Relation between Changing Lifestyle and Adolescent Obesity in India: A Community Based Study among School Children

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Abstract—Obesity is the major global nutrition concern. Modernisation and urbanisation have led to changes in dietary and lifestyle factors which are contributing to the increased prevalence of overweight and obesity.

Objective: To find out various life style risk factors for obesity among school children of affluent families aged 10-18 years in Jaipur city.

Methods: A cross-sectional study in ten randomly selected schools of Jaipur city with tuition fee > 18000 ₹/year was conducted from July 2012 to April 2013. 1610 students of class V to XII were included and their detailed life style history with anthropometric measurements was recorded after their informed written consent. Indian Academy of Pediatrics' growth Monitoring Guidelines for children from birth to 18 years was followed for defining and classifying obesity.

Result: 364 (22.61%) participants were found obese/overweight. Watching television during meals, frequency of main meals outside home per month, frequency of snacks outside home per week and duration of television/ computer watching per day were found significant predictors of overweight/ obesity on binary multivariate logistic regression method.

Conclusion: The present study highlights childhood overweight/obesity is an emerging health problem (22.61%) and lifestyle factors are important risk for it.

Key words: Obesity/overweight, Affluent families, Adolescents, Life- style factors.

I. INTRODUCTION

Obesity/Overweight in children and adolescents is gradually becoming a public health problem in India as our country is going through economic and nutrition transition which are associated with change in dietary habits, decreased physical activity and increased prevalence of obesity[1]. Obesity can be seen as the first wave of a defined cluster of non communicable diseases called "New World Syndrome" creating an enormous socioeconomic and public health burden in poorer countries [2]. Eating out which was quiet a rare thing earlier have become a trend now- a – days. Moreover, widespread accessibility of computer, electronic games and cable network with satellite television has modified childhood life style in last decade. Due to increasing modernisation, outdoor games have been replaced by computers, television and mobile games. Obesity/Overweight increases mortality and morbidity as it is positive risk factor for development of Hypertension, Non Insulin dependent diabetes mellitus, Gall bladder diseases, Coronary artery disease, osteoarthritis, Gout, Dyslipidemia, Sleep apnoea, Psychological stress, Cancer (e.g. Breast, endometrial, colon).[3] More than 50% of obese children become obese adults and the complications of adult obesity are made worse if obesity begins in childhood.[4] Also; obesity in adults is harder to treat than in children, [3]so, effective prevention of adult obesity requires prevention and management of childhood obesity.[5] Globally, an estimated 10 per cent of school-aged children, between

5 and 17 yr of age, are overweight or obese.[6] As per the Census 2011, adolescents constitute almost 20.9% of Indian population,[7] so about 2.1% adolescents in India are supposed to be overweight or obese. This being such a high proportion of the population, the problem of obesity and overweight among this age group needs to be addressed. These are influential stages in people's lives when lifelong sustainable health related behaviors, as well as beliefs and attitudes, are being developed.

Moreover, adolescent obesity is more frequently found in children of affluent families as they are more inclined to sedentary lifestyle and decreased physical activity. So, this study was designed to know the various lifestyle factors associated with adolescent obesity among school children of affluent families of Jaipur city so that evidence-based policies and programs for community intervention can be planned and implemented for better health care of the children.

II.　METHODOLOGY

A cross-sectional study among adolescents (10 – 18 years of age) in 10 randomly selected schools of Jaipur city with tuition fee > 18000 ₹/year was conducted from July 2012 to April 2013 after procuring list of all senior secondary schools in Jaipur city from District Education Officer (DEO). Sample size of 1600 school children was taken assuming 20% obesity in study population, relative allowable error of 10% with 95% Confidence interval. One section from each standard from V to XII was selected by chit box method and with the help of class teacher and class monitor, all available students in the selected section were oriented about the nature and purpose of the study and were given an envelope, containing the consent form and the performa to be filled by them/ their parents with signature of parents, for participation and information. Out of 1912 performa distributed, 1610 students of affluent families (socioeconomic class I & II of modified Kuppuswamy index) of standard V to XII who provided their informed written consent and the information regarding age, sex, socioeconomic profile, lifestyle factors regarding frequency of outside home servings, television/ computer watching, mode of transport to school, physical activity and sleep of child, were included. BMI was recorded and as per IAP growth Monitoring Guidelines for children from birth to 18 years, students with BMI $\geq 85^{th}$ percentile and < 95th were considered overweight and $\geq 95^{th}$ percentile were considered obese.

All data collected were entered into Microsoft excel 2007 worksheet and subjected to statistical analysis. Data was expressed in terms of percentage and proportions. Odds ratio was used to find out risk associated with various factors. Binary multivariate logistic regression was used to find out predictors of adolescent obesity. Age, sex, watching television during meals, daytime sleep, mode of transport to school, main servings outside home per month, frequency of snacks outside home per week, frequency of outdoor games were per week, frequency of exercise other than outdoor games per week, duration of television/computer watching and duration of night sleep were entered in the model. Method for model was "Enter" and criteria for a variable to be retained in the model was kept as p value between 0.05 and 0.10

The "Medcalc 14.0.0 version" software was used for analysis of the Data.
Ethical clearance and prior approval was taken from institutional research review board

III.　RESULTS

Out of total 1610 students included in the study, 50.2% (808) were girls and 49.8% (802) were boys with M:F ratio 0.993. Majority i.e. 44.78% of students were in 10-12 years of age followed by 13-16

years and more than 16 years. Majority i.e. 68.20% of students belonged to nuclear family. These students were of either I or II socioeconomic status class. Eighty three percent of students were from family having ≥ 5 member and 1-2 siblings. (Table 1)

Table No. 1
Bio-socio-demographic characteristics of the study population

Bio-socio-demographic Variables		No	%
Age groups	10-12 years	721	44.78
	13-15 years	663	41.18
	≥ 16 years	226	14.04
Sex	Male	802	49.80
	Female	808	50.20
Type of family	Nuclear	1098	68.20
	Joint	512	31.80
Socioeconomic class	I	192	11.93
	II	1418	88.07
Occupation of mother	Non-working	1350	83.85
	Working	260	16.15
Family size	≤ 5 members	1293	80.3
	> 5 members	317	19.7
Number of siblings	None	213	13.23
	1-2	1340	83.23
	≥3	57	3.54

Out of 1610 students , only 69.5% were with normal range of weight otherwise 364 (22.61%) children were overweight/ obese. Among overweight/ obese group, 275 (17.08%) were overweight and 89 (5.53%) obese. (Figure 1)

Figure 1
Distribution of cases according to BMI
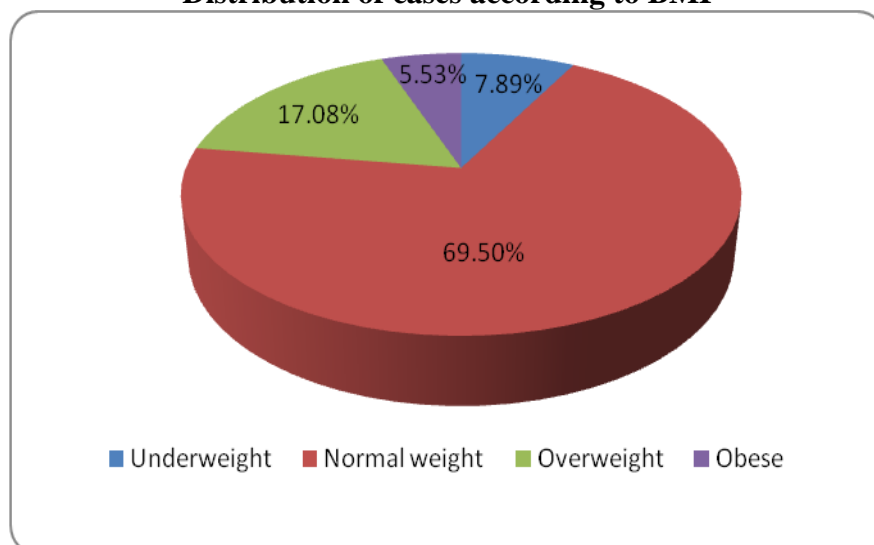
On further analysis it was found that risk of overweight/ obesity was 30.20% more in those who had meals more than 5 times in a month outside home as compared to those having less than 2 times.

However, risk was less for those eating snacks outside home more frequently. Eating meals and snacks outside home were found significant predictors for overweight/obesity using regression analysis. (Table 2)

Table No. 2
Risk of overweight and obesity according to lifestyle factors

Variables		Overweight and obesity				OR (95 % C.I.)
		Yes	%	No	%	
Sex	Male	188	23.44	614	76.55	1.099 (0.870 to 1.389)
	Female	176	21.78	632	78.21	1
Age	10 - 12	189	26.21	532	73.78	1.160 (0.817 to 1.645)
	13- 15	122	18.40	541	81.59	0.736 (0.511 to 1.060)
	16 - 18	53	23.45	173	76.54	1
Main servings outside home per month	up to 2	277	22.70	943	77.30	1
	3-5 times	61	20.61	235	79.39	0.884 (0.647 to 1.207)
	>5 times	26	27.66	68	72.34	1.302 (0.812 to 2.085)
Frequency of snacks outside home per week	up to 2	297	23.67	958	76.33	1
	3-5 times	55	21.65	199	78.35	0.891 (0.644 to 1.235)
	>5 times	12	11.88	89	88.12	0.435 (0.235 to 0.806)
Watching TELEVISION during meals	Yes	302	24.24	944	75.76	1.558 (1.152 to 2.109)
	No	62	17.03	302	82.97	1
mode of transport	walking or cycling	46	18.25	206	81.75	1
	motor vehicle	318	23.42	1040	76.58	1.369 (0.971 to 1.930)
frequency of outdoor games	up to 2	168	23.93	534	76.07	1.126 (0.867 to 1.462)
	3-5 times	68	21.12	254	78.88	0.958 (0.688 to 1.335)
	>5 times	128	21.84	458	78.16	1
Frequency of Exercise other than outdoor games per week	up to 2	278	22.05	983	77.95	1.012 (0.709 to 1.445)
	3-5 times	41	28.67	102	71.33	1.438 (0.881 to 2.349)
	>5 times	45	21.84	161	78.16	1
Duration of TELEVISION/ Computer watching	<1 hr	35	22.88	118	77.12	1
	1-3 hr	257	21.29	950	78.71	0.912 (0.610 to 1.363)
	>3hr	72	28.80	178	71.20	1.364 (0.856 to 2.173)
Day time sleep	Yes	192	24.15	603	75.85	1.19 (0.942 to 1.504)
	No	172	21.10	643	78.90	1
Duration of night sleep	< 6 hr	14	26.42	39	73.58	1.194 (0.640 to 2.226)
	6-8 hr	323	23.12	1074	76.88	1
	> 8 hr	27	16.88	133	83.13	0.675 (0.438 to 1.040)

It was also found in this study that risk of overweight/obesity was 55.8% higher in children who watches television during meals than children who doesn't watches television during meals and 36.4% higher in children who watch television/computer for > 3 hours in a day as compared to those watching television/computer for <1 hour. Watching television during meals and duration of television/computer watching in a day were found significant predictors for overweight/obesity using regression analysis. (Table 2)

It was also found in this study that sleeping in daytime is associated with 19% increased risk of overweight/obesity and there is 19.40% more chances of overweight/obesity in children sleeping < 6 at night as compared to those sleeping 6 to 8 hours in night in bivariate analysis. (Table 2)

It was also found in this study that there is 12.6% increased risk of overweight/obesity in those playing games less than 2 times a week than those playing > 5 times a week in present study. (Table 2)

It was also found in this study that risk of overweight/obesity was 1.2% and 43.8% more in those performing exercise less than 2 times a week and 3-5 times a week respectively as compared to those performing > 5 times a week in bivariate analysis. (Table 2)

Likewise It was also found in this study that there is 36.9% increased risk of overweight/obesity among those going to school via some motor vehicle as compared to those going be either cycling or walking. (Table 2)

IV.   DISCUSSION

Out of 1610 students included in the study, 50.2% (808) were girls and 49.8% (802) were boys. Overall, 364(22.61%) children were overweight/obese [275 (17.08%) overweight and 89 (5.53%) obese]. These results are comparable to the results of studies by Jagdish P. Goyal et al (2011)[8] (Overweight and obesity prevalence 6.5% and 13.9% respectively), Pankaj Kumar Mandal et al (2012)[9] (17% overweight and 3.5% obese)] and S.Kumar et al (2007)[4] (obesity prevalence 5.74%).However study in Delhi by Kapil et al 2001[10] and Sharma A et al (2010)[11] revealed prevalence overweight and obesity of about 25% &7% and 22% & 6.4% respectively which is quite higher than present study. This may be because of sedentary life style of children in New Delhi is more than in Jaipur and limitation of space for outdoor activities for children in Delhi. Studies done by Anitha Rani et al (2013)[12] in Chennai city, Bharati et al (2008)[13] in Wardha city revealed a lower prevalence (overweight 6.2% and obese 5.2%; overweight 3.1% and obese 1.2% respectively) than this study. This difference could be because of differences in socioeconomic status and dietary behaviors of adolescents in these study areas.

Risk of overweight/ obesity was 30.20% more in those who had meals more than 5 times in a month outside home as compared to those having less than 2 times. However, risk was less for those eating snacks outside home more frequently. Eating meals and snacks outside home were found significant predictors for overweight/obesity using regression analysis. Aiesha Ishaque et al (2012)[15] found negative association between eating snacks at school and overweight/obesity. Jagdish P. Goyal et al (2011)[8] and T Aggarwal[14] found significant association between outside servings and overweight/obesity. It may be due to the increased consumption of high calorie food as many varieties are available at restaurant.

In present study, risk of overweight/obesity was 55.8% higher in children who watches television during meals than children who doesn't watches television during meals and 36.4% higher in children who watch television/computer for > 3 hours in a day as compared to those watching television/computer for <1 hour. Watching television during meals and duration of television/computer watching in a day were found significant predictors for overweight/obesity using regression analysis. S. Jain et al (2010)[16], S Patnaik et al (2010)[17], Kuriyan R (2011)[18] et al and Jagdish P. Goyal et al (2011)[8] also in their studies found a significant association between overweight and longer duration of watching television/ Computer. High viewing time on screen is associated with more consumption of snacks and physical inactivity during watching time; also advertisements during viewing attract adolescents towards junk and fast foods.

In present study, sleeping in daytime is associated with 19% increased risk of overweight/obesity. However, this factor was excluded from the regression model. Goyal RK et al (2010)[19] in Ahmadabad, found that sleeping habit in afternoon having remarkable effect on prevalence on overweight/obesity. After sleep in day and completing the academic work hardly any time is left for physical activities which may increase BMI.

In present study, there is 19.40% more chances of overweight/obesity in children sleeping < 6 at night as compared to those sleeping 6 to 8 hours in night in bivariate analysis. Kuriyan R et al (2011)[18] found increased sleep duration to be significantly negatively associated with overweight/obesity. Short sleep duration might modulate the hormones related to obesity such as leptin and ghrelin.

There is 12.6% increased risk of overweight/obesity in those playing games less than 2 times a week than those playing > 5 times a week in present study. However, this factor was excluded from the regression model. In studies by Rajat Vohra et al (2011)[20], Jagdish P. Goyal et al (2011)[8], Rebecca Kuriyan et al (2012)[18], Pankaj Kumar Mandal et al (2012)[9], playing outdoor games was associated with decreased risk of overweight/obesity. Regular outdoor games help to burn out extra calories.

In present study, the risk of overweight/obesity was 1.2% and 43.8% more in those performing exercise less than 2 times a week and 3-5 times a week respectively as compared to those performing > 5 times a week in bivariate analysis. S Patnaik et al (2010)[17], Kotian MS (2010)[21] and Jagdish P. Goyal et al (2011)[8] found exercise to be significantly associated with overweight. In present study, children were asked only about frequency of exercise, not about duration and nature of exercise which might have influenced the outcome.

In present study, there is 36.9% increased risk of overweight/obesity among those going to school via some motor vehicle as compared to those going be either cycling or walking, This finding is in accordance with the results of studies by Ranu Rawat et al (2012)[22], Kotian MS (2010)[21] and Jagdish P. Goyal et al (2011)[8]. Transportation to school by either walking or cycling reduces the prevalence of overweight or obesity by providing the opportunity for increased physical activity.

CONCLUSION

More than one fifth of the school children were overweight/obese in the present study. Watching television during meals, frequency of main meals outside home per month, frequency of snacks outside home per week and duration of television/computer watching per day were found significant predictors of overweight/obesity.

Encouraging family meals in which parents and children eat together along with removing television and computer screens from children's primary sleeping area and reducing daily screen time to less than two hours should be practiced.   School health programmes including periodic screening of children for overweight in schools followed by counseling of students, parents and teachers through IEC activities regarding possible adverse effect of overweight/obesity and lifestyle modification like avoidance of junk foods and regular participation in physical activities and outdoor games in schools, with compulsory hours of sports and games and organising games tournaments should be implemented.

LIMITATIONS

Tool used for the study was distributed and explained to the students and most of the information was filled in by their parents so there are chances of misinterpretation of questions due to lack of direct communication. Behaviour bias of students and recall bias of parents may also confound the results.

CONFLICT OF INTEREST

None declared till now.

REFERENCES

1. Mahajan PB, Purty AJ, Singh Z, Cherian J, Natesan M, Arepally S, Senthilvel V: Study of Chilhood Obesity among school Children aged 6 to 1 years in Union Territory of Puducherry. IJCM ; 2011 Jan; 36 (1)
2. World Health Organization. Obesity: preventing and managing the global epidemic. Technical Report Series No. 894, Geneva: WHO; 2000.
3. WHO/ OVERWEIGHT AND OBESITY/ FACTSHEET UPDATED MAR 2013. URL ADDRESS-HTTP://WWW.WHO.INT/MEDIACENTRE/FACTSHEETS/FS311/EN/
4. S Kumar, DK Mahabalaraju, MS Anuroopa.: Prevalence of obesity and its influencing factor among affluent school children of Davangere city. IJCM. 2011 Jan; 1(1)
5. National Family Health Survey (NFHS-3) 2005–06. International Institute for Population Sciences (IIPS) and Macro International. 2007. URL address- http://www.rchiips.org/nfhs/.
6. Childhood obesity-The global picture; Available from URL: http://www. iotf.org/ childhoodobesity.asp
7. Census 2011-adolescent population available at following URL: www. censusindia.gov.in.
8. Jagdish P. Goyal, Nagendra Kumar, Indira Parmar, Vijay B. Shah, Bharat Patel: Determinants of Overweight and Obesity among Affluent Adolescents in Surat City, South Gujarat Region; India IJCM. 2011 Oct; 36(4)
9. Pankaj Kumar Mandal, Seshadri Kole, Sarmila Mallik, Nirmalya Manna, Pramit Ghosh, Samir Dasgupta: Behavioural factors related to overweight and obesity among adolescents: A cross-sectional study in an urban area of West Bengal, India; Sudanese Journal of Public Health. 2012 Jan; 7(1)
10. Kapil U, Singh P, Pathak P, Dwivedi SN, Bhasin S: Prevalence of obesity among affluent adolescent school children in Delhi; Indian Pediatr 2002; 39:365-368.
11. Sharma A, Sharma K, Mathur KP: Growth pattern and prevalence of obesity in affluent schoolchildren of Delhi; Public Health Nutr. 2007 May; 10(5):485-91.
12. M. Anitha Rani and B.W.C. Sathiyasekaran: Behavioural Determinants for Obesity: A Cross-sectional Study among Urban Adolescents in India; J Prev Med Public Health. 2013 Jul; 46(4):192-200
13. D.R. Bharati, P.R. Deshmukh & B.S. Garg: Correlates of overweight & obesity among school going children of Wardha city, Central India; Indian J Med Res. 2008 June; 127:539-543.

14. T Aggarwal, RC Bhatia, D Singh, and Praveen C Sobti: Prevalence of obesity and overweight in affluent adolescents from Ludhiana, Punjab; Indian Pediatr. 2008 Jun; 45(6):500-2.

15. Aiesha Ishaque, Farah Ahmad, Nosheen Zehra, Huma Amin: Frequency of and factors leading to obesity and overweight in school children; J Ayub Med Coll Abbottabad 2012; 24(2).

16. Jain S, Pant B, Chopra H, Tiwari R: Obesity among adolescents of affluent public schools in Meerut; Indian J Public Health. 2010 Jul-Sep; 54(3):158-60.

17. S Patnaik, L Patnaik, S Patnaik, M Hussain: Prevalence of Overweight and Obesity In A Private School of Orissa, India; The Internet Journal of Epidemiology. 2010;10(1)

18. Rebecca Kuriyan, Tinku Thomas, S Sumithra, Deepa P Lokesh, Nishita R Sheth, Renju Joy Swarnarekha Bhat and Anura V Kurpad: Potential Factors Related to Waist Circumference in Urban South Indian Children; Indian Pediatr 2012;49: 124-128.

19. Goyal RK, Shah VN, Saboo BD, Phatak SR, Shah NN, Gohel MC, Raval PB, Patel SS :Prevalence of overweight and obesity in Indian adolescent school going children: its relationship with socioeconomic status and associated lifestyle factors; J Assoc Physicians India. 2010 Mar; 58:151-8.

20. Vohra R, Bhardwaj P, Srivastava JP, Srivastava S, Vohra A: Overweight and obesity among school-going children of Lucknow city; JFCM. 2011 Aug; 18 (2)

21. Kotian MS, S GK, Kotian SS Prevalence and determinants of overweight and obesity among adolescent school children of South Karnataka; India.IJCM. 2010 Jan; 35(1)

22. Ranu Rawat, S K Garg, H Chopra, S K Bajpai, Tanveer Bano, S Jain, A Kumar: Prevalence of malnutrition among school children with reference to overweight and obesity and its associated factors; Indian Journal of Community Health. 2012 June; 24 (2)