

Original Research Article

## Assessment of Risk Factors of Non-Communicable Diseases among Adolescents

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### ABSTRACT

**Objective:** A number of modifiable and non-modifiable risk factors are contributors for non-communicable diseases. Therefore the objective of the study was to assess the various risk factors associated with non-communicable diseases among adolescents.

**Methods:** This was a cross sectional study conducted in Mumbai, India. Fifty adolescents in the age group of 13-17 years were included in the study. Data on selected risk factors were collected using a self-administered modified Global School Based Students Health Survey (GSBHS). Anthropometric indicators i.e. height and weight were measured using calibrated instruments and blood pressure was measured using a digital blood pressure apparatus. The World Health Organization (WHO) simplified field tables used by Government of India were used to determine the Body Mass Index (BMI). Systolic and diastolic blood pressure were computed based on age and height of the adolescent.

**Results:** There was a linear relationship between height, weight, body mass index and systolic and diastolic blood pressure among males and females ( $p<0.05$ ). A higher percentage of males were prehypertensive, hypertensive as well as overweight and obese as compared to females. The study showed that various risk factors i.e. low physical activity, poor dietary pattern, family history of obesity were present among adolescents.

**Conclusion:** School based interventions focusing on various risk factors among adolescents and regular physical and medical examinations are required to reduce the morbidity associated with non-communicable diseases. Health education and awareness regarding the risk factors will go a long way in reducing the burden and help in improving life and health outcome.

**Key Words:** Adolescents, GSHS, Global School Health Survey, Mumbai, risk factors

### INTRODUCTION

Unhealthy diet, lack of physical activity, obesity, tobacco use are risk factors for many non-communicable diseases. They have an impact on the individual's health and result in morbidity and mortality.<sup>[1]</sup> If these risk factors are eliminated 80% of premature stroke, 80% of type 2 diabetes and 40% of cancers can be prevented.<sup>[2]</sup> According to the World Health Organization (WHO) report the various causes of mortality are high blood pressure (13%) tobacco use (9%), high blood glucose

(6%), physical inactivity (6%) followed by overweight and obesity (5%).<sup>[3,4]</sup>

Studies show that the prevalence of risk factors of non-communicable diseases is seen from childhood.<sup>[5]</sup> School based data on obesity in India shows a prevalence of 5.6-24% among children and adolescents.<sup>[6]</sup> Overweight and obesity leads to various metabolic disorders and increases the risk of hypertension, cancer, coronary heart disease and stroke.<sup>[7,8]</sup> Sedentary lifestyle and consumption of fast food and reduced intake of fruits and vegetables are the important

risk factors of non-communicable diseases. Low fruit and vegetable consumption is estimated to contribute to the development of approximately 31% of coronary heart disease and 11% of ischaemic stroke.<sup>[9]</sup> It is therefore essential to monitor the risk factors at an earlier age to prevent various non-communicable diseases. Hence the objective of the study was to assess the various risk factors associated with non-communicable disease in adolescents.

## MATERIALS AND METHODS

This was a cross sectional study conducted at a coaching institute of Mumbai. Permission to conduct the study at the institute was obtained from the head of the department. Prior to the study consent and assent was obtained from parents and students, respectively. Fifty adolescents in the age group of 13-17 years were randomly selected for the study. Data were collected using a self-administered modified Global School Based Students Health Survey (GSBHS).<sup>[10]</sup> It included questions on demographic characteristics, physical activity, dietary behaviour, hygiene, oral health, obesity, tobacco use and protective factors. Anthropometric indicators i.e. height and weight were measured using a calibrated stadiometer and digital weighing machine respectively. Blood pressure was measured using a calibrated digital apparatus with the subject in the sitting position. The WHO simplified field tables used by Government of India were used to determine Body Mass Index (BMI) in children. Systolic and diastolic blood pressure were computed based on age and height.<sup>[11]</sup>

Data were compiled, coded, grouped and analysed using Statistical Package for Social Sciences (SPSS) version 21. Descriptive analysis was used to describe relationship among variables. Fischer's exact test was used to determine the association between the variables, correlation and regression analysis was done to check the relationship between the

variables. Statistical significance was established at  $p<0.05$ .

## RESULTS

The total number of adolescents who participated in the study was 50, of which 40% were males and 60% were females. Twenty two percent were in the age group of 13-15 years and seventy eight percent were in the age group of 16-17 years. Table 1 gives the mean of height, weight, BMI, systolic blood pressure (SBP) and diastolic blood pressure (DBP) for males and females respectively. Mean height, weight, BMI and diastolic blood pressure were not statistically significant whereas mean systolic blood pressure showed a statistical significance between males and females ( $p<0.05$ ).

Table 1: Mean of height, weight, BMI, systolic and diastolic blood pressure (n=50)

Variables	Males	Females	p value
Height	$168 \pm 9.03$	$58.78 \pm 12.08$	0.264
Weight	$156.1 \pm 5.69$	$48.19 \pm 6.57$	0.422
BMI	$20.8 \pm 3.6$	$19.7 \pm 2.7$	0.435
Systolic BP	$113.5 \pm 12.68$	$101.6 \pm 12$	<0.05*
Diastolic BP	$70.5 \pm 7.59$	$67.3 \pm 5.8$	0.088

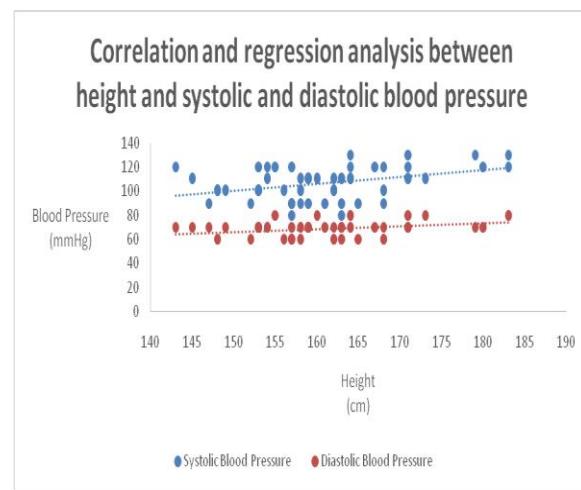
\*significant

Table 2 shows that 20% boys and 30% girls were underweight, 40% boys and 54% girls were in the normal category whereas 25% of boys and 16% girls were overweight. Two percent boys were obese. When asked about description of their body weight (Subjective) almost half of the adolescents said that they had a normal body weight. Thirty percent boys said that they were underweight, whereas more females reported to be overweight (27%). Fifty percent boys had normal blood pressure, forty five percent were prehypertensive and five percent in the category of Stage 1 hypertension. Among girls, 83% had normal blood pressure and 17% girls were prehypertensive. Higher percentage of boys were prehypertensive and stage 1 hypertensive as compared to girls ( $p<0.05$ ).

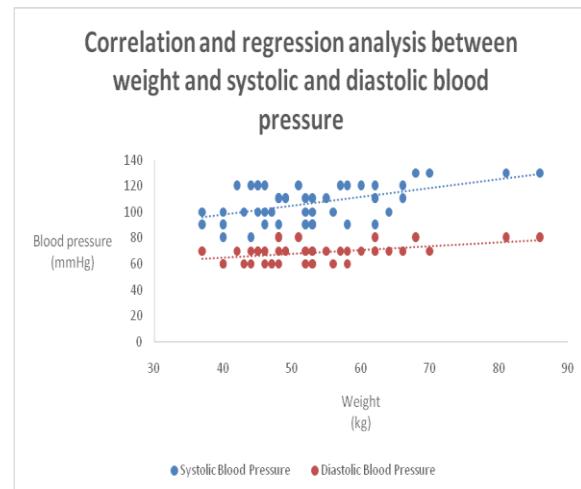
**Table 2: BMI and blood Pressure of adolescents (n=50)**

BMI	Males n (%)	Females n (%)
Underweight	5 (20)	9 (30)
Normal	8 (40)	16 (54)
Overweight	5 (25)	5 (16)
Obese	2 (10)	0 (0)
Blood Pressure		
Normal	10 (50)	25 (83)
Prehypertensive	9 (45)	5 (17)
Stage 1 hypertension	1 (05)	0 (0)
Fischer's exact test-0.017*		
*significant		

Figure 1 shows a linear relationship between height and systolic and diastolic blood pressure. The correlation coefficient for relationship between height and SBP in males was 0.38 and DBP was 0.32 with significant p value ( $p<0.05$ ).



**Figure 1: Correlation and regression analysis between height and systolic and diastolic blood pressure**

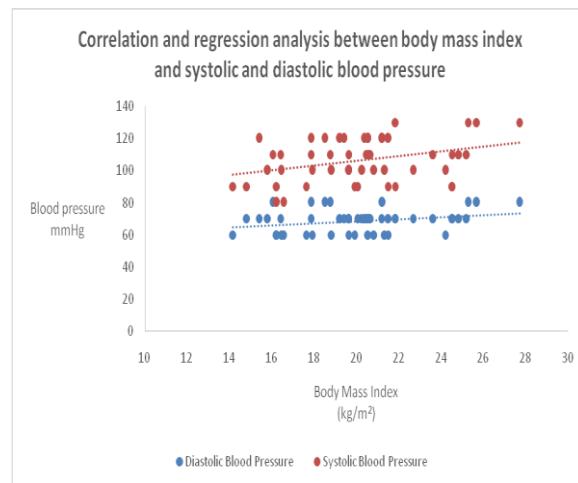


**Figure 2: Correlation and regression analysis between weight and systolic and diastolic blood pressure**

Figure 2 shows a linear relationship between weight and systolic and diastolic blood pressure.

blood pressure. The correlation coefficient for relationship between weight and SBP in males was 0.53 and DBP was 0.44 with significant p value ( $p<0.05$ ).

Figure 3 shows a linear relationship between body mass index and systolic and diastolic blood pressure. The correlation coefficient for relationship between height and SBP in males was 0.35 and DBP was 0.29 with significant p value ( $p<0.05$ ).



**Figure 3: Correlation and regression analysis between body mass index and systolic and diastolic blood pressure**

### Physical activity

This section included questions on physical activity. Physical activity included stretching exercises such as toe touching, knee bending, leg stretching, aerobic exercises such as running, fast walking, dancing, cycling. The findings showed, 16% adolescents did stretching exercises and 40% adolescents were involved in aerobic exercises. About 12% of students spent time in sitting activities like watching television, sitting on the computer, talking with friends or other sitting activities for 3 or more hours. Females (17%) spent more time than males (5%) in sitting activities. Fifty percent were involved in sports activity, 46% were taught to develop a physical activity plan and 70% were taught about injury prevention during physical activity. More than half (70%) were taught of the benefits of physical activity. Twenty percent exercised specifically to lose weight and 6% adolescents slept less than 8 hours per day (Table 3).

**Table 3: Physical activity in adolescents**

Sr. No.	Questions	Male n (%)	Female n (%)	Total n (%)
1	During the past 7 days, stretching exercises, such as toe touching, knee bending, or leg stretching for at least 60 minutes a day?	03 (15)	05 (17)	8 (16)
2	During the past 7 days, aerobic exercises, such as running, fast walking, dancing, and cycling for at least 60 minutes a day?	10 (50)	10 (33)	20(40)
3	More than 3 hours of sitting activity like watching TV, playing video games, or using computer on an average school day	01 (05)	05 (17)	06(12)
4	Involved in sports activity at the school or the community level	12 (60)	13 (43)	25(50)
5	Taught in class to develop a physical fitness plan	06 (30)	17 (57)	23(46)
6	Taught in class about preventing injury during physical activity	05 (25)	16 (53)	21(42)
7	Taught in class about the benefits of physical activity	13 (65)	22 (73)	35(70)
8	Exercised in the last 30 days to lose weight or to keep from gaining weight	06 (30)	04 (16)	10(20)
9	Less than 8 hours of sleep per day	02 (10)	01 (3)	03(06)

### Dietary behaviour

Table 4 shows the dietary pattern of adolescents. The findings of the study showed that only 14% adolescents consumed fruits every day. The adolescents were asked about addition of extra salt in food where 38% reported that they never added extra salt in food in the past 30 days. Consumption of fast food was observed in 38% among which majority was males. This was observed in all males. Forty four percent never skipped breakfast in the past 30 days and twenty eight percent adolescents ate more to gain weight.

### Hygiene

Ninety percent adolescents washed hands before eating and ninety two percent

washed hands after using toilet, among which majority were females (Table 5).

**Table 4: Dietary behaviour**

Sr. No.	Questions	Male n (%)	Female n (%)	Total n (%)
1	During the past 30 days, ate fruits everyday	03 (15)	04 (13)	07(14)
2	During the past 30 days, never added extra salt (table salt) in your food	06 (30)	13 (43)	19(38)
3	During the past 7 days, ate fast foods like pizza, burger, sandwich etc. more than 2-3 times	11 (55)	08 (27)	19(38)
4	During the past 30 days, never skipped breakfast	09 (45)	13 (43)	22(44)
5	During the past 30 days, ate more food, more calories, or food high in fat to gain weight	09 (45)	05 (33)	14(28)

**Table 5: Hygienic practices**

Sr. No.	Questions	Male n (%)	Female n (%)	Total n (%)
1	During last 30 days, washed your hands always before eating	17 (85)	28 (93)	45(90)
2	During last 30 days, washed your hands always after using the toilet or latrines	18 (90)	28 (93)	46(92)

### Oral health

Twelve percent adolescents missed school because of tooth ache and 14% had difficulty in biting food. In the past one year 10% adolescents visited the dentist for check-up or any other dental problem. Only 14% adolescents reported to have excellent health of teeth. The rest considered the health of their teeth as average or poor (Table 6).

**Table 6: Oral Health**

Sr. No.	Questions	Male n (%)	Female n (%)	Total n (%)
1	During the past 12 months, missed school or classes because of tooth ache	03 (15)	03 (10)	06(12)
2	Difficulty in biting hard food	01 (05)	06 (20)	07(14)
3	In the past one year, visit to the dentist for a check-up, exam, tooth cleaning, or other dental work	02 (10)	03 (10)	05(10)
4	Health of your teeth as excellent (Subjective)	04 (20)	03 (10)	07(14)

## Tobacco Use

Table 7 shows the data on the smoking habits of adolescents aged 13 to 17 years, to find out the percentage of current smokers and history of smoking among family members. It was found that 5% males and 3% females smoked cigarette in the past 30 days. Overall 14% reported that daily a parent, guardian or relative smokes inside the house and three percent females had a past history of smoking.

Table 7: Tobacco Use

Sr. No.	Questions	Male n (%)	Female n (%)	Total n (%)
1	In the past 30 days, smoked cigarette	01 (05)	01 (03)	02 (04)
2	Daily anyone smokes inside your home	01 (05)	06 (20)	07 (14)
3	Smoked in the past	0 (0)	01 (03)	01 (02)

## Obesity

Fifty six percent adolescents ate within duration of less than 5 hours every day and 12% reported that there is family history of obesity. The adolescents were asked to categorize their lifestyle as sedentary, moderate or active lifestyle for which 50% said that their lifestyle was active. Sixteen percent said that they consumed more food when angry, sad or frustrated (Table 8).

Table 8: Obesity

Sr. No.	Questions	Male n (%)	Female n (%)	Total n (%)
1	Eating food in less than 5 hours	07 (35)	21 (70)	28 (56)
2	Obesity run in family	05 (25)	01 (03)	06 (12)
3	Active lifestyle (Subjective)	06 (30)	19 (63)	25 (50)
4	Eating in response to anger, sadness, frustration	04 (20)	04 (13)	08 (16)

## Protective factors

Protective factors are those factors that protect the adolescents from negative health outcomes. Bond with parents play a major role and is an important protective factor. In this study results showed that almost 52% parents supported their children, 78% paid attention and were there to listen to their problems, 58% had open communication and 44% spent time with their children. In all categories, the

percentage was high among females as compared to males (Table 9).

Table 9: Protective factors

Sr. No.	Questions	Male n (%)	Female n (%)	Total n (%)
1	During the past 30 days, parents or guardians support or encourage you always	10 (50)	16 (53)	26 (52)
2	During the last 30 days, parents or guardians give you attention and listen to you always	13 (65)	22 (73)	35 (70)
3	During the past 30 days, parents or guardians have open communication with you always	08 (40)	21 (70)	29 (58)
4	During the past 30 days, parents or guardians spend time with you always	08 (40)	14 (47)	22(44)

## DISCUSSION

The presence of various risk factors right from an early age increases the incidence and prevalence of non-communicable diseases in future. Therefore the study was conducted to identify these risk factors among adolescents in the age group of 13-17 years.

The study showed that there was a statistical significant difference between the mean systolic blood pressure of males and females similar to the findings of the study conducted in Delhi among adolescents. [5] Mean values of height, weight, body mass index, systolic and diastolic blood pressure were higher among males as compared to females similar to the findings of a study done in Southern India. [12] Like other studies, this study also showed that there is a linear relationship between height, weight and body mass index and systolic and diastolic blood pressure among males and females and males had higher blood pressure as compared to females. [12-14] This could be explained because males are heavier and taller as compared to females. These findings suggest that measurement of blood pressure should be included as part of medical examination of adolescents as it is an important predictor of hypertension in adulthood.

Like other studies a higher percentage of females were underweight and a higher percentage of males were overweight and obese. [5,6,15,16] The study showed that boys are more physically active than girls similar to the findings of the report by WHO and also by other studies. [3,15] Girls were involved more in sitting activities as compared to boys. The overall percentage of physical activity in adolescents was low. School based physical activity is essential to improve the overall well-being. Lack of physical activity may increase the prevalence of musculoskeletal problems as well as diseases like hypertension, cardiovascular diseases and diabetes. [17,18]

The dietary pattern showed that only 14% adolescents consumed fruits daily. The percentage of fruit consumption is low similar to other studies. [5,19,20] Less intake of fruits deprives the body of the vitamins and antioxidants. The findings of the study also showed that the fast-food consumption was high among boys as compared to girls. It also leads to weight gain in children and also increases the risk of hypertension and diabetes. [19-22] More than half the adolescents (56%) skipped breakfast. Hand washing practice was seen in majority (90%). The oral health of majority of adolescents was reported to be good as poor oral health has a link with diseases like diabetes, hypertension and cardiovascular problems. [23] The percentage of smokers in the past 30 days was 4% and those exposed to passive smoking was 14%. This highlights the fact that adolescents are at a risk of non-communicable diseases if not through active but passive smoking. [24] Family history of obesity was seen in 12% pointing to the fact that non modifiable risk factors also play an important role in contributing to non-communicable diseases. When asked about their description of body weight majority of the girls said they were overweight similar to the results of the Health Behaviour in School-Aged Children study. [23] The study also showed that females spent more time with parents and

had good communication unlike males. The present study is one of the few studies that helped in identifying the various risk factors for non-communicable diseases among the adolescents. Future studies can be done using a larger sample size as the study sample was not representative of the population. The findings of this study indicate that it is essential to target the adolescent age group and focus on health education, awareness and health promotion through school based programs by focusing on a balanced diet, hygienic practices, promoting physical activity in schools and also concentrating on non-modifiable risk factors like family history of obesity so that healthy behaviour and practices are inculcated from childhood.

## CONCLUSION

Risk factors of various non-communicable diseases are present in adolescents. Targeting this group is essential for health promotion, health education and to provide early intervention through school based programs, policies and parent support which in turn will help in reducing the burden of non-communicable diseases in the future generations.

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