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## ORIGINAL ARTICLE

# Different Etiological Factors of Obesity in Primary School Children in Third Largest City of Pakistan

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### ABSTRACT

**Objective:** To find out prevalence of obesity in primary school children in third largest city of Pakistan and its etiological factors among obese children.

**Study Design:** Cross sectional observational study

**Place and Duration of Study:** Three private and two government primary schools of Faisalabad city from October 2018 to January 2019.

**Material and Methods:** Questionnaire was filled regarding dietary, family history and life style of 1254 children of Grade I to Grade V. Body mass index (BMI) of children was calculated by measuring height and weight, plotted on standard BMI growth charts for age and gender according to National Health and Nutrition Examination Survey III (NHANES-III). Children of BMI more than 95<sup>th</sup> percentile were labeled obese. The etiological factors of obesity were sorted out.

**Results:** Prevalence of obesity was recorded as 21.5%. Obesity was more common in males (23.5%) than females (18.4%). Daily intake of junk foods (61.1%) and sedentary life style were frequent risk factors of obesity. Obesity was more common in upper socioeconomic class students (70%) while familial obesity was 33.3%.

**Conclusion:** Upper socioeconomic status, family history of obesity and male sex are the familiar risk factors of obesity.

**Key Words:** *Obesity, Body mass index, Risk factors.*

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### INTRODUCTION

Obesity is rapidly becoming a prevalent nutritional disorder among children and adolescents. Since 1988 there has been a dramatic increase in prevalence of childhood obesity among all age groups.<sup>1</sup> According to global nutrition report 2018, more than three hundred and thirty million children and adolescents aged 5-19 years were overweight or obese in 2016.<sup>2</sup> Obesity is defined by using Body Mass Index (BMI); BMI = weight (kg)/height (m<sup>2</sup>).<sup>3</sup> Children and adolescents are considered overweight, obese and severe obese if the BMI exceeds 85<sup>th</sup>, 95<sup>th</sup> and 98<sup>th</sup> percentiles

respectively.<sup>3</sup> Obesity may also be defined as BMI more than 30 kg/m<sup>2</sup> at any age.

The precise etiology of obesity is unknown but it is a complex multifactorial condition which involves genetics, metabolism, and endocrine regulation of appetite as well as psychological and cultural factors.<sup>4</sup> Obesity is the result of a mismatch between energy intake and expenditure that results from behavior and physiology. Both of these traits are affected by environmental and genetic factors. Risk factors associated with increasing incidence of obesity are parental obesity, male sex, lower socioeconomic groups,

dietary intake (energy input) and physical activity (energy expenditure).<sup>5</sup> Increased use of fatty and sugary food and decreased intake of fruits and vegetables, increased television watching and using computer and more low intensity activities than high, all are associated with over weight.<sup>6</sup>

According to 6<sup>th</sup> population and housing census 2017, Faisalabad is the third largest city of Pakistan. It has a mixed population of upper and lower socioeconomic class with different cultures and life style. Study on childhood obesity and over weight is scanty in Pakistan. Studying different etiological factors of obesity among school age children is necessary so that the need for preventive measures can be assessed, secular trends monitored and high-risk population groups identified. This study aims to explore the prevalence of obesity among primary school children in third largest city of Pakistan and etiological factors of obesity in obese children.

## MATERIAL AND METHODS

This was a cross sectional observational study carried out in 5 different schools of Faisalabad from October 2018 to January 2019. A list of all private and public urban schools of Faisalabad was made. Clusters were formed based on location of the school. From private school cluster three schools (Kamil foundation school, City school and Sandal school) were selected while from public school cluster two schools (Government primary school PMC colony and Government elementary school Gujjar Basti) were selected by simple random sampling. A list was made, containing the name of all the students who were of grade I to grade V, from the selected schools. Two hundred and fifty one students each were selected from the randomly selected three private and two public schools by simple random sampling using computer generated table. A total of one thousand two hundred and fifty four consecutive children of either sex of grade I to grade V from the selected primary schools were recruited. The students/parents/guardian who declined the consent, those having any physical disability, children with chronic diseases like chronic kidney disease, congenital heart disease and diabetes mellitus were excluded from the study. Approval from the ethics committee of the hospital was taken and there was no conflict of interest. Three junior doctors from pediatric department were involved by principle investigator for collection of

data. The study procedure was discussed with respective school administration to get permission before start of the study. The students were informed, educated and counseled about the importance and the relevant procedure of the study by the principle investigator through respective class teacher. The consent form, under direct supervision of school teacher, was sent with each student to respective parents/guardians for permission and to be filled. After informed consent and assurance of confidentiality about their personal data, children were interviewed in comfortable environment for each case and their weight and height was taken according to standard method. Standard height was measured by making the child stand against a wall and then marking the highest point of vertex on the wall, making sure that the child stands comfortably with the heels, buttocks, shoulders and back of the head touching the wall and the feet parallel, arms hanging naturally by the sides, the external auditory meatus and the lower border of the orbit in the plane parallel to the floor. Height was measured by using a good steel measuring tape in centimeters. Weight was measured accurately over the lever type of the weighing scale and the same machine was used for all the children. The students were wearing light clothes, bare feet and empty bladder before measuring weight and it was taken to the nearest 100 grams and noted in kilograms. Body mass index was calculated using the formula: weight (in kilograms)/height in meter<sup>2</sup> and then plotted on standard BMI growth charts for age and gender according to National Health and Nutrition Examination Survey III (NHANES-III).<sup>7</sup> A child was labeled obese if BMI for age and sex was more than 95<sup>th</sup> percentile.

The parents of obese children were called in the school for interview to find out the etiological factors of obesity. Questions like educational status of parents, total family members and number of siblings were recorded. Regarding socioeconomic status, those children whose parents were senior public servants, mill-owners or owner of large business concerns, executives or professionals like doctors and engineers were classified in upper socioeconomic status class. Those children whose parents were self-employed, non-gazette servants, laborers, non-skilled workers and un-employed were classified in lower socioeconomic status class. Regarding conveyance ownership, it was asked whether the

children were coming to school by car, school van, rickshaw, and motorcycle or they come to school by foot. Complete dietary intake history including number of meals per day, junk foods, sugary foods, and fatty diets was recorded. About sedentary lifestyle it was asked whether the child participates in active sports or not and for how much time. Similarly television/video viewers and computer, internet or mobile phone users were also identified and recorded. The total time of such activities (screen time) was calculated to check whether it was more or less than two hours.

A proforma was designed to collect the demographic information, weight, height and BMI of children for assessing obesity and the etiological factors of obesity. All these information were recorded on the proforma by principle investigator.

Data was collected according to the proforma. All recorded data was entered and analyzed by using SPSS version 20. Qualitative data were summarized by using frequency and percentages.

## RESULTS

A total of 1254 students were studied. Out of these 21.5% (n=270) were obese while remaining 78.5% (n=984) were non obese. Majority of the students were male (61%, n=765). Out of total 270 obese cases, male students out-numbered female in the ratio 2:1. Statistical analysis of data showed that sex had a significant effect on prevalence of obesity. Table 1 shows base line characteristics of students.

**TABLE 1: Base line characteristics of students**

Characteristics	Frequency (%)
<b>Total students studied</b>	<b>1254 (100)</b>
Obese Students	270 (21.5)
Non Obese Students	984 (78.5)
<b>Gender and obesity (among total students studies)</b>	
Total Male Students	765 (61)
Obese	180 (23.5)
Total Female Students	489(39)
Obese	90 (18.4)
<b>Gender distribution of obese students</b>	<b>270 (100)</b>
Obese male	180 (66.7)
Obese female	90 (33.3)

As regard age of the students we divided students into 3 groups and calculated the frequency and percentages of obese and non-obese cases which showed that the obesity was slightly more prevalent in students of age range 9-11 years (26.32%). The distribution of obesity on the basis of age is shown in table 2.

**TABLE2: Age wise distribution of obesity in the study subjects**

Age in Years	No. of Obese Cases n=270 (%)	No. of Non Obese cases n=984 (%)	Total
6-8	129 (18.45)	570 (81.55)	699
9-11	120 (26.32)	336 ( 73.68)	456
12-14	21 (21.21)	78 (78.79)	99

Factors involved in obesity were identified. As regard socioeconomic class, 70% of obese children belonged to upper socioeconomic class (n=189) while only 30% belonged to lower socioeconomic class (n=81). Other factors involved in obesity like family history of obesity, sedentary life style including decreased physical activity, increased screen time habit (watching TV, movies, use of computer or mobile), availing the facility of conveyance while coming to school and junk foods including fatty diets, sweets, candies, burgers, ice cream, soft drinks or energy drinks are described in table 3.

**TABLE 3: Factors involved in obesity**

Factors of Obesity	Obese patients n=270 (%)
Family History	90 (33.3)
Upper Socioeconomic class	189 (70)
TV/video viewers, computer & mobile users	180 (66.7)
Conveyance	195 (72.2)
Decrease participation in Sports	150 (55.5)
Junk Foods	160 (61.1)

Out of 270 obese students, only two cases were of pathological obesity. These were already diagnosed case as we confirmed from their medical record. One of them was a case of Cushing syndrome and the other of Hypoparathyroidism. These were not investigated any more.

## DISCUSSION

Childhood obesity is becoming a point of concern especially in developing countries of Asia where

the rise of obesity is steep. There are about 15 million obese children in China followed by India (14 million).<sup>8</sup> The prevalence of obesity in children is 17.1% and 18.5% in Nigeria and America respectively.<sup>9,10</sup> Chattha MN et al<sup>11</sup> in their study in Sialkot showed that 15.2 % of school children were obese. Similarly in another study from Pakistan, obesity was present in 44.7% of urban school going children.<sup>12</sup> In our study 21.5% of school children are obese. We studied a large number of school children (1254) as compared to above mentioned local studies (520 and 600 respectively). The high prevalence of obesity in our study shows the recent surge of obesity in this big city of Pakistan

According to recent studies the prevalence of obesity is increasing in children of both genders with a slight dominance in males. In NCD Risk Factor Collaboration (NCD-RisC) study, the prevalence of obesity in children and adolescents increased from 0.7% (1975) to 5.6% (2016) in girls while the numbers increased from 0.9% (1975) to 7.8% (2016) in boys.<sup>13</sup> Studies from Sialkot and Iran showed that obesity is more common in male sex than female.<sup>11,14</sup> In our study 23.5% male and 18.4% female students were obese.

The impact of age of a child to obesity has been studied. During early pubertal period there is release of androgens, which lead to increase concentration of growth hormone and related insulin growth factor 1 (IGF-1).<sup>15</sup> Furthermore there is a normal tendency during early puberty for insulin resistance and it is a natural co factor for excessive weight gain. The result of our study also showed that obesity was relatively more common in the school children of age group 9-11 years.

Parental obesity is an important factor in childhood obesity. Twin and adoption studies also indicate that heritability of body fatness in childhood is 65% to 85%.<sup>16</sup> A study of parental obesity status and childhood obesity in China conducted on 2066 Chinese parents-children showed that parental obesity was associated with a greater increase in their children's BMI and waist circumference.<sup>17</sup> In our study out of 270 obese children 33.3% (n=90) were having positive family history i.e. either one or both parents were obese. This is because of significant genetic

influences on resting metabolic rate, feeding behavior, food preferences, and changes in energy expenditure which occurs in response to over feeding.

The prevalence of obesity is now greater than 3% in lower socioeconomic developing countries of South Asia like Pakistan, Afghanistan, Bhutan and Bangladesh.<sup>18</sup> In our study obesity was more prevalent in upper socioeconomic class. A study conducted by Sheetal Monga<sup>19</sup> in India concluded that prevalence of obesity in upper socioeconomic class was 10.38% and in lower socioeconomic class was 0.48%. Similarly a study conducted in Nigeria<sup>20</sup> showed obesity was more common in upper socioeconomic class students (7.4%) than lower socioeconomic class (2.4%). There are similar reports from the city of Sialkot.<sup>11</sup> Our study is comparable to both above studies. This difference in prevalence of obesity in both socioeconomic classes is due to malnutrition in our part of the world in lower socioeconomic class.

Physical activity, dietary intake, and with adolescents, maturational status are the potential confounders of any relationship between sedentary behavior and adiposity.<sup>21</sup> Some of the environmental factors thought to contribute to reduced physical activity are decreased physical activity in schools, reductions in physical activity required for daily living and increased attractive, sedentary activities like TV/Video viewing, and use of internet/computers. Modest effects in weight and adiposity have been observed as a result of interventions to reduce sedentary behavior in young people.<sup>21</sup> Obesity is more common in children who watch T.V more than two hours/day. In our study majority of obese children (66.7%) had habit of watching T.V for more than 2 hours. Results of our study are comparable to studies reviewed by Carson V et al.<sup>22</sup> Similarly we found that 72.2% of obese children had the facility of using conveyance while coming to school and majority were involved in more low physical activities and participation in sports was less than one hour/day thus leading to high prevalence of obesity.

The usage of high energy density, processed foods and sugary beverages has risen significantly at the expense of more nutrient rich options.<sup>23</sup> A study conducted in primary school of

Nepal by Karki A et al<sup>24</sup> showed children who used junk foods like candies, sweets, burgers, fries, ice-cream, sand witches, soft drinks etc in school twice or more in a week were 2.9 times more likely to be obese. Another study from Chennai, India showed that 30.14 % of school children were overweight while 5.92% were obese among those who preferred junk foods.<sup>25</sup> In our study majority of school children had habit of using junk foods and the results are very much comparable.

Pathological obesity accounts for less than 1% of all the cases. In our study, only two cases were of pathological obesity. No other case of obesity associated with genetic syndrome/ mutation was detected.

**Limitations of the study:** Our data relied entirely on the parents' subjective information regarding their socioeconomic class and the quality of life of kids which may question its accuracy. It is better to perform this type of study in a large number of schools of both urban and rural area so that results can be generalized for whole population but it was not possible for us because of time constraint.

## CONCLUSION

A significant number of school children are obese in the 3<sup>rd</sup> largest city of Pakistan. The upper socioeconomic class is a greater risk factor of obesity as the sedentary life style including increased screen time and regular use of junk foods are more common habits in this particular population. However family history and male sex are also familiar risk factors of obesity. Steps should be taken to combat this health issue. There is a need for more studies to be conducted in schools and in the general population so as to establish guidelines on nutrition and weight status for the Pakistani children.

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