

## ORIGINAL ARTICLE

## Life style profile of High School students and its association with Body Mass Index in Nagpur city, Central India

Shilpa Trilok Hajare<sup>1</sup>, Aniruddha Ramdas Deoke<sup>2</sup>, Prachi Ajeet Saoji<sup>3</sup>

<sup>1</sup>Assistant Professor, <sup>2</sup>Associate Professor, Department of Community Medicine, NKP Salve Institute of Medical Sciences and Research Center, Nagpur- 440019, India, <sup>3</sup>Assistant Professor, Department of Mathematics, Ram Dev Baba College of Engineering, Nagpur, India

<a href="#">Abstract</a>	<a href="#">Introduction</a>	<a href="#">Methodology</a>	<a href="#">Results</a>	<a href="#">Conclusion</a>	<a href="#">References</a>	<a href="#">Citation</a>	<a href="#">Tables / Figures</a>
--------------------------	------------------------------	-----------------------------	-------------------------	----------------------------	----------------------------	--------------------------	----------------------------------

### Corresponding Author

Address for Correspondence: Dr Shilpa Trilok Hajare, Assistant Professor, Department of Community Medicine, NKP Salve Institute of Medical Sciences and Research Center, Digdoh Hills, Hingna Road, Nagpur - 440019, India  
E Mail ID: [drshilpah@yahoo.com](mailto:drshilpah@yahoo.com)

### Citation

Hajare ST, Deoke AR, Saoji PA. Life style profile of High School students and its association with Body Mass Index in Nagpur city, Central India. Indian J Comm Health. 2016; 28, 3: 248-253.

Source of Funding: Nil Conflict of Interest: None

### Article Cycle

Received: 08/09/2016; Revision: 10/09/2016; Accepted: 15/09/2016; Published: 30/09/2016

This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

### Abstract

**Background:** In the present era with a drastic change in lifestyle of every individual, weight gain and obesity are posing a growing threat to health in countries all over the world. Once a problem of affluence, obesity growing in many developing countries also due to decreased physical activity, sedentary lifestyle, altered eating habits, increased fat content in diet and decreased social activities. It is therefore imperative that rising incidence of obesity is controlled by tracking the trend of obesity since childhood and by BCC activities. **Aims & Objectives:** To study the life-style profile of high school students and association of lifestyle with Body Mass Index. **Material & Methods:** A cross-sectional study was conducted in 565 high school students. Students were interviewed regarding daily activity, physical activity, hours of television and computer viewing and routine food habits. The anthropometric measurements were done. BMI was calculated according to WHO 2007 criteria. **Results:** The prevalence of overweight in students was found to be 5.84% and obesity was 0.35%. There was statistical evidence that the overweight students were associated with higher socio economic status group ( $p=0.000107$ ), decreased physical activity ( $p= 0.0001$ ; OR- 10.88), increased consumption of junk food ( $p=0.0005817$ ; OR- 3.4) and more hours of viewing television/ computer ( $p=0.00555$ ; OR- 2.99).

### Keywords

Life style; High school students; Body mass index

### Introduction

Since ancient times of human history, weight gain and fat storage have been viewed as signs of health and prosperity.(1) But now in the present era as standards of living continue to rise and with a drastic change in lifestyle of every individual, weight gain and obesity are posing a growing threat to health in countries all over the world.(2) Dietz has mentioned that one of the critical periods for development of obesity is adolescence.(3) The changing lifestyle,

increased standards of living, increase in purchasing power along with freedom to spend and peer pressure has made adolescents more prone for obesity.

Obesity can be seen as first wave of a defined cluster of Non-Communicable Diseases called “New World Syndrome” creating an enormous socio-economic and public health burden in poorer countries.(4) Once considered a problem of affluence, obesity is fast growing in many developing countries like India,

which are typically known for high prevalence of under nutrition, a significant proportion of overweight and obese children now coexist with those who are under nourished.(5) Existing WHO standards and data from 79 developing countries including a number of industrialized countries suggest that about 22 million children five years old are overweight worldwide.(5)

The adolescents are facing increased hours of inactivity due to increased competition in the field of education leading to more hours spent on doing homework and attending coaching classes after the school. The explosion (increase) of newer gadgets like television with innumerable satellite channels, computers, i-pads etc, along with invention of internet is favoring sedentary lifestyle. Children belonging to high schools/ senior secondary classes are particularly vulnerable to external factors owing to new found independence and the influence through peer pressure and exposure to media. The nutrition transition that has been occurred from ancient times to present era which is an era of convenience foods and fast foods has also contributed a lot to increase in body mass index at very early age.

The two most important factors that contribute to a sudden increase in incidence of obesity are changes in dietary practices and urbanization.(4) The most important consequence of childhood obesity is its persistence into adulthood with all its health risks. The health risks include dyslipidemia, hyperinsulinemia, cardiovascular diseases, type 2 diabetes, osteoarthritis, gall bladder disease, hypertension and some sex hormone-sensitive cancers.(4,7) WHO has emphasized on urgent need of understanding the prevalence trend, factors contributing and developing strategies for effective intervention.(8) It is therefore imperative that the rising incidence of obesity is controlled by tracking the trend of obesity since childhood and by BCC activities before it emerges as the single most important public health problem.

### Aims & Objectives

1. To study the life-style profile of high school students.
2. To study the association of lifestyle with Body Mass Index in high school students.

### Material & Methods

**Study type:** Community based cross-sectional study

**Study population:** 565 out of 583 students attending 8th, 9th and 10th standards of high schools of urban area were included in the study

**Study area:** Study was conducted in the high schools of urban area of Nagpur city.

**Study duration:** 2 years

**Sample size:** 565 school children

The sample size was estimated as follows

Sample size:  $n = 4pq / d^2$

$n$  = sample size

$p$  = prevalence

$q$  = 100 – prevalence

$d$  = absolute point precision 5%    point = 2

So, the sample size would be

$n = 4 \times 6 \times 94 / 4$

$n = 564$

**Inclusion Criteria:** All girls and boys attending high schools were included in the study.

**Exclusion Criteria:** Following subjects were not be included in the study

1. Those who had been advised bed rest for more than 15 days during the last 6 months, due to any sickness.
2. Those who were suffering from any heart disease.

**Statistical Analysis:** Data was analyzed with Epi-info version 3.4.1.

A community based cross sectional study was conducted in the high schools of Nagpur city during year 2009-2010. The total number of schools in urban area were 424. The sample size was calculated by assuming prevalence of overweight and obesity to be 6.1% as reported by Laxmaiah *et al* (2007) (7) and confidence interval (CI) of 95% and absolute allowable error at 2%, the sample size was calculated to be 550. To achieve the sample multistage sampling was done. The urban area was divided in 6 zones i.e. North, South, East, West, Central and South-west. Out of the 6 zones one was selected randomly i.e. the south-west zone. The total number of schools in South-west zone were 63. Out of these schools 2 schools were selected again by simple random sampling. All the high school students i.e. students of 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> class from these 2 schools were included in the study. An informed consent was taken from the Principals of the schools and the parents of the students to carry out the study.

The total number of students in both the high schools were 583 out of which one girl was having severe anaemia, 12 student's parents did not give consent and 5 students had left the school. So, these

students were excluded from the study. The total number of students included in the study were 565. Student's complete information regarding profile was taken in pretested questionnaire format.

Students were also interviewed regarding his/ her daily activity, physical activity, hours of television and computer viewing and routine food habits. The anthropometric measurements of the students were done i.e. height and weight of the students was measured. BMI for students was calculated according to WHO 2007 criteria. The student was considered overweight if his/her BMI was  $\geq 85^{\text{th}}$  percentile and obese if BMI  $\geq 97^{\text{th}}$  percentile according to WHO 2007 sex specific BMI for age percentile charts. (9)

**Ethical considerations:** The ethical approval for the study was obtained from the institutional ethics committee of the tertiary care hospital before the initiation of study. A proper written consent was obtained from the heads of the schools. The parents of the students were informed about the study through a format and their written consent was obtained to include their ward in the study.

**Statistical Analysis:** Data was analyzed with Epi-info version 3.4.1. p value < 0.05 was considered statistically significant.

## Results

The total number of students included in the study were 565. Out of these majority of the students belonged to 14-15 years 191 (33.81%). Total number of girls were 43.36% and boys were 56.64%. ([Figure 1](#))

The prevalence of overweight in students was found to be 5.84% and obesity was 0.35%. The combined prevalence of overweight and obesity was 6.19%. The prevalence of overweight in boys is 5.31% and obesity was 0.63% and that in girls is 6.53% and 0% respectively. Most of the students i.e. 64.96% had normal BMI. ([Figure 2](#))

The students' socioeconomic status was assessed by modified Prasad's classification. The observations were that 51.33% students belong to class I. There was a statistical evidence that the overweight students were associated with higher socio economic status group. When class I and class II were compared with other classes i.e. III, IV and V the chi square test was found to be significant. ([Table 1](#), [Table 2](#))

Moreover, statistical analysis indicated that there is no association between age and overweight. It was

also observed that the difference between overweight girls and boys was statistically not significant; there was no association of gender and overweight. ([Table 2](#))

Investigations about physical activity like walking, jogging, cycling, any exercise or playing any outdoor sport indicated that 40.53% did physical activity for more than 14 hours/week. The association between physical activity and overweight was statistically significant. There was 10.88 times more risk of being overweight for those students who do physical activity for  $\leq 7$  hours per week than those who did physical activity for > 7 hours per week. ([Table 1](#), [Table 2](#))

4.25% students consumed junk food daily while 36.63% consumed more than 3 times a week and 47.79% consumed junk food less than 3 times a week. 11.33 students were not having any habit of eating junk food. The association between frequency of consumption of junk food and overweight was found to be statistically significant. The students who consumed junk food daily or for  $\geq 3$  times/ week had 3.4 times more risk of being overweight than those who consumed junk food less frequently or had no habit of eating junk food. ([Table 1](#), [Table 2](#))

When  $\geq 3$  hours group was compared with < 3 hours and none it was found to be statistically significant. The students who viewed television/ computer for  $\geq 3$  hours have 2.99 times more risk of being overweight than those who watched for < 3 hours or none. ([Table 1](#), [Table 2](#))

## Discussion

The prevalence of overweight was found in 5.84% students and obesity was observed in 0.35% which was similar to the studies done in other parts of India (Supreet Kaur *et al* (5), Bharati *et al* (4), Laxmaiah *et al* (7)). But the studies conducted in big cities like Delhi, Bangalore, Amritsar etc showed increased prevalence overweight and obesity ranging from 9.9%-15.2% and 4.8%-6.31% respectively. This may be due to higher standards of living in bigger cities and increased frequency of eating at outdoor food joints. Kotian SM *et al* (10), Sidhu S *et al* (11), Mohan B *et al* (12), Sood A *et al* (13), Mehta M *et al* (2). Association between age and overweight was found to be statistically not significant ( $p > 0.05$ ) like the reports from Hyderabad by Laxmaiah *et al* (7) who mentioned similar findings in their study, whereas Sood A *et al* (13) mentioned that prevalence of overweight was more in girls at (11) 5 years which is

around six months before the mean age of menarche of these girls. Unnithan AG *et al* (14) mentioned that the prevalence of overweight and obesity was more in 12 and 13 years old boys and girls and was lowest in 15 years old boys and girls which was not so in this study. In the present study, it was found that 19 (5.94%) boys were overweight. Out of these 17 (5.31%) boys were overweight and 2 (0.63%) were obese. In the girls 16 (6.53%) were overweight and none were obese. Though more number of girls were overweight than boys the difference was statistically not significant, whereas Laxmaiah *et al* (7), Tharkar S *et al* (15), Cameron N *et al* (16), Mohammad I *et al* (17) mentioned that prevalence of overweight was more in girls than boys. This may be because of small sample size in the present study. The analysis between relationship of socioeconomic status and overweight revealed that all the overweight students belonged to upper socioeconomic status group. The association between socioeconomic status and overweight was found to be statistically highly significant ( $p= 0.0001$ ) (class I & II compared with class III, IV and V) Similar were the findings of Marwaha RK *et al* (18), Tharkar S *et al* (15) and Kotian MS *et al* (10). This may be due to increase in socioeconomic status increases standard of living which leads to luxurious sedentary lifestyle responsible for weight gain. The students who did physical activity for more than 7 hours/week were 78.15% while 21.95% students did physical activity for less than 7 hours/ week. The association between physical activity (<7 hours/week with >7 hours/week) and overweight was statistically significant ( $p= 0.0001$ , OR= 10.88, C.I.= 4.83; 26.10), Tharkar S *et al* (15), Kaur S *et al* (5), Aggarwal T *et al* (6) also stated similar findings. Physical inactivity has not only a prime role in the development of overweight and obesity, but also in the development of chronic diseases such as heart disease, diabetes, hypertension, cancers and osteoporosis in later life. The association between television/ computer viewing and overweight ( $\geq 3$  hours with <3 hours and none) was found to be statistically significant. The risk of being overweight was 2.99 times more in students who viewed T.V. or computer for  $\geq 3$  hours.

### Conclusion

Overweight is behavioral problem and it should be tackled by primordial prevention. As family is the first and most important point of inculcating healthy habits & behaviors, so parents especially mothers as

well as children should be made aware about causes and consequences of overweight. In the present study, out of 565 students 35 (6.19%) students were overweight. The risk factors associated with overweight were higher socioeconomic status, frequent consumption of junk food, long hours of television and computer viewing and decreased physical activity of students.

### Recommendation

It is now imperative to inculcate the importance of habits like physical activity, outdoor games and sports in students as well as teachers. Practices like “no television” and “no computer” day once a week should be observed and promoted. Education regarding nutrition, physical activity and hazards of unhealthy lifestyle needs to be incorporated in the school curriculum.

### Relevance of the study

The study gives information about current lifestyle of high school students and how it is affecting the body mass index of the students which is a risk factor for various non-communicable diseases. It also mentions that improvement in lifestyle at younger age is need of the hour to avoid the related non communicable diseases in later life.

### Authors Contribution

The contribution of first and second author is equal and third author supported for the statistical analysis.

### Acknowledgement

We would like to thank all the participants who consented to participate in the study.

### References

1. World Health Organisation. Obesity: Preventing and managing the global epidemic, Technical Report Series 894. 2000.P. 1-2.
2. Mehta M, Bhasin SK, Agrawal K, Dwivedi S. Obesity amongst affluent adolescent girls. Indian J Pediatr. 2007 Jul;74(7):619-22. PubMed PMID: 17699967. [PubMed].
3. Dietz WH. Critical periods in childhood for the development of obesity. Am J Clin Nutr. 1994 May;59(5):955-9. Review. PubMed PMID: 8172099. [PubMed].
4. Bharati DR, Deshmukh PR, Garg BS. Correlates of overweight & obesity among school going children of Wardha city, Central India. Indian J Med Res. 2008 Jun;127(6):539-43. PubMed PMID: 18765871. [PubMed].
5. Kaur S, Sachdev HP, Dwivedi SN, Lakshmy R, Kapil U. Prevalence of overweight and obesity amongst school children in Delhi, India. Asia Pac J Clin Nutr. 2008;17(4):592-6. PubMed PMID: 19114395. [PubMed].
6. Aggarwal T, Bhatia RC, Singh D, Sobti PC. Prevalence of obesity and overweight in affluent adolescents from

Ludhiana, Punjab. Indian Pediatr. 2008 Jun;45(6):500-2. PubMed PMID: 18599939.[\[PubMed\]](#).

7. Laxmaiah A, Nagalla B, Vijayaraghavan K, Nair M. Factors affecting prevalence of overweight among 12- to 17-year-old urban adolescents in Hyderabad, India. Obesity (Silver Spring). 2007 Jun;15(6):1384-90. PubMed PMID: 17557974.[\[PubMed\]](#).

8. Kumar S, Mahabalaraju DK, Anoroopa MS. Prevalence of obesity and its influencing factor among affluent school children of Davangere city. IndJor Com Med, 32(1): 1-5.

9. de Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. Bull World Health Organ. 2007 Sep;85(9):660-7. PubMed PMID: 18026621; PubMed Central PMCID: PMC2636412.[\[PubMed\]](#).

10. Kotian MS, S GK, Kotian SS. Prevalence and determinants of overweight and obesity among adolescent school children of South karnataka, India. Indian J Community Med. 2010 Jan;35(1):176-8. doi: 10.4103/0970-0218.62587. PubMed PMID: 20606948; PubMed Central PMCID: PMC2888353.[\[PubMed\]](#)

11. Sidhu S, Marwah G, Prabhjot. Prevalence of overweight and obesity among the affluent adolescent school children of Amritsar, Punjab. Coll Antropol. 2005 Jun;29(1):53-5. PubMed PMID: 16117299.[\[PubMed\]](#).

12. Mohan B, Kumar N, Aslam N, Rangbulla A, Kumbkarni S, Sood NK, Wander GS. Prevalence of sustained hypertension and obesity in urban and rural school going children in Ludhiana. Indian Heart J. 2004 Jul-Aug;56(4):310-4. PubMed PMID: 15586739.[\[PubMed\]](#)

13. Sood A, Sundararaj P, Sharma S, Kurpad AV, Muthayya S. BMI and body fat percent: affluent adolescent girls in Bangalore City. Indian Pediatr. 2007 Aug;44(8):587-91. PubMed PMID: 17827634.[\[PubMed\]](#).

14. Unnithan AG, Syamakumari S. Prevalence of overweight, obesity and underweight among school going children in rural and urban areas of Thiruvananthapuram educational district, Kerala state (India) . The Internet Journal of Nutrition and Wellness 2008; 6(2).

15. Tharkar S, Viswanathan V. Impact of socioeconomic status on Prevalence of Overweight and Obesity among Children and Adolescents in Urban India. The Open Obesity Journal 2009; 1: 9-14.

16. Cameron N, Getz B. Sex differences in the prevalence of obesity in rural African adolescents. Int J Obes Relat Metab Disord. 1997 Sep;21(9):775-82. PubMed PMID: 9376890.[\[PubMed\]](#).

17. El Mouzan MI, Foster PJ, Al Herbish AS, Al Salloum AA, Al Omer AA, Qurachi MM, Kecojevic T. Prevalence of overweight and obesity in Saudi children and adolescents. Ann Saudi Med. 2010 May-Jun;30(3):203-8. doi: 10.4103/0256-4947.62833. Erratum in: Ann Saudi Med. 2010 Nov-Dec;30(6):500-2. PubMed PMID: 20427936; PubMed Central PMCID: PMC2886870.[\[PubMed\]](#)

18. Marwaha RK, Tandon N, Singh Y, Aggarwal R, Grewal K, Mani K. A study of growth parameters and prevalence of overweight and obesity in school children from Delhi. Indian Pediatr 2006; 43(11): 943-52[\[PubMed\]](#)

**Tables**

**TABLE 1 DISTRIBUTION OF STUDENTS ACCORDING TO SES AND LIFESTYLE**

Parameter	Students	Percentage
<b>Socioeconomic status*</b>		
I	290	51.33
II	113	20.00
III	118	20.88
IV	34	06.02
V	10	01.77
<b>Total</b>	<b>565</b>	<b>100.00</b>
<b>Physical activity/ week</b>		
≤ 7 hours	124	21.95
7-14 hours	212	37.52
>14 hours	229	40.53
<b>Total</b>	<b>565</b>	<b>100.00</b>
<b>Consumption of junk food</b>		
Daily	24	04.25
≥3 times/wk	207	36.63
<3 times/wk	270	47.79
No habit	64	11.33
<b>Total</b>	<b>565</b>	<b>100.00</b>
<b>Watching TV/ computer hours/day</b>		
≥ 3 hours	64	11.33
<3 hours	479	84.78
None	22	03.89
<b>Total</b>	<b>565</b>	<b>100.00</b>

\*SES according to Modified Prasad’s Scale

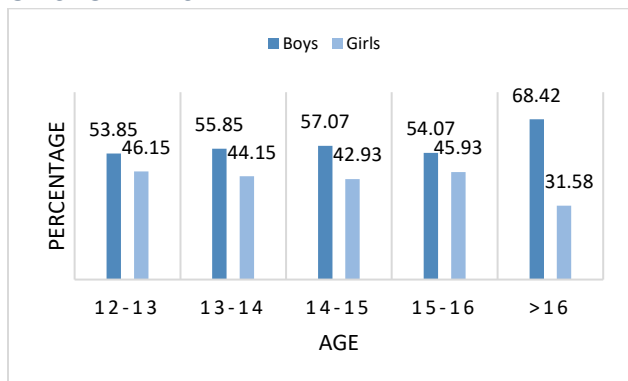
**TABLE 2 ASSOCIATION OF LIFESTYLE PARAMETERS WITH BODY MASS INDEX**

Parameter	Students			X2*	p
	Overweight (%)	Normal (%)	Total (%)		
<b>Age in years</b>					
12-13	0 (0.00)	13 (100.00)	13 (100)	0.88 †	0.34856
13-14	12 (6.38)	176 (93.62)	188 (100)	0.03	0.8693
14-15	16 (8.38)	175 (91.62)	191 (100)	1.98	0.1593
15-16	5 (3.70)	130 (96.30)	135 (100)	0.06	0.80517
>16	2 (5.26)	36 (94.74)	38 (100)		
<b>Total</b>	35 (6.19)	530 (93.81)	565 (100)		
<b>Sex</b>					
Boys	19 (5.94)	301 (94.06)	320	0.08	0.7719443
Girls	16 (6.53)	229 (93.47)	245		
<b>Total</b>	35 (6.19)	530 (93.81)	565		
<b>Socio-economic status</b>					
Class I	35(12.07)	255(87.93)	290	15.00	0.000107
Class II	0(00.00)	113(100.00)	113		
Class III	0(00.00)	118(100.00)	118		
Class IV	0(00.00)	34(100.00)	34		
Class V	0(00.00)	10(100.00)	10		
<b>Total</b>	35	530	565		
<b>Physical activity in hrs/wk</b>					
≤ 7	25(20.16)	99(79.84)	124	53.33	0.0001
7-14	10(04.72)	202(95.28)	212		OR= 10.88
>14	0(00.00)	229(100.00)	229		C.I. = 4.83; 26.10
<b>Total</b>	35	530	565		
<b>Television/computer hrs/day</b>					
≥3	9(14.06)	55(85.94)	64	7.69	0.00555
<3	26(05.43)	453(94.57)	479		OR= 2.99
None	0(00.00)	22(100.00)	22		C.I. = 1.17; 6.99
<b>Total</b>	35	530	565		
<b>Frequency of consumption of junk food</b>					
Daily	8(33.33)	16(66.67)	24	11.83	0.0005817
≥3 times/wk	16(07.73)	191(92.27)	207		OR = 3.40
<3 times/wk	9(03.33)	261(96.67)	270		C.I. = 1.56; 7.85
No Habit	2(03.13)	62(96.87)	64		
<b>Total</b>	35	530	565		

X2 = chi-square test, † = chi-square for trend, OR = odds ratio, C.I. = confidence limit

**Figures**

**FIGURE 1 AGE AND SEXWISE DISTRIBUTION OF STUDENTS**



**FIGURE 2 DISTRIBUTION OF STUDENTS ACCORDING TO BODY MASS INDEX**

