

ORIGINAL ARTICLE**TO STUDY THE PREVALENCE OF CHILDHOOD OVERWEIGHT AND OBESITY IN THE SCHOOL GOING CHILDREN OF 6-11 YEARS OF AGE GROUP**Mridula Mittal¹, Vishal Gupta², Vikram Gupta³, Preeti Bansal⁴, Vishal Sharma⁵, Tejbir Singh⁶, AS Padda⁷¹M.O. Central University, Bathinda, ²Associate Professor, GGSMC, Faridkot, ³SMO, NPSP, WHO Chandigarh, ⁴Government. Dental College, Amritsar, ⁵Associate Professor Mullana, Solan, ⁶Prof. & Head GMC. Amritsar, ⁷Ex. Professor & Head GMC Amritsar**ABSTRACT:**

Introduction:- Childhood age group falls between 0-14 years and this is the most important age group in all societies. Concerns for children and adolescents experiencing rapid weight gain are enhanced by the research indicating that children are likely to carry obesity into adulthood and thus experience the health and social consequences of the disease at even earlier stages. Children who reach the high levels of adiposity at a younger age have higher risk of obesity as adults. This is the age group where children usually capture ideas from the surroundings. Hence, this study was conducted to study prevalence of childhood overweight and obesity. **Material & Methods:-** Present study a list of private reputed schools of Amritsar city in which the children belonging to the elite class study were prepared and D.A.V Public School was selected by draw of lots. The study was conducted between the periods of March 2007 to December 2007. The list of number of students in the age group of 6-11 years in the school was prepared. The schedules of visits were prepared in consultation with school authorities keeping in view the holidays, examinations and other activities in the school. **Result & Conclusion-** Prevalence of overweight and obesity was more in females as compared to males. Prevalence of obesity was more in the males in the age group of 8-9 years and more in females in the age group of 7-8 years. Prevalence of overweight and obesity is more in children whose parents are Doctors.

Key words:- Adiposity, Overweight, obesity, Body Mass Index.

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INTRODUCTION

Childhood age group falls between 0-14 years and this is the most important age group in all societies. This is because there is a renewed awareness that the determinants of chronic disease in later life and health behaviour are laid down at this stage. Family influences and education are of the highest importance, and these experiences ultimately influence patterns of their future lifestyles, occupational skills and even political attitudes and leadership. It is also a vital period because of the so called socialization process, that is transmission of attitudes, customs and behaviour.¹ According to Census of India 2001 and NFHS-III children constitute about 35.3% of the population of whole of the country.^{3,2} As this age group constitutes about one third of the India's population, the health concerns of this age group are of utmost importance.

The main health problems encountered in the childhood population are either due to infectious diseases or due to nutritional problems. Infectious diseases are prevalent in the developing nations. But nutritional problems like undernutrition are prevalent in developing countries and overnutrition is prevalent in developed countries. Developing countries in transition also suffer from problems of overnutrition in the wealthier segments of their populations. Thus, developing countries suffer a double burden due to both overnutrition and undernutrition.⁶ This situation in the developing countries changed with time due to major shift in the structure of the global diet marked by the uncoupling of the classical relationship between incomes and fat intakes. This lead to increased fat consumption and replacement of traditional diets, rich in fibres and grains with diets that include a greater proportion of fats and calories. The

changing life style of families in the so called modernized India with increased purchasing power, easy availability, more comfortable and luxurious living, thanks to improved technology has all attributed to the problem of obesity.⁴

Obesity may be defined as an abnormal growth of the adipose tissue due to an enlargement of fat cell size (hypertrophic obesity) or an increase in the fat cell number (hyperplastic obesity) or a combination of both.⁵ The human race is facing a novel and enormous health challenge due to the rapidly unfolding global epidemic of obesity. This global epidemic is nowadays known by the term 'Globesity'.^{7,8} The rising epidemic reflects the profound changes in society and in behavioural patterns of communities over recent decades. While genes are important in determining a person's susceptibility to weight gain, energy balance is determined by calorie intake and physical activity. Thus societal changes and worldwide nutrition transition are driving the obesity epidemic. Economic growth, modernization, urbanization and globalization of food markets are just some of the forces thought to underlie the epidemic. As incomes rise and populations become more urban, diets high in complex carbohydrates give way to more varied diets with a higher proportion of fats, saturated fats and sugars. At the same time, large shifts towards less physically demanding work have been observed worldwide. Moves towards less physical activity are also found in the increasing use of automated transport, technology in the home, and more passive leisure pursuits.⁹ Concerns for children and adolescents experiencing rapid weight gain are enhanced by the research indicating that children are likely to carry obesity into adulthood and thus experience the health and social consequences of the disease at even earlier stages. There is cause for even greater concern when one considers that the degree of persistence of obesity into adulthood changes with the age at which the onset of obesity originally developed.¹⁰ Children who reach the high levels of adiposity at a younger age have higher risk of obesity as adults.¹¹

This is the age group where children usually capture ideas from the surroundings. Hence, this study was conducted to study prevalence of childhood overweight and obesity

MATERIAL AND METHODS

High prevalence of childhood obesity is present in well to do section of the society, so in the present study a list of private reputed schools of Amritsar city in which the children belonging to the elite class study were prepared and D.A.V Public School

was selected by draw of lots. The author personally visited the school and the purpose of study was explained to the principal. The principal was assured that this information will be used only for the study and will be kept strictly confidential to elicit full co-operation. The permission of conduction of study was sought.

The list of number of students in the age group of 6-11 years in the school was prepared. Most of the students fell in the class range from 1st standard to 5th standard. As the desired sample size was achieved in the school, the other schools were not visited.

The study was conducted between the periods of March 2007 to December 2007. The schedules of visits were prepared in consultation with school authorities keeping in view the holidays, examinations and other activities in the school. It was taken into full consideration that school schedule was not affected in any manner. The schedule of visit was intimated to the authorities and class teachers well in advance.

The author personally visited the school. The students which were to be studied on that day were called in batches of 5 or 10 in a separate room. Each student was informed regarding the purpose of the study and was assured that the information will be kept strictly confidential and will be used only for the purpose of study so that he/she give us the correct and reliable answers. The information regarding the general biodata, parents detail, eating habits, physical activity, etc. was obtained from the child and confirmed from the Identity card and other school records and was recorded on a proforma evolved and pretested for the study by the author and interns. All the proformas were verified personally by the author to ensure that information was complete and reliable.

Weight and height were also recorded using standard techniques. The weight of the participants of the study was measured with an ISI marked weighing machine, calibrated upto 0.5 kg; with minimum of clothes and without shoes. The child was asked to stand still on the middle of the scale without leaning or holding on to anything. The zero mark was checked and the weight was standardized daily.

The height was measured with the help of ISI marked measuring tape; calibrated upto 0.5 cm without shoes and in erect posture. The child was asked to stand erect against wall. A footruler was kept at the top of the head directed parallel to the floor to minimize any error on the part of the author.

Classification of children on the basis of BMI(Body

Mass Index) as per CDC-2000 standards for age and sex is as follows:

$$\text{BMI (In kg/m}^2\text{)} = \frac{\text{Weight in Kilogram (Kg)}}{\text{Height in meter square (m)}^2}$$

BMI more than 95th percentile : Obese
BMI between 85th and 95th percentile: Overweight

(BMI is age and gender specific in children)

In case of any difficulty help of teachers was sought. The list of absentees was also prepared simultaneously so that they could be covered during the subsequent visits. This procedure was followed until the desired number i.e. 2000 was reached. The information collected was compiled; analyzed, documented and valid conclusions were drawn.

OBSERVATIONS AND DISCUSSION

The present study was conducted at D.A.V Public School, Amritsar from March 2007 to December 2007. A total of 2000 students in the age group of 6-11 years were studied about prevalence of childhood overweight and obesity. The observations and discussion of the study are as follows:

Table 1 shows the distribution of overweight and obesity in children of 6-11 years of age group according to sex. Of the total 2000 children, 388(19.40%) were overweight while 280(14.00%) were obese. Most of the children i.e. 1164(58.20%) were males while 836(41.80%) were females. Of the total 1164 males, 221(18.99%) were overweight while 161(13.83%) were obese. Of the total 836 females, 167(19.98%) were overweight while 119(14.23%) were obese.

As per 1999-2000 NHANES data, 30.3% of children 6 to 11 yrs exceeded 85th percentile of weight for age charts (comparable to the overweight category in the current study). This included 15.3 % children who were more than the 95th percentile of this chart.¹²

In a study from Chennai, Ramachandran, *et al.* reported that 17.8% boys and 15.8% girls were overweight, while obesity was reported in 3.6% boys and 2.7% girls.¹²

In a study by Sharma in Delhi 22% children were overweight and 6.4% were obese.¹³

In the study from Pune by Khadilkar and Khadilkar, the overweight and obesity prevalence in boys aged 10-15 years was 19.9% and 5.75% respectively.¹⁴

In a study by Kaneria and Singh in Udaipur in 2002, it was observed that there has been a significant increase in overweight (4.85%) and obesity (3.73%) in children belonging to affluent

and upper middle class income group as compared to non-affluent group which was 1.6% and 0% respectively.¹⁵

In the present study, prevalence of overweight and obesity in 6-11 years of age group is 19.40% and 14.00% respectively. The distribution of overweight and obesity in males and females is almost similar. It has been observed that the prevalence of overweight and obesity in the present study is higher than the other studies. It may be due to the fact that Punjab has high prevalence of overweight and obesity, as the Punjabi society has achieved a higher socio-economic status and food habits different from other regions. Moreover, school chosen for the study was a private reputed school where only children belonging to elite class study.

Table 2 shows the distribution of overweight and obesity in children of 6-11 years of age group according to age and sex. Most of the children i.e. 522(26.10%) were in the age group of 9-10 years followed by 428(21.40%) in age group of 7-8 years, 398(19.90%) in age group of 8-9 years, 334(16.7%) in age group of 10-11 years, 246(12.30%) in age group of 6-7 years and 72(3.60%) in age group of 11-12 years respectively. Among males, the distribution of overweight was highest i.e. 20.17% in the age group of 8-9 years followed by 19.44% in 7-8 years, 19.32% in 10-11 years, 19.05% in 11-12 years, 18.58% in 9-10 years and 11.89% in 6-7 years. The distribution of obesity in males was highest i.e. 18.18% in the age group of 6-7 years followed by 17.46% in 7-8 years, 14.91% in 8-9 years, 12.38% in 9-10 years, 11.90% in 11-12 years and 10.80% in 10-11 years. Among females, the distribution of overweight was highest i.e. 23.06% in the age group of 7-8 years followed by 21.76% in 8-9 years, 19.42% in 6-7 years, 19.10% in 9-10 years and 18.99% in 10-11 years. The distribution of obesity in females was highest i.e. 17.06% and 17.05% in the age group of 8-9 years and 7-8 years followed by 13.59% in 6-7 years, 10.13% in 10-11 years, 10.05% in 9-10 years and 10.00% in 11-12 years respectively. In a study by Sharma in Delhi, overweight rates were more in the age group 9-11 years for girls and 12-14 years for boys.¹³

In the present study, prevalence of obesity appears to decrease after 9 years of age in females. This may be due to the fact that females are going towards growth spurt which starts in this age group resulting in physical changes like gain in height. Moreover, children at this age start perceiving their body image and become conscious about it.

Table 1: Distribution of overweight and obesity in children of 6-11 years of age group according to sex

	Normal (%)	Overweight(%)	Obese(%)	Grand total (%)
Male	782 (67.18)	221 (18.99)	161 (13.83)	1164 (58.20)
Female	550 (65.79)	167 (19.98)	119 (14.23)	836 (41.80)
Grand total	1332 (66.60)	388 (19.40)	280 (14.00)	2000

Table 2: Distribution of overweight and obesity in children of 6-11 years of age group according to age and sex

	6-7 yrs		7-8 yrs		8-9 yrs		9-10 yrs		10-11 yrs		11-12 yrs		Grand Total
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	1332
Normal (%)	100 (69.93)	69 (66.99)	159 (63.09)	104 (59.09)	148 (64.90)	104 (61.18)	223 (69.04)	141 (70.85)	123 (69.89)	112 (70.89)	29 (69.04)	20 (66.67)	388
Overweight (%)	17 (11.89)	20 (19.42)	49 (19.44)	42 (23.06)	46 (20.17)	37 (21.76)	60 (18.58)	38 (19.10)	34 (19.32)	30 (18.99)	8 (19.05)	7 (23.33)	280
Obese (%)	26 (18.18)	14 (13.59)	44 (17.46)	30 (17.05)	34 (14.91)	29 (17.06)	40 (12.38)	20 (10.05)	19 (10.80)	16 (10.13)	5 (11.90)	3 (10.00)	30
Total	143	103	252	176	228	170	323	199	176	158	42	30	2000
Grand total (%)	246(12.30)		428(21.40)		398(19.90)		522(26.10)		334(16.7)		72(3.60)		

Table 3: Distribution of overweight and obesity in children according to religion

	Normal (%)	Overweight (%)	Obese(%)	Grand total (%)
Hindu	1084 (66.70)	310 (19.08)	231 (14.22)	1625 (81.25)
Sikh	245 (66.04)	77 (20.75)	49 (13.21)	371 (18.55)
Others	3 (75.00)	0	1 (25.00)	4 (0.20)
Grand total	1332	388	280	2000

Table 3 shows distribution of overweight and obesity in children according to religion. Of the 2000 children studied, majority i.e. 1625(81.25%) were Hindus, 371(18.55%) were Sikhs. Of the total 1625 Hindus, 310(19.08%) were overweight while 231(14.22%) were obese. Of the total 371 Sikhs, 77(20.75%) were overweight while 49(13.21%) were obese respectively.

In a study in adults by Aggarwal P.K in Northern India, 8 percent and 21 percent of Sikh women are obese and overweight as compared to 7 and 18 percent obese and overweight among the Hindu women, respectively.¹⁶

In the present study, the difference between overweight and obesity among Hindus and Sikhs is not significant. The age structure and distribution of population is different in the present study and the quoted study which might have resulted in this change.

Table 4 shows distribution of overweight and obesity in children according to occupation of father. Of the 2000 children studied, majority i.e. 1322(66.10%) were those whose father was a Businessman, 224(11.20%) whose father was in Govt. service, 180(9.00%) whose father was a Doctor, 65(3.25%) whose father was a Teacher. The distribution of overweight was maximum i.e. 23.89% in children whose father was a Doctor followed by 19.67% whose father was a businessman, 19.20% whose father was in Govt. service and 12.31% whose father was a teacher. Distribution of obesity was maximum i.e. 16.11% whose father was a Doctor followed by 15.13% whose father was a businessman, 13.85% whose

father was a teacher and 8.48% whose father was in Govt. service respectively.

The distribution of overweight and obesity was highest among children whose father was either a Doctor or a Businessman due to high socioeconomic status.

Table 5 shows distribution of overweight and obesity in children according to occupation of mother. Of the 2000 children studied, majority i.e. 1436(71.80%) were those whose mother was a Housewife followed by 276(13.80%) whose mother was a teacher, 117(5.85%) whose mother was a Doctor, 49(2.45%) whose mother was in Business and 35(1.75%) whose mother was in govt. service. The distribution of overweight was maximum i.e. 31.25% in children whose mother was a Doctor followed by 19.78% in children whose mother was a Housewife, 17.14% whose mother was in Govt. service, 16.33% whose mother was in Business and 14.13% whose mother was a teacher. The distribution of obesity was maximum i.e. 17.09% in children whose mother was a Doctor followed by 14.48% whose mother was a Housewife, 14.29% whose mother was in business, 12.68% whose mother was a Teacher and 5.71% whose mother was in govt. service respectively.

In a study by Shah and Dewan in Bhavanagar, the prevalence of obesity almost doubled when the mother was a housewife as compared when the mother was a working woman.¹⁷

In the present study, the distribution of overweight and obesity was highest among children whose mother was a Doctor or a Housewife.

Table 4: Distribution of overweight and obesity in children according to occupation of father

	Normal(%)	Overweight(%)	Obese(%)	Grand total(%)
Business	862 (65.20)	260 (19.67)	200 (15.13)	1322 (66.10)
Doctor	108 (60.00)	43 (23.89)	29 (16.11)	180 (9.00)
Govt. service	162 (72.32)	43 (19.20)	19 (8.48)	224 (11.20)
Teacher	48 (73.85)	8 (12.31)	9 (13.85)	65 (3.25)
Others	145 (72.50)	34 (17.00)	21 (10.50)	200 (10.00)
Father expired	7 (77.78)	0	2 (22.22)	9 (0.45)
Grand total	1332	388	280	2000

Table 5: Distribution of overweight and obesity in children according to occupation of mother

	Normal (%)	Overweight (%)	Obese (%)	Grand total (%)
Business	34 (69.39)	8 (16.33)	7 (14.29)	49 (2.45)
Doctor	62 (55.36)	35 (31.25)	20 (17.09)	117 (5.85)
Govt. service	27 (77.14)	6 (17.14)	2 (5.71)	35 (1.75)
Housewife	944 (65.74)	284 (19.78)	208 (14.48)	1436 (71.80)
Teacher	202 (73.19)	39 (14.13)	35 (12.68)	276 (13.80)
Others	63 (72.41)	16 (18.39)	8 (9.20)	87 (4.35)
Grand total	1332	388	280	2000

Table 6: Distribution of overweight and obesity in children according to occupation of parents

Occupation of Father	Occupation of Mother	Normal(%)	Overweight(%)	Obese(%)	Grand total(%)
Doctor	Doctor	55(56.12)	32(32.65)	11(11.22)	98(4.90)
Business	Housewife	721(64.26)	224(19.96)	177(15.78)	1122(56.10)
Teacher	Teacher	31(77.50)	3(7.50)	6(15.00)	40(2.00)
Teacher	Housewife	15(75.00)	4(20.00)	1(5.00)	20(1.00)
Doctor	Housewife	26(59.09)	7(15.91)	11(25.00)	44(2.20)
Others		484(71.60)	118(17.46)	74(10.95)	676(33.80)
Grand total		1332	388	280	2000

Doctor/Doctor and Teacher/Teacher: Chi square= 9.498, df= 2, p < 0.01, Highly significant
 Doctor/Housewife and Teacher/Teacher; Chi square= 3.326, df= 2, p > 0.05, Not significant

Table 7: Distribution of overweight and obesity in children according to birth order

	Normal(%)	Overweight(%)	Obese(%)	Grand total(%)
1	681 (64.86)	212 (20.19)	157 (14.95)	1050 (52.5)
2	565 (69.33)	150 (18.40)	100 (12.27)	815 (40.75)
3	75 (63.03)	24 (20.16)	20 (16.81)	119 (5.95)
4	10 (66.67)	2 (13.33)	3 (20.00)	15 (0.75)
6	1 (100%)	0	0	1 (0.05)
Grand total	1332	388	280	2000

Table 6 shows distribution of overweight and obesity in children according to occupation of both parents. Of the 2000 children studied, majority i.e. 1122(56.10%) were those whose father was a businessman and mother was a housewife followed by 98(4.90%) whose both parents were doctors, 44(2.20%) whose father was a Doctor and mother was a housewife, 40(2.00%) whose both parents were teachers and 20(1.00%) father was a Teacher and mother was a housewife. The prevalence of overweight was maximum i.e. 32.65% in children whose both parents were doctors followed by 20.00% whose father was a Teacher and mother was a housewife, 19.96% whose father was a businessman and mother was a housewife, 15.91% whose father was a Doctor and mother was a housewife, and 7.50% whose both parents are teachers. The distribution of obesity was maximum i.e. 25.00% in children whose father was a Doctor and mother was a housewife followed by 15.78% whose father was a businessman and mother was a housewife, 15.00% whose both parents were teachers, 11.22% whose both parents were doctors and 5.00% whose father was a Teacher and mother was a housewife respectively. The difference observed between children whose parents were doctors and whose parents were Teachers was Highly significant(< 0.01). The difference observed between children whose parents were doctor and Housewife and whose parents were Teachers is statistically not significant (> 0.05).

In the present study, overweight is highest when both parents are doctors. This may be due to the fact that children of doctors are given less time by their parents. So they indulge in sedentary behavior like watching TV for extra hours because no one is there to stop them or look after and there is frequent consumption of high calorie food. The distribution of obesity is highest when father is a Doctor and mother is a housewife. This may be due to the fact that housewives are more cautious about the diet of their child.

Table 7 shows distribution of overweight and obesity in children according to birth order. Most of the children out of 2000 i.e. 1050(52.5%) were of birth order 1 followed by 815(40.75%) of birth order 2, 119(5.95%) of birth order 3, 15(0.75%) of birth order 4 and only 1 child of birth order 6. The maximum number of overweight children i.e. 20.19% were of birth order 1 followed by 20.16% of birth order 3, 18.40% of birth order 2 and 13.33% of birth order 4. The maximum number of obese children i.e. 20.00% were of birth order 4 followed by 16.81% of birth order 3, 14.95% of birth order 1 and 12.27% of birth order 2. The distribution of overweight and obesity in children with birth order 1 is 20.19% and 14.95% as compared to children with birth order more than 1 is 18.53% and 12.95% respectively.

In Toyama birth cohort study it was seen that boys from three-child families showed a significantly lower risk of overweight than only boys and girls

from larger families have a significantly lower risk than only girls.¹⁸

In the present study, overweight is more in the first and obesity in the third birth order. Hence, there is no correlation between the birth order and overweight and obesity.

Most of the males i.e. 20.17% in the age group of 8-9 years were overweight while 19.44% in age of 7-8 years. 18.18% in the age group of 6-7 years were obese followed by 17.46% and 14.91% in 7-8 years and 8-9 years respectively.

Most of the females i.e. 23.06% in the age group of 7-8 years were overweight followed by 21.76% and 19.42% in 8-9 years and 6-7 years respectively. 17.06% were obese in the age group of 8-9 years followed by 17.05% and 13.59% in 7-8 years and 6-7 years respectively.

Majority i.e. 81.25% of children in the study were Hindus and 18.55% were Sikhs. The overweight and obesity was 19.08% and 14.22% among Hindus and 20.75% and 13.21% among Sikhs.

Majority i.e. 66.10% of the children were those whose father was a Businessman while in 11.20%, 9.00% and 3.25% children father was in Govt. service, Doctor and Teacher respectively.

Overweight was present in 23.89% of children whose father was a Doctor followed by 19.67% and 12.31% whose father was a businessman and teacher respectively. The corresponding figures in obesity were 16.11%, 15.13% and 13.85% respectively.

Majority i.e. 71.80% were those whose mother was a Housewife followed by 13.80% and 5.85% whose mother was a teacher and Doctor respectively.

Overweight was present in 31.25% of children whose mother was a Doctor followed by 19.78% and 14.13% whose mother was a Housewife and teacher respectively. The corresponding figures in obesity were 17.09%, 14.48% and 12.68% respectively. If the occupation of both the parents was taken, 32.65% of children were overweight whose both parents were doctors while in 20.00%, 19.96% and 7.50% were those whose father was a Teacher and mother was a housewife, father was a businessman and mother was a housewife and whose both parents were teachers respectively.

Conclusions drawn from the study are as follows:

- Prevalence of overweight and obesity was more in females as compared to males.
- Prevalence of obesity was more in the males in the age group of 8-9 years and more in females in the age group of 7-8 years.
- Prevalence of overweight and obesity is more in children whose parents are Doctors.

RECOMMENDATIONS

Childhood obesity is an emerging health problem which needs to be confirmed by large scale, in-depth, multicentric longitudinal studies and effective preventive strategies should be developed to halt this epidemic at its beginning keeping in view all the major contributing factors i.e. diet, physical activity and other contributing factors.

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