Research Article

Toward primordial prevention of childhood obesity—predictors and parameters of childhood obesity

Anil Kumar Paruchuri[1], Mohammed Faisal[2], Samiksha Singh[3]

[1]Government General Hospital, Vijayawada, Andhra Pradesh, India.
[2]Siddhartha Medical College, Vijayawada, Andhra Pradesh, India.
[3]Gandhi General Hospital, Hyderabad, Telangana, India.
Correspondence to: Mohammed Faisal, E-mail: gdfaisal@gmail.com

Received March 9, 2016. Accepted April 23, 2016

Abstract

Background: Overweight children may become overweight adults, particularly if obesity is present in adolescence. There are very much chances of children to become obese if they have obese parents. Parents can contribute both the genes and eating environment for their children and familial patterns of adiposity because of gene-environment interactions.

Objective: To find out associations between parental and child overweight and obesity.

Materials and Methods: This was a cross-sectional study done in the schools of a city of South India. Children between the ages of 12–15 years were included in the study. During the enrollment, study objectives and methodology were explained to each participant, and written consent was taken.

Result: There was a poor but statistically significant correlation between child's BMI and father's BMI ($r = 0.226$, $p = 0.000$). Similarly, the correlation between child's BMI and mother's BMI was poor but statistically significant ($r = 0.252$, $p = 0.000$). Poor but statistically significant correlation was also observed between BMI and waist-to-height ratio ($r = 0.189$, $p = 0.000$) and waist–hip ratio ($r = 0.127$, $p = 0.000$) of children.

Conclusion: The results of this study may assist to identify those children who have more chances to become overweight and obese in adulthood. Parental overweight or obesity is one of the important factors for the development of obesity in the children. Strategies for prevention of overweight and targeted interventions for prevention of the progression of overweight to obesity are required in school-aged children.

KEY WORDS: Obesity, overweight, children, body mass index, parental BMI

Introduction

Overweight and obesity are defined as abnormal or excessive fat accumulation that may lead to impairment of the health.[1] They are the fifth leading risk of deaths worldwide. The prevalence of obesity has been doubled since 1980. In 2008, more than 1.4 billion adults, 20 years and older, were overweight globally, and, from these, more than 200 million men and about 300 million women were obese.[2] In 2012, it was found that more than 40 million children under 5 years of age were overweight. Initially, it was considered as a problem of developed countries; now this problem has risen in developing countries as well, particularly in urban settings.[2] Around 30 million overweight children are living in developing and 10 million in developed countries.[2] Childhood obesity is associated with a higher chance of obesity, premature death, and disability in adulthood. It is also associated with future risk of respiratory problems, frequent fractures, cardiovascular disease including hypertension and myocardial infarction, insulin resistance and diabetes mellitus, and psychological problems.[3]

Body mass index (BMI) is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2).[1] On the basis of BMI, the WHO has defined overweight when a person's BMI is greater than or equal to 25 kg/m^2 and obese when a person's BMI greater than or equal to 30 kg/m^2.[1] BMI is a very useful tool as it remains the same

Access this article online	
Website: http://www.ijmsph.com	Quick Response Code:
DOI: 10.5455/ijmsph.2016.09032016444	

for both gender and for all ages of adults. However, it should be considered a rough guide because it does not distinguish between body fat and lean body mass.

The 1997 WHO Expert Consultation on Obesity recognized that BMI only cannot be relied upon for the risk measurement for various Cardiovascular system and other morbidities.[4] Abdominal fat can vary considerably within a narrow range of total body fat and BMI, which can be measured by waist–hip ratio.[4] Waist–hip ratio can be calculated by dividing the waist circumference by the hip circumference.[4] There are studies which found that abdominal obesity (measured as waist–hip ratio) was associated with an increased risk of myocardial infarction, stroke, and premature death.[5] Waist–hip ratio can complement the BMI for identifying individuals at increased risk of obesity-related morbidity.[6] Recently, waist-to-height ratio (WHtR) has been documented as a better indicator of obesity and cardiovascular risk than BMI in several different pediatric populations.[7]

There are studies which suggest that overweight children may become overweight adults, particularly if obesity is present in adolescence.[8] There are very much chances of children to become obese if they have obese parents.[9] Parents can contribute both the genes and eating environment for their children and familial patterns of adiposity as a result of gene-environment interactions.[10,11] So, this study was planned with the objective to find out associations between parental and child overweight and obesity.

Materials and Methods

This was a cross-sectional study done in the schools of a city of South India. Permission from the ethics committee was obtained prior to the initiation of this study. Schools with annual fee of more than Rupees 20,000 were selected for this study. Permission for the inclusion in the study was obtained from the 11 schools, and, of these 11, 7 schools were selected randomly. Children between the ages of 12–15 years were considered for inclusion from these 7 schools. Children who were not willing to participate, those who advised bed rest for > 2 weeks during last 6 months, those who presented any chronic disease, and those with physical deformities were excluded from the analysis. During the enrollment, study objectives and methodology were explained to each participant, and written consent was taken.

Result

Table 1 depicts the descriptive statistics of parameters used to predict the BMI of children. There was a poor but statistically significant correlation between child's BMI and father's BMI (r = 0.226, p = 0.000). Similarly, the correlation between child's BMI and mother's BMI was poor but statistically significant (r = 0.252, p = 0.000). Poor but statistically significant correlation was also observed between BMI and WHtR (r = 0.189, p = 0.000) and waist–hip ratio (r = 0.127, p = 0.000) of children.

Table 1: Descriptive statistics of parameters used to predict children's BMI

Parameters	Mean	SD	*N*
BMI	18.35	3.709	1644
Waist-to-height ratio	0.16	0.22	1644
Waist–hip ratio	0.34	2.03	1644
Father's BMI	24.25	4.39	1644
Mother's BMI	24.63	5.76	1644

Multiple regression analysis was done to evaluate the effect of mothers BMI, fathers BMI, waist–hip ratio and WHtR of children on the BMI of children. Descriptive statistics of these parameters are given in Table 1. It was observed that all these parameters in combination explain significant amount of variance in the value of BMI of children (ANOVA *df* (4, 1639), F = 53.62, p = 0.000, R^2 = 0.116, adjusted R^2 = 0.114). Further analysis revealed that all predictor parameters were found to predict the BMI of the children, but WHtR was found to be a better predictor when compared with waist–hip ratio, mother's BMI, and father's BMI [Table 2].

Discussion

In this study, we have tried to explore associations between parental and child overweight/obesity. Many studies related to obesity in children have emphasized the role of the family. Parent's genetic and behavioral factors are essential to explaining the nutritional status of these children.[12]

In this study, it was found that father's BMI and mother's BMI were associated with child's BMI. The higher BMI in the father increased the risk of overweight/obesity among male and female children. Similar results were found in the study

Table 2: Coefficient of different predictor parameters

Model	Unstandardized coefficients		Standardized coefficients	*t*	Sig.
	B	Std. error	Beta		
(Constant)	12.21	0.52		23.491	0.000
Waist-to-height ratio	2.22	0.41	0.13	5.450	0.000
Waist–hip ratio	0.19	0.04	0.10	4.264	0.000
Father's BMI	0.12	0.02	0.14	5.391	0.000
Mother's BMI	0.12	0.02	0.18	7.181	0.000

done by Ohlund et al.,[13] which also found an association between a child's BMI and parental BMI. There are reports which suggest that relative risk of overweight increased if one parent was overweight and increased further if both parents were overweight.[14] Wardle et al.[15] have done study to compare the food and activity preferences and lifestyles of children, independently of their BMI classes, from obese and lean families. They have found interesting results that children from the obese/overweight families showed a higher preference for fatty foods in a taste test, a lower liking for vegetables, and a more "overeating-type" eating style. They also showed a stronger preference for sedentary activities and spent more time in sedentary pastimes. The parents' obesity is clearly one of the most important factors in favoring an increase of the children's overweight and obesity.[16] The parents are also responsible for the quality and the availability of food within the home and, for this reason, if their food habits are incorrect, those of their children will follow.[17]

Statistically significant correlation was observed between BMI and WHtR (r = 0.189, p = 0.000) and waist–hip ratio (r =0.127, p = 0.000) of children in this study. A study done by Freedman et al.[18] found a strong association between BMI and WHtR. While waist–hip ratio has been used to describe body fat distribution in adults, it is influenced by several other body factors and is a poor measure of body fat distribution and risk of related diseases in children.[19] WHtR is age-independent among both boys and girls.[20] There are studies which have provided a strong correlation between WHtR and the risk of cardiovascular and metabolic diseases in children, and it has been proposed as an alternative measure for assessing central fatness in children especially for pediatric primary care practice and epidemiological studies.[21,22]. Our results are an extension to results of our reference study "Prevalence and determinants of overweight and obesity among affluent adolescents in Vijayawada city, Andhra Pradesh."[23]

Limitations

This study includes limited number of predictors; chronic diseases require long follow-up and observation over a large time frame which this study lacks.

Conclusion

The results of this study may assist to identify those children who have more chances to become overweight and obese in adulthood. Parental overweight or obesity is one of the important factors for the development of obesity in the children. Strategies for prevention of overweight and targeted interventions for prevention of the progression of overweight to obesity are required in school-aged children in order to prevent the epidemic of overweight in the adult population.

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How to cite this article: Paruchuri AK, Faisal M, Singh S. Toward primordial prevention of childhood obesity—predictors and parameters of childhood obesity. Int J Med Sci Public Health 2016;5:2154-2157

Source of Support: Nil, **Conflict of Interest:** None declared.