

ORIGINAL ARTICLE

Prevalence of obesity and its correlates in school going adolescents of Haldwani, Nainital, Uttarakhand, IndiaShantanu Aggarwal¹, Sadhana Awasthi², Rajesh Kumar Singh³, Chandramohan Singh Rawat⁴, Saurabh Shukla⁵, Farha Akhtar⁶^{1,5,6}Post Graduate Resident, ^{2,3}Associate Professor, ⁴Professor & Head, Department of Community Medicine, Government Medical College, Haldwani, Uttarakhand, India

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Aggarwal S, Awasthi S, Singh RK, Rawat CMS, Shukla S, Akhtar F. Prevalence of obesity and its correlates in school going adolescents of Haldwani, Nainital. Indian J Comm Health. 2016; 28, 2: 163-168.

Source of Funding: Nil **Conflict of Interest:** None declared**Article Cycle****Received:** 15/05/2016; **Revision:** 02/06/2016; **Accepted:** 10/06/2016; **Published:** 30/06/2016This work is licensed under a [Creative Commons Attribution 4.0 International License](#).**Abstract**

Background: With a rising trend of Non-Communicable Diseases (NCDs) in the present world, overweight and obesity has gained importance as it is not only a disease in itself but also risk factor for majority of other NCDs. A dramatic increase in overweight and obesity among children and adolescent has raised the concern of various public health physicians especially in developing country like India. **Aims & Objective:** To study the prevalence of overweight and obesity & its correlates among school going adolescents of Haldwani block. **Material & Methods:** School based cross sectional study was done among the adolescents of 8th to 12th standard. To calculate the maximum sample size prevalence of obesity was assumed to be 50%, taking absolute error of 5%, design effect of 2 and 10% non-response rate the sample was calculated to be 880, rounded off to 900. Samples were collected from 30 clusters/schools using simple random sampling. Data was collected using a pre-designed, semi-structured and pre-tested questionnaire and analyzed by using SPSS version 22. **Results:** Prevalence of overweight and obesity was 13% (CI = 10.8 - 15.2%). Overweight and obesity was found to be significantly associated with urban area, private school, Socio-economic class I, non-vegetarian diet, physical inactivity and playing videogames, working on laptops and computer on univariate analysis. On applying binary logistic regression factors like private schools, socioeconomic class I, non-vegetarian diet and physical inactivity were again found to be significantly associated with overweight and obesity. **Conclusion:** Prevalence of obesity was found to be more in adolescents having modifiable risk factors.

Keywords

Non-communicable diseases; overweight; obesity; adolescent; school

Introduction

The present day Non Communicable Diseases (NCDs) are replacing the previously prevalent infectious disease in today's era of epidemiological transition. Presently NCDs are showing a rising trend and this trend will continue to rise in the future. Among the NCDs obesity holds a great importance as it is a disease in itself and a risk factor for majority of NCDs (1).

Obesity which is defined as abnormal growth of the adipose tissue due to increase in fat cell number or fat cell size or both, is highly prevalent in both developed and developing countries. Obesity affects both adults as well as children (2). In the past two decades there has been dramatic increase in the proportion of children and adolescent who are overweight (3). It is seen that 30% of obesity begins

in childhood and about 50-80% obese children become obese adult (4).

Obese children are exposed to various health risks like dyslipidemia, hyperinsulinemia, type (2) diabetes, hypertension, cardiovascular disease, arthritis and behavioral problems and also an obese individual tends to develop these at a very younger age as compared to their normal counterparts. Obesity in children and adolescents is now being taken as a major public health problem in developing countries which includes India (5).

Obesity among adolescents has various risk factors. Physical inactivity and dietary habits are independent risk factors for obesity (2,6). Patrick *et al* in their study found that vigorous physical activity is associated with decreased likelihood of being obese and overweight (3). Lazarau *et al* showed TV viewing as the most significant factor associated with obesity (7). Laxmaiah *et al* found obesity significantly less in children who participated in outdoor games than among non-participants and significantly higher in children watching television for long time (5). In the study by Kotian *et al*, obesity was significantly higher among adolescents with less physical activity, viewing television and computers for long hours and those who ate chocolates (8).

Aims & Objective

To estimate the prevalence of obesity and to identify its various correlates among adolescents.

Material & Methods

The present study was a school based cross sectional study done in Haldwani block of district Nainital in the state of Uttarakhand conducted for a period of one year from September 2014 to August 2015.

Study Subjects: The study subjects were adolescents from class 8th to 12th in the schools of Haldwani block of district Nainital in the state of Uttarakhand.

Sample Size: The sampling procedure adopted was 30 cluster sampling. Due to lack of data in Uttarakhand on prevalence of obesity in this age group maximum sample size was calculated assuming prevalence of obesity to be 50% and absolute error of 5% by the formula $4pq/d^2$ (9). Design effect of 2 was applied and considering 10% non-response rate the sample size was calculated to 880, which were rounded off to 900.

Sampling Technique: As per the list obtained from district education officer, Nainital there are 62 senior secondary schools in Haldwani block (34 in urban area and 28 in rural area). Out of these 30 schools/

clusters were selected by lottery system, 15 schools each from rural and urban area. Permission was taken from the principles of the concerned school. The desired 30 students from each school were selected in equal number from each class. In case if there were more than one section in a particular class then one section was selected by simple random sampling using lottery system. Thus six students from each class were selected by systematic random sampling. In case the any of the student falling in our sample was absent on the day of survey then the next roll number was included in the study.

Data Collection: Data was collected after taking informed verbal consent from principals of schools and the participants, by means of a pre-designed, pre-tested and semi-structured questionnaire covering information regarding age, residence, religion, standard in which the participant is presently studying, education and occupation of the parents, family income, family history, dietary habits, physical activity and life style. Stress was assessed using 12- item general health questionnaire (10). All the participants were weighed without shoes. Height was recorded for every student using standard procedures.

Data Analysis: Data was entered and analyzed using SPSS software version 22 for windows. Socio-economic class was divided according to modified B.G. Prasad classification update for 2015. Students were classified as non-vegetarians if they were consuming meat in addition to vegetarian food at least once a week. Physically active adolescents were classified according to the criteria of playing outdoor games for more than 30minutes to 1 hour for 4 to 5 days a week. Watching Television was defined as spending any duration of time watching television. If the student spent time on playing videogames on any available device or working on laptops and computer for any duration were classified as playing videogames, working on laptops and computer. Overweight was classified as BMI above 23 adult equivalent and obesity as BMI above 27 adult equivalent in the revised IAP BMI charts for boys and girls aged 5 to 18 years (11). Combined prevalence of overweight and obesity was used for the analysis. An adolescent was classified as having stress if his/her score was more than 15 on 12- item general health questionnaire (10). **Ethical Approval:** Ethical approval was taken from institutional ethical

committee of Government Medical College, Haldwani.

Results

The study sample was contributed equally by rural and urban schools. Out of the 30 schools selected for the study, 16 were run by government bodies while 14 by private authorities. Among the 900 adolescent interviewed, maximum (57.6%) belonged to the age group 15 to 19 years. Majority of the adolescents (67.0%) in the study were males. Hindus formed the major proportion (89.2%) of the study subjects. Highest number of study subjects (27.3%) belonged to socio-economic class II. 20% belonged to class I, 20.6% belonged to class IV, 17.4% belonged to class III and 10.4% belonged to class V [Table 1]

The prevalence of overweight and obesity was found to be 13% (CI = 10.8 - 15.2%) among the adolescents. Among this 9% were overweight and 4% were obese. Univariate analysis showed that odd of being overweight and obese among adolescents in urban schools was 1.51 as compared to adolescents in rural and it was found to be statistically significant. The significantly higher risk of overweight and obesity was observed among adolescent in private schools with odds ratio of 3.91. The odds of having overweight and obesity was found to be increasing as we move from low to high socio-economic status but only socio-economic class I (OR = 9.72) and socio-economic class II (OR = 4.18) was found to be significantly associated with overweight and obesity. Non-vegetarian diet had a significant increased risk for overweight and obesity (OR = 2.07). The prevalence of overweight and obesity was found to be significantly more in adolescents who were physically inactive with the odds ratio of 2.25. Adolescents playing videogames, working on laptops and computers had a significantly higher risk of having overweight and obesity as compared to other adolescents (OR = 1.81). A higher odds was also observed for overweight and obesity among adolescents with factors like male sex, 15 – 19 years age group, watching television and stress but it was not found to be statistically significant [Table 2].

Binary logistic regression analysis showed that adolescents of private school (adjusted OR = 2.43; CI: 1.42 – 4.17), belonging to class I socio-economic status (adjusted OR = 5.59; CI: 1.56 – 20.03), eating non-vegetarian diet (adjusted OR = 2.71; CI: 1.68 – 4.38), and not being physically active (adjusted OR =

2.49; CI: 1.64 – 3.79) were at significantly higher risk of overweight and obesity [Table 3].

Discussion

The ongoing epidemiological transition has shifted our focus from communicable diseases to non-communicable diseases and their risk factors. Due to advancements in the knowledge of these diseases, it is clear that these risk factors can arise from the childhood. Hence, it becomes essential to assess an important risk factors of non-communicable diseases i.e. overweight and obesity in the adolescent age group, which are diseases in itself.

Overweight and obesity was detected among 13% of the adolescent in the present study. Similar findings were observed by Kotian *et al* in Karnataka (8). Prevalence of overweight and obesity was found to be very high in the studies conducted by Gupta *et al* and Singh *et al* as compared to our study (12,13). Both these studies have been conducted in New Delhi which is a metropolitan city with different lifestyle and dietary practices which explains the difference in the prevalence in these and our study. Prevalence of overweight and obesity was found to be more among students in private schools in our study which is in accordance with the results shown by Gupta *et al*, Bharati *et al* and Jagadesan *et al* (13,14,15). More number of females were found to be overweight and obese as compared to males in our study but this difference was not found to be significant similar findings were also observed by Jagadesan *et al* and Jain G *et al* (15,16).

Adolescents belonging to socio-economic class I were found to have significantly high prevalence of overweight and obesity. Kotian *et al* (8) also showed that risk of overweight was two times higher among the adolescents of high socio-economic status (8). Goyal R K *et al* also observed that children of high socio-economic status were at higher risk of obesity (17). Jain G *et al* noticed in her study that the subjects belonging to high socioeconomic status would score significantly higher on body mass index than the subjects from low socioeconomic status group (16). The highest prevalence of overweight and obesity was found in socio economic status Class I and Class II in a study by Brahmabhatt *et al* (18).

Non-vegetarian diet was found to be significantly associated with the overweight and obesity among adolescents in the present study. Aggarwal T *et al* in there study in Ludhiana also observed that out of total obese children, significant high percentages

were non-vegetarian (19). It is an established fact that no or low level of physical activity is associated with overweight and obesity which is also evident in our study. This fact has also been supported in the studies conducted by Kotian *et al*, Laxmaiah *et al*, Jain S *et al*, Goyal R K *et al*, S Kumar *et al* and Bharati *et al* (5,8,14,17,20,21).

Conclusion

Prevalence of overweight was found to be 9.0% and that of obesity was found to be 4.0% among the study participants, combined prevalence being 13%. The odds of being overweight and obese was found to be significantly more among adolescent in urban area, private school, belonging to class I and class II socio-economic status, taking alcohol, non-vegetarians, physically inactive and playing videogames, working on laptops and computers on univariate analysis but on multivariate analysis adolescents of private school, those belonging to class I socio-economic status, non-vegetarians and physically inactive adolescents were at high risk of overweight and obesity

Recommendation

Prevalence of obesity was found to be high among the adolescents having different modifiable risk factors. This makes primordial prevention extremely necessary from the school level for those not having these risk factor and primary prevention for those having these risk factor. School authorities must conduct yearly screening programs in order to identify students at risk of developing or having overweight and obesity. Students must be made aware about the various risk factors by organizing health days at school or conducting health education camps. Parents of the students must also be sensitized regarding the risk factors and ways of prevention during parent teacher meetings and other school events. The rising prevalence of these diseases necessitates policy makers to plan and form policies for their prevention and control before they become a major cause of morbidity and mortality among this age group.

Limitation of the study

The study has the limitation that there may be error in some of the responses made by the participants which is the basis of information in our study.

Authors Contribution

All the authors had made substantial contributions to conception, design, data collection, analysis and

interpretation of data; drafting the article, revising it critically for important intellectual content; and final approval of the version to be published.

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Tables

TABLE 1 SOCIO-DEMOGRAPHIC PROFILE OF THE STUDY SUBJECTS (N = 900)

Socio-demographic variables	No. (%)
School	
Government	480 (53.3)
Private	420 (46.7)
Age Group (Years)	
10 – 14	382 (42.4)
15 – 19	518 (57.6)
Sex	
Male	603 (67.0)
Female	297 (33.0)
Religion	
Hindu	803 (89.2)
Muslims	86 (9.6)
Others	11 (1.2)
Socio-economic Status*	
Class I	225 (25.0)
Class II	246 (27.3)
Class III	157 (17.4)
Class IV	185 (20.6)
Class V	87 (9.7)
<i>*Modified B.G. Prasad classification updated for January 2015</i>	

TABLE 2 UNIVARIATE ANALYSIS OF FACTORS ASSOCIATED WITH OVERWEIGHT AND OBESITY AMONG ADOLESCENTS

Characteristics	Normal	Overweight & Obesity	Odds Ratio	95% CI
	No. (%)	No. (%)		
Region				
Rural	402 (89.3)	48 (10.7)	1.00	
Urban	381 (84.7)	69 (15.3)	1.51	(1.02 – 2.24)
School				
Government	450 (93.8)	30 (6.2)	1.00	
Private	333 (79.3)	87 (20.7)	3.91	(2.52 – 6.07)
Sex				
Male	532 (88.2)	71 (11.8)	1.00	
Female	251 (84.5)	46 (15.5)	1.37	(0.92 – 2.04)
Age group				
10 -14 years	341 (89.3)	41 (10.7)	1.00	
15 - 19 years	442 (85.3)	76 (14.7)	1.43	(0.95 – 2.14)

Religion				
Hindu	697 (86.8)	106 (13.2)	1.00	
Muslim	77 (89.5)	9 (10.5)	0.76	(0.37 – 1.57)
Others	9 (81.8)	2 (18.2)	1.46	0.31 – 6.85)
Socio-economic Status				
Class I	167 (74.2)	58 (25.8)	9.72	(2.95 – 31.95)
Class II	214 (87.0)	32 (13.0)	4.18	(1.24 – 14.04)
Class III	144 (91.7)	13 (8.3)	2.52	(0.70 – 9.12)
Class IV	174 (94.1)	11 (5.9)	1.77	(0.48 – 6.51)
Class V	84 (96.6)	3 (3.4)	1.00	
Diet				
Vegetarian	309 (91.7)	28 (8.3)	1.00	
Non-vegetarian	474 (84.2)	89 (15.8)	2.07	(1.32 – 3.24)
Physically active				
Yes	516 (90.5)	54 (9.5)	1.00	
No	267 (80.9)	63 (19.1)	2.25	(1.52 – 3.33)
Watching television				
No	84 (87.5)	12 (12.5)	1.00	
Yes	699 (86.9)	105 (13.1)	1.05	(0.55 – 1.99)
Playing videogames				
No	470 (89.9)	53(10.1)	1.00	
Yes	313 (83.0)	64 (17.0)	1.81	(1.22 – 2.68)
Stress				
Absent	738 (87.4)	106 (12.6)	1.00	
Present	45 (80.4)	11 (19.6)	1.70	(0.85 – 3.39)

TABLE 3 MULTIVARIATE ANALYSIS OF FACTORS ASSOCIATED WITH OVERWEIGHT AND OBESITY AMONG ADOLESCENTS

Explanatory variable	Odds Ratio	p value
Region		
Urban	1.00	
Rural	1.11 (0.72 – 1.71)	0.638
School		
Government	1.00	
Private	2.43 (1.42 – 4.17)	0.001
Socio-economic status		
Class I	5.59 (1.56 – 20.03)	0.008
Class II	2.96 (0.83 – 10.47)	0.092
Class III	2.05 (0.55 – 7.59)	0.282
Class IV	1.78 (0.47 – 6.69)	0.388
Class V	1.00	
Diet		
Veg	1.00	
Non-veg	2.71 (1.68 – 4.38)	0.001
Physically active		
Yes	1.00	
No	2.49 (1.64 – 3.79)	0.001
Playing videogames, working on laptops and computers		
No	1.00	
Yes	1.22 (0.79 – 1.89)	0.363