"Prevalence and trends of obesity in Indian school children of different socioeconomic class."

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Abstract :

Introduction: Childhood obesity with all its adverse health consequences is growing at a fast rate in developing countries due to changing life style as a result of rapid urbanization and mechanization. Identification of obese status early during childhood has substantial health benefits to the children and to the country. Present study aimed to assess prevalence of obesity amongst children of different socioeconomic class.

Methods: A survey was conducted in randomly selected 2158 (1038boys & 1120girls) school children from government and private schools. Anthropometric measurements were taken using standard protocol. Obesity was assessed using Body Mass Index (BMI) criteria, those having their BMI>95th percentile for age and sex were considered obese. To study the effect of social class subjects were classified into upper middle and lower socioeconomic class on the basis of modified kuppuswami scale.

Results: The overall prevalence of obesity was found to be 14.97% (6.817% Boys 8.16% Girls). Higher values of mean weight, height, BMI and blood pressure was found in obese children as compared to non obese. A highly significant relationship was observed for SBP and BMI (p<.0001) between obese and non-obese groups. Prevalence of obesity was found significantly higher in children belonging to higher class (35%) as compared to lower (13%) and middle class (15.7%) (Chi-square value 9.748; & p< .001).

Conclusion: Prevalence of obesity is on rise in Indian children, highlighting the possible role of change in the dietary pattern and physical activities with increase in income levels. Collective effort of parents and schools are required to institute early preventive measures to reduce march towards obesity and its future complications.

Key Words: Obesity, body mass index, Indian school children, socio economic status

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Introduction:

In the last few decades, childhood obesity has tripled and it has reached epidemic levels in developed countries[1,2]. About 10% of school children aged between 5 to 17 years around the globe are overweight out of which 70% grow up to become obese adults[3,4]. Obesity has significant impact on both physical and psychological health of the child, increasing proneness of the overweight children to suffer from hyperlipidemia, abnormal glucose tolerance, hypertension, coronary artery disease , obstructive sleep apnea, infertility ,orthopedic problems etc.[4,5]. In addition, social and psychological disorders such as depression, stigmatization and poor self esteem occur with increased frequency in obese children[5].

The Center for Disease Control and Prevention defined obesity as at or above the 95th percentile of BMI for age and sex [6,7]. Obesity is not a single disorder but a heterogeneous group of conditions with multiple causes, but common to all is, over-consumption of calories and reduced physical activity. There are multiple etiologies for this imbalance; hence it cannot be explained by a single etiology[8].

In the past obesity was considered a problem of affluence, but now it is growing very fast in many developing countries[8,9]. An estimated 42 million of school children aged less than 5 years are overweight, and close to 35 million of these are living in developing countries [10]. Furthermore in both developed and developing countries girls are proportionately more overweight than boys[8,11].

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This rising trend in developing countries is largely due to rapid urbanization and mechanization which led to reduction in energy expenditure along with increase in energy intake in the form of high calorie snack and junk food[12].

Limited data is available from India on prevalence of obesity but it was reported between 5.5 to 24% and showing a rising trend[13,14,15]. The nationally representative data on childhood obesity in developing countries including India are scarce with very few reports on prevalence of obesity among children are available. Keeping this in mind, and the long term adverse consequences of obesity, the present study was carried out in school children of Indore District of Madhya Pradesh, to find out the prevalence of childhood obesity and its etiologies.

Material Methods:

A cross-sectional study was conducted in randomly selected 2158 school children of age 7 to 14 years,of different socioeconomic classes from government and private schools. The sample size was calculated keeping in view 6% of expected prevalence of obesity in children. Informed written consent was obtained prior to data collection both from the school authorities and from the parents of the children after explaining the objectives and the method of study. Two days prior to data collection a pre tested proforma was distributed amongst the subjects to get the information on family characteristics like type of residence, type of family, education, occupation and income of parents etc. The exact age of the child was verified from the school records and rounded to the completed years. Anthropometric measurements were done utilizing the standard equipments and methodology. Weight was recorded using electronic weighing scale, to nearest 100 grams and height was recorded using the stadiometer attached to the wall to the nearest 0.1 cm. All the measurements were done after removing shoes and all the loose outfits of the child[16].

Blood pressure (BP) was recorded from the right arm in supine position after giving adequate rest to the child with the help of validated automated device as per the standard protocol of Task force[17]. Body mass index (BMI) was calculated as weight in kilograms / (Height in meter)^2. International Obesity Task Force (IOTF) classification was utilized for the estimation of obese subjects. Obesity was defined as, BMI value above 95th percentile for age and sex[11]. Children were classified into high, middle and low socioeconomic groups as per the modified Kuppuswamy's socioeconomic status scale, taking into account, occupation, education and income of the parents[18].

Statistical analysis:

Prevalence rates of obesity was calculated in both sexes and presented as percentage. Pearson correlation analysis was done to test statistical significance of the difference in the mean values of the different variables in obese and on obese groups. Pearson's chi-square test was used to estimate the *p* value for the difference in prevalence of obesity in different socioeconomic groups. The SPSS (version 11.0) software was used for this purpose.

Results:

A total of 2158 (1038 boys & 1120 girls) school children were included in the study. Utilizing age and sex specific international cut off points (BMI >95th percentile) a total of 325 subjects (148 boys & 177 girls) were found to be obese. The overall prevalence of obesity was found to be 14.97%. Prevalence of obesity in girls was higher (8.16%) as compared to boys (6.81%), highest prevalence rates of obesity were seen in the age groups 9 to 11yrs in both sexes. (*Table-I*)

Observations: Table:-I Prevalence of obesity according to BMI Criteria:

Age Yrs	BOYS				GIRLS			
	n	Non-obese	Obese	Prevalence	n	Non-obese	Obese	Prevalence
7	133	131	2	0.09	112	107	5	0.23
8	81	78	3	0.13	86	79	7	0.32
9	128	101	27	1.25	117	101	16	0.74
10	76	54	22	1.01	109	75	34	1.57
11	133	83	50	2.31	173	110	63	2.91
12	199	190	9	0.41	189	179	10	0.46
13	174	156	18	0.83	166	149	17	0.78
14	114	97	17	0.78	168	143	25	1.15
TOTAL	**1038**	**890**	**148**	**6.81**	**1120**	**943**	**177**	**8.16**

(Non obese (BMI <95th percentile), Obese (BMI >95th percentile)

Table-II Comparison of variables in Obese and Non-obese Subjects :

Variables	Non-obese (n=1833)		Obese (n=325)		Test of significance	
	Mean	*SD*	*Mean*	*SD*	*t-value*	*p-value*
Weight (Kgs)	32.10	11.06	34.15	12.55	3.014	<0.003
Height (cms)	141.71	16.23	143.17	11.58	1.546	>0.05
BMI (Kg/m2)	14.56	2.02	22.99	15.71	21.989	<0.0001
SBP (mmHg)	106.08	10.02	109.87	9.51	6.289	<0.0001
DBP (mmHg)	66.09	6.94	66.62	6.44	1.266	>0.05

(Significant at 5% level.)

Table-III Prevalence of obesity according to Socioeconomic Class:

Socioeconomic Class*	n	Non-Obese	Obese	Prevalence	Chi-square value	p-Value
Lower	1332	1147	185	13.9%		
Middle	775	653	122	15.7%	9.748	**<.001**
Upper	51	33	18	35.3%		

*(*Based on Modified Kuppuswami Scale)*

Mean weight, height, BMI, systolic blood pressure (SBP) and diastolic blood pressure (DBP) in obese and non obese subjects is presented in *table-II*. It is evident that obese boys and girls had higher and statistically significant anthropometric measurements as compared to non-obese. A highly significant relationship was observed for SBP and BMI (p<.0001) between the two groups, however, in case of DBP no such relationship was found. Comparisons were made for prevalence of obesity amongst the different socioeconomic classes and the findings were presented in *table-III*. Modified Kuppuswami scale was utilized for dividing the subjects into upper, middle & lower socioeconomic classes. A significantly large proportion of children (35%) belonging to higher class were obese in comparison to lower (13.9%) and middle class (15.7%) respectively. (Chi-square value 9.748; & p< .001).

DISCUSSION:

In order to find out prevalence of obesity in different socioeconomic classes, present study was conducted in randomly selected 2138 (1038 boys & 1120 girls) school children of age group 7 to 14ysrs of different socioeconomic classes from government and private school in Indore district of M.P. A total of 325 school children were found to be obese giving the overall prevalence of 14.97% of obesity according to BMI criteria. Similar prevalence was reported by earlier studies[14,20,21,22]. Some of the studies [10, 22] reported a very low prevalence; it may be due to use of different cut off criteria of obesity. In the present study, the overall prevalence of obesity was higher in girls (8.16%) than boys (6.81%) this difference was not statistically significant (p>0.05). However in some of the studies [8,13,23,24] a higher prevalence was reported in boys. On comparing both the sexes maximum prevalence of obesity was found during the pubertal period, between 9-11 years.

This may be due to physiological changes such as hormonal variations taking place with respect to their age resulting in adipose tissue deposition and overall weight gain during the pubertal growth spurt[13,25].

An increasing trend in mean BMI values across all age groups was observed. The mean BMI values between obese and on obese group *(table-II)* shows a highly significant relationship (p<.0001). Similarly on comparing the mean SBP & DBP values between obese and non obese groups a highly significant relationship was observed for SBP (p<.0001) but, in case of DBP, no such relationship (p>0.05) was observed. The observed difference in the SBP values between obese and non obese group may be due to the differences in the BMI values, since high BMI correlates strongly with blood pressures levels of the child [26,27].

Study subjects were classified in different socioeconomic classes as per Kuppuswami scale[18] in order to study the effect of social class on obesity. It is evident from the table-III that an increasing pattern of obesity was apparent as we move from lower socioeconomic class to towards upper class. Highest prevalence rates of obesity was found in children belonging to higher class (35%), however it was 15 & 13% in middle & lower class respectively. In the present study a statistically significant association (chi-square value 9.748; & p< .001) was observed between social class and obesity. Studies of[19,20,21,26] had similar observations with respect to social class and obesity. The observed higher prevalence rates of obese children in upper class may be because of sedentary lifestyles, altered eating patterns and increased sugar and fat content of their diet [13,22].

The present study documented that prevalence of childhood obesity is on rise in Indian children, highlighting the possible role of lifestyle changes along with decline in physical activity of the child with increase in income levels of parents[23,24]. To control it from reaching epidemic proportions, and to reduce its future complications, preventive measures should be instituted early during childhood. Henceforth collective effort of parents and

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and schools is required.

Awareness should be created in the parents to educate, motivate and encourage their children to adopt healthy lifestyles, more involvement in physical exercises, sports and outdoor activities. Schools should play a critical role, by establishing a safe and supportive environment with policies and practices that support and promote healthy behavior in children.

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