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Research Article

DIETARY PATTERN OF OVERWEIGHT AND OBESE CHILDREN FROM AFFLUENT CLASS OF JAIPUR CITY

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ABSTRACT
Childhood obesity is on the rise in both developing and developed countries. The major contributor to increase in childhood obesity is the changing dietary habits and physical inactivity. This study is an attempt to find the dietary habits of obese and overweight children of Jaipur city of India. The study was conducted in five schools from Jaipur city selected on the basis of their fee structure and their willingness to participate in the study. The fee structure was made a criterion for selection of school for selection of affluent class children. Data was collected using a pre tested and standardized interview schedule. Measurement of anthropometry and dietary data was done using standardized methods. The percentage of overweight and obese children from the baseline survey was 20.89 and 5.20 according to IOTF classification. Dietary data was collected for only obese and overweight children. Food consumption pattern showed high intake of snacks replacing regular meals and packed school lunch. Energy consumption, protein and carbohydrate intakes were higher as compared to Recommended Dietary Allowances (RDA) for Indians and was highly significant at p =<0.001 between genders. Strong association was found between weight and energy intake. The affluent class school children are more vulnerable to junk foods as their buying capacity and food choices are increased manifold. Since obesity is a threat to their health measures to inculcate good eating habits and awareness regarding right food choices needs to be taken up on the national level by government, community and family level.

Keywords: *Childhood obesity, Jaipur City*

INTRODUCTION
Childhood dietary habits are important because a food culture once adopted is apparently difficult to converse (Brunner, 1998). With obesity linked to an "obesogenic environment", in urban areas, knowledge of dietary patterns of school children is important (Chopra *et al.,* 2002). Over the last three decades, the prevalence of overweight and obesity is increasing substantially (World Health Organization, 2011), and proportion of adolescents who are overweight or obese is high and rapidly increasing too (Lobstein *et al.,* 2004). Indian studies (Cherian *et al.,* 2012; Thakre *et al.,* 2011; Parimalavalli and Kowsalya, 2011; Kumar *et al.,* 2008; Rao *et al.,* 2007) are representative of prevalence rates of overweight and obesity in children and highlights the changing trends in overweight and obesity increased in the recent times.
Our modern eating environment has had an effect on the way the children eat. The changing environment by making the fast food outlets conveniently available has promoted consumption of energy dense foods high in fats and sugar.
The traditional micronutrient rich foods are being replaced by energy dense processed micronutrient poor foods (snacks) like burgers, pizza, aerated soft drinks and high sugar fruits drinks. Diet pattern plays an important role in development of overweight and obesity. Increasing numbers of households have two working parents, which limits the ability of parents to encourage participation and provide access to regular after school physical activities (Williams *et al.,* 2002). In the present scenario the problem due to changing life style is grave not only in adults but also in children. With this background in mind the present study was taken up to study the extent of faulty eating habits in overweight and obese children from affluent class schools from Jaipur city.

MATERIALS AND METHODS

Methods

Five schools of affluent class were selected, on the basis of their fee structure and their willingness to participate in the study and all the children (a total of 2499-1209 girls and 1290 boys) falling in the age group of 10-14 were screened on the basis of BMI (Body Mass Index) for overweight and obesity. Six hundred fifty-two children were selected for the detailed study.

For screening the students for overweight and obesity, anthropometric parameters like height and weight, waist and hip measurement was used. Standardized tools and methods were used for record of measurements.

Height, waist and hip circumference was measured to the nearest 0.1 cm using non-stretchable measuring tape and weight by an electronic weighing scale to the nearest 0.1 kg. The body mass index (BMI) was derived and overweight and obesity defined using IOTF international cut-offs for BMI (Cole *et al.*, 2002). For WHR the cut-off were taken as given by Hans (Hans *et al.*, 1997). WHR is the simplest measure to assess central obesity which is directly related to non-communicable diseases.

The screening of overweight and obese children was done in schools. To collect information on dietary data, personal home visits were made to all overweight and obese children. A set of pre-coded questions were prepared and the children were interviewed in the presence of their family members.

A twenty-four-hour food recall method was used, and 2 days diet recall was recorded based on elaborate questionnaire.

The children were asked to recall the exact amount of foods taken during the past 24 hours. Two days from the week were selected for this purpose, one school going day and the other was a holiday. The usual food eaten at different meal times like breakfast, packed school lunch, lunch, tea, dinner etc. was taken into account.

The data was tabulated, classified and analyzed using SPSS 19.0 version. Ethical clearance was not required as this was not an intervention study and no biochemical parameters were taken into consideration.

RESULTS AND DISCUSSIONS

From five affluent schools, a total of 2499 children (1209 girls and 1290 boys) in the age group of 10-14 were screened. The study was conducted in two phases-Phase 1-baseline study where all 2499 children were screened for overweight and obesity and phase 2 where a detailed study was done on overweight and obese children.

According to IOTF cut off for BMI, the children were categorized as normal (57.94%) overweight (20.89 %) and obese (5.20%) (Figure 1).

Based on WHR classification more than 44 % girls were categorized as ‘at risk’ and as less as 10.62 % boys were ‘at risk’.

Waist to Hip ratio is an indicator of a risk or likelihood to develop degenerative diseases like diabetes, hypertension, and dyslipidemia (World Health Organization, 2011).

Based on the grades of obesity, maximum number of children were categorized as overweight-girls 85.02% and boys 75.58%, obesity and morbid obesity was common in boys (21.82% and 2.60%) than girls (14.23% and 0.75%).

Our gender based results were consistent with several other studies (Guo *et al.*, 2012; Fatemah *et al.*, 2012; Dunacn *et al.*, 2011; So *et al.*, 2011; Dhkar and Singh, 2012; Goyal *et al.*, 2010; Marwaha *et al.*, 2006).

The WHR of overweight and obese children were found to be high in case of 85.77 % girls and 27.27 % boys (Figure 2). Girls were found to be more at-risk than boys. High correlation between BMI and WHR were observed making these children at double risk.

WHR among girls indicates a strong positive correlation with BMI which was highly significant (*P* value 0.01).

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Table 1: Association of Age and BMI with Factors Related to Food Consumption Pattern in Boys

Spearman's RHO		**Age**	**BMI**	**Meals at Home**	**Meals Skipped**	**How Often**	**Snacks**	**Eating Binges**	**Food Cooked By**	**Eating out**
Age	Correlation Coefficient	1.000	.413**	.083	-.121*	.003	.089	.137**	.007	.016
BMI	Correlation Coefficient		1.000	.144**	-.092	.124*	-.044	.095	.127*	.078
Meals at Home	Correlation Coefficient			1.000	.036	-.035	-.254**	.069	.033	.045
Meals Skipped	Correlation Coefficient				1.000	.158**	.210**	.140**	-.070	.034
How Often	Correlation Coefficient					1.000	.550**	.044	.447**	.279**
Snacks	Correlation Coefficient						1.000	.136**	.355**	.179**
Eating Binges	Correlation Coefficient							1.000	.118*	-.052
Food Cooked by	Correlation Coefficient								1.000	-.056
Eating out	Correlation Coefficient									1.000

Table 2: Percent Distribution of Children According to Food Consumption Pattern

	Age Group	10-11 years	11-12 years	12-13 years	13-14 years	Total	
						Girls	Boys
		(n=136)	(n=164)	(n=234)	(n=118)	267	385
Meals at Home	Twice Daily	33.8	23.2	26.9	28.0	29.2	26.5
	Thrice Daily	41.9	41.5	42.7	42.4	42.7	41.8
	More Than Thrice Daily	22.8	29.9	29.1	28.0	25.5	29.4
Meals Skipped	Breakfast	12.5	14.6	10.3	15.3	16.9	9.9
	School Lunch	14.7	18.3	20.1	10.2	18.0	15.8
	Home Lunch	18.4	23.2	29.5	27.1	21.0	28.1
	Evening Snack	25.7	24.4	26.5	31.4	25.8	27.3
	Dinner	28.7	19.5	13.7	16.1	18.4	19.0
Skipping Meals	Once Daily	36.8	32.9	24.4	40.7	31.8	32.2
	Twice Daily	19.9	19.5	33.8	28.0	30.3	23.4
	More Than Twice Daily	41.2	32.9	30.3	30.5	32.6	23.6
	Less Frequently	2.2	14.0	5.1	0.0	4.9	16.6
	Never	0.0	0.6	6.4	0.8	0.4	4.2
Having Snacks	Once Daily	36.8	39.0	24.8	33.9	33.3	31.9
	Twice Daily	31.6	39.0	40.6	39.8	40.1	35.1
	More Than Twice Daily	31.6	22.0	28.2	26.3	26.6	27.3
Eating Binges	Yes	69.9	77.4	66.2	72.9	72.7	69.9

Table 3: Age and Gender wise Comparison of Mean Intake of Macronutrients with RDA

		10-11 years			11-12 years			12-13 years			13-14 years		
	Gender	**RDA**	**Mean±SD**	**'t' Value**	**RDA**	**Mean±Sd**	**'t' Value**	**RDA**	**Mean±Sd**	**'t' Value**	**RDA**	**Mean±Sd**	**'t' Value**
Energy (kcal/d)	Girls	2010	3078.06±986.23	6.719**	2010	3356.42±906.88	11.246**	2010	3813.62±1172.92	15.020**	2330	3417.79±926.15	8.222**
	Boys	2190	3692.60±1377.86	3.576**	2190	3777.60±1248.65	12.587**	2190	3923.43±151.73	13.059**	2750	3861.33±1364.57	6.676**
Protein (g/d)	Girls	39.9	96.84±21.91	17.473**	39.9	111.45±30.38	19.060**	39.9	120.15±23.05	35.613**	51.9	106.10±29.71	12.770**
	Boys	40.4	113.30±27.00	25.795**	40.4	125.07±27.69	30.453**	40.4	122.35±26.12	35.720**	54.3	122.23±24.91	22.652**
Carbohydrates (g/d)	Girls	383.8	386.02±142.51	1.974*	383.8	430.60±137.67	0.183^{NS}	383.8	473.84 401.78	3.357**	440.6	441.41 176.98	0.032^{NS}
	Boys	428.3	471.81±137.97	16.211**	428.3	487.87±146.90	16.970**	428.3	461.77 146.98	17.374**	531.35	470.72 139.90	3.635**
Fat (g/d)	Girls	35	153.87 ±110.66	7.285**	35	158.51±109.36	9.175**	35	170.11±118.11	11.777**	40	149.82±84.06	9.145**
	Boys	35	166.63±124.91	9.997**	35	156.67±106.86	11.272**	35	180.09±146.47	11.439**	45	149.82±84.06	11.042**
Fiber (g/d)	Girls	30	21.60 ±8.41	6.770**	30	25.10 ±9.37	4.242**	30	27.20 ±8.74	3.290**	30	23.43 ±9.35	4.914**
	Boys	30	24.61 ±9.18	5.565**	30	26.04 ±9.49	4.122**	30	26.74 ±9.128	4.032**	30	27.36 ±8.85	2.471**

** Highly significant- P value< 0. 001; * Significant P value< 0.05; NS: Non-significant

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A detailed questionnaire was developed to study the food habits of the overweight and obese children. Based on which it was found that food habits (Table 3) of the children indicate that 20 % girls were vegetarian as compared to 10 % boys, 13 % girls and boys were ova-vegetarian and 66 % girls and 76.62 % boys were non vegetarian.

Food consumption pattern showed high intake of snacks instead of regular meals and packed lunches in schools, eating out was common in children and skipping of meals of one or more meals was common. It was found that skipping of meals had a negative association with the age of boys and it was found to be highly significant (Table 1) Eating out was more common in boys than girls and it increased with age. On an average 72.7% girls and 69.9 % boys agreed that they had craving for food and had eating binges. Eating binges had a highly significant correlation with skipping of meals in both genders and in case of boys it was correlated with snacking too.

Results of the intake of the three macronutrients and energy i.e. protein, carbohydrates and fats are indicated in Table 3.

The percentage of energy consumed as compared to RDA's (Recommended Daily Allowances) for Indians was high. The percent consumption of all macronutrients were significantly higher in all age groups and both genders (Table and Figure) as compared to RDA. The mean fiber intake of children was significantly lower for all the participants of both the genders in all the age groups, when compared to the RDAs. The mean fiber intakes were comparable for both the genders except in the age group of 13-14 years (t-2.321, $p < 0.05$).

The results of the present study are similar to a study from Iran carried out on 140 girls in the age group of 11-13 years. The mean energy intake of girls was found to be 3357 kcal/d. The mean protein intake was 66.3±20.7 g/d, carbohydrate was 322.5±55 g/d and fat intake was found to be 98.5±26 g/d (Rouhani *et al.*, 2012). Energy and carbohydrates had a significant 2-tailed correlation ($p<0.01$) with age in girls. No significant correlation could be established with BMI of girls and protein, carbohydrates and fats. However, a strong positive correlation was observed in energy with protein intake, carbohydrate intake and fats ($p<0.01$).

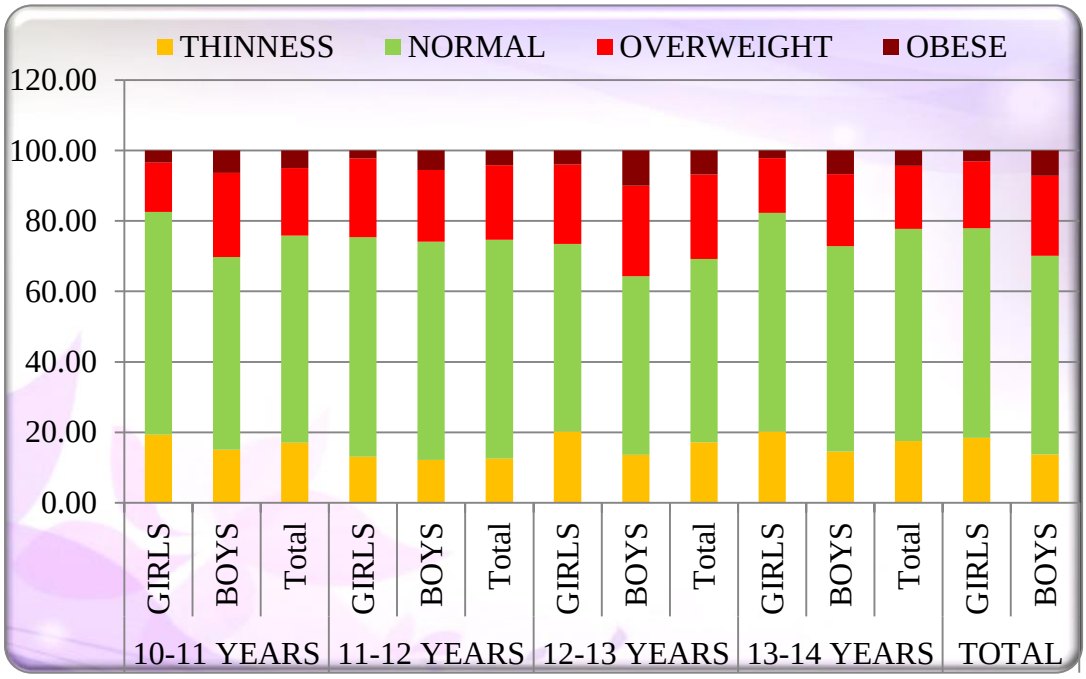

Figure 1: Age and Gender Wise Percent Distribution of Overweight and Obese Children on the Basis of BMI

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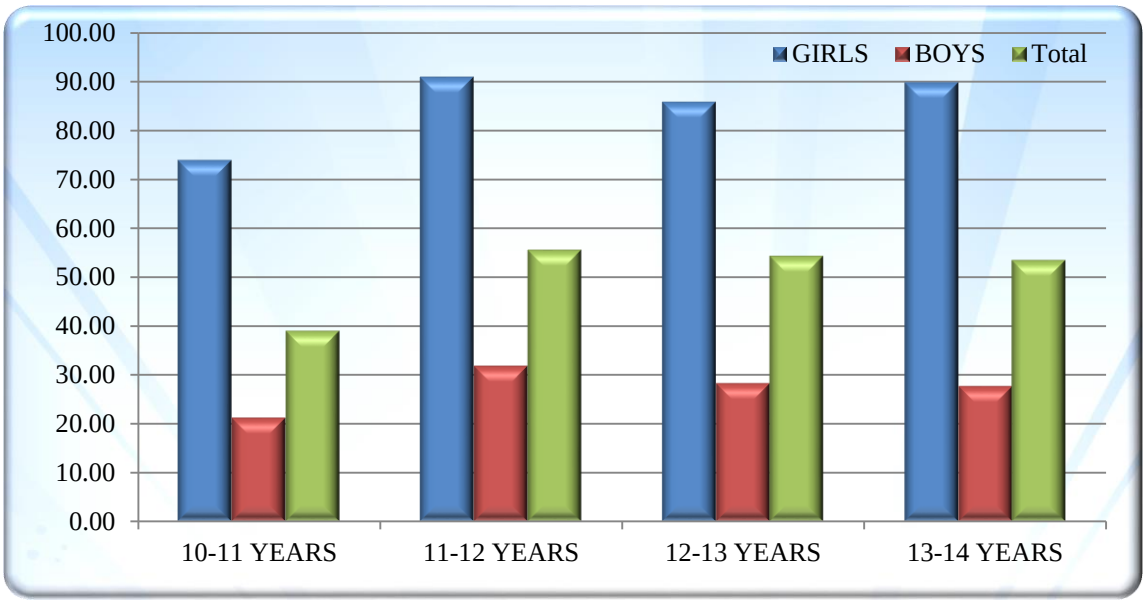

Figure 2: Age and Gender Wise Percent Distribution of Overweight and Obese Children 'at Risk' on the Basis of WHR

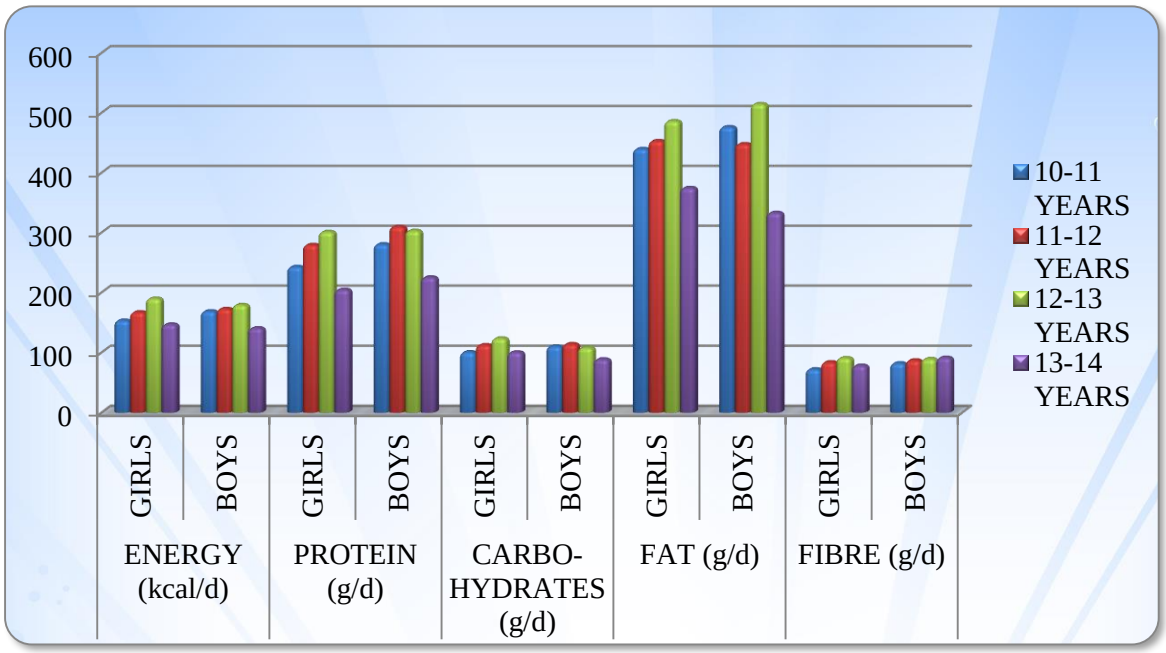

Figure 3: Age and Gender Wise Macronutrients as Percent of RDA's for Children

Conclusions

Childhood obesity has been recognized as an increasing health problem worldwide (Maria and Teresa, 2013) and is one of the most serious public health challenges of the 21st century (World Health Organization, 2013). It is evident from the above study that shifts in eating pattern of children are major contributor to obesity. Also food choices and replacement of regular food with energy dense and low nutrient snacks and drinks is observed in the study. Frequent habit of eating out was common in children and skipping of meals of one or more meals was common.

When compared with RDAs for protein and carbohydrate and fat the mean intakes were found to be significantly higher for all the age groups of both the genders. Identification of faulty behaviours in terms of feeding and physical activity can highlight strategies to be considered while planning programs to combat childhood obesity of specific ethnic groups.

List of Abbreviations Used

BMI: Body Mass Index
IOTF: International Obesity Task Force
WHR: Waist Hip ratio
RDA: Recommended Dietary Allowances

Competing Interests

Both the authors declare that they have no competing interests.

Authors Contribution

Both the authors have contributed substantially in the research study. NS had designed the major part of the study, critically analyzed each and every aspect of the final outcomes and has finally contributed in finalizing the manuscript. TKS did the entire field survey, data compilation, tabulation, and drawing the results through SPSS software, and finally interpretation and report writing.

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