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A CROSS SECTIONAL STUDY ON C-REACTIVE PROTEIN LEVEL AMONG OVERWEIGHT AND OBESE CHILDREN ATTENDING A TERTIARY CARE HOSPITAL OF DISTRICT KANPUR

Paediatrics

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ABSTRACT

Introduction- The global prevalence of overweight and obesity in children and adolescents has increased substantially over the past several decades. Accumulating evidence suggests that Hs-CRP, which is also found within macrophages of atheromatous plaques. However, there is no much data available that guarantee its utility as a marker of cardiovascular risk in obese children and adolescents. Hence, the present study was taken up to assess the metabolic abnormalities and its association with hsCRP in obese children and adolescents. **Methodology-**Present cross sectional study was conducted on 100participants attending the tertiary care hospital of District Kanpur and 5ml fasting sample had been collected after overnight fasting and data was entered in Microsoft excel and analysed in SPSS 15.0 using ANOVA and unpaired student t test.**Result-** among cases group there were 4 participants among the age group of 4-8yrs,10 in the age group of 9-13yrs,23 in the age group of >13yrs while in control group there were 3 participants ampong 4-8yrs of age and 28 in 9-13 yrs ,32 participants among the age of >13yrs. On applying independent sample T-test, we could not established correlation between age and Hs-CRP (p value >0.05).**Conclusion-** obese children and adolescents have significantly increased hsCRP compared with a normal weight group. Early intervention and prevention of obesity in children and adolescents decreases cardiovascular disease in later life.

KEYWORDS

Overweight,Obesity,Hs-CRP,Tertiary hospital,Kanpur

INTRODUCTION-

Childhood obesity has reached epidemic proportions worldwide[1]. The prevalence of obesity in childhood and adolescence is becoming a major public health problem all over the world. The incidence and prevalence of obesity and overweight in children is relatively low compared to adults but it is strongly linked to persistence of obesity into adulthood and related morbidity in adulthood.

Dramatic changes have occurred in developed countries over the past 50 years in the lifestyle and physical growth of children and adolescents. Similar changes are being observed in urban regions of developing countries such as India. Obesity is evolving as a major nutritional problem in developing countries, affecting a substantial number of adults and resulting in an increased burden of chronic diseases. Studies on urban Indian schoolchildren from selected regions report a high prevalence of obese and overweight children.(7–11) In addition, studies on Indian school children have also demonstrated that the prevalence of hypertension in overweight children is significantly higher than that among normal children.(12–15).

Obesity in children appears to increase the risk of subsequent morbidity, whether or not obesity persists into adulthood[2]. Outcomes related to childhood obesity include hypertension, type 2 diabetes mellitus, dyslipidaemia, left ventricular hypertrophy, non-alcoholic steatohepatitis, obstructive sleep apnoea, and orthopaedic and psychosocial problems (3–5). Data from **Bogalusa Heart Study** indicate a distinct correlation between childhood obesity and risk of cardiovascular diseases, such as coronary atherosclerosis and hypertension.Coronary artery diseases are set to become the leading cause of mortality worldwide including Indian subcontinent. Therefore the World Health Organization (WHO) designates obesity as one of the most important public health threats.

Obesity is defined qualitatively as excess of body fat but for a quantitative definition, there is wide disagreement about how to measure body fat and what cut off separate obese from non obese.

The **International Obesity Task Force (IOTF)** and US **Centre for Disease Control and Prevention (CDC)** have developed age and gender specific BMI.

IOTF (International Obesity Task Force) BMI cut off points are:
Overweight > 25 kg/m²
Obesity > 30 kg/m²

CDC (Centre for Disease Control and Prevention) BMI cut off points are

Overweight: BMI Between 85th and 95th percentile of age and gender specific.

Obese: BMI >95th percentile of age and gender specific.

The prevalence of obesity and overweight is increasing in developing countries.[3,4] The obesity related Metabolic syndrome is known to associatedwith low grade systematic inflammation.[5,6] Of the many markers used to detectthis inflammatory state in obesity,C-reactive proteinhas emerged as the analyte choice.[7]Recently there has been increasing interest in the role of immune system and inflammation in relation to cardiovascular mortality. Adipocyte tissue is a source of cytokines such as tumor necrosis factor α (TNF-α) and interleukin-6 (IL-6). TNF-α promotes the production of IL-6 and IL-1, which stimulates hepatocytes to produce different acute-phase proteins. Several studies in adults and some studies in children have shown that body mass index is strongly associated with High sensitive C-reactive protein (Hs-CRP), an acute phase protein, suggesting that obesity is a state of low grade inflammation.

Therefore the purpose of this study is to establish the relation between HsCRP (High sensitive C-reactive protein) with the development of Coronary Artery Disease Risk Factors in obese and overweight children and adolescents.

METHODOLOGY-

The Present study was conducted in the Department of Pediatrics, GSVM Medical College and LLR & Associated Hospitals. A total of 100 overweight and obese children and adolescents, having BMI > 85 percentile and meeting the inclusion criteria, were included in this prospective study. Detailed history and examination including anthropometric examination was done to rule out causes of exogenous obesity. These children were then assessed by history, examination and investigation for presence of cardiovascular risk factors (i.e. hypertension and Dyslipidemia). Those subjects having cardiovascular risk factors were taken as cases and those not having cardiovascular risk factors were taken as controls.

INCLUSION CRITERIA

- Children within 4 to 18 years of age group and BMI > 85th percentile.
- Children with informed consent of their parents/ school health authorities.

EXCLUSION CRITERIA

- Children suffering from endogenous causes of obesity such as renal, thyroid, liver disorder or endocrinal causes.

Blood sample (5ml) was collected in the morning after overnight fasting. Out of this 2 ml was collected in a vial containing EDTA as anti-coagulant and 3 ml was collected in plain vial. These vials were sent to the lab immediately for analysis. Analysis of blood samples were done by Paliwal Diagnostic Pvt. Ltd., Kanpur. HsCRP was measured by immuno-nephelometric method. Data was entered in Microsoft excel and analysed in SPSS15.0 using ANOVA and Chi-square test.

Table 1-Distribution of age and sex in cases and control group

Age Group(Yrs)	Cases		Total
	Male	Female	
4-8	3	1	4
9-13	7	3	10
>13	12	11	23
Age Groups	Controls		Total
4-8	2	1	3
9-13	16	12	28
>13	22	10	32

Above table shows that among cases group there were 4 participants among the age group of 4-8yrs,10 in the age group of 9-13yrs,23 in the age group of >13yrs while in control group there were 3 participants ampong 4-8yrs of age and 28 in 9-13 yrs ,32 participants among the age of >13yrs.

Table -2 Distribution of BMI and Sex

Gender	Overweight	Obese	Total
Male	30(48.4%)	32(51.6%)	62(100%)
Female	24(63.2%)	14(36.8%)	38(100%)
Total	54(54%)	46(46%)	100(100%)

Table3- Distribution of Cases and Controls according to BMI

BMI Category	Cases	Control	Total
Overweight	20(45.94%)	33(52.38%)	53
Obese	17(54.06%)	30(47.62%)	47
Total	37(100%)	63(199%)	100

Out of total 37 cases, 17(45.94%) were obese and 20(54.05%) were overweight. Out of 63 controls, 30(47.61%) were obese and 33(52.38%) were overweight. χ^2 =0.026 and p >0.05. On performing binary logistic regression analysis, odds ratio = 0.99 and p > 0.05. Thus the correlation between BMI and risk factors could not be established.

Table 4- Distribution of Hs-CRP according to Age

Age Group	Hs-CRP		Total
	High	Normal	
4-8	3(42.85%)	4(57.15%)	7
9-13	11(29.72%)	26(70.28%)	37
>13	25(44.64%)	31(	56
Total	39	61	100

	HsCRP	
	High	Normal
Mean age	13.08	13.33
Std. Deviation	2.32	2.64

On applying independent sample T-test, we could not established correlation between age and Hs-CRP (p value >0.05).

Table 5- BMI v/s waist circumference and Hs-CRP in cases

Cases	Waist circumference ≤ 70 cm		Waist circumference > 70 cm	
	HsCRP normal	HsCRP high	HsCRP normal	HsCRP high
Overweight	0	4	0	16
Obese	0	0	3	14

Table 6- BMI v/s waist circumference and Hs-CRP in controls

Controls	Waist circumference ≤ 70 cm		Waist circumference > 70 cm	
	Hs-CRP Normal	Hs-CRP high	Hs-CRP Normal	Hs-CRP high
Overweight	12	1	19	2
Obese	3	0	24	2

On taking presence of cardiovascular risk factors (Cases or control) as dependent variable and HsCRP, waist circumference and BMI as independent variable, linear regression analysis was applied and analysis of variance (ANOVA) was performed. We found that there is significant relationship between the above mentioned parameters where F= 73.39 and p < 0.001

BMI Category	Cases	Control	Total
Overweight	20(45.94%)	33(52.38%)	53
Obese	17(54.05%)	30(47.61%)	47
Total	37	63	100

DISCUSSION-

The study population consisted of 100 overweight and obese children and adolescent attending health camps in various schools of Kanpur. Some of the cases were also taken from those attending Pediatrics OPD for health checkup. this cross sectional study aimed to assess clinical utility of using High sensitive C-reactive protein (Hs-CRP) individually as well as in combination with Basal Metabolic Index (BMI) and Waist Circumference (WC) to identify coronary artery risk factors among overweight and obese children and adolescents of 4-18 years age group. A recent study indicates that the inflammatory state reflected in the increase in hsCRP levels is present even during early stages of accumulation of weight towards obesity[8]

The study population consisted of 100 overweight and obese children and adolescent. Out of these, 37 (37%) were having cardio vascular risk factors. Leandro Soriano-Guillen found 24% of obese and overweight subjects having cardiovascular risk factors[9]. This difference between prevalence can be attributed to the fact that Indians are more susceptible to metabolic syndrome as compared to other populations due to their genetic makeup. Gullen et al in their study, by using SDS for BMI according to Spanish BMI data, had established association between BMI and cardiovascular risk factors[10]. The present study could not show significant association between BMI and cardiovascular risk factors (p>0.05) as SDS for BMI data is not available for Indian population. Another reason for not showing significant correlation between higher BMI and cardiovascular risk factor is that we did not take age matched normal lean children as control. However Hatem Hamed El-shorbagy et al has compared BMI of study group (obese and overweight children) and control group (age matched normal lean children) and established significant association between BMI and cardiovascular risk factors[11].

On using Hs-CRP in combination with waist circumference and BMI, there was significant association between these variables and cases in the present study. Thus the present study demonstrates that cardiovascular risk factors can be predicted on the basis of Hs-CRP measurement along with waist circumference and BMI. This finding is clinically very significant as it supports clinical utility of Hs-CRP along with WC and BMI for predicting the presence of cardiovascular risk factors in obese and overweight children and adolescents. Whether Hs-CRP is a predictor of first cardiovascular event is yet to be studied.

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