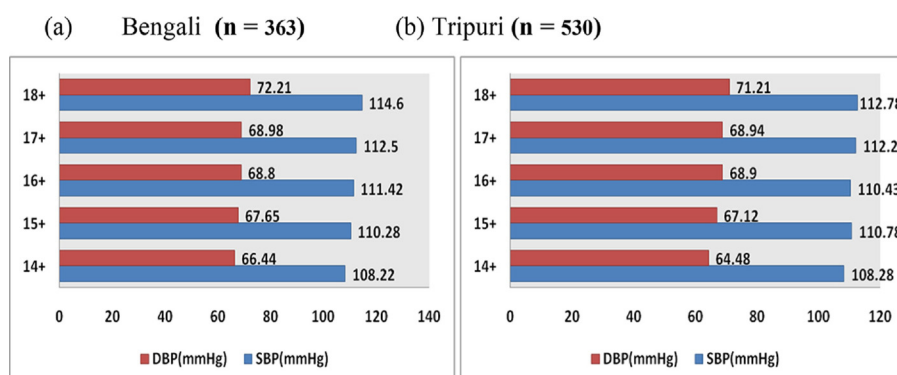


Fig. 1. Trends of systolic and diastolic blood pressure (mmHg) with age in Bengali (a) and Tripuri (b) subjects.

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