Original Research Article

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Parental obesity influence on body mass index of children: a cross sectional study

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ABSTRACT

Background: Childhood obesity is a serious public health concern in both developed and developing countries. The children share food habits, physical activity habits etc. with their parents either in term of genetic or environmental influences, which affects the body mass index of the children. The objective of this study was to study the association of parental overweight/obesity with overweight/obesity in the children.

Methods: A cross-sectional study was conducted in a government aided school in Nagpur during January 2016 to April 2016. Data was collected by a self-administered questionnaire which had information regarding the socio demographic characteristics like age, sex, socio economic status etc. Anthropometric measurements like height and weight of the children and their parents were measured. Necessary permissions were sought before the start of the study.

Results: We found a significant association (p<0.01) between the obesity and overweight status of father and mother with the body mass index of their children with an odds ratio of 2.49 (1.69 to 3.66) and 2.90 (1.98 to 4.25) respectively. If both the parents are overweight/obese then the odds of their being overweight/obese is 3.00 (1.93-4.68). If either of parents is overweight/ obese, then the odds ratio is 3.10 (2.12-4.54).

Conclusions: Stronger and significant associations were found between the overweight and obesity of the parents and their children. A significantly positive correlation was found between the body mass index of parents and body mass index of their children.

Keywords: Association, Body mass index, Parental obesity

INTRODUCTION

Obesity is a serious public health concern.¹ According to Global Health Observatory data, the mean body mass index (adults 18+ years) of the South-East Asia region has increased drastically from the year 2010 to 2014.² This trend of overweight and obesity is affecting all age groups, increasing the complications at a very younger age.³ Industrial revolution has a huge impact on increasing the average body mass index of the population across the world. By doing this, the fight for under

nutrition is coming to the normal level but as a side effect of urbanization equally there is rise in over nutrition.

The children share food habits, physical activity habits etc. with their parents either in term of genetic or environmental influences, which affects the body mass index of the children. Parental obesity is one of the predominant risk factor for development of childhood obesity. Twin studies also suggest that obesity from parents to the children is inheritable up to the range of 84-88% providing evidence that genes are responsible for

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body fatness.^{5,6} Basal metabolic rate of the children may be genetically related to parental obesity. Since obesity is a modifiable risk factor for development of metabolic abnormalities in later life, preventing this epidemic becomes an important step in having better future generations.⁷

Various studies have been conducted across the world to find the association between the parental obesity and the obesity in their children. But, there exists paucity of data of research in India. Further, the cut off for body mass index in adults used in studies outside India will not be generalizable to our country profile. So, we conducted this study to investigate the association of parental overweight/obesity with overweight/obesity children using the cut off for South East Asian population.

METHODS

A cross sectional study was conducted among the children of a government aided school of Nagpur. Necessary permissions from the district education authorities and school authorities were taken. Written and informed consent was taken from the parents and assent from children before the start of the study. Children who gave assent were included in the study. Data was collected by a pre-designed and pre-tested questionnaire. The data instrument had socio demographic details like age, gender, educational status of parents and socio-economic status.

Socio economic status was classified using BG Prasad classification for urban areas. ¹⁹ The educational status of the parents was classified according the Indian standards for classification of literacy status. ²⁰ Anthropometric parameters of the children like height and weight were taken according to standard guidelines. ²¹ Height was measured using the non-stretchable tape and weight by digital weighing scale giving accurate readings up to nearest 0.1cm and 0.1 Kg respectively. Data on the height and weight of parents was self-reported. ^{22,23} Body mass index was calculated by the formula Body mass index = weight (kg) / {height (m)}² of the children and parents.

Ethics committee approval was sought before the start of the study. Obesity in children was defined by the CDC classification for body mass index percentile for age and sex. The children less than 5th percentile, 5th to 85th percentile, 85th to 95th percentile and more than or equal to 95th percentile were classified was underweight, normal, overweight and obese respectively. South East Asian guidelines were used to classify body mass index of the parents. The body mass index less than 18.5kg/m², 18.5 to 22.99 kg/m², more than or equal to 23kg/m² were classified as underweight, normal, overweight and obese respectively. One of the parents is the start of the parents are the start of the start of the start of the parents. The body mass index less than 18.5kg/m², 18.5 to 22.99 kg/m², more than or equal to 23kg/m² were classified as underweight, normal, overweight and obese respectively.

A study conducted in urban school children of central India had reported prevalence of overweight and obesity to be 14.52%.²⁷ Considering this prevalence, with 15%

relative precision and 95% confidence interval the minimum sample size was 1056. We recruited 1200 children from the age group of 9 to 15 years in the study. Of which 51 students were excluded from the analysis because the data on their parent's height and weight was not available. So, total 1149 students have been included in the analysis.

Statistical analysis

The data was collected and compiled using EPI info 7.2 and the analysis was done using social package for statistical software (SPSS) version 20.00 for windows. All variables were tested for normality using Kolmogorov-Smirnov test. The level of significance was set to be <0.05 and all analysis were two tailed. Descriptive statistics using frequencies and percentages were used. Chi square test was used to indicate the differences between two proportions. Odds ratio was used to define the strength of the association.

RESULTS

Table 1 describes the socio demographic characteristics of the school children. Majority of the children were males (56.66%); majority of them had age 12 completed years (27.67%), followed by 11 completed years (23.93%) and 13 completed years (21.67%). Majority of the children belonged to middle class according to BG Prasad classification.

Table 1: Distribution of school children according to socio demographic characteristics.

Socio demographic characteristics	Frequency	Percentage				
Age*						
≤10	236	20.54				
11	275	23.93				
12	320	27.85				
13	249	21.67				
≥14	69	6.01				
Gender						
Male	651	56.66				
Female	498	43.34				
Educational status of father						
<secondary< td=""><td>463</td><td>40.30</td></secondary<>	463	40.30				
≥Secondary	686	59.70				
Educational status of mother						
<secondary< td=""><td>571</td><td>49.70</td></secondary<>	571	49.70				
≥Secondary	578	50.30				
Socio economic status#						
Class 1	147	12.79				
Class 2	321	27.93				
Class 3	370	32.20				
Class 4	179	15.58				
Class 5	132	11.50				

^{*}completed years, # B G Prasad classification used

Table 2 shows the association between the parental obesity and child overweight/obesity. We found a highly significant association between the overweight/obesity status of father and the overweight/obesity status of the children with an odds ratio of 2.49 (1.69-3.66). Similarly, the association between the overweight/obesity status of mother and overweight/obesity status of the child was

also highly significant with an odds ratio of 2.90 (1.98-4.25). If both the parents were overweight/obese, we found increased risk of their child to be overweight/obese with an odds ratio of 3.00 (1.93-4.68). Similarly, if either of the parents were overweight/obese the child had increased risk overweight/obesity with an odds ratio of 3.10 (2.12-4.54).

Table 2: Association between parental obesity and child overweight and obesity.

		Obesity in children	Odds ratio		
Parental obesity\$		Overweight/obese	Normal	(95% confidence interval)	
Father	Overweight/obese	81 (15.88%)	429 (84.12%)	2.40 (1.60.2.66)	
	Normal	45 (7.04%)	594 (92.96%)	2.49 (1.69-3.66)	
Mother	Overweight/obese	77 (17.66%)	359 (82.34%)	2.00 (1.00 4.25)	
	Normal	49 (6.87%)	664 (93.13%)	2.90 (1.98-4.25)	
Both the parents	Overweight/obese	99 (14.98%)	562 (85.02%)	3.00 (1.93-4.68)	
	Normal	27 (5.53%)	461 (94.47%)		
Either of parent	Overweight/obese	59 (20.70%)	226 (79.30%)	2.10 (2.10.4.54)	
	Normal	67 (7.75%)	797 (92.25%)	3.10 (2.12-4.54)	

^{\$} South East Asian Cut off used.

Table 3 shows the Pearson's correlation coefficients of parent's body mass index when compared with the body mass index of the child. We found weak correlations between the father's body mass index, between mother's body mass index and body mass index of male children.

Similar weak correlations were found between body mass index of father and mother when compared to body mass index of female children. Overall, there were weak correlations between father's body mass index, mother's body mass index and body mass index of the children.

Table 3: Pearson's correlation coefficients (r) of parent's BMI with BMI of the children based on gender.

Children's BMI	Male		Female	Female		Overall	
Children's Divil	r	p value	r	p value	r	p value	
Father's BMI	0.208	< 0.01	0.274	< 0.01	0.234	< 0.01	
Mother's BMI	0.223	< 0.01	0.276	< 0.01	0.238	< 0.01	

DISCUSSION

We found significant associations between the parental obesity and overweight/obesity in children in the present study. Weak correlations between the body mass index of parents and children were also inferred.

A case control study conducted by Kumar S et al in a school of urban area of Karnataka inferred that presence of parental obesity increases the risk of the child up to 25.2 times. ¹⁵ Present study showed highly significant associations between parental obesity and obesity in children.

Many other studies conducted across the world by Bralic et al (Croatia), Zurrigga O et al (Spain), Nasareddine L et al (Lebanon), Farajain P et al (Greece), Fleten et al and Shahin K et al also showed similar significant

associations between parental obesity and the overweight and obesity in children. 12,28,29,10,9

In the present study, the odds of the children to be overweight/ obese are 2.49 (1.69-3.66) when father is also overweight/ obese. This was in concordance with studies conducted by Ochoa MC et al and Shafaghi K et al. 18,8 Higher odds ratio when the body mass index of the father was associated with body mass index of the children were found in the studies conducted by Shahin K et al, Zurrigga O et al and Bralic et al. 9,28,12 When the body mass index of mothers was associated with body mass index of the children the odds ratio was found to be 2.90 (1.98-4.25). Similar results were inferred by Shahin K et al and Bralic et al who conducted a cross sectional study in Iran and Croatia respectively. 9,12 Higher odds ratio were reported by studies conducted by Ochoa MC et al and Zurrigga O et al. 18,28 Study conducted by Shafaghi

K et al did not find any significant association between mother's body mass index and body mass index of the children.⁸ In the present study, the odds of the children being overweight/obese averaged to 3.00 (1.93-4.68) when both of the parents were overweight/obese. Further, if either of the parents are overweight/obese the odds ratio rose to 3.10 (2.12-4.54). Compared to the present study, higher odds ratio were reported by studies conducted by Tchicaya et al, Ochoa MC et al, Shahin K et al, Zurrigga O et al and Farajain P et al. ^{14,18,9,28,29}

We also found weak correlations between parental body mass index and body mass index of their children in both the genders. Similar weak correlations were described by Sangha JK et al, Shahin K et al, Bralic et al, Fuiano N et al and Ochoa MC et al in both males and females. 16,9,12,11,18

Some of the limitations of the present study have been elucidated here. First, this is a cross sectional study the associations which are drawn have to confirmed by conducting prospective studies. Second, the height and weight of the parents were self-reported, this will in turn affect the external validity of the inference drawn. Third, some other factors that influence the association like cultural factors, ethnic factors, and physical activity patterns of both the children and parents have not been considered. Fourth, sibling obesity has also been associated with overweight/obesity in children. This has not been considered in the present study. The large sample size included in our study and the cut off to classify overweight/obesity in parents, which is specific to Indian population are the main strengths of the study.

CONCLUSION

Higher prevalence of overweight and obesity was found in urban children of central India. Stronger and significant associations were found between the overweight and obesity of the parents and their children. Such stronger associations indicate that there is a parental influence on body mass index of their children. The prevention of overweight and obesity should start from the family, the eating habits, and the physical activity patterns etc are indeed acquired from parents passing it on to the future generations. Parental education along with health education of their children will have an added impact in the prevention of childhood obesity. Policy makers should have a focus on primary prevention of the overweight/obesity in children.

Recommendations

It is recommended that follow up studies on changes of body mass index of the children and their association with parental obesity. This further will add to the knowledge about the trends of associations. Education of parents along with children forms a crucial part in cutting down the rates of childhood obesity. The prevention of overweight/obesity has to start from the family itself.

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Institutional Ethics Committee

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