

Original Article

Lifestyle predictors affecting 21st century epidemic of Obesity among 18-24 year old college girls in Agra, India

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Abstract

Background: The problem of overweight and obesity is not confined only to developed countries but is also widely prevalent in developing countries. Low levels of physical activity, TV watching, and dietary pattern are modifiable risk factors for overweight and obesity in college girls.

Objective: To assess the prevalence of overweight and obesity as defined by the Body Mass Index(BMI) criteria of WHO among 18-24 year old college girls in Agra and identify its associated factors.

Material & Methods: A cross-sectional study, adopting a multistage stratified random sampling procedure, has been conducted in 2009 among 400 college going girls aged 18-24 years in randomly selected degree colleges of Agra(urban & rural). Pre-designed and pre-tested questionnaire was used to elicit the information about dietary history and physical activity. Height and weight was measured and BMI was calculated.

Statistical Analysis: Percentage, chi square

Results: The prevalence of overweight and obesity was found to be 18.5% & 4.5% respectively according to BMI criteria of WHO. Skipping of breakfast was found to be about 14.5%. Eating fast food on alternate basis at college and at other places was found to be common among 48.5% & 51% of the subjects respectively. The average time spent on watching television was significantly higher among the obese (4.2hrs/day) & overweight (4.0hrs/day) than among normal & underweight subjects (3.5hrs/day). Gossip hours found to be nearly twice among obese (1.8hrs/day) as compared to normal & underweight (1.0hrs/day). It was found that close to two third (63.0%) and more than half (55.7%) of the subjects had never or occasionally been involved in outdoor and indoor games respectively and only one fourth (24.3%) of the subjects involved in daily play. Among obese subjects, 28.3% of the subjects used to play for <2 hrs/week as compared to only 10.9% who used to play for ≥ 2 hours/week. Almost all the subjects (94.3%) were involved in daily household task like washing clothes. Three fourth (76.1%) of obese subjects participated in household chores for less than two hours. Public transport was found to be the main mode of conveyance for the majority (70.7%) of the subjects.

Conclusion: This study confirmed the findings of earlier studies carried out in Western countries and emphasizes that regular physical exercise, doing household activities, regulated television viewing, and healthy eating behaviors could contribute to controlling overweight and obesity.

Key-words: Body mass index, overweight, obesity, physical activity, gossip.

Introduction:

It is now evident that many diseases of adulthood have their roots in earlier life. Lifestyle, food habits and physical activity established during childhood and adolescence may contribute to some chronic diseases, including obesity in adulthood (WHO 1993). Further evidence for the link between obesity and fast food can be found in many metropolitan cities in India and the data obtained is well correlated in Agra too. With the advent of multinational fast food brand in early nineties, western style fast food culture has spread like wildfire around the Indian urban and world and obesity has followed, accompanied by its many unwelcome side effects: heart disease, diabetes, arthritis and other ills.

As people in countries like Japan and China have abandoned traditional healthy diets in favour of fast food, the rates of obesity and associated diseases have soared. In countries which have resisted the spread of fast food culture, like France, Italy and Spain, obesity is far less of a problem. The relative proportion of underweight, overweight and obesity depend on the stage of development reached in a transitional society, and the rapidity with which modern marketing practices displace traditional diet and lifestyle. In the first stage of transition, high BMI remained confined to the wealthier section of society since the obesogenic influences affect them first. It is only in the later phase of transition when poorer sections start showing increase in the prevalence of high BMI.

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Material and Methods:

A cross-sectional study has been conducted in 2009 among college going girls aged 18-24 years in randomly selected degree colleges of Agra(urban & rural). The sample size was estimated by using the formula $4pq/d^2$ where prevalence was taken as 24%¹. The required precision of the estimate (d) was set at 20%. Using the above-mentioned formula, the sample size was estimated to be 316 and for the sample to be more representative of population, a total of 400 college going girls of 18-24 years were included in the study.

The girls were selected using a multistage stratified random sampling technique. The list of colleges was obtained from Agra University. Colleges were divided into two educational levels, undergraduate and postgraduate. The colleges were then numbered, and two colleges, one undergraduate and the other postgraduate, were chosen randomly from each geographical region (urban & rural). The girls were selected from each college by a systematic random sampling procedure from college records till the desired sample size was completed.

Anthropometrical Measurements

Anthropometric measurements were carried out by a single professional investigator. Height and weight of the subjects were measured using the standard procedure suggested by Jelliffe². BMI (weight in kilograms divided by the square of height in metres) used to assess the weight status in the subjects. The girls were grouped into four categories in accordance with WHO standards of BMI to define individuals with underweight (BMI <18.5), normal (BMI ≥18.5-24.9), overweight (BMI ≥25–29.9) and obese (BMI ≥30)³.

A semi structured pre-tested interview schedule was administered to all the subjects to elicit information on demographic parameters and other routine activities. Data were analysed using the SPSS statistical package (SPSS 17.0). The designated level of statistical significant was $p < 0.05$ (two-tailed) where relevant.

All measurements were performed in accordance with relevant guidelines and regulations and informed verbal consent and cooperation was sought from all subjects prior to their participation in the study. The research described was compliant with basic ethical standards.

Results:

Table 1: Biosocial profile of respondents

Demographic characteristics	Normal & underweight (n=308)		Overweight & Obese (n=92)		Total (n=400)		Level of significance
	No.	%	No.	%	No.	%	
Age							
• 18-20	66	21.4	24	26.1	90	22.5	p>0.05
• 20-22	139	45.1	39	42.4	178	44.5	
• 22-24	103	33.4	29	31.5	132	33.0	
Religion							
• Hindu	267	86.7	79	85.9	346	86.5	p>0.05
• Muslim	33	10.7	9	9.8	42	10.5	
• Sikh	8	2.6	4	4.3	12	3.0	
Educational status							
• Undergraduate	195	63.3	60	65.2	255	63.7	p>0.05
• Postgraduate	113	36.7	32	34.8	145	36.3	
Type of family							
• Nuclear	260	84.4	80	87.0	340	85.0	p>0.05
• Joint	48	15.6	12	13.0	60	15.0	
Family size							
• >4	267	86.7	29	31.5	296	74.0	p<0.001
• <4	41	13.3	63	68.5	104	26.0	
Socio-economic status							
• Upper							p<0.01
• Middle	97	31.5	25	27.2	122	30.5	
• Lower	189	61.4	67	72.8	256	64.0	
	22	7.1	0	0	22	5.5	
Food habits							
• Vegetarian	202	65.6	79	85.8	281	70.3	p<0.001
• Mixed	106	34.4	13	14.2	119	29.7	

Table-1 discloses the biosocial profile of the respondents. Most of the study subjects fall into the 20-22 age group (44.5%), Hindu by religion (86.5%), undergraduate by education (63.7%) and are living in nuclear families (85%). This distribution was almost similar in both normal & underweight as well overweight/obese groups.

It was also observed that more than two third of overweight/obese subjects (68.5%) were coming from

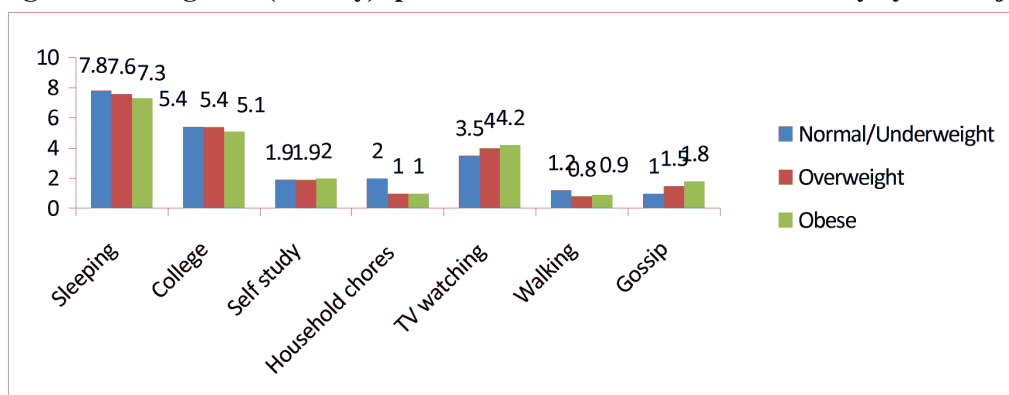
smaller family size and majority (72.8%) belonged to middle socio-economic class which was statistically significant. Findings suggest that more than two third (70.3%) of the subjects were vegetarian. Likewise, among the overweight/obese subjects majority (85.9%) belonged to vegetarian class as compared to only 14.1 percent mixed. The difference has been found to be statistically significant.

Table 2: Dietary routine as stated by study subjects according to their BMI status

Dietary habits	Normal & underweight (n=308)		Overweight (n=74)		Obese (n=18)		Total (n=400)	
	No.	%	No.	%	No.	%	No.	%
Breakfast at home								
Daily	184	59.7	16	21.6	4	22.2	204	51.0
3-6 times/week	40	13.0	20	27.0	5	27.8	66	16.5
≥ 2 times/week	35	11.4	30	40.6	8	44.4	72	18.0
Skipping	49	15.9	8	10.8	1	5.6	58	14.5
Before lunch	15	4.9	3	4.1	3	16.7	21	5.3
Lunch	302	98.1	71	95.9	17	94.4	390	97.5
After lunch	34	11.0	8	10.8	1	5.6	43	10.8
Evening snacks	224	72.7	54	72.9	16	88.9	294	73.5
Dinner	298	96.8	74	100	18	100	390	97.5
After dinner	77	25.0	16	21.6	3	16.7	96	24.0
Eating fast food at college								
Daily	16	5.2	5	6.8	2	11.1	23	5.7
3-6 times/week	154	50.0	36	48.6	4	22.2	194	48.5
≥ 2 times/week	9	2.9	1	1.4	1	5.6	11	2.8
Never	129	41.9	32	43.2	11	61.1	172	43.0
Eating fast food at places other than college								
Daily	5	1.6	1	1.4	1	5.6	7	1.8
3-6 times/week	152	50.0	39	52.7	13	72.2	204	51.0
≥ 2 times/week	12	3.9	3	4.1	2	11.1	17	4.2
Never/Occasional	139	45.1	31	33.7	2	11.1	172	43.0

This table gives information about subjects' dietary habits according to their BMI status. More than half (51%) were taking their breakfast at home in routine. Skipping was found to be about 14.5%. Almost all (97.5%) of the subjects were used to taking their lunch and dinner regularly. Three fourth (73.5%) were taking evening snacks whereas only one fourth (24%) were taking after dinner in routine. 10.8% & 5.3% used to take after lunch and before lunch snacks respectively.

Eating fast food on alternate basis at college and at other places was found to be common among 48.5% & 51% of the subjects respectively. 43 percent of the subjects never used to take fast food at either of these places. Further analysis shows that skipping of breakfast (84.5%) was most common among normal & underweight subjects. No association has been found between eating out and overweight/obesity.

Figure 1: Average time(Hrs/day) spent on various routine activities in a day by the subjects

In general, the average duration of sleep was marginally higher among normal & underweight (7.8hrs/day) than overweight/obese ones. The hours past during college time or while studying at home was more or less similar among all the subjects. The average time spent on watching TV was significantly higher among the obese

(4.2hrs/day) & overweight (4.0hrs/day). Walking hours per day were relatively more in normal & underweight (1.2hrs/day) than overweight/obese. Gossip hours found to be nearly twice among obese (1.8hrs/day) as compared to normal & underweight (1.0hrs/day) and higher than that of overweight subjects (1.5hrs/day).

Table 4: Distribution of subjects according to their routine physical activity

Routine Physical activity	Normal & underweight (n=308)		Overweight & Obese (n=92)		Total (n=400)		p value
	No.	%	No.	%	No.	%	
Household task							p>0.05
• Washing clothes	293	95.1	84	91.3	377	94.3	
• Washing utensils	184	59.7	57	62.0	241	60.3	
• Sweeping	155	50.3	50	54.3	205	51.3	
• Cooking	134	43.5	51	55.4	185	46.3	
• Ironing	209	67.8	69	75.0	278	69.5	
Outdoor games							p>0.05
• Daily	75	24.4	23	25.0	98	24.5	
• Weekly	21	6.8	7	7.6	28	7.0	
• Monthly	16	5.2	6	6.5	22	5.5	
• Occasional/Never	196	63.6	56	60.9	252	63.0	
Indoor games							p>0.05
• Daily	78	25.3	20	21.7	98	24.5	
• Weekly	38	12.3	10	10.9	48	12.0	
• Monthly	23	7.5	8	8.7	31	7.8	
• Occasional/Never	169	54.9	54	58.7	223	55.7	
Physical exercise							p>0.05
• Daily	126	40.9	29	31.5	155	38.7	
• Alternately	27	8.8	12	13.1	39	9.8	
• Weekly	12	3.9	5	5.4	17	4.3	
• Occasional/Never	143	46.4	46	50.0	189	47.2	
Mode of conveyance to college							p>0.05
• Own vehicle	93	30.2	24	26.1	117	29.3	
• Public transport	215	69.8	68	73.9	283	70.7	
• Walking	--	--	--	--	---	---	

According to our study, almost all the subjects (94.3%) were involved in daily household task like washing clothes. Followed by this, 69.5, 60.3, 51.3 & 46.3 percent of the subjects were involved in ironing, washing utensils, sweeping the house & cooking respectively. In general, the participation of overweight/obese subjects in household activities was marginally higher among all the household tasks except washing clothes. No significant difference was observed statistically. It was found that close to two third (63.0%) of the subjects had never or occasionally been involved in outdoor games and only one fourth (24.3%) of the subjects involved in daily play. Although statistically insignificant, participation by overweight/obese subjects was found to be marginally higher than normal & underweight subjects. It was also found that more than half (55.7%)

of the subjects were occasionally or never involved in indoor games. The proportion of subjects, who participated in indoor games, was not significantly different among overweight/obese and normal & underweight subjects.

Similarly, nearly half (47.2%) had never been involved in exercise, but more than (38.7%) of the subjects participated daily. No significant differentials were observed in the proportion of subjects, participating in the physical exercises between overweight/obese and normal & underweight. Public transport was found to be the main mode of conveyance for the majority (70.7%) of the subjects. No statistically significant difference was found among the subjects having own vehicle or using public transport.

Table 5: Distribution of subjects according to duration of physical activities in relation to BMI

Variable	Duration	Normal & underweight (n=308)		Overweight & Obese (n=92)		Total (n=400)		p value
		No.	%	No.	%	No.	%	
Participation in household activities(hrs/day)	<2hr	100	32.5	70	76.1	170	42.5	p<0.001
	≥2hr	208	67.5	22	23.9	230	57.5	
Participation in outdoor games(hrs/week)	None	196	63.6	56	60.9	252	63.0	p<0.001
	< 2hr	36	11.7	26	28.2	62	15.5	
	≥2hr	76	24.7	10	10.9	86	21.5	
Participation in indoor games(hrs/week)	None	169	54.9	54	58.7	223	55.7	p>0.05
	< 2hr	51	16.5	20	21.7	71	17.8	
	≥2hr	88	28.6	18	19.6	106	26.5	
Physical exercise (hrs/week)	None	143	46.4	46	50.0	189	47.3	p<0.001
	< 2hr	10	3.3	40	43.5	50	12.5	
	≥2hr	155	50.3	6	6.5	161	40.2	

More than half (57.5%) of girls were participating in household activities daily for ≥2 hrs with majority (90.4%) of the subjects being normal & underweight. Three fourth (76.1%) of obese subjects participated in household chores for less than two hours. Association found to be statistically significant.

Approximately two third (63.0%) of subjects did not participate in outdoor games and 21.5% of the subjects participating in any outdoor games used to play for ≥2 hrs/week. Among this, majority (88.4%) were normal & underweight subjects. Among obese subjects, 28.3% of the subjects used to play for <2 hrs/week as compared to only 10.9% who used to play for ≥2 hours/week. Association found to be statistically significant.

More than half (55.7%) did not participate in any indoor games and about one fourth (26.5%) of the subjects involved for ≥2 hours per week. Out of this 26.5%, majority (83%) were normal & underweight subjects. Among obese, marginally higher subjects (2.1%) participated for <2hrs/week. Statistically the association has been found to be insignificant.

Likewise, nearly half (47.3%) were not involved in physical exercise. And two fifth (40.2%) were involved in ≥2 hours per week with a majority of normal & underweight subjects. Among obese, close to half (43.5%) exercised for less than 2 hrs/week. Association found to be statistically significant.

Discussion:

Findings in the present study suggest that among the overweight/obese subjects majority (85.9%) belonged to vegetarian class as compared to only 14.1 percent mixed. Statistically significant difference has been found among prevalence of obesity in vegetarians (28.1%) as compared to mixed (10.9%). D.R. Bharati et al. (2006)⁴ have also shown similar reports among 10-17 year subjects. Study conducted by R. Tiwari et al. (2006)⁵ in Gwalior reported insignificant difference in the dietary profile of the participants as far as vegetarian and mixed diet is concerned in contrast to our study. The difference can be explained on the fact that their study has been conducted among higher income group subjects as well different frequency criteria which might have been adopted for leveling subjects as non vegetarian in their study.

In the present study, more than half (51%) were taking their breakfast at home in routine. Skipping of breakfast was found to be about 14.5% in the current study. Study conducted by Augustine and Poojara (2003)¹ showed a higher prevalence of skipping breakfast among the respondents (41%). Relatively more pressure from the society to be thin might be responsible for the difference. However, in both the studies association between skipping of breakfast and obesity was not established. Almost all (97.5%) of the subjects were used to taking their lunch and dinner regularly. Three fourth (73.5%) were taking evening snacks whereas only one fourth (24%) were taking after dinner in routine. 10.8% & 5.3% used to take after lunch and before lunch snacks respectively. However, association between no. of meals/day and obesity was not established. Eating fast food on alternate basis at college and at other places was found to be common among 48.5% & 51% of the subjects respectively. 43 percent of the subjects never used to take fast food at either of these places. However, association between eating out and obesity was not established. This may be because of their wrong perception regarding fast food and reporting accordingly. Tarek Tawfik Amin et al. (2007)⁶ reported the frequency of eating out was high among overweight and obese children in Saudi Arabia as compared to our study. The difference can be explained on the basis of age group of subjects in their study. A. Sinhababu (2004)⁷ conducted a study among students of Nursing Training School, Bankura noted daily eating out behavior 33.5% to occasional 46% which is more or less similar to our study. According to our study, the participation of

overweight/obese subjects in household activities was marginally higher among all the household tasks except washing clothes though the average duration of participation in household activities was significantly higher among normal/below normal subjects as compared to that of overweight/obese. Avula Laxmaiah et al. (2003)⁸ also reported that the prevalence of overweight and obesity was significantly higher among the adolescents who did not perform any household activities. Study conducted by NIN, Hyderabad (2005)⁹ also reported that the proportion and duration of participation of adolescents in household activities were marginally higher in non obese as compared to obese. It was found that close to two third (63.0%) of the subjects had never or occasionally been involved in outdoor games and only one fourth (24.3%) of the subjects involved in daily play in the current study. No association found with the frequency of participation. The average duration of participation in outdoor games was significantly higher among normal/below normal subjects as compared to that of overweight/obese. Avula Laxmaiah et al. (2003)⁸ also reported that approximately 45% of adolescents did not participate in outdoor games. The prevalence of overweight and obesity was significantly higher among the adolescents who did not perform any outdoor games. Also the study conducted by NIN, Hyderabad (2005)⁹ reported that the proportion and duration of participation of adolescents in outdoor games were marginally higher in non obese as compared to obese similar to our study.

As evident from our results, more than half (55.7%) did not participate in any indoor games. And about one fourth (26.5%) of the subjects involved for ≤ 2 hours per week. Out of this, majority (83%) were normal/below normal subjects involved for ≥ 2 hours. Among obese, two fifth (41.3%) used to play with a majority playing for less than two hours per week. However, no association can be established. Similarly, study conducted by NIN, Hyderabad (2005)⁹ also reported the proportion and average duration of participation of non obese in indoor games was relatively higher compared obese.

In the present study, nearly half (47.2%) had never been involved in exercise, and two fifth (40.2%) were involved in ≤ 2 hours per week with a majority of normal/below normal subjects. Among obese, close to half (43.5%) exercised for less than 2 hrs/week. Association found to be statistically significant. Avula Laxmaiah et al. (2003)⁸ also reported the prevalence of overweight and

obesity was significantly higher among the adolescent who were not involved in physical activities. These findings were also supported by NIN, Hyderabad (2005).⁹ Present study reported public transport was found to be the main mode of conveyance which was marginally higher among overweight/obese (73.9%) as compared to non obese (69.9%) subjects. The difference was found to be statistically insignificant. Study conducted by NIN, Hyderabad (2005)⁹ also reported that means of transport such as school/college bus and auto rickshaw were marginally higher among obese as compared to non obese. In general, the average duration of sleep was marginally higher among normal & underweight (7.8hrs/day) than overweight subjects (7.6hrs/day) and obese (7.3 hrs/day). This finding was again supported by the study of NIN, Hyderabad (2005)⁹.

The hours past during college time or while studying at home was more or less similar among all the subjects. The average time spent on watching TV was significantly higher among the obese (4.2hrs/day) & overweight (4.0hrs/day) than among normal & underweight subjects (3.5hrs/day). Giammattei et al. (2003)¹⁰ also reported that children who spent more time watching television had a higher BMI and a higher per cent of body fat and were less physically active. This finding was also supported by the study of NIN, Hyderabad (2005).⁹ Walking hours per day were relatively more in normal/below normal (1.2hrs/day) than overweight (0.8hrs/day) or obese (0.9hrs/day) subjects. Gossip hours found to be nearly twice among obese (1.8hrs/day) as compared to normal & underweight (1.0hrs/day) and higher than that of overweight subjects (1.5hrs/day).

Conclusion:

In order to get the best outcomes from investment in the prevention of future obesity, efforts should be made to implement programmes before the age of five years, which aim to increase age-appropriate play, habitual physical activity, and healthy eating habits while also, supporting effective parenting and parental health. Similarly, alliances are urgently needed between education, healthcare systems and sporting bodies in order to re-brand what sport and activity mean.

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