Study of Obesity in the Children (5-15 years) in Selected English Medium Schools, Berhampur with Special Reference to Their Lifestyle & Family Pattern

Abinash Routray[1], Seshdev Panigrahi[2], Suchitra Rani Haldar[3], D. Shobha Malini[4], Niranjan Mohanty[5]

[1]Paediatric Specialist, Department of Health and Family Welfare, District Head quarter Hospital Khurda, Odisha, India.
[2]Associate Professor, Department of Radiodiagnosis, M.K.C.G. Medical College & Hospital Berhampur, Odisha, India.
[3]Assistant Professor, Department of Community Medicine, M.K.C.G. Medical College & Hospital Berhampur, Odisha, India.
[4]Associate Professor, Department of Community Medicine, M.K.C.G. Medical College & Hospital Berhampur, Odisha, India.
[5]Former Professor & HOD Department of Paediatrics, M.K.C.G. Medical College & Hospital Berhampur, Odisha, India.

Abstract

Background: In this study, we wanted to estimate the prevalence of overweight and obesity among school-going children aged between 5 and 15 years in the English medium school of Berhampur town, identify the factors influencing overweight and obesity and evaluate the lifestyle & family patterns of these children.

Materials and Methods: This study was conducted in M.K.C.G Medical College, Odisha, after obtaining ethical committee clearance from the institutional ethical committee, among students (5-15 yrs.) of English medium schools of Berhampur city from December 2013 to November 2015.

Results: During the year 2015 prevalence of overweight and obesity was 7.6% in E. M. school children of Berhampur city.

Prevalence of overweight and obesity was slightly more in boys (7.9%) than girls (7.4%).

Conclusions: The education of parents and family income had a direct relationship to childhood obesity. Parental obesity had a definite influence on the obesity of children. An increase in the frequency of snack intakes like chocolates, sweets, ice creams, bakery products and other fast foods was more commonly seen in obese children than in non-obese children.

Keywords: High School Children, Childhood Obesity, Prevalence, Influencing Factors, BMI, Parental Obesity, Sedentary Lifestyle.

Background

It is now well recognized that there is a global epidemic of obesity affecting all ages[1]. Reports from countries such as the United States, Israel and Canada have shown that overweight and obese children have a higher prevalence of iron deficiency anaemia than normal-weight children and intakes of other micronutrients such as folate, vit. D, calcium, magnesium and vitamin E were sub-optimal among obese children[2].

Social, educational, economic, cultural, psychological, and personal factors along with the availability of food play a key role in "food behaviour". WHO has also emphasized the urgent need of understanding the prevalence trend and influencing factors of childhood obesity[3]. Results of such studies are helpful in the development of intervention strategies to halt the emerging epidemic of childhood obesity. The success of adult obesity prevention is firmly based on the prevention of childhood obesity.

Aim and Objectives

1. To estimate the prevalence of overweight and obesity among school-going children aged between 5 and 15 years in English medium schools of Berhampur town.
2. To identify the factors influencing overweight and obesity.
3. To evaluate the lifestyle & family patterns of these children.

Materials and Methods

This study was conducted in M.K.C.G. Medical College, Odisha, after obtaining ethical committee clearance from the institutional ethical committee, among students (5-15 yrs.) of English medium schools of Berhampur city from December 2013 to November 2015.

Sampling

Previous studies have shown that the prevalence of overweight in children and adolescents was 12 to 15%. Therefore considering 12% of the prevalence by using the following formula, the sample size was determined.

$n = 4 pq/d2$, here p=prevalence of overweight = 12%.

q = normal weight = $100 - 12 = 88\%$.

d = admissible error = 20% of p=2.4%.

Therefore 4x12x88/2.4=734 (a minimum number of samples was required)[4].

To represent the 4 age groups of both sexes, it was decided to study 1000 children.

Inclusion Criteria

1. All the children between 5-15 years of age
2. Both the sexes were between 05-15 years of age.
3. Selected English Medium School Children.

Exclusion Criteria

a. Children having a chronic illness, endocrinal problems, physical and mental defects etc.
b. Children aged below 05 years and above 15 years.
c. Children who did not get consent from their parents.
d. Children outside Berhampur City.

Statistical Analysis

The data collected was tabulated in accordance with variables and analysed. Interpretations were drawn with appropriate statistical analysis. Data analysis was conducted at SPSS/PC programme (version 13 USA). The results for continuous variables were given as mean ± standard

deviation and proportions as percentages. Both univariate and multivariate analyses were performed to identify the influencing factors of childhood obesity. The chi-square test was used for categorical data and the odds ratio was calculated wherever required. The difference between the groups was assessed by 2 tests for proportions. For all the tests, P-value of 0.05 or less was considered for statistical significance.

Results

Population coverage

Three English Medium schools in Berhampur city were assessed for the evidence of obesity. Data regarding age, sex, BMI, and type of school children were presented in tabular form.

Table 1: Age and sex-wise distribution

Age (yrs)	Boys n (%)	Girls n (%)	Total n (%)
5 to 8	146 (35.8)	181 (35.1)	327 (35.4)
9 to 11	146 (35.8)	157 (30.5)	303 (32.8)
12 to 13	91 (22.3)	144 (28.0)	235 (25.5)
14 to 15	25 (6.1)	33 (6.4)	58 (6.3)
Total	408 (100)	515 (100)	923 (100)

Out of 923 students studied, 42.2% were boys (408) and 55.7% were girls (515), which gave a M: F ratio of 1:1.26. The age of our subjects ranged from 05 to 15 years. 35.4% were 13 years, 32.8% were 14 years, 25.5% were 15 years and 6.3% were 5 to 12 years.

Among our subjects, 389(43%) were studying at De Paul E. M. School, while 292(31%) were studying in a Convent school and the remaining 242(26%) were studying at K. C. Public School.

Table 2: Mean body mass index for boys and girls

Age (years)	Boys (Mean ± SD)	Girls (Mean ± SD)
5 to 8	15.80 ± 2.65	17.02 ± 2.87
9 to 11	16.47 ± 2.37	17.57 ± 2.68
12 to 13	16.96 ± 2.72	17.85 ± 2.57
14 to 15	17.29 ± 2.27	18.70 ± 3.53

This mean BMI at the age of 5 to 8 years for boys was 15.80±2.65 and for girls, it was 17.02±2.87, at the age of 9 to 11 years for boys 16.47±2.37 and girls 17.57±2.68. At the age of 12 to 13 years for boys 16.96±2.72 and girls 17.85±2.57, at the age of 14 to 15 years for boys 17.29±2.22 and girls 18.70±3.53.

BMI tends to increase with increasing age. BMI increased with age both in boys and girls. The BMI of girls was more than the BMI of boys of all ages

Table 3: Prevalence of overweight and obesity

Gender	No.	Non-overweight / non obese n (%)	Overweight n (%)	Obese n (%)	Overweight and obese n (%)	95% CI
Boys	408	376 (92.2)	28 (6.9)	4 (1.0)	32 (7.9)	5.2 – 10.6
Girls	515	477 (92.6)	32 (6.2)	6 (1.2)	38 (7.4)	5.1 – 9.7
Total	923	853 (92.4)	60 (6.5)	10 (1.1)	70 (7.6)	5.8 – 9.4

A total of 923 high school children of Berhampur city were assessed for overweight and obesity on gender and age-specific BMI criteria.

Out of 923 children examined, 70 were overweight and obese. Thus, the prevalence of overweight and obesity was 7.6% among high school children.

Prevalence of overweight was 6.9% and obesity 1% in boys and for girls overweight was 6.2% and obesity was 1.2%.

Few contemporary studies conducted in different parts of India on school children have come out with a prevalence of obesity ranging from 6.2 – 7.5%

In a study conducted in New Delhi by Sheetal Monga on 1238 school children of 7 to 9 years of age by using NHANES III (National Health and Nutrition Examination Survey) criteria, prevalence of obesity was 6.22%[5].

In a study on 10-16 year old affluent school children in Delhi in 2002, the prevalence of obesity was 7.4%[6]. A study on 5-15 years old 3861 school children showed a prevalence of obesity as 7.56%.

A study from MS University of Baroda showed that the prevalence of overweight and obesity was 8.5% and 1.5% respectively. Among overweight, 8% were boys and 9% were girls. Among obesity 1.4% were boys and 1.7% were girls[7].

On the other hand, Mishra *et al* have recently reported a prevalence of 18% in New Delhi School Children and a study by Ramachandran *et al* in Chennai suggests the trend of higher prevalence in metropolitan cities[8].

Variations in the prevalence of obesity in children were reported in studies, which were made at different times, in different places with different parameters. Hence an exact comparison conclusion seems inappropriate. However, they give a reasonable idea regarding the prevalence of childhood obesity in different parts of the country.

Prevalence of overweight and obesity at the age group of 13 years was 7.6%, in 14th year 7.3%, at 15th year 6.4%, and in the 16th year it was 13.8% which was highest among all the other ages. An increase in the prevalence of obesity by age was seen in the study by Ramachandran of Chennai school children.

Prevalence of Obesity by Sex

In this study, the boy's prevalence of overweight and obesity was 6.9% and 1% respectively, similarly, in the girls, it was 6.2% and 1.2% respectively.

In this study, there was not much difference in the prevalence of obesity by sex-wise distribution in these age groups. A higher prevalence of obesity in girls than boys was reported by Jasvinder Singh Sangha in a study of 7-9 year old children of Punjab[9].

In contrast, a few studies have come out with a lower prevalence of obesity in girls than in boys.

Strata of the students were heterogeneous between K.C.P.S, C.S and D.E.P.M.S schools. Here an attempt was made to know the difference in prevalence among these 3 different schools.

The prevalence of overweight and obesity in K.C.P.S children was 5.4%, it was increased to 5.8% in C.S. children and reached a peak of 10.3% in D.E.P.M.S. children. This difference was statistically highly significant ($P<0.05$)[10]. The socio-economic background of the students seems to play a role in the determination of obesity.

Table 4: Qualification

Qualification	Total No.	Normal n(%)	OW/Obese n(%)
0 (no education)	55	54 (98.2)	1 (1.8)
1 (till 7th standard)	345	329 (95.4)	16 (4.6)
2 (PUC i.e., pre-University course till 12th)	390	357 (91.5)	33 (8.5)
3 (Degree and above)	133	113 (85.0)	20 (15.0)
Total	923	853	70
Association between father's education and obesity of children			
$X^2 = 17.86$ P<0.05, Sig.			
Qualification	Total No.	Normal n(%)	OW/Obese n(%)
0 (no education)	178	174 (97.8)	4 (2.2)
1 (till 7th standard)	289	270 (93.4)	19 (6.6)
2 (PUC i.e., pre-University course till 12th)	386	348 (90.2)	38 (9.8)
3 (Degree and above)	70	61 (87.1)	9 (12.9)
Total	923	853	70
Association between mother's education and obesity of children			
$X^2 = 13.24$ P<0.05, Sig.			
SES	No. of subjects	Normal n(%)	OW/Obese n(%)
I	76	58 (76.3)	18 (23.7)
II	206	176 (85.4)	30 (14.6)
III	272	256 (94.1)	16 (5.9)
IV	354	348 (98.3)	6 (1.7)
V	15	15 (100)	-
Total	923	853	70
Association between family income and obesity of children as per BG Prasad classification			
$X^2 = 62.29$ P<0.001, HS			

Education status among fathers of obese and non-obese children was found to be different. For 20 (15%) of obese children (cases) and 113 (85%) of non-obese children (controls), father's education was college and above. For 33 (8.5%) cases and 357 (91.5%) controls, father's education was up to PUC.

For 16 (4.6%) cases and 329 (95.4%) controls, father's education was up to 7th standard, for 1 (1.8%) case and 54 (98.2%) controls, father's education was nil.

The frequency rate of obesity in children whose father's education was college and above was higher than in children whose fathers studied lesser qualifications.

The association between the father's education level and the occurrence of obesity in children was significant statistically (P<0.05).

For 9 (12.9%) of obese children (cases) and 61 (87.1%) of non-obese children (controls), mothers' education was college and above. For 38 (9.8%) cases and 348 (90.2%) controls, mother's education was up to PUC. For 19 (6.6%) cases and 270 (93.4%) controls, mother's education was

up to 7th standard and for 4 (2.2%) cases and 174 (97.8%) controls, mothers' education was nil. As education increases the prevalence of obesity increases. The association between mother's education and the prevalence of obesity in children was statistically significant (P<0.05).

Discussion

WHO (1997) reports that the level of education appears to be inversely related to the body weight in developed countries. Unfortunately, little was known about the relationship between education level and obesity in developing countries.

Socio-economic status was classified into 5 grades as per the modified B.G.Prasad's criteria[10]. It was based on the per capita income of the family. The coefficient of correction factor CCF = The value of all India consumer price index X 4.93/100. (23.7%) children were overweight/ obese and they belonged to class I SES, 30 (14.6%) obese children belonged to class II, 16 (5.9%) belonged to class III, 6 (1.7%) belonged to class IV and none were overweight and obese in class V.

The association between family income and the prevalence of obesity in children was statistically significant (P<0.001).

This shows that as the socio-economic status improves the prevalence of overweight and obesity increases. A study by Ramachandran showed a higher prevalence of obesity in the higher socio-economic groups.

Parental Obesity

Parental obesity was considered as a criterion to know the genetic influence on childhood obesity. In 18.4% (48) of children who were obese, there was a parental history of obesity, whereas only in 3.3% (22) of overweight and obese children parental obesity history was not present.

Influence of parental obesity on childhood obesity observed here was statistically significant (P<0.001).

Rajalaxmi in 2000 reported that the risk of childhood obesity increasing has a direct relationship with parental obesity[11].

A study by Sheetal Monga among 7–9-year-old children in New Delhi showed family history as an important factor in the development of obesity in children.

Similarly, Meenu Singh and Madhu Sharma in a study of Punjab school children reported that positive family history of obesity contributed significantly to childhood obesity[12].

A study conducted by Al-Rukban in Saudi Arabia on male adolescents in 2001-02 showed that family history was associated with adolescent obesity[13].

All these studies were similar to this study and confirmed the influence of parental obesity on children's overweight and obesity.

Diet and Obesity

Dietary habits of cases (overweight and obese) and controls (non-obese) were compelled to analyze the influence of diet on obesity.

Among the overweight and obese children, 9.4% were vegetarians, 10.6% were Eggetarians and 5.8% were non-vegetarians. The difference observed in the dietary habits between cases and controls was found to be statistically insignificant (P=0.07).

A study by Yamini Ramachandran in Kerala reported a slightly higher prevalence of obesity among non-vegetarians than among vegetarians; however, the difference was statistically insignificant.

Commonly used snacks by children were arbitrarily categorized into 3 varieties for

convenience

1. Chocolates/ Sweets / Ice creams.
2. Bakery products
3. Soft drinks/other fast foods.

Here an attempt was made to know the association between frequency of consumption and obesity. Frequency of chocolates, sweets, ice creams, biscuits, puffs/ samosa, chips, cakes etc. Consumption of these was more than 3 times a week for 26.4% (51) of obese children and only 2.6% (19) of non-obese children.

The association between an increase in the frequency of consumption and the development of obesity was apparent and statistically significant (P<0.001).

Studies have shown that dietary varieties of sweets, snacks, condiments and entrées were positively associated with body fatness whereas a variety of vegetables were negatively associated[14].

Between 7 and 15 years of age, an excess of approximately 165 Kcal could lead to a theoretical 3 kg excess weight largely as fat per year. Worldwide eating foods away from home have been implicated as a cause of increased energy intake[15,16].

Of children who consumed more fatty foods and more in frequency, 87.1% were overweight and obese, whereas for those who did not consume fatty foods only 4.8% were overweight and obese. The above finding was statistically significant (<0.001).

Studies have shown an association between high energy, high fat and junk foods as one of the influencing factors of obesity in childhood. Studies have shown a positive relationship between fat intake and adiposity in children. Soft drink intake has been associated with the epidemic of obesity and type 2 DM in children.

Moreover, diets high in fats are likely to be energy-dense and highly palatable. This combination leads to increased energy intake and increased body mass index.

Outlets have contributed to childhood obesity. All these studies were similar to our study and show there was an association between snacking of high energy, foods and obesity.

Physical Activity and Obesity

Obesity is mainly a product of energy imbalance. The amount of energy spent determines the storage of fat. The time spent on activities like walking, cycling, playing outdoor games, swimming and physical training in schools and any other such more energy spending activities are considered as physical activity.

Accordingly, 96.5% of non-obese children and only 3.5% of overweight /obese children were involved in more physical activities. As physical activity increased, a decrease in the prevalence of obesity was seen. This difference observed was statistically significant (P<0.001).

Many studies have said that an increase in physical activity was associated with decreasing BMI in girls and overweight boys, while conversely, an increase in inactivity was associated with increasing BMI in girls, which was similar to this study.

94.5% of children who were involved more in household activities were non-obese and 5.5% of these children were obese. It shows that more involvement in physical activities like household activity leads to less chance of obesity. The difference observed was statistically significant (P<0.001).

Association between Sedentary Activity and Obesity of Children

Sedentary activities like attending school and tuition, reading, homework, sleep, TV

viewing etc., influence obesity. The prevalence of obesity has increased corresponding to the duration of sedentary activity.

Beaton G.H. (1976) has pointed out many studies showings almost characteristic differences in the recreational and leisure activities of obese and non-obese persons, the former choosing activities involving less energy expenditure.

In a report by Ramachandran, the percentage of overweight was high in lower quartiles of physical activity. A study by Yamini Ramachandran has come out with the opinion that a sedentary lifestyle and lack of physical activity was the contributory factor to the prevalence of obesity.

Lack of physical activity as one of the most influencing factors of childhood obesity was well documented in the literature.

Watching TV

TV viewing has become a routine for children and, is socially accepted, playing computer games is also an increasing trend. These sedentary activities were associated with the development of obesity in children. 13.7% (60) among 437 TV viewing children were obese and only 2.1% (10)

among 486 non-TV viewers were obese. This observation was statistically significant (P<0.001).

This could be because of the changing lifestyle and working parents with no one to play especially in the case of a single child.

A study of TV viewing by William H. Dietz on 6-17 year old children showed that children who watched more TV experienced a higher rate of prevalence of obesity than children watching less TV[17].

A study by Rose Anderson on 16 to 18 year old children in the USA showed that boys and girls who watched 4 or more hours of TV each day, had greater body fat and greater BMI than those who watched less than 2 hours per day[18].

Studies in Punjab by Meenu Singh and Madhu Sharma reported that watching TV or video for more than one hour daily contributed to childhood obesity.

Obesity incidence was 8.3 times higher for youth watching more than 5 hours of television per day compared with those watching for 0 to 2 hours[19].

All these observations along with this study, confirm the positive association between viewing television/ playing computer and childhood obesity.

Table 5: Multivariate Analysis

Effect	Likelihood ratio tests			Significance
	Chi-Square	df	P-value	
Indoor	3.10	1	0.078	S
Outdoor	27.31	1	0.000	HS
Physical	196.60	1	0.000	HS
Household	0.02	1	0.896	NS
TV	12.58	1	0.000	HS
Food type	3.45	2	0.179	NS
Fatty food	16.99	1	0.000	HS
Snacks	6.65	1	0.010	S
F h/o obese	9.90	1	0.002	S
Pocket money	9.87	1	0.002	S
Father's qualification	5.61	4	0.230	NS

Fathers occupation	6.32	6	0.389	NS
Mothers qualification	4.10	3	0.215	NS
Mothers occupation	1.63	4	0.804	NS
SES	16.55	4	0.002	S
School type	34.50	2	0.000	HS
S: Significant, HS: Highly significant, NS: Not significant				

Obesity may be due to multifactorial aetiology. The variable shown in this study has a significant association with obesity in univariate analysis. Hence an attempt has been made to ascertain the interaction of effects by multivariate analysis.

In the present study, dependent variable has 2 values of regression. Independent variables were both qualitative and quantitative.

The independent variables for the study were indoor games, outdoor games, physical activity, household activity, TV viewing, type of food, fatty food, snacks, family history of obesity, pocket money, father's qualification, father's occupation, mother's qualification, mother's occupation, socioeconomic status and school type.

Analysis revealed that indoor games, outdoor games, physical activity, TV viewing, fatty food, snacks, family history of obesity, pocket money, socioeconomic status, and school types were strongly associated with obesity.

Household activities, type of food, fathers and mothers' qualifications, fathers and mothers occupation, though not significant have indicated indirect influence on childhood obesity.

Limitations

The study should have included more number of schools of different levels like Govt, Aided, Non-aided etc.

Conclusion

The education of parents and family income has a direct relationship to childhood obesity. Parental obesity has a definite influence on the obesity of children. An increase in the frequency of snack intakes like chocolates, sweets, ice creams, bakery products and other fast foods was more commonly seen in obese children than in non-obese children. An increase in the duration of physical activity helps reduce the problem of obesity. An increase in the duration of sedentary activity contributed to obesity in children.

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