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**Original Research Article**

# Life style effects on hypertension and obesity in adolescents

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## ABSTRACT

**Background:** Studies based on effects of lifestyle on hypertension and obesity in adolescent age group are lacking in India. The present study was conducted to evaluate the prevalence of lifestyle associated risk factors in school going adolescents of Kendriya Vidyalaya in district Firozabad and their effects on hypertension and obesity.
**Methods:** The study was carried out among 200 students of classes 9$^{th}$ and 11$^{th}$ in the age group of 13 to 17 years. Students were given a pre-designed questionnaire and feedback was taken about dietary practices and physical activity along with family history of hypertension and obesity. Height, weight, waist circumference, hip circumference, blood pressure was measured in all children. Effects of lifestyle associated risk factors were determined on obesity and hypertension.
**Results:** The study documents that inappropriate dietary practices (fast food consumption, low fruit intake) and less physical activity were strongly associated with high prevalence of obesity and hypertension in the adolescents. The study also showed that adolescents with positive family history of obesity and/or hypertension are also at higher risk. There was a positive correlation between high BMI and hypertension.
**Conclusions:** School based interventions are required to educate the adolescent children about lifestyle modifications to reduce the morbidity associated with non-communicable diseases.

**Keywords:** Adolescence, Hypertension, Lifestyle, Obesity

## INTRODUCTION

Non-Communicable Diseases (NCDs), also known as chronic diseases, are the result of a combination of genetic, physiological, environmental and behavioral factors. The main types of NCDs are Cardiovascular diseases (like heart attacks and stroke), Cancers, Chronic Respiratory Diseases (such as chronic obstructive pulmonary disease and asthma) and Diabetes Mellitus.

NCDs contribute to around 5.87 million deaths that account for 60 % of all deaths in India. India shares more than two-third of the total deaths due to NCDs in the South-East Asia Region (SEAR) of World Health Organization (WHO).[1] In India, due to increasing urbanization there is a shift in the disease spectrum from communicable to Non-Communicable Diseases (NCDs).[2] According to the WHO World Health Statistics Report 2012, globally one in six adults is obese and nearly 2.8 million individuals die each year due to overweight or obesity.[3]

Childhood obesity is a global phenomenon affecting all socio-economic groups, irrespective of age, sex or ethnicity. The emerging epidemics of Obesity, Cardiovascular Disease (CVD) and Diabetes Mellitus form the crux of this phenomenal change. According to the WHO, obesity is one of the most common, yet among the most neglected, public health problem in both developed and developing countries.[4] It has been

estimated that worldwide over 22 million children under the age of 5 are obese, and one in 10 children is overweight.[5] Childhood obesity is a forerunner of metabolic syndrome, poor physical health, mental disorders, respiratory problems and glucose intolerance, all of which can track into adulthood.[6] Developing countries like India have a unique problem of 'double burden' wherein at one end of the spectrum, authors have obesity in children and adolescents while at the other end, authors have malnutrition.

Obesity in children and adolescents is gradually becoming a major public health problem in many developing countries, including India.[7] Author thus undertook this study to evaluate the prevalence of lifestyle associated risk factors in adolescents and their effect on hypertension and obesity.

## METHODS

A cross sectional study was carried among 200 randomly selected healthy adolescents aged 13-17 years from class IX and class XI in Kendriya Vidyalaya, Hazratpur, District Firozabad, Uttar Pradesh. An informed consent was taken from the principal of the school. Students with obvious disability or systemic illness known to be associated with weight gain or weight loss were excluded such as cushing syndrome, chronic cardiopulmonary diseases, cerebral palsy. This information was taken from the class teachers. Remaining students were given a predesigned proforma for ascertaining their dietary practices and physical activity.

Dietary practices were assessed by putting questions on dietary preferences, fast-food consumption, fruit intake, extra table salt-added. Physical activity was ascertained by asking for daily physical activity (running, brisk walking, cycling, dancing) for at least 30 minutes/day during the past 7 days and during a typical week. Any involvement in sports at school or in the community and the time spent at home in sitting activities like watching Television (TV) and video games were also asked. Family history of hypertension and obesity in parents or grandparents was asked. Anthropometric parameters such as body weight, height, Waist Circumference (WC), Hip Circumference (HC) and Blood Pressure (BP) measurements were done in every child.

Weight was measured (to the nearest 0.5 kg) with the child standing motionless on the weighing scale with feet 15 cm apart and weight equally distributed on each leg. Height was measured with adolescent being bare foot (to the nearest 0.5 cm) with the child standing in an erect position against a vertical scale of portable stadiometer with the participants feet placed together with heels, buttocks and shoulder blade against the stick head positioned in Frankfurt horizontal plane.

Waist circumference was measured with a non-stretchable tape (exerting the same standard pressure on the tape) at the midpoint of the lowest rib cage and the iliac crest, to the nearest 0.1 cm. Hip circumference was measured at the maximum girth of hip with the subject in standing position and both feet together. For all measurements, tape was positioned parallel to the floor. BMI was computed by dividing weight (kg) by height square ($m^2$). BMI categories were defined by using z scores for both girls and boys as classified in IAP growth charts 2015(8). Central obesity was defined when waist circumference was >90$^{th}$ centile or waist hip ratio was >0.95 in males and >0.8 in females.[9]

BP was measured on left arm by auscultatory method using mercury sphygmomanometer. The individual was made comfortable and seated at least for five minutes in the chair before measurement. Pre-hypertension and hypertension were diagnosed if systolic or diastolic blood pressure (or both) are >90th to <95$^{th}$ and >95$^{th}$ centile as per age and height, respectively. Hypertensive and pre-hypertensive children had their BP checked again after half an hour and the average of two readings was taken. The obese and overweight children were separately counseled for lifestyle modifications and were instructed to come to hospital with parents.

### *Statistical analysis*

Data were analyzed using SPSS version 21.0. Numerical data was expressed as mean±SD and categorical data was depicted in numbers and percentage. Categorical data was compared using Chi- square test. For all test p value <0.05 was considered statistically significant.

## RESULTS

### *Anthropometric measurements*

The male: female ratio was 77:123. The mean age of the children was 14.8±1.3 years. The mean weight was 48.4±7.2 kg and mean height was 161.1±9.3 centimeters. The mean BMI was 18.7±2.9 kg/$m^2$. The prevalence of obesity and overweight in girls was 4(5.1%) and 5(6.4%) whereas in males it was 3(2.4%) and 5(4.1%) respectively.

The mean waist/hip ratio was 0.81±0.07. Mean systolic BP in boys was 121.9 mm of Hg and that for girls was 111.84 mm of Hg whereas the mean diastolic BP in boys and girls was 70.42 and 68.17 mm of Hg respectively. Hypertension was seen in 6(3%) individuals of which 2 had normal BMI while 4 were overweight/ obese.

### *Dietary habits*

Out of 200 children 94(47%) ate non-vegetarian food. 23(11.5%) ate fast food (burgers, pizzas, chowmein, etc.) daily and 91(45.5%) children ate fast food at least once a week. Daily fast-food intake was significantly associated with obesity, while there was no association between dietary habits and hypertension. Effect of dietary habit on

obesity and hypertension is depicted in (Table 1) and (Table 2) respectively.

**Table 1: Factors associated with obesity.**

| | Obese children (n=7) | Non-obese children (n=193) | p value |
|---|---|---|---|
| Fast food consumption daily | 4(57.1%) | 19(9.8%) | 0.001 |
| Fast food consumption weekly | 3(42.8%) | 88(45.5%) | 0.11 |
| TV > 2 hours a day | 5(71.4%) | 38(19.6%) | 0.001 |
| Daily exercise | 1(14.2%) | 53(27.4%) | 0.44 |
| Non-vegetarian food habits | 3(42.8%) | 12(6.2%) | 0.21 |
| Daily mobile use | 3(42.8%) | 26(13.4%) | 0.31 |
| Hypertension | 2(28.5%) | 4(2.07%) | 0.0005 |
| Meals in front of TV | 7(100%) | 157(81.3%) | 0.7 |
| Family History of non-communicable diseases | 3(42.8%) | 21(10.8%) | 0.01 |

**Table 2: Factors associated with hypertension.**

| | Hypertension (n=6 ) | Normotensive (n=194) | p value |
|---|---|---|---|
| Fast food consumption daily | 2(33.3%) | 23(11.8%) | 0.11 |
| Fast food consumption weekly | 3(50%) | 88(45.3%) | 0.82 |
| TV >2 hours a day | 3(50%) | 40(20.6%) | 0.08 |
| Daily exercise | 2(33.3%) | 52(26.8%) | 0.72 |
| Non-vegetarian food habits | 1(16.6%) | 14(7.2%) | 0.38 |
| Daily mobile use | 2(33.3%) | 27(13.9%) | 0.18 |
| Meals in front of TV | 5(83.3%) | 159(81.9%) | 0.93 |
| Family History of non-communicable diseases | 3(50%) | 21(10.8%) | 0.003 |
| Obesity | 4 (66.6%) | 3 (1.5%) | 0.001 |

***Physical activity***

A 164(82%) children used to see TV while taking food at least 3 times per week and 43(21.5%) children used to see TV >2 hours daily which is significantly associated with obesity (Table 1). Only 54(27%) students did daily exercise and outdoor games. There is no effect of TV watching on hypertension.

***Family history***

In children with normal BMI 14(9%) had history of non-communicable diseases. In overweight category, 4 (40%) had family history of non-communicable diseases. In obese category, 3(42.9%) had history of non-communicable disease in the family (p value <0.05). Hypertension is significantly associated with positive family history of non-communicable disease (p value <0.05).

## DISCUSSION

In this study, 5% children were overweight and 3.5% were obese which is lesser than that described by Kotian et al, in Karnataka and Khadilkar et al, in Pune, where 5.7% were obese and 19.9% were overweight.[10] However their study was done in urban affluent school boys in Pune.[8]

Author also found that girls were more obese and overweight as compared to boys which is similar to that reported by Kotian et al, and Khadilkar et al.[8] It is due to lack of outdoor activities in female and consumption of more fast food as compared to boys.[10] In this study, prevalence of central obesity was 7%, which was higher than prevalence of obesity. In a study by Cavalcanti et al, the prevalence of abdominal obesity was 6%, and it was higher among girls (6.7%) than among boys (4.9%) which was similar to this study.[11]

In the present study, there was a significant association of obesity and hypertension with a positive family history of non-communicable diseases. Similarly, in study conducted by Milligan et al, subjects with family history of hypertension had a higher diastolic BP and BMI, higher cholesterol and uric acid concentrations, and an increased risk of obesity. Those with a family history of non-communicable disease had a higher BMI and were at increased risk of obesity and hypertension.[12] It may be due to inheritance of genes responsible for obesity and hypertension in families.

The risk factors for obesity in this study were consumption of fast food on daily basis and watching TV for more than 2 hours on daily basis similar to that observed by Schroder et al. Probable hypothesis is that more junk food consumption is associated with more energy intake from non-fast-food sources.[13] Higher fat content of junk foods might also have a role in this association. More screen time could contribute to a positive energy balance, either by decreasing energy expenditure, as a consequence of increased sedentary behavior or increasing energy intake, as a consequence of snacking and exposure to food advertisements. The same findings have been stated by McManus AM et al, and Malhotra et al.[14,15]

In this study, total 6 students had hypertension with a prevalence of 3% of which 2 students had normal BMI and 4 were obese and overweight. A study done by Narayanappa et al, among apparently healthy school children showed an overall prevalence of prehypertension and hypertension to 2.8% and 2.4% respectively which is similar to this study.[16]

A study done by Ramya et al, revealed that compared to students with normal BMI, those who are overweight had 7.19 times higher risk to have prehypertension or hypertension. Similarly, obese students are 28.76 times at a higher risk to have pre hypertension or hypertension.[17] In a study done by Mohan et al, the BMI of hypertensive adolescents in both rural and urban areas were significantly higher than respective normotensive population.[18] It may be due to dyslipidemia and activation of renin angiotensin system.

## CONCLUSION

On the basis of this study authors concluded that the incidence of obesity and hypertension in adolescent population is quite high and it is rising continuously. It leads to mortality, financial burden on parents and long-term consequences into adulthood. It is mainly due to lifestyle changes in modern adolescent population such as more consumption of junk food and sedentary lifestyle and genetic predisposition in some families. So, for the prevention of these non-communicable diseases and their consequences authors should educate school adolescent population about lifestyle modifications and its advantages.

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