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Original Research Article

Blood pressure and its associated factors: a comparative study among rural and urban adolescents in Bangladesh

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ABSTRACT

Background: Hypertension in adolescents may lead to irreversible damages in vital organs, such as heart, brain, kidney and may cause death if treatments are not given despite early diagnosis. The aim of this study is to identify the status of blood pressure and its associated factors among adolescents.
Methods: It was a cross-sectional study. 810 adolescents of 8 schools and colleges in Chittagong district were collected by stratified cluster sampling technique. Ages of the respondents were 14 to 19. Status of Blood pressure and its associated factors in urban and rural area were the main outcome of interest.
Results: The study found the significant difference in physical activities and overweight statistics between urban and rural adolescents (P<0.001). Obesity was found only in the urban area that was 1.2%. The mean systolic blood pressure (114.53 mmHg, 110.61 mmHg) and mean diastolic blood pressure (69.87 mmHg, 68.58 mmHg) of boys and girls in urban respondents were more than rural (109.79 mmHg, 68.97 mmHg and 105.02 mmHg, 67.941 mmHg respectively) and was statistically significant (P<0.001). The mean SBP and DBP were 126 mmHg and 79 mmHg respectively among obese. In the study prevalence of hypertension was 1.5% in urban adolescents and 0.2% in rural adolescents. Consumption of fast food, living area, physical activity, paternal hypertension and BMI were found significantly associated (p<0.05) with hypertension among urban adolescents.
Conclusions: The results suggest that hypertension and pre-hypertension is an important public health problem among adolescents in urban than rural. The main associated factors are fast food consumption, living area, physical activity, paternal hypertension and BMI.

Keywords: Hypertension, Blood pressure, Adolescent, Urban, Rural

INTRODUCTION

Adolescents and young people represent a significant proportion of the South Asian population. While adolescents between the ages of 10-19 years comprise over one fifth of South Asians large population, young people between the ages of 10-24 years, constitute 31% of the total population of South Asian Region. Within the region, Bangladesh and Pakistan have the greatest proportion of adolescents, while India has the greatest absolute number.[1] Adolescent age 10-19 years consists of 21% Bangladesh, 23% India, 21% Nepal, 23% Pakistan and 19% Sri Lanka of the total population.

The sheer large numbers of young population and the socio economic and cultural context of South Asia, which perpetuates gender stereotypes leading to discriminatory practices in nutrition and overall behaviour towards

adolescent, being a cultural norm, poor access to physical activity, increasing trend in overweight and obesity pose a tremendous challenge for addressing their development and health concerns.[2]

The leading global risks for mortality in the world are high blood pressure (responsible for 13% of deaths globally), tobacco use (9%), high blood glucose (6%), physical inactivity (6%), and overweight and obesity (5%). These risks factors are responsible for raising the risk of chronic diseases such as heart disease, diabetes and cancers. They affect countries across all income groups: high, middle and low.[3]

Elevated blood pressure (BP) in populations of African origin and excess coronary events in populations of South Asian origin are widely documented.[4] BP is an established risk factor for cardiovascular disease, and the evidence for BP tracking from adolescent to adulthood is strong.[5] Remarkably little is known about the change in BP over time in these ethnic groups and, in particular, in childhood and adolescence. In the coronary artery risk development in young adults study, obesity and lifestyle factors accounted for the differences in mean BP and in hypertension in African American subjects. There are few longitudinal studies and none to our knowledge comparing several ethnic groups in similar locations in childhood. On the basis of baseline data in the Determinants of Adolescent Social Well-Being and Health (DASH) Study reported a general lack of ethnic differences in BP in early adolescence in the United Kingdom, despite more overweight in Black girls of African origin.[6-9]

It was once believed that most cases of high blood pressure in adolescent were caused by underlying problems with the heart or kidneys. Further research has shown that this is not true, and it now appears that adolescent develop high blood pressure in approximately the same proportions as adults. In other words, most cases of high blood pressure in adolescent are classified as primary hypertension. As with adults, the underlying causes of primary hypertension are not entirely understood. Some adolescent appear to inherit the tendency to develop high blood pressure from their parents, while others fall victim to poor lifestyle choices, which result in obesity and decreased cardiovascular fitness.[10]

The European Society of Hypertension (ESH) and European Society of Cardiology (ESC) guidelines on the management of arterial hypertension, first published in 2003 and subsequently updated in 2007, regrettably did not contain any section devoted to hypertension in childhood and adolescence.[11,12] This was not due to lack of awareness of the importance of this problem. Indeed, there is growing evidence that children and adolescents with mild blood pressure (BP) elevations are much more common than it was thought in the past. Longitudinal studies have now made it clear that BP abnormalities in those age ranges do not infrequently translate into adult hypertension, thereby emphasizing the importance of the tracking phenomenon not just epidemiologically but also clinically.

Hypertension, with an estimated prevalence of between 2% and 5% is a common chronic disease in adolescent.[13-14] Pediatric hypertension may be secondary to another disease process or it may be essential hypertension. Secondary hypertension is more common in adolescent than in adults, and common causes of hypertension in adolescent include renal disease, coarctation of the aorta, and endocrine disease.[15] However, as with adults, the majority of children and adolescents with mild to moderate hypertension have primary hypertension in which a cause is not identifiable.

Hypertension in adolescent has been shown to correlate with family history of hypertension, low birth weight, and excess weight.[16] With the increasing prevalence of childhood weight problems, increased attention to weight-related health conditions including hypertension is warranted.[17-18] Several lines of evidence suggest that blood pressure in US children and adolescents is increasing in parallel with weight.[19-20] Although long-term sequel such as myocardial infarction, heart failure, stroke, and kidney disease rarely manifest in adolescent, hypertension during childhood has been shown to be an independent risk factor for hypertension in adulthood, and to be associated with early markers of cardiovascular disease, including left ventricular hypertrophy, intima-media thickness, arterial compliance, atherosclerosis, and diastolic dysfunction.[21-22]

Although pediatric clinicians are generally familiar with the possibility of hypertension, recognizing it in their patients is not simple. Consensus guidelines define hypertension during adolescent as blood pressure that is, on 3 different visits, measured at or higher than the 95th percentile for age, sex, and height.[23]

The incidence of hypertension in adolescent varies from 1% to 3%.[24,25] Hypertension, a chronic disease, can lead to failure in vital organs, such as heart, brain, and kidney, and can cause death. Hypertension may lead to death, a sequel, or an irreversible damage in vital organs, such as heart, brain, and kidney, in children who do not undergo therapy despite early diagnosis.[26-29] The rising prevalence of overweight worldwide has led to an increased prevalence of essential hypertension among younger population. Obesity amongst adolescents is responsible for carrying weight-related risks like Hypertension, cardiovascular diseases into adulthood. An Indian study has shown that obese adolescents are more likely to develop hypertension later in life as compared to their leaner counterparts. According to a Thai study, over-consumption of calories, especially fast food, snacks and soft drinks were contributing factors resulting in obesity and female adolescents were more prone to this as compared to males.

METHODS

This data was collected from 4 schools and 4 colleges of Chittagong district, Bangladesh. Among them 2 schools and 2 colleges were situated in Chittagong metropolitan area and rest of them were in rural area such as Satkania upazilla, chandnaish upazilla, Boalkhali upazilla, Hathazari upazilla. This cross-sectional study was carried out from March to August of 2015. Information was collected from 404 rural and 406 urban adolescents, 'studying at those schools and colleges. Ages of the respondents were 14 to 19 years. Respondents who are mentally handicapped and/or bearing any congenital heart diseases were excluded. With a 95% confidence interval and a precision of 5%, and assuming prevalence of hypertension 50% the calculated sample size was 384.

To get better result we finally collected 404 and 406 data from rural and urban area respectively. After clearly described the purposes of the study the respondents provided written informed consent. Data was collected by face to face interview with semi-structured questionnaires. The questionnaires consist of socio-economics, life style and dietary related information. The length of the interview was 30 to 45 minutes. Blood pressure was measured with relaxed and comfortable sitting position. The sphygmomanometer cuff was wrapped around at the left upper arm with the inflation bag placed over the brachial artery. The cuff was puffed up until the arterial pressure exceeds and the radial pulse no longer palpable, the diaphragm was positioned over the brachial artery just below the cuff. Then the cuff pressure was slowly abridged until sounds (Korotkoff sounds) could be heard.

This was measures as the sytolic blood pressure in mmHg. The pressure was allowed to fall still further until the sounds moved out. This was measured as diastolic blood pressure. The total procedure was conducted following 10 minutes of rest; three reading was taken with 5 minutes intervals. Averaged of the measurement were counted as systolic and diastolic blood pressures of the participants.

Body weight was measured with a bathroom weighing scale. The balance was calibrated every day before use. Body weight was measured bare footed and in light clothes. The measurement was done in empty bladder and in empty stomach. The participant was requested to stand without any weight in hand or touching or catching other things. Height of the participants was measured in bare footed in standing position with a standard scale to nearest 0.1 cm. When measuring the height, participant was requested to stand straight with the eyes looking forward, head positioned such that the Frankfurt plan is horizontal, feet together and knees straight.

RESULTS

Socio-demographic characteristics of respondents

From 810 adolescents 49.9% and 50.1% of urban and rural areas respectively. Majority of the respondent's fathers were business man and mothers were housewife both in urban and rural areas. Income level of respondents in urban area (97.5%) were more than 10 thousand taka and in rural area (91.6%) were <10 thousand taka respectively (Table 1).

Table 1: Distribution of the respondents according to socio-demographic characteristics (n=810).

Variables		Rural (%) n=404	Urban (%) n=406	Total (n=810)
Sex	Boys	195 (48.2)	266 (65.5)	461 (56.9)
	Girls	209 (55.8)	140 (34.4)	349 (43)
	Total	**404**	**406**	**810**
Occupation of fathers	Business	248 (61.3)	190 (46.7)	438 (54)
	Service holder	113 (27.9)	204 (50.2%)	317 (39.1)
	Farmer	14 (3.4)	0	14 (1.72)
	Others	29 (7.1)	12 (2.9)	31 (3.82)
	Total	**404**	**406**	**810**
Occupation of mothers	Housewife	390 (96.5)	387 (95.3)	777 (95.9)
	Service holder	8 (1.9)	19 (4.6)	27 (3.3)
	Business	6 (1.4)	0	6 (0.4)
	Total	**404**	**406**	**810**
Income level	<10000	370 (91.6)	10 (2.5)	380 (47)
	10000-20000tk	34 (8.4)	64 (15.8)	98 (12)
	21000-30000tk	0	130 (32)	130 (16)
	31000-40000tk	0	117 (28.8)	117 (14.5)
	>41000tk	0	85 (20.9)	85 (10.5)
	Total	**404**	**406**	**810**

Table 2: Distribution of urban and rural respondents according to anthropometric characteristics (urban, n=406 and rural, n=404).

Variable	Living Area	Mean	SD	t value	p Value
Height of participant(in meter)	Rural	1.52	0.04	-6.6	<0.001
	Urban	1.54	0.05		
weight of participant (in kg)	Rural	47.19	4.7	-3.6	<0.001
	Urban	48.64	6.5		
BMI of participant (in Kg/m2)	Rural	20.42	1.8	0.11	0.910
	Urban	20.40	2.4		

Table 3: Physical activity of respondents in urban (n=406) and rural (n=404).

Variable	Living Area	Mean	SD	t value	p Value
Time of heavy work (min/week)	Rural	162.35	83.447	5.1	< .001
	Urban	60.79	39.835		
Time of recreational physical activity (min/week)	Rural	89.57	36.587	7.7	< .001
	Urban	67.73	32.586		
Physical activity at transportation (day/week)	Rural	4.85	1.821	-1.4	0.142
	Urban	5.06	1.919		

Anthropometric characteristics of respondents

The mean height and weight of study respondents in urban area were 1.54 (meter) and 48.64(kg) respectively. In rural area, mean height and weight of study respondents were 1.52 (meter) and 47.19(kg) respectively and was statistically significant. However, the difference in mean BMI of urban and rural respondents was not statistically significant (Table 2).

Physical activity of study respondents

Regarding physical activity status, heavy physical activities of urban and rural adolescents were 60.79 minute/week and 162.35 minute/week respectively and were statistically significant (Table 3).

Blood pressure status among respondents

Status of systolic and diastolic blood pressure among respondents

The mean SBP of boys (114.53 mmHg) in urban respondents were more than rural (109.79 mmHg). However the mean DBP of boys (69.87 mmHg) in urban respondents were more than rural (68.97 mmHg).

Correspondingly the mean SBP of girls (110.61 mmHg) in urban respondents were more than rural (105.02 mmHg). Also the mean DBP of girls (68.58mmHg) in ban respondents were more than rural (67.941mmHg).

However, the difference in mean systolic blood pressure among urban and rural respondents was statistically significant (Table 4). Normal blood pressure, pre-hypertension and hypertension were 88.4%, 10.6% and 0.98% respectively (Figure 1).

Distribution of hypertension according to the living area

Regarding hypertension, pre-hypertension was more (14%) in urban than rural (4%) adolescents. Prevalence of hypertension was 1.5% in urban and 0.2% in rural adolescents.

The difference in status of both pre-hypertension and hypertension among urban and rural adolescents were found statistically significant (Table 5).

Table 4: Status of systolic and diastolic blood pressure in urban (n=406) and rural (n=404) respondents.

Blood pressure	Rural (n=404)			Urban (n=406)		
	Boys (n=195)	Girls (n=209)	t/p value	Boys (n=266)	Girls (n=140)	t/p value
Mean SBP (mmHg)	109.79±7.5	105.02±8.9	5.79/<0.001	114.53±7.9	110.61±8.8	4.58/<0.001
Mean DBP (mmHg)	68.97±5.1	67.94±6.1	1.88/0.068	69.87±6.9	68.58±6.7	1.86/0.063

Table 5: Distribution of hypertension in urban (n=406) and rural (n=404) respondents.

Blood pressure		Rural (%) n=40	Urban (%) n=406	Significance test
Systolic	Normotensive	401 (99.3)	345 (85)	Chi-sq=57.27 (p<0.001)
	Pre hypertension	2 (0.5)	57 (14)	
	Hypertension	1 (0.2)	4 (1)	
Diastolic	Normotensive	388 (96)	342 (84.2)	Chi-sq=32.73 (p<0.001)
	Pre hypertension	16 (4)	58 (14.3)	
	Hypertension	0 (0)	6 (1.5)	

Table 6: Relationship of blood pressure among urban (n=406) and rural (n=404) area of respondents.

Blood Pressure (mmHg)	Living area		t value	P value
	Rural	Urban		
Mean SBP (SD)	107.33 (8.601)	113.18 (8.477)	-9.7	< 0.001
Mean DBP (SD)	68.44 (5.716)	69.41 (6.869)	-2.1	0.030

Distribution of anthropometric variable among respondents

Distribution of BMI categories according to urban and rural of respondents

Figure II. Shows the underweight, normal weight, overweight and obese categories of urban respondents were 24%, 66%, 7.9% and 1.2% respectively. Underweight, normal weight and overweight categories of rural respondents were 23%, 75% and 7.9% respectively. Normal weight was more in rural respondents and overweight and obese was more in urban respondents.

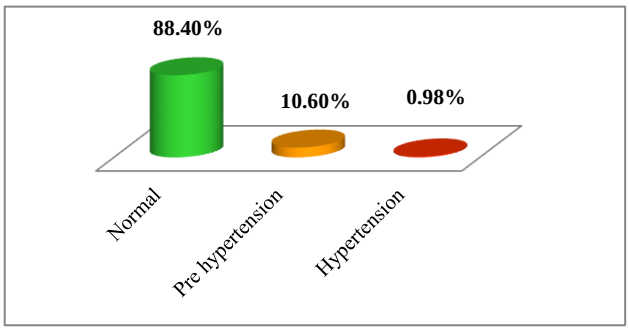


Figure 1: Prevalence of hypertension among respondents.

Table 7: Relationship of blood pressure with fast food consumption (n=810).

Mean BP	Taking Fast food status		t/p value
	Yes	No	
Systolic BP mmHg (SD)	121.61 (±6.88)	109.42 (±8.58)	-10.38/<0.001
Diastolic BP mmHg (SD)	77.50 (±5.47)	68.29 (±5.92)	-11.28/<0.001

Table 8: Relationship of blood pressure with physical activity at recreation.

Mean BP	Status of physical activity at recreation		t/p value
	Yes	No	
Systolic BP (SD)	109.70 (±9.10)	112.66 (±8.26)	3.7/<0.001
Diastolic BP (SD)	68.77 (±6.29)	69.61(±6.48)	3.9/0.136

Table 9: Relationship of blood pressure with paternal hypertension among urban respondents (n=406).

Mean BP	Status of paternal hypertension		t/p value
	Yes	No	
Systolic BP (SD)	112.69 (±9.84)	109.79 (±8.78)	-3.37/0.001
Diastolic BP (SD)	70.62 (±6.28)	68.60 (±6.29)	-3.12/0.001

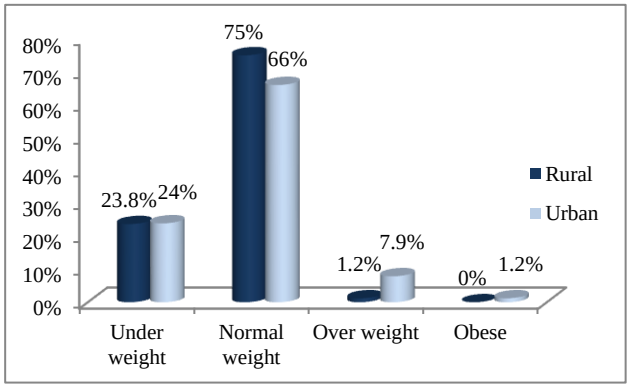
Table 10: Association of blood pressure with independent variables among respondents (n=810).

Prehypertension			
Variable	**ß -Coefficient**	**P value**	**Expected risk (95% CI)**
Taking fast food at least twice a week	-3.568	<0.001	0.28 (0.11-0.75)
Sex	0.250	0.395	1.824 (0.722-2.282)
Living area	-0.76	0.015	0.410 (0.225-0.747)
Status of paternal hypertension	-0.891	0.004	0.410 (0.225-0.747)
Status of smoking	1.934	0.311	6.92 (0.164-291.55)
Physical activity at recreation	-0.539	0.176	0.583 (0.267-1.273)
BMI			
Underweight	-41.87	<0.001	6.50 (2.12-1.91)
Normal weight	-42.0	<0.001	5.75 (2.04-1.62)
Overweight	-39.85	<0.001	4.91 (3.61-4.41)
Hypertension			
Taking fast food at least twice a week	-4.94	<0.001	0.007 (0.001-0.093)
sex	0.249	0.805	1.283 (0.177-9.29)
Living area	-0.142	0.922	0.866 (0.05-14.91)
Status of paternal hypertension	-0.121	0.211	0.29 (0.045-1.98)
Status of smoking	0.719	0.830	2.05 (0.003-1433.4)
Physical activity at recreation	-0.372	0.751	0.689 (0.0069-6.87)
BMI			
Underweight	-6.18	0.002	0.002 (4.39-0.097)
Normal weight	-6.02	<0.001	0.002 (0.00-0.057)
Overweight	-5.66	<0.001	0.003-0.003

Relationship of blood pressure with demographic, anthropometric, dietary behaviour, life style and genetic status among the respondents (n=810)

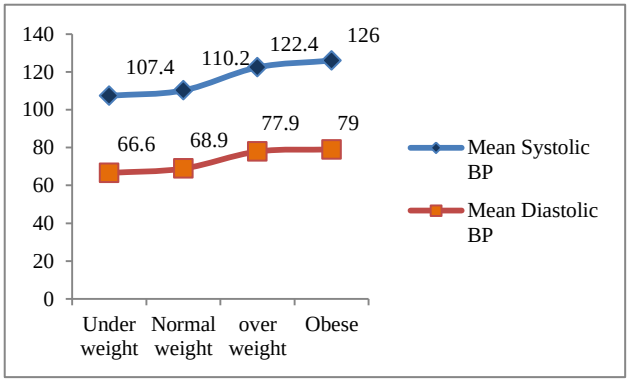
Relationship of blood pressure among urban and rural area of respondents

The mean SBP and mean DBP in urban respondents (113.18 mmHg and 69.41 mmHg) were higher than rural respondents (107.33mmHg and 68.44 mmHg) and the difference was statistically significant (Table 6).



Results were presented as percentage. BMI-Body Mass Index. Under weight-BMI <18.5, Normal BMI-18.5-23.9, Over weight- BMI 24-26.9, Obese-BMI>27.

Figure 2: Distribution of BMI categories according to urban (n=406) and rural (n=404) of respondents.



Results were presented as mean value. Student "t" test was conducted. Mean systolic and diastolic blood pressure among overweight were significantly different p<0.001.

Figure 3: Relationship of BMI and blood pressure among respondents.

Relationship of blood pressure and BMI categories of respondents

Figure 3 Shows the mean SBP and the mean DBP among the obese were 126 mmHg and 79 mmHg respectively. The mean SBP and the mean DBP among overweight were 122 mmHg and 78 mmHg, normal weight were 110 mmHg and 69 mmHg and underweight were 107mmHg and 66 mmHg respectively. The relationship between mean blood pressure and overweight were found statistically significant.

Relationship of blood pressure with taking fast food among respondents

The mean systolic and diastolic blood pressure of respondents who consumed fast food at least twice a week was 121.61 mmHg and 77.50 mmHg respectively. The mean systolic and diastolic blood pressure of respondents who did not consume fast food was 109.42 mmHg and 68.29 mmHg respectively. The mean systolic blood pressure and diastolic blood pressure was statistically significant with consumption of fast food at least twice a week (Table 7).

Relationship of blood pressure with physical activity at recreation among respondents

The systolic and diastolic blood pressure of respondents who were with physical activity at recreation were 109.7mmHg and 68.77 mmHg respectively and without physical activity at recreation were 112.6 mmHg 69.61 mmHg respectively. The difference is statistically significant with (P <0.001) (Table 8).

Relationship of blood pressure with paternal hypertension among urban respondents

Table 9 shows the systolic and diastolic blood pressure of urban respondents with history paternal hypertension were 112.6 mmHg and 70.6mmHg respectively and without history paternal hypertension were 109.79 mmHg 68.60 mmHg respectively. History of paternal hypertension was not found in rural areas. However, the difference in systolic and diastolic blood pressure in urban respondents with history paternal hypertension was found statistically significant.

Association of blood pressure with independent variables among respondents

Table 10 shows multinominal regression analysis of the relevant factors to hypertensive and prehypertensive versus normal blood pressure among urban and rural adolescents. In multinominal regression analysis found significant relationship among taking fast food at least twice a week and BMI with hypertensive and prehypertensive adolescents.

DISCUSSION

Hypertension associated with early marker of cardiovascular disease is alarming issue in adolescents world-wide due to its socio-demographic behaviour, nutritional management, sedentary behaviour and history of hypertension in parents. Several epidemiological studies conducted in the past on hypertension and related factors associated in adolescent with the development and progression of this sequel. Published data on adolescent hypertension among rural and urban settings in Bangladesh are scarce and therefore the objective of the present study was to estimate the prevalence of hypertension and find out the blood pressure status and different related factors among rural and urban adolescent.

It was found that the mean SBP and DBP of boys in urban respondents were higher than rural. Correspondingly the mean SBP and DBP of girls in urban respondents were higher than rural area (Table 4). The cause of higher blood pressure in urban area may be attributed to the different urban life style of the adolescents than those of the rural counterparts. The present study was consistent with two Indian studies where urban population (adolescents) had higher blood pressure than rural areas and the difference was significant.[30-31]

The study found (Table 5) that the prevalence of hypertension was higher in urban adolescents than rural. According to 95th percentile in adolescents the prevalence of hypertension was 1.5% in urban adolescents. In rural area 0.2% hypertensive adolescents were found. In urban area 6 were hypertensive, their mean systolic and diastolic blood pressure were 125.46 and 85 mmHg respectively. Prehypertension were also higher in urban (14%) adolescents than rural (4%).

However, overall prevalence of hypertension among study populations was 0.98%. The prevalence of hypertension in our study was somewhat consistent with other studies in which the reported prevalence of hypertension in adolescent ranges from 2% to 5%.[31-32] According to the National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents in the USA the prevalence of children and adolescents with high blood pressure is 4.5%. Cappuccino et al indicated that the prevalence of hypertension is lower in rural than urban area in Cairo.[33-34]

The present study found (Table.6) that mean systolic blood pressure of urban respondents (113.18 mmHg) were more than rural (107.33mmHg) and statistically significant (P<0.001). In a West-African study it was found that adolescent systolic blood pressure is higher in urban than rural that were statistically significant.

The present study showed (Table 7) the relationship among the mean Systolic and diastolic blood pressure and taking of fast food .The mean systolic blood pressure and diastolic blood pressure having fast food were statistically significant. A study done earlier by Aranceta et al demonstrated that dietary patterns of adolescents are associated with various socio-demographic and behavioural characteristics, with nutrient intakes, and that a dietary pattern rich in fast food may be associated with higher systolic and diastolic blood pressure among adolescents.[35]

It was found in present study (Table 8) that the systolic and diastolic blood pressures of study population with

physical activity at recreation were 109.7mmHg, 68.77 mmHg respectively and without physical activity at recreation were 112.6mmHg and 69.61mmHg respectively and statistically significant. Similar findings observed in a study done in Cairo in which adolescents hypertension was related to genetic, physical activity, life style and psychological factors starting early in childhood. In that Study it was shown that there is a rise of blood pressure levels among subjects without physical activity than who performed physical activity. Physical activity influencing the blood pressure is well documented in many studies among adults.[36] However, even among adolescents, inverse relationship between DBP and exercise has been demonstrated.

In the present study, Blood pressure correlated positively with living area, fast food, and physical activity, genetic history of hypertension, height, weight, and BMI categories. In a multinominal regression analysis (Table 10) it was found that taking fast food at least twice a week and BMI categories was significantly associated with hypertension and prehypertension. This result was consistent with the results of previous studies.[34] As reported in some studies, race and ethnicity also have an impact on blood pressure. Blood pressure values are particularly higher for black and south East Asian races.[37]

It was found that (Table 9) the mean SBP and mean DBP in urban adolescents with history of paternal hypertension were higher than those without history of paternal hypertension. However, the difference in mean SBP and mean DBP in urban adolescents with history of paternal hypertension was statistically significant. This indicates that there is a relationship of genetic history of hypertension with blood pressure. In Kuruchikuppam, Pondicherry, Indian study found that subjects in whom positive family history of hypertension had higher blood pressure.[38] The prevalence of hypertension was also higher in them. This suggests, there is a genetic role to play in the development of hypertension.

It was found that the (Figure 3) relationship between mean systolic blood pressure and mean diastolic blood pressure on different aspect of BMI categories. The relationship between blood pressure and overweight were found statistically significant. This indicates that there is a relationship of overweight and blood pressure in respondents. Indian study found significant rise in both SBP and DBP with different aspect of BMI categories of both sexes. A similar finding was also reported elsewhere in India, Hungary and France that there was an association in adolescent's blood pressure with overweight.[31,39-41]

From the findings of this research it may be concluded that the prevalence of hypertension and pre-hypertension was higher in urban (1.5%, 14%) adolescents than rural (0.2%, 4%). The mean systolic blood pressure and diastolic blood pressure of urban boys (114.53±7.9 mmHg and 69.87±6.9 mmHg) and girls (110.61±8.8 mmHg and 68.58±6.7 mmHg) were higher than rural boys (109.79±7.5 mmHg and 68.97±5.1 mmHg) and girls (105.02±8.9 mmHg and 67.94±6.1mmHg). In urban adolescents boys (114.53±7.9 mmHg and 69.87±6.9 mmHg) had higher mean BP than girls (110.61±8.8 mmHg and 68.58±6.7 mmHg).

CONCLUSION

In general, result of this study revealed that higher socio-economic status, consumption of fast food, physical inactivity; overweight and obese are more likely to have higher blood pressure in urban boys and girls than rural boys and girls. This study assist to identify and explore factors that related with high Blood Pressure to initiating preventive measure at national, community and individual levels for combating the growing hypertension in adolescents.

From the finding of this study several factors are related with hypertension which is the alarming marker of cardiovascular disease and premature mortality in later part of life. Based on the findings of this research it may be recommended that as hypertension is more likely to have developed in urban adolescents than rural which may be attributed to consumption of fast food, less physical activity, overweight and obesity etc. There is an urgent need for motivation to avoid intake of fast food and enhance physical activity among adolescents and awareness program regarding life style modification among school going adolescents should be properly addressed by policy makers.

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