

Impact of lifestyle changes and dietary habits on cardiovascular risk factors among obese and non-obese children-A comparative study

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Abstract

Background: The prevalence of overweight and obesity in childhood and adolescence is high, lifestyle and dietary habits has major impact in developing obesity. Excessive body fat at young age is likely to persist into adulthood and is associated with physical and psychosocial morbidities, with increase in incidence of cardiovascular risk factors.

Objectives: To compare the dietary habits and lifestyle patterns and their association with cardiovascular risk factors among the obese and non-obese children. **Materials and Methods:** Study was conducted in 112 children aged 5-15 years, who had presented with complaints of obesity to pediatric outpatient department in a tertiary care hospital, Tumkur, Karnataka from December 2013 to September 2014. Prevalence of childhood obesity was calculated based on BMI using NCHS guidelines. Cardio vascular risk factors like blood pressure, lipid profile and fasting blood sugar were evaluated. Dietary pattern, physical activity and behavioral patterns were recorded on a pre-tested proforma informed by parents. **Results:** Out of 112 children included in the study 28 (25%) children were obese, 28 (25%) children were overweight, 56 (50%) children were normal. Pre-hypertension (18.9%) and Hypertension (24.5%) were found to be statistically significant in the obese group when compared to the non-obese group. Obese group had higher levels of total cholesterol, LDL-C and low levels of HDL-C compared to non-obese group. Obese children had higher significant risk factors like excess calorie intake and sedentary activities compared to non-obese group. **Conclusion:** Childhood obesity was associated with excess calorie intake and certain behavioral changes like TV watching habit. These children are at a higher risk of "childhood onset of adult diseases" especially hypertension and dyslipidemia. This demands a timely intervention to decrease the adulthood morbidity and mortality due to obesity in these children.

Keywords: Obese and Non-obese, Cardio-vascular risk factors, Dietary habits, Physical activity.

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INTRODUCTION

Obesity has emerged as one of the global health problems with 200 million school-aged children world-wide categorized as being overweight/obese, of which 40-50 million are obese¹. The factors attributing to increasing

childhood obesity are increased intake of high-calorie foods that are low in vitamins, minerals and micronutrients coupled with decreased physical activity². Overweight and obesity are conditions of excessive body fat accumulation. In clinical practice, pediatric overweight and obesity are commonly identified by age- and gender-specific body mass index (BMI) percentiles, BMI standard deviation scores, BMI cut offs and waist circumference (WC) percentiles relative to a reference population³.

The primary criteria used to define overweight and obesity includes:

1. Overweight: BMI or WC \geq 85th percentile to 95th percentile, BMI $>$ +one standard deviation of the average; and
2. Obesity: BMI or WC $>$ 95th percentile, BMI $>$ +two standard deviations of the average.⁴

Childhood obesity is associated with adverse health consequences, including atherosclerosis, hypertension, type 2 diabetes, fatty liver disease and the metabolic syndrome⁵. Co-morbid health problems are common in obese children and include psychosocial disorders (e.g. depression, anxiety), respiratory disorders (e.g. obstructive sleep apnea) and skeletal disorders (eg. musculoskeletal discomfort)⁶. Interest is growing in the connection between increased body fatness and children's brain health, cognitive function and related attainments such as educational achievement and future socioeconomic success⁷. Various studies done in India from 2002-2012 indicate a rising trend in the prevalence of overweight and obesity in children and adolescents^{8,9,10}. This may have major implications towards increasing prevalence of non-communicable disease (NCD) like diabetes, hypertension and cardiovascular disease in early adulthood¹⁰. Thus the present study was conducted to compare the dietary habits and lifestyle pattern between obese and non-obese children and the impact of it leading to obesity and to study the cardiovascular risk factors in obese children.

METHODOLOGY

A hospital-based, cross-sectional study was conducted among 112 children aged 5-15 years attending to the pediatric out-patient department during the study period in a tertiary care hospital, Tumkur, Karnataka from December 2013 to September 2014 after obtaining approval from the institution ethics committee. Parental consent was obtained prior to interview and testing. Children diagnosed to be obese due to endogenous causes like endocrine abnormalities on clinical examination were not included in the study. The age of the children was obtained from the hospital records and parents. The height was measured using sliding stadiometer with an accuracy of 0.1mm. Weight was recorded using weighing machine calibrated to 0.5 kg accuracy. Body Mass Index (BMI) was calculated based on the formula- $BMI = \text{Weight in kg} / (\text{Height in mts})^2$. Children were categorized based on BMI as per NCHS guidelines with respect to their age and sex.

Category BMI

Normal 5th – 85th percentile

RESULTS

Out of 64 children included in the study, 67(59.4%) were males and 45 (40.6%) were females. 28 (25%) of the children were obese, 28 (25%) of the children were overweight, 56 (50%) of the children were Normal.

Overweight 85th – 95th percentile

Obese > 95th percentile

In those children who were categorized as overweight and obese (study group, n=56), cardiovascular risk factors were analyzed and compared with equal number of age and sex children with normal BMI (controls, n=56). Resting Blood Pressure (B.P) was determined using mercury manometer with appropriate sized cuffs, by auscultating in right arm after a 5 minute resting period. Children with an average systolic or diastolic B.P >90th percentile but < 95th percentile with respect to their age, sex and height were classified as having pre-hypertension. Children with average systolic or diastolic B.P >95th percentile with respect to their age, sex and height were designated as having hypertension as per update on 1987 task force report, National high blood pressure education programme coordinating committee. Lipid profile was measured in clinical laboratory on a fasting sample and included Total cholesterol, HDL cholesterol, and Serum Triglycerides (TGs). From these values, LDL cholesterol was calculated using Friedwald's equation.

LDL = TC – HDL - (TG / 5)

Fasting plasma glucose was also obtained for each case. To analyze the life style factors and dietary habits in obese and non-obese groups, a pre-tested proforma was designed and explained to each individual parent and was asked to collect data regarding the child's dietary pattern including food given in between meals and snacks, when the child was healthy. Later, the mean calorie intake of each child was calculated and compared with normal calorie requirement of the child for age and sex and was entered in the proforma as calorie excess or calorie deficit. Child's physical activity (out- door activity) and T.V. viewing/ video games/computer games were also recorded in minutes per day including one Sunday, when the child was healthy. The number of hours of T.V. viewing was compared between cases and controls.

STATISTICAL ANALYSIS

The data entry and analysis was done using STATA version 11. Comparison of means of two continuous variables was done using Independent Student T test. Chi Square test was used to find any significant differences in association among categorical variables.

Table 1: Participant Characteristics and comparative measurements among study group and control group

	Obese, n=56 (Study group)	Non-Obese, n=56 (Control group)	p value
Age (years)	9.84±2.94	10.44±3.01	0.344
Gender (Male: Female)	38:26	17:17	0.373*
BMI(kg/m ²)	22.51±5.42	15.71±1.50	<0.001**
SBP(mmHg)	110.75±12.75	101.21±10.93	<0.001**
DBP(mm Hg)	70.38±8.32	63.23±8.98	<0.001**
Birth weight(kg)	3.12±0.54	2.62±0.34	<0.001**
Physical activity (minutes)	71.32±39.28	71.32±18.64	0.999
Time spent on TV/Computer (minutes)	90.78±50.99	61.32±19.67	0.002**
Total cholesterol (mg/dl)	153.98±15.53	149.97±13.97	0.211

*Chi square test, ** Independent student T test

Pre-hypertension and hypertension were found to be significantly higher in the obese group when compared to the non-obese group. In the obese group it was more predominant in the age group of 11 - 15 than the 5 -10 years age group. [Table 1].

Obese children had significantly higher caloric intake than non obese children. Female children had excess calorie intake compared to the males. [Table 2]

Table 2: Mean Calorie excess in Cases and Controls

Group	Sex	Mean Calorie Excess (K Cal)	N
Over weight and Obese	Male	150.7	28
	Female	158.6	19
	Total	153.9	47
Non-Obese	Male	99.5	12
	Female	105.9	11
	Total	102.6	23

Independent T test, p<0.001

Obese children had significantly higher levels of TC and LDL-C and lower levels of high density lipoprotein (HDL) [Table 3] when compared to non-obese group whereas no such difference was found with respect to triglycerides showing an unfavourable cardio-vascular risk profile

Table 3: Comparison of Lipid profile and Fasting Blood sugar between obese and non obese group

Group	Mean	t value	P Value
TCH	Obese 156.3	4.899	.000
	Non obese 146		
TG	Obese 78.2	1.115	.266
	Non obese 75		
HDL	Obese 43.3	-7.265	.000
	Non obese 48.0		
LDL	Obese 97.3	7.834	.000
	Non obese 3		
FBS	Obese 78.2	-6.874	.000
	Non obese 86		

Fasting Blood sugar (FBS) was more in non-obese group compared to obese group and this was statistically

significant though the mean value of FBS between obese and non-obese was within the normal range.

DISCUSSION

Mortality and morbidity due to infectious diseases like diarrhea and pneumonia have undergone epidemiological transition towards increasing non-communicable diseases related morbidities among under-5 children in our country. Obesity, the other side of the coin of malnutrition, remains un-intervened, leading to severe cardio-vascular morbidities in later ages among the children who are overweight and obese. In a study done by Boyd G. S, *et al*¹¹, elevated BP was detected in 34.7% of obese children whereas in our study 27.9% had pre-hypertension and 6.8% had hypertension. The magnitude of elevated BP was more in severely obese boys (46.5%) and girls (39%) than moderately obese boys and girls (28.1% and 23.1%). A study done by Boyd G.S *et al*¹¹ showed, hypertensive obese children having significantly higher Serum triglycerides and lower HDL-C compared to normotensive obese children but no significant associations was found with respect to Total cholesterol and LDL-C levels. In our study we found unfavorable lipid profile associated with obese children which can lead to cardio-vascular morbidity later. This co-related with the sedentary life style and behavior patterns like TV watching habits in inter-factorial comparisons. Kapil U *et al*¹² found that 17% of all adolescent boys and girls included in their study had their energy intake 100% or more as compared to their RDA. The excess calorie intake among the girl children in our study again is a threat as this was associated with dyslipidemia. Cardio-vascular morbidity profile takes a great toll in females post menopause which needs an alarm for such children to initiate early interventions and primary prevention strategies. Robinson TN¹³ examined data from more than 13,500 children and adolescents in the National health examination survey and reported statistically significant association between hours per day of watching television and prevalence of obesity. The present study reinforces the results of above mentioned studies and stresses the

need for behavioral change education in the school curriculum introducing more outdoor activities and inculcating interest in sports among the children.

CONCLUSION

Childhood obesity was associated with excess calorie intake and certain behavioral changes like TV watching habit. Obese children were associated with early onset essential hypertension and dyslipidemia which might lead to serious cardio-vascular morbidities in the later ages. This necessitates a timely high-risk approach to intervene on such risk factors from progressing into complications and decrease the adulthood cardio-vascular morbidity and mortality due to obesity in these children.

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