International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 8; Issue 05 (A); May 2019; Page No.18574-18578
DOI: http://dx.doi.org/10.24327/ijcar.2019.18578.3555

Research Article

STUDY OF OBESITY IN ADOLESCENT SCHOOL GOING CHILDREN OF CUTTACK TOWN WITH SPECIAL REFERENCE TO THEIR LIFESTYLE AND FAMILY PATTERN

Bibhu Prasad Nayak [1], Mangal Charan Murmu*[2] and Anshuman Saha[3]

Department of Pediatrics, S C B Medical Collage, Cuttack, Odisha, India

A R T I C L E I N F O

Article History:
Received 4th February, 2019
Received in revised form 25th March, 2019
Accepted 23rd April, 2019
Published online 28th May, 2019

Key words:
Body Mass Index, Adolescent, Obesity, Lifestyle, Family pattern.

A B S T R A C T

Introduction: Indians are an ethnic group at high risk for central obesity, type2 diabetes mellitus and dyslipidemias, all resulting from a state of insulin resistance and contributing to future cardiovascular morbidity and mortality. Mortality from cardiovascular disease is expected to rise by 60% and overtake deaths from infectious disease by 2020.Though in India under nutrition is one of the major problems threatening the fabrics of child health, childhood and adolescent obesity is steadily upcoming. BMI is the preferred method of expressing body fat percentile from clinical measurements for determining obesity.
Material & Method: The study was conducted over a period of two years from October 2016 to September 2018 at S C B Medical College, Cuttack. The patient fulfilling the inclusion criteria were taken into study.
Result: The present study shows the prevalence of obesity and overweight to be 3.44% and 10.5% respectively. Obesity is more prevalent in children of higher socioeconomic status family than those in the lower ones.
Conclusion: As majority of the chronic diseases in adults have its origin in childhood, intervention in early childhood is essential to curb the mortality associated.

INTRODUCTION

Obesity is defined as a condition of abnormal or excessive fat accumulation in adipose tissue , to the extent that health may be impaired[1] .Rapid globalisation, increasing living standards, sedentary habits, altered eating patterns has lead to an increase in prevalence of obesity in India. A variety of measurement can be made in children to determine the degree of overweight, the proportion and distribution of body fat. They are Body Mass Index (BMI), Skin Fold Thickness (SFT), Waist circumference, Waist Hip Ratio (WHR), Bioelectrical impedance analysis, Dual energy X-ray absorptiometry (DEXA), Air displacement plethysmography (BOD-POD). Cut off value for obesity is 30% body fat in girls and 20-25% body fat in boys. There is no Indian reference data and its has no significant advantage over BMI[2]. Waist circumference is highly sensitive and specific measure of central obesity. Cut off value for risk -102cm in adult male, 88cm in adult female, 71 cm in pre-pubertal children. Disadvantage is there is no Indian data[3].waist hip ratio i.e. waist circumference /hip circumference>0.9 in women,>1in men is central obesity. No added advantage of WHR over waist circumference in assessing central obesity[2].

BMI is the most practical way of measuring and comparing obesity for clinical and epidemiological purposes.

Corresponding author:* **Mangal Charan Murmu
Department of Pediatrics, S C B Medical Collage, Cuttack, Odisha, India

BMI= Weight in Kg/(height in meter^2). An Indian study by Agarwal *et al* , has described indices including BMI and skin folds for affluent Indian school children[3].however the sample size of the study is probably not large enough to generate internationally accepted standards[4]. The two BMI charts that can be used as a reference, for Indian children as of now are 1.The NCHS/CDC charts from USA[5]. The American obesity association uses the 85th percentile of BMI for age and sex as a reference point for weight and 95th percentile for obesity in children. 2. BMI standards obtained by a large internationally representative sample from six different countries (not India) with widely differing prevalence rates for obesity[6]. Age and sex specific BMI cut off points for defining overweight and obesity in children have been derived by identifying percentiles in children analogous to adult BMIs of 25Kg/m^2 and 30 Kg/m^2 respectively. These are referred to as IOTF cut off points and are now recommended as standards for international comparison of data[7].

At least 30% of obesity begins in childhood. Conversely 50%-80% of obese children become obese adults[8]. Many longitudinal studies have demonstrated convincingly, the substantially higher risks of childhood onset obesity[9,10]. In the Harvard study, morbidity from cardiovascular disease, diabetes, obesity related cancers and arthritis was 50% -100% higher in obese individuals who were also obese as children and generally the cardiovascular mortality in such individuals was doubled[11]. A study of children between 5 to 15 years of age in Maryland extending up to 52 years, showed a positive

relationship between increased relative weight and adult mortality for pre pubertal boys and girls of post pubertal female adolescent[12].These studies indicate an increased risk for mortality with increased weight in childhood. A number of studies have shown that high birth weight is positively related to subsequent fatness[13] but higher prevalence of obesity is also seen in lower birth weight the U or J shaped relationship[14]. The tendency for indicators of adiposity such as BMI to fall around the age of one year, and then increase again by 5th year is referred as adiposity rebound. The earlier the rebound the greater the risk of subsequent obesity, although what drives the timing of adiposity rebound remain obscure[15]. However the most important predictor of adult obesity appears to be adolescent weight and changes of BMI during this time[16]. The older a child is, when he or she remains overweight, the greater the likelihood that overweight will remain in adulthood. The prevalence of diabetes, CHD and other lifestyle disorder is increasing alarmingly in India and is affecting much younger population than in west. A large pool of young Indians demonstrate 'prediabetes'(i.e. insulin resistance and/or glucose intolerance)[17].The association of these problems with high BMIs and importantly central obesity is now well accepted[18]. So we opted to do a study on this topic.

Aim & objective: To study the prevalence, socio-economic and behavioural risk factor for obesity among adolescent urban school in Cuttack.

MATERIAL AND METHOD

After obtaining clearance from institutional ethical committee this work 'study on obesity in adolescent school going children of Cuttack town with special reference to their life style and family pattern' was carried out in various schools of Cuttack town (Odisha, India) during the period extending from September 2017 to august 2018. The study was a cross sectional observation study. Five schools were selected in urban Cuttack on a random basis involving Odia medium and English medium school, government and non-government school for the purpose. Students of class VIII to XII of age groups between 12 to 19 years were approached. After taking informed consent, 1524 students were enrolled for the study by systematic random sampling method. Sample size was decided by standard method, basing upon a pilot study. A semi-structured questionnaire was administered to each student to collect data on socio demographic profile (age, sex, order of birth, number of family member in the family, family type, socioeconomic status), dietary pattern, hours of television viewing, hours of games played per day & hobbies.

Socio-Economic Status

Socio –economic status of the family was assessed by adopting a scored scale considering the education of the father, occupation of the head of the household, income and housing as described. (Family formation patter& health , 1981, WHO).
Education of the father

Low: illiterate or just literate,
Middle: Primary or secondary education completed,
High: continued education beyond class X

Occupation of the head of the family

Low: small land or business owner,
Middle: skilled worker/clerk/ teacher/medium sized land or business owner,
High: Physician, lawyer, manager, banker, engineer etc.

Income

High: Includes families having savings, Low: when family had loans works in respect of basic needs i.e. food, shelter, clothing or stated to manage the house with difficulties.

Middle: in between high & low group.

Housing

The number of living rooms taken into account to calculate the number of person per living room.

Low: when more than 4 persons per living room, High: when less than 2 person per living room,
Middle: when 2-4 persons living in one room. Scoring system was done as high, middle or low for each indicator. The family getting 3 or more high (H) score classified high (H) those getting 3 or more less (L) score treated as low social status and all other families were classified as middle (M) socio-economic status.

Type of Family

Family is Divided into Three Types

Nuclear family: it consist of married couple and their children who are dependent on parents,
Joint family: consist of number of married couples and their children who live together in same house hold,
Joint extended: consist of household containing representatives of three generation. (Park text book of preventive medicine, 18th edition 2005)

Anthropometric measurements of weight and height were measured by standard methodology. Weight was recorded by a Seca beam balance to the nearest 0.1 kg. Standing height was measured using a stadiometer and recorded to the nearest 0.1cm.the value of height and weight were converted to body mass index formula BMI= weight in kg /(height in meter)². CDC (Centre for Disease Control 2000) chart for BMI was used to compare the calculated BMI and classify children as obese, overweight, normal or underweight.

Children with BMI more than 85th & 95th percentile for age and sex were considered as overweight and obese respectively. Those BMI less than the 5th percentile for age and sex were grouped as underweight. The rest were taken as normal. To assess the socio-economic and behavioural risk factor for overweight and obesity. The data was analysed by SSPS 10.0. Non-parametric tests were used to compare data in two or more group.

Observation

Table 1 Sex wise distribution of cases

Sex	No (n)	Percentage
Male	808	53
Female	716	47
Total	1524	100

The number of males (53%) were more than the female.

Table 2 Age wise distribution of BMI category

Age in years	Non obese& overweight		Overweight		Obese		Total	
	No	%	No	%	No	%	No	%
12-<13	6		0	0	0	0	6	0.4
13-<14	170		32		8		210	

14-<15	470	60	16	546
15-<16	302	32	12	346
16-<17	160	28	12	200
17-<18	94	4	4	102
18-<19	10	4	0	14
Total	1312	160	52	1524

The prevalence of obesity was maximum between 16 to <17 years of age (6%). But most number of cases 16(50%) from obese population were between 14to<15 years age.

Table 3 Age wise distribution of BMI category in males

Age in years	Non obese& overweight		Overweight		Obese		Total	
	No	%	No	%	No	%	No	%
12-<13	6		0	0	0	0	6	
13-<14	102		0		0		102	
14-<15	172		24		16		212	
15-<16	222		20		8		250	
16-<17	120		16		8		144	
17-<18	40		0		0		80	
18-<19	10		4		0		14	
Total	712		64		32		808	

Prevalence of obesity was maximum between 14 to <15 years of age (7.6%)

Table 4 Age wise distribution of BMI category in females

Age in years	Non obese& overweight		Overweight		Obese		Total	
	No	%	No	%	No	%	No	%
12-<13	0		0	0	0	0	0	0
13-<14	168		32		8		208	
14-<15	298		36		0		334	
15-<16	80		12		4		96	
16-<17	40		12		4		56	
17-<18	14		4		4		22	
18-<19	0		0		0		0	
Total	600		96		20		716	

Obesity was maximum detected at 13 years of age, 8 cases (40%) of the 20 cases found to be obese. But the highest percentage of cases found to be between 17 to<18 years (18.2%).

Table 5 Distribution of BMI category according to socio economic status

Socio economic status	Non obese& overweight		Overweight		Obese		Total	
	No	%	No	%	No	%	No	%
High	184	74.19	44	17.8	20	8	248	16.3
Middle	1050	87.93	116	9.8	28	2.4	1194	78.3
Low	78	95.12	0	0	4	4.8	82	5.4
Total	1312	86.06	160	10.5	52	3.44	1524	100

Chi square value=25.102, Df=4,p<0.001

Statistically significant association was observed between SES & BMI category (p<0.001). Prevalence of obesity was significantly higher in high SES family (8%) as compared to middle (2.4%) and low (4.8%) socioeconomic status family. However most number of obese children were from middle SES family as number of children belonging to middle SES family in the study was very high.

Table 6 BMI category distribution according to family type

Family type	Non obese& overweight		Overweight		Obese		Total	
	No	%	No	%	No	%	No	%
Nuclear	706	84.24	96	11.4	36	4.2	838	55
Joint	552	90.12	48	7.8	12	2	612	40.01
Joint extended	54	72.97	16	21.6	4	5.4	74	4.9
Total	1312	86.06	160	10.5	52	3.44	1524	100

Chi square value =16.791,Df=4, p<0.05

Statistically significant association was observed between family type and BMI category. Majority of obese (69.2%) and overweight (60%) belonged to nuclear family as compared to joint family 23% (obese),30%(overweight) and joint extended family 7.6% (obese), 10%(overweight).

Table 7 BMI category distribution according to number of family members

Family members	Non obese& overweight		Overweight		Obese		Total	
	No	%	No	%	No	%	No	%
<4	64	76.19	8	9.6	12	14.2	84	5.5
4-7	1074	87	128	10.4	32	2.6	1234	81
>7	174	11.41	24	11.6	8	3.8	206	13.5
Total	1312	86.06	160	10.5	52	3.44	1524	100

Chi square value =7.015,Df=4, p>0.05

No statistical significant association was observed between the two. Majority 1234 (81%) children belonged to families with members ranging between 4-7.

Table 8 BMI category distribution according to duration of TV viewing per day

Duration of TV viewing (Hours)	Non obese& overweight		Overweight		Obese		Total	
	No	%	No	%	No	%	No	%
<2	878	87.97	88	8.8	32	3.2	998	65.5
2-4	362	84.97	48	11.2	16	3.8	426	27.9
>4	72	72	24	24	4	4	100	100
Total	1312	86.06	160	10.5	52	3.44	1524	100

Chi square value =6.317,Df=4, p>0.05

No statistical significant association was observed between the two.

Table 9 BMI category distribution according to hours of game played per day

Game played (hrs/day)	Non obese& overweight		Overweight		Obese		Total	
	No	%	No	%	No	%	No	%
<1	232	87.87	24	9.09	8	3	262	17.3
≥1	1080	85.71	136	10.74	44	3.4	1260	82.7
Total	1312	86.06	160	10.5	52	3.44	1524	100

Chi square value =5.99,Df=2, p<0.05

Statistically significant association was observed between the two. Significant number (8) of obese children played game<1 hour per day.

Table 10 BMI category distribution according to dietary pattern

Dietary pattern	Non obese& overweight		Overweight		Obese		Total	
	No	%	No	%	No	%	No	%
Vegetarian	168	80.7	32	15.4	8	3.8	208	13.7
Non Vegetarian	50	86.2	8	13.8	0	0	58	3.8
Mixed	1094	86.96	120	9.6	44	3.4	1258	82.5
Total	1312	86.06	160	10.5	52	3.44	1524	100

Chi square value =4.705,Df=4, p>0.05

No statistical significant association was observed between the two (p>0.05).

DISCUSSION

This work 'study on obesity in adolescent school going children of Cuttack town with special reference to their life style and family pattern' was carried out in various schools of Cuttack town (Odisha,India) during the period extending from September 2017 to august 2018 .Of the 1524 students taken for the study, 808(53%) were male and rest were female. In our study overall prevalence of obesity is 3.44% (52cases). The prevalence of overweight is 10.5% (160cases). The prevalence of overweight and obese combined is 13.91 % (212 cases). Mohan B *et al*[19] found the prevalence of overweight and obese in urban children to be 11.63% and 2.53%respectively , where as in the rural area it is found to be 4.7% and 3.63 respectively. A study by Agarwal *et al* showed prevalence of obesity and overweight 3.4% and 12.7%[20].

Looking at the age wise distribution of BMI category in the study, the maximum prevalence of obesity is at 16 years of age (6%). A study by Kapil U *et al*[21] found the maximum prevalence of obesity was found at 10 years of age (7.8%). Study by Khadikar *et al*[22] maximum prevalence of obesity was found during prepubertal period between 10-12years. This variation may due to geographical or life style variations.

The prevalence of obesity is maximum 7.6% in male between 14 to <15years of age compared to maximum of 18.2% between 1 to <18 years of age in female. A study by Khadilkar *et al*[22] the prevalence in male at 14 years of age was 5.2%and that of females are at 16 years of age was 2.4%. Subramanyam V *et al*[23]a greater proportion of overweight and obese adolescent girls was observed in 12 to 14yearsof age. In the long term longitudinal study it was observed that the changes of BMI during and after adolescence were more important predictors of adult adiposity than the BMI rebound[9].

In our study of the total obese cases 32 are males; contributing 61.5% of the total cases and the rest 20 are females(38.5%). The overall prevalence of obesity in males and females is 4% and 2.8%respectively . the study done by Khadilkar *et al*[22] also shows similar type of result. How ever the study among Bengal adolescents, girls had a higher BMI compared to boys in all age groups except at age 11 years[24].

This study statistically significant association between BMI category and socio economic status. The prevalence of overweight and obesity is highest in high SES families.

Kaneria Y *et al*[25] in their study found prevalence of overweight and obesity 4.85% and 3.73% respectively in the affluent group , and in the non affluent group 1.6% and 0% respectively. Similar result was found by Mohan B *et al*[19], and Kapil U *et al*[21].

There is statistically significant association between the family type and BMI category in the present study(p=<0.05).majority of obese(69.2%) and overweight (60%)belonged to nuclear family as compared to joint family and joint extended family. Similar studies relating the BMI category to the family type is not available for comparison. However in the study prevalence of obesity among affluent adolescent scholl childrenin Delhi was found by Khidarkar *et al*[22], 65% of the children belonged to nuclear families and the overall prevalence of obesity was 7.4% . In the study 55% of the children belong to nuclear families and the overall prevalence of obesity is 3.44%.

Observing the relation between the number of members in the family & BMI category, no significant association was found (p>0.05). Similar study relating the above two factor is not available for comparison. In the present study 81% of the children belong of families with 4 to 7 members.

In the present study there is no statistically significant association between the duration of TV viewing per day and category of BMI. Similar result was found by in studies by Robinson *et al*[26], Trucker LA[27] and Wolf AM *et al*[28]. However the study done by Dietz and Gortmaker showed showed a statistically significant association between hours of TV viewing and prevalence of obesity[29].

Significant association is observed between hours of games played per day and BMI (P=0.05). Though no similar studies have been carried out to relate the above two, studies have suggested that reduced physical activity may have significant role in the causation of obesity in children[30,31].

Looking at the relationship between dietary pattern and BMI, no significant association is observed (p>0.05). although similar studies directly relating to the dietary pattern & BMI is not available for comparison but interpretation of various studies provides evidence that vegetarian diet is associated is lower BMI than non vegetarian diet. In this study the association was insignificant, may be due to the fact that there is great discrepancy in the sample size as only 13.7% and 3.8% of the studied children are vegetarian and predominantly non vegetarian respectively and the rest a large chunk(82.5%) consume mixed diet . also the intake of calories, fibre, fats in proportion could not be assessed.

Summary: The present study shows the prevalence of obesity and overweight to be 3.44% and 10.5% respectively. Obesity is more prevalent in children of higher socioeconomic status family than those in the lower ones. Also significant number of obese and overweight children belonged to nuclear families. A significant correlation between life style and prevalence of overweight and obesity could be not be ascertained. That could be because measuring physical activity in the children is very difficult. The two measurements taken in this study i.e. hours of TV viewing and hours of game played per day may not be enough to cover all domain of activity. A more thorough questionnaire is required for proper assessment.

CONCLUSION

As majority of the chronic diseases in adults have its origin in childhood, intervention in early childhood is essential to curb the mortality associated.

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How to cite this article:

Bibhu Prasad Nayak *et al* (2019) 'Study of Obesity in Adolescent School Going Children of Cuttack Town With Special Reference to Their Lifestyle and Family Pattern', *International Journal of Current Advanced Research,* 08(05), pp. 18574-18578. DOI: http://dx.doi.org/10.24327/ijcar.2019.18578.3555