



International Journal of Advanced Community Medicine

E-ISSN: 2616-3594

P-ISSN: 2616-3586

www.comedjournal.com

IJACM 2022; 5(1): 01-05

Received: 19-10-2021

Accepted: 02-12-2021

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Obesity and hypertension in young adult girls

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DOI: <https://doi.org/10.33545/comed.2022.v5.i1a.218>

Abstract

Objective: The prevalence of obesity and hypertension is increasing in Indian adolescents and young adults. This increase is attributed to factors like changed dietary habits (consumption of processed food) and a sedentary lifestyle. Hypertension which develops in childhood/ adolescence persists in adulthood. This study was conducted to determine obesity and hypertension in girls between 18-20 years of age.

Method: The study included 120 girls from different colleges in Mumbai. Anthropometric measurements-height and weight were measured, BMI was calculated. Blood pressure was measured using a digital sphygmomanometer.

Results: Seventy-nine girls had normal blood pressure whereas 41 girls were hypertensive. In the hypertensive group 11 girls had elevated BP, 18 girls had stage I hypertension and 12 girls had stage II hypertension. There was a significant correlation between BMI and hypertension. Among the participants, 6.7% girls were underweight and 23.3% girls were overweight 4.5% girls were obese. The highest percentage of underweight girls was observed in stage II hypertension (41.7%). Sedentary activity was reported by 92% subjects.

Conclusion: The present study suggests that maintaining healthy weight with a balanced diet and physical activity are important to reduce the risk obesity and hypertension in young girls.

Keywords: Hypertension, adolescent girls, obesity, physical activity

Introduction

The report of Global Burden of Disease data had stated in 2015 that there was a rise in hypertension in India [1]. It had been predicted that by 2020 there would be a 111% increase in cardiovascular death in India [2]. Hypertension is called as a “silent killer” because most of the people with hypertension have no symptoms at all. Symptoms such as headache, shortness of breath, dizziness, chest pain and palpitation of the heart are reported by people who suffer from hypertension. Hypertension may have its origin in childhood and adolescence but may go undetectable due to the absence of signs and symptoms [3, 4].

Hypertension in Asian adolescents has been associated with obesity [5]. In the past two decades, dietary habits have changed and physical activity has reduced worldwide [6]. Physical activity is considered important in the prevention of hypertension in adolescents. WHO has recommended that adults in the age group of 18-64 should do 30 minutes of physical activity five times/week to prevent non-communicable diseases [7].

The prevalence of hypertension has been increasing in adolescents and older children [8]. This is because of the rise in obesity which is attributed to changed dietary habits and decreased physical activity [9]. Table 1 presents studies on children with HT. These studies show the rising prevalence of pre-hypertension and hypertension in young children and adolescents from 8.5% in 2006 to 20.2% in 2017. This study was therefore conducted with the aim to determine obesity and hypertension in adult girls.

Table 1: Prevalence of Hypertension in Indian Children and Adolescents

Author	Year	Age Group	Place	Subjects	Prevalence
Soudarssanane <i>et al.</i> ; [10]	2006	15-19	Pondicherry	673	8.5%
Rao <i>et al.</i> ; [11]	2007	9-16	Pune	2223	12.3%
Goel <i>et al.</i> ; [5]	2010	14-19	New Delhi	1022	6.4%
Chirag <i>et al.</i> ; [12]	2013	5-15	Ahmedabad	983	6.38%
Bagudai <i>et al.</i> ; [13]	2014	10-16	Odisha	5155	3.68%
Venkatachalam <i>et al.</i> ; [14]	2015	15	Tamilnadu	3681	10.8%
Vedavathy <i>et al.</i> ; [9]	2016	11-19	Banglore	748	7.2%
Maiti <i>et al.</i> ; [15]	2017	14-16	West Bengal	129	20.2%

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Materials and Methods

This was a cross sectional study of 120 adult girls selected from various colleges of Mumbai. The objectives of the study were to calculate the body mass index (BMI) and record blood pressure using digital sphygmomanometer as well as to observe the relation between BMI and hypertension. The participants were between the age group of 18-20 years.

Inclusion-Exclusion Criteria: Girls who had completed 18 years but did not exceed 20 years of age were included in the study. Participants already identified with hypertension were excluded from the study.

Data was collected using a questionnaire. The purpose of the study was explained before asking any question to participants and their written consent was obtained. The questionnaire included general information, anthropometric measurement and blood pressure measurement. Physical activity questions were also included in the questionnaire.

Blood pressure was recorded using a digital sphygmomanometer (OMRON, Model No: HEM-7113). The BP was classified using guideline given by the American College of Cardiology and American Heart Association Task Force ^[16]. Table 2 shows classification of blood pressure.

Table 2: Classification of Blood Pressure

Category	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)
Normal blood pressure	<120	<80
Elevated blood pressure	120-129	<80
Hypertension stage 1	130 – 139	80-89
Hypertension stage 2	≥140	≥90

Table 3: Mean of Anthropometric Measurement in Categories of Blood Pressure.

Parameter	Normal Blood Pressure (n=79)	Elevated Blood Pressure (n=11)	Stage I Hypertension (n=18)	Stage II Hypertension (n=12)	F,p
Height (cm)	156.20 ± 6.57	154.22 ± 6.13	158.73 ± 5.65	158.60 ± 7.46	1.60, 0.19
Weight (kg)	48.77 ± 9.12	45.75 ± 9.15	55.18 ± 10.73	53.22 ± 14.47	3.08, 0.03
BMI (kg/m ²)	19.99 ± 3.50	19.84 ± 3.86	21.65 ± 3.36	21.06 ± 4.85	1.22, 0.30

The mean systolic pressure was 113.76 ± 13.14 mmHg and mean diastolic pressure was 73.26 mmHg. In the present study 79 girls have normal blood pressure and 41 girls were hypertensive out of which 18 girls have stage I hypertension and 12 girls had stage II hypertension. Among all the participants, 38 girls had a family history of hypertension with 14% girls having the family history of both parents being hypertensive.

The highest percentage of normal BMI was observed in the elevated BP group compared to stage I stage II hypertension (45.5%). In stage I hypertension maximum girls were overweight (33.3%). Only 9.1% of obese girls had elevated BP. The distribution of BMI categories in the HT categories was not significant ($\chi^2 p = 0.634$). In this study, there was a significant correlation between BMI and systolic ($p = 0.011$) as well as diastolic ($p = 0.004$) blood pressure.

No significant correlation was found between physical activity and systolic BP ($p = 0.252$) and diastolic BP ($p = 0.492$). In the study 92.5% had sedentary activity, 6.7% moderate activity and only 0.8% reported heavy physical activity. Physical activity was compared in the HT category. There was no significant difference between physical activity and HT category.

The information of participant's physical activity was collected by including the various questions of physical activity in daily life and to identify sedentary, moderate or heavy activity. The WHO physical activity questionnaire was taken as a guideline to create a physical activity questionnaire for this study. SPSS version 20 was used to conduct appropriate statistical tests. The study was approved by Inter System Biomedical Ethics Committee (ISBEC/NR-24/KM-SU/2018).

Results

The average age of participants was 19.03 years. The mean height of the girls was 156.64 cm (min. 141cm and max. 179cm). The mean weight was 49.90 kg (min. 34.30 kg and max. 87.45 kg). The mean BMI was 20.33 kg/m². The girls were classified as underweight, normal weight, overweight and obese and out of 120, 44 (36.7%) girls had normal BMI, 44 (36.7%) girls were in underweight category, 28 (23.3%) girls were in overweight category and 4 (4.5%) girls were in obese category.

In the present study, 79 girls had normal blood pressure and 41 girls were hypertensive. Highest weight was observed in subjects who had stage I hypertension (55.18 ± 10.73 kg). Elevated and stage II hypertension girls had lower weight than stage I hypertension. Lowest weight was observed in 79 girls who had normal blood pressure and this was significant ($p < 0.03$). High BMI was found in stage I hypertension (21.65 ± 3.36). The girls who had normal BMI also had elevated BP and stage II hypertension. The BMI in normal BP group was 19.99 ± 3.50 kg/m² and it was not significant ($p = 0.30$). Table 3 shows the comparison of anthropometric measurements in blood pressure categories.

Discussion

In the present study, there were 32% participants in the overweight/obese category. Previous studies have reported lower percentages of girls in obese or overweight category. A cross sectional study conducted in Wardha, reported more than half the female participants had a mean BMI of 18.8 ± 6.08 kg/m² with only 5.2% being obese ^[17]. Similarly, a Hyderabad study reported that a much lower percentage of overweight and obese females (9.38% and 2.60% respectively) were observed compared to the present study. Jain *et al.*, conducted a study in Central India and had similar results in 196 females between 17-26 years of age. They observed 8% overweight and 11.3% obesity. In contrast a Punjab study in 123 females of 18-50 years of age, observed a very high percentage of obesity (22%) ^[20]. These studies indicate that obesity has been increasing over the years.

Dual burden of malnutrition is also evident in this study. There were a high percentage of underweight girls (36%) in the present along with 26% of adolescents who were overweight and obese. This study therefore indicates the presence of dual burden of malnutrition in the adolescent participants. Dual malnutrition increases the risk of chronic

diseases including hypertension, diabetes and cardiovascular disease^[21]. Underweight may cause low immunity and can easily lead to infections^[22]. Under nutrition is seen in urban girls due to poor dietary habits, as they may not be consuming healthy and balanced meals. Many of overweight girls have sedentary lifestyle and high consumption of junk foods. Thus because of various factors dual malnutrition is increasing in India.

Hypertension too has been increasing in younger age groups. In Karnataka, the prevalence of HT in adolescents was assessed. They reported that out of 748 participants between 11-19 years, 19.4% participants had a family history of HT. They also reported a significant correlation between family history of HT and hypertensive individuals^[9]. The Lucknow study reported that almost one-fourth participants (24.2%) out of 1041 were hypertensive^[23]. The cross sectional study from Uttar Pradesh reported family history of HT in 23.47% participants^[24]. In one Assam study; they observed that out of 800, 96 participants had hypertension^[25]. Sixty three girls were hypertensive and 67 pre-hypertensive in the Wardha study (n= 958 girls) between 6-16 years of age^[26].

BMI is useful to identify nutritional status particularly overweight or obesity. Obesity is one of the risk factors for hypertension. It decreases the nitric oxide production which has major role in vasodilation. Increase in body weight increases resistance for blood flow in body. It also activates the renin angiotensin system and elevates the production of renin, aldosterone, angiotensinogen which leads to increased BP. As BMI increases SBP and DBP are likely to rise^[27].

Prevalence of obesity is increased among adolescents^[28]. Obesity is caused due to imbalance between energy intake and expenditure. Lack of healthy food habits, excessive sugar intake from soft drinks and carbonated beverages, large portion sizes and decreased physical activity can lead to obesity. Overweight/ obesity increase risk of non-communicable diseases in children and young adults. Weight loss, regular physical activity and reduced salt intake will help to reduced BP among adolescents^[29].

Several studies have observed overweight and obesity to cause hypertension. A significant correlation between BMI and systolic and diastolic blood pressure was observed in the Haryana study where out of the sample of 1080, 18.6% were hypertensive^[30]. A cross sectional study in Berhampur, reported that while most of the participants were normotensive only 3.68% were hypertensive. However, they observed a significant association of HT and obesity^[13]. Similarly a study with 965 individuals, less than 30 years of age reported that 59.2% participants were hypertensive and there was a strong association between BMI and HT^[31]. A study in Karnataka on 1152 young adults reported that 45.2% of them were pre-hypertensive and the risk of hypertension increased with increase in BMI^[32].

Lack of physical activities leads to overweight and obesity^[33]. Being obese can lead to serious health condition including high blood pressure, high cholesterol, coronary heart disease and stroke, congestive heart failure, sudden cardiac death and end stage renal disease^[34]. The prevalence of obesity is increased because of sedentary lifestyle. Most of the subjects in the present study had a sedentary lifestyle. The reasons may vary (lack of time, study burden, spending more hours with mobile and laptop). Physical activity is important for a healthy life among all age groups. Involving

in moderate physical activity such as jogging, brisk walking, cycling will help to prevent HT in children and youth. A 2018 cross sectional study in Srinagar reported 50.2% were physically inactive^[35]. In the study in Malaysia researchers observed that 22% participants had low physical activity and 38% had moderate physical activity^[36]. In Greece among 496 adolescents, 39 had low physical activity, 230 had moderate physical activity and 231 had high physical activity^[37].

Physical activity can affect the blood pressure. We observed no correlation between physical activity and hypertension. Similarly, a study of 1249 young girls in Greece observed no significant correlation between physical activity and hypertension. They reported 44.4% girls to have low physical activity, 45% had moderate physical activity and 10.6% had high physical activity^[38]. However, a study conducted in Maharashtra observed higher prevalence of HT in participants with sedentary activity (36.45%) followed by those with moderate activity (10.32%) and lowest prevalence of HT was found with heavy activity (8.65%)^[39]. Among 1152 individuals (20-30 years) in Karnataka it was observed that 62.6% who were pre-hypertensive belonged to the sedentary activity category, 29% were pre-hypertensive from moderate activity category and 8.4% were pre-hypertensive from heavy activity category^[32].

Regular physical activity is necessary for fitness and good health. WHO has recommended at least 30 minutes of daily physical activity in adults will help to prevent non-communicable diseases. People who are involved in exercise have a strong heart and muscles compared to those living a sedentary lifestyle. Now a day's adolescents and adults are spending more time on a couch in front a television or with a laptop/tab and mobile phone so physical activity has reduced. Due to use of escalators/elevators in malls, offices and at home, individuals avoid walking. For transportation too individuals use car, train, bike, auto and bus rather than walking or cycling even for short distances. The energy intakes too have increased and physical activity has decreased among young adults. Such a lifestyle contributes to obesity, high blood pressure, cardiovascular disease etc. Regular physical activity helps to have a good mood, feel more relaxed and even sleep better. Exercise keeps away from the negative thoughts and distract from daily worries thereby reduces stress. Exercise for hypertensive subjects is very important as it helps to reduced systolic and diastolic blood pressure.

Conclusion

Healthy diet and exercise are important to reduce the risk of obesity and hypertension in young adults. Healthy diets include a variety of whole grains, fruits, pulses, legumes, vegetables and nuts. All are these rich in vitamins and minerals and provide necessary nutrients for growth and development of the body. While healthy and nutritious foods should be consumed, processed (high sodium, high sugar and high fat) foods should be avoided. Increasing physical activity will help to reduce weight and regular exercise will make the heart strong and reduce possibility of blood pressure. Encouraging an active and healthy life in adolescents is necessary.

Acknowledgments

The authors are thankful to all the participants of this study.

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