

ORIGINAL ARTICLE**Serum neopterin in obese and overweight children and adolescents**

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ABSTRACT:

Background: In India, the number of children and adolescents who are overweight or obese is rising quickly. It is often known that children and adolescents who are overweight are more likely to become obese adults. The present study was conducted to evaluate the levels of serum neopterin in obese and overweight children and adolescents. **Materials & Methods:** 180 obese and overweight children and adolescent of both genders were selected. Obese were put in group I, overweight in group II and healthy control in group III. The anthropometric variables, the lipid profile, the fasting serum glucose which was analyzed by using an autoanalyzer and the serum neopterin levels were assayed by HPLC (Shimadzu). The serum insulin levels were measured by using ELISA kits. **Results:** In group I, group II and group III, the mean BMI (Kg/m²) was 29.4, 25.1 and 19.0, WHR was 1.08, 0.96 and 0.82, S.B.P (mmHg) was 129.5, 122.5 and 114.6, D.B.P (mmHg) was 78.6, 78.9 and 76.4, Neopterin (nmol/L) was 8.4, 6.8 and 4.8, insulin was (μ U/mL) was 21.1, 14.9 and 4.2, HOMA-IR was 4.8, 2.7 and 0.9, TC (mg/dl) was 169.2, 155.9 and 142.6, TG (mg/dl) was 107.3, 91.0, 76.7, LDL-C (mg/dl) was 95.6, 91.7 and 86.9, HDL-C (mg/dl) was 39.4, 39.1 and 39.2, fasting glucose (mg/dl) was 82.0, 81.4 and 86.6 and non-veg were 87.4%, 75.2% and 65.2% respectively. The difference was significant ($P < 0.05$). There were 57%, 54% and 21% family history of obesity, 31%, 35% and 14% family history of diabetes, 38%, 32% and 10% family history of hypertension and 8%, 10% and 3% family history of heart diseases in group I, II and III respectively. The difference was significant ($P < 0.05$). **Conclusion:** The results of this investigation showed a positive correlation between the biochemical and anthropometric parameters and serum neopterin. Therefore, regular camps at schools to counsel and advise the children who have been recognized as overweight or obese to engage in physical activity and eat a balanced diet should be organized.

Keywords: Adolescents, children, Neopterin

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INTRODUCTION

In India, the number of children and adolescents who are overweight or obese is rising quickly. It is often known that children and adolescents who are overweight are more likely to become obese adults. In recent years, strong evidence has surfaced about the connection between cardiovascular disorders, inflammation, and obesity.¹ The natural history of atherosclerosis, which includes the formation, development, and rupture of the arterial plaque, is significantly influenced by inflammation. Adipose tissue and compromised immune function in both genetically obese mice and humans have been linked by a number of lines of evidence. There is ample evidence that macrophages penetrate the adipose tissue of obese people. A decrease in macrophage infiltration is linked to weight loss.²

Interest in whether circulating inflammatory indicators may aid in identifying individuals who are at risk of future cardiovascular events has increased as a result of an increasing understanding of the role inflammation plays in atherogenesis.³ Therefore, it would be crucial to identify the indicators of inflammation in order to screen and treat infants and adolescents early. According to scientific research, obesity, diabetes, and cardiovascular disorders are associated with elevated levels of serum neopterin in

the blood.⁴ Human and primary monocyte/macrophages create neopterin, a pteridine molecule, when they are activated by proinflammatory stimuli such as the Th-1 type cytokine interferon gamma. Neopterin interacts with reactive oxygen, nitrogen, and chloride species to produce cytotoxic NO radicals, which increase the cytotoxicity of macrophages.^{5,6} The present study was conducted to evaluate the levels of serum neopterin in obese and overweight children and adolescents.

MATERIALS & METHODS

The study was carried out on 180 obese and overweight children and adolescent of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Obese were put in group I, overweight in group II and healthy control in group III. The anthropometric variables, the lipid profile, the fasting serum glucose which was analyzed by using an autoanalyzer and the serum neopterin levels were assayed by HPLC (Shimadzu). The serum insulin levels were measured by using ELISA kits. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Comparison of various parameters

Parameters	Group I	Group II	Group III	P value
BMI(Kg/m ²)	29.4	25.1	19.0	0.05
WHR	1.08	0.96	0.82	0.02
S.B.P(mmHg)	129.5	122.5	114.6	0.15
D.B.P(mmHg)	78.6	78.9	76.4	0.26
Neopterin (nmol/L)	8.4	6.8	4.8	0.05
Insulin(μU/mL)	21.1	14.9	4.2	0.01
HOMA-IR	4.8	2.7	0.9	0.02
TC(mg/dl)	169.2	155.9	142.6	0.04
TG(mg/dl)	107.3	91.0	76.7	0.04
LDL-C(mg/dl)	95.6	91.7	86.9	0.83
HDL-C(mg/dl)	39.4	39.1	39.2	0.90
Fastingglucose(mg/dl)	82.0	81.4	86.6	0.74
NonVeg(%)	87.4	75.2	65.2	0.05

Table I, graph I shows that in group I, group II and group III, the mean BMI (Kg/m²) was 29.4, 25.1 and 19.0, WHR was 1.08, 0.96 and 0.82, S.B.P (mmHg) was 129.5, 122.5 and 114.6, D.B.P (mmHg) was 78.6, 78.9 and 76.4, Neopterin (nmol/L) was 8.4, 6.8 and 4.8, insulin was (μU/mL) was 21.1, 14.9 and 4.2, HOMA-IR was 4.8, 2.7 and 0.9, TC (mg/dl) was 169.2, 155.9 and 142.6, TG (mg/dl) was 107.3, 91.0, 76.7, LDL-C (mg/dl) was 95.6, 91.7 and 86.9, HDL-C (mg/dl) was 39.4, 39.1 and 39.2, fasting glucose (mg/dl) was 82.0, 81.4 and 86.6 and non-veg were 87.4%, 75.2% and 65.2% respectively. The difference was significant (P< 0.05).

Graph I Comparison of various parameters

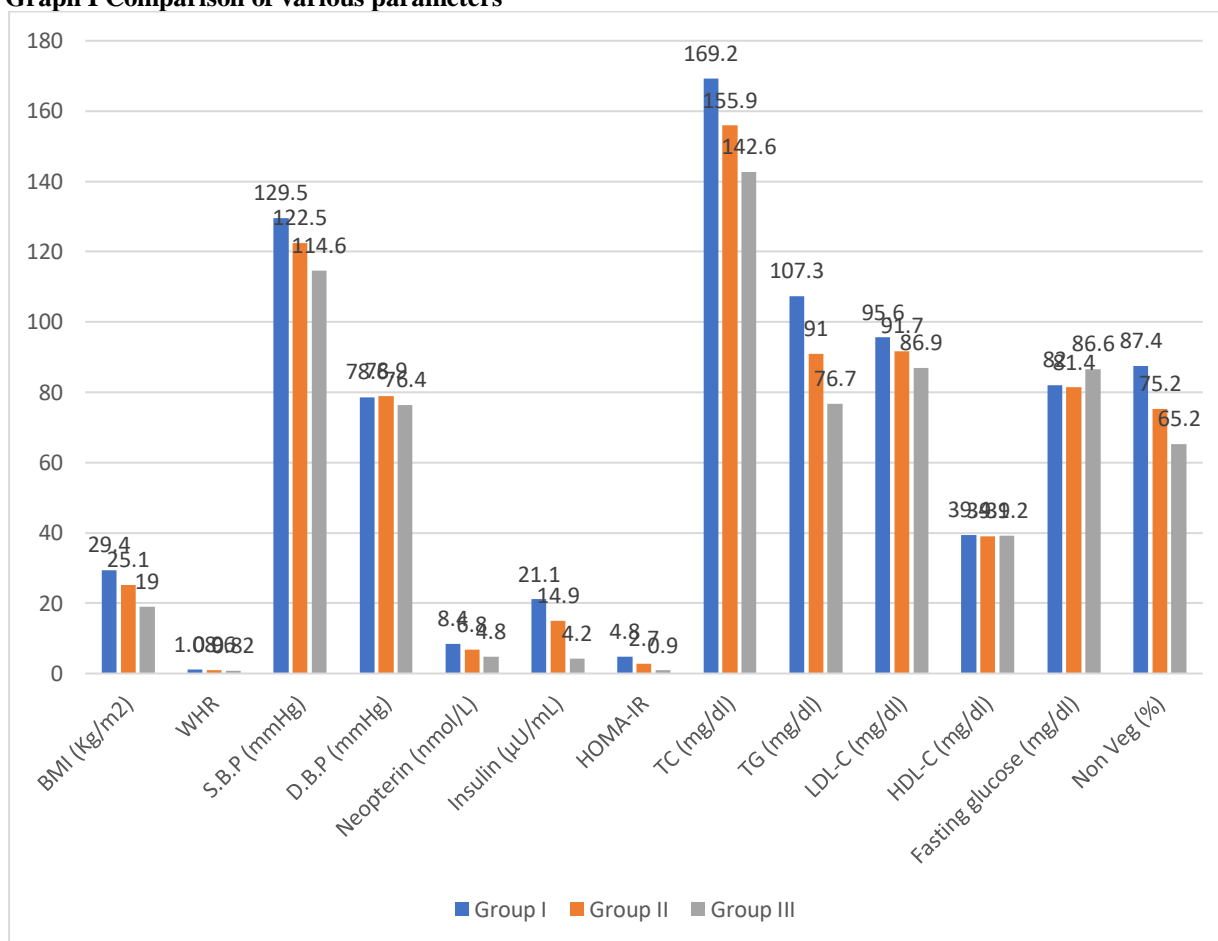


Table II Comparison of family history between all groups

Parameters	Group I	Group II	Group III	P value
Obesity	57%	54%	21%	0.05
Diabetes	31%	35%	14%	0.04

Hypertension	38%	32%	10%	0.05
Heartdiseases	8%	10%	3%	0.01

Table II shows that there were 57%, 54% and 21% family history of obesity, 31%, 35% and 14% family history of diabetes, 38%, 32% and 10% family history of hypertension and 8%, 10% and 3% family history of heart diseases in group I, II and III respectively. The difference was significant ($P < 0.05$).

DISCUSSION

Neopterin has been identified as a prognostic factor in acute coronary syndromes, in survivors of acute myocardial infarction, as well as for rapid disease progression in patients with stable angina pectoris.^{7,8} The medical literature has pointed out the vital role of serum neopterin in obesity and its correlation with inflammation.^{9,10} The present study was conducted to evaluate the levels of serum neopterin in obese and overweight children and adolescents.

We found that in group I, group II and group III, the mean BMI (Kg/m²) was 29.4, 25.1 and 19.0, WHR was 1.08, 0.96 and 0.82, S.B.P (mmHg) was 129.5, 122.5 and 114.6, D.B.P (mmHg) was 78.6, 78.9 and 76.4, Neopterin (nmol/L) was 8.4, 6.8 and 4.8, insulin was (μ U/mL) was 21.1, 14.9 and 4.2, HOMA-IR was 4.8, 2.7 and 0.9, TC (mg/dl) was 169.2, 155.9 and 142.6, TG (mg/dl) was 107.3, 91.0, 76.7, LDL-C (mg/dl) was 95.6, 91.7 and 86.9, HDL-C (mg/dl) was 39.4, 39.1 and 39.2, fasting glucose (mg/dl) was 82.0, 81.4 and 86.6 and non- veg were 87.4%, 75.2% and 65.2% respectively. Gurumurthy Pet al¹¹ evaluated the levels of serum neopterin in obese and overweight children and adolescents of the Indian population. The study groups included 296 school going children and adolescents. (96 obese and 97 overweight subjects were compared with 103 normal controls who were aged between 10- 17 years). The anthropometric variables, the lipid profile, the fasting serum glucose which was analyzed by using an autoanalyzer and the serum neopterin levels were assayed by HPLC (Shimadzu) by using the method of Palfrey et al., 1993. The serum insulin levels were measured by using ELISA kits. The serum neopterin levels (nmol/l) were elevated significantly in the obese (7.4 ± 1.4) and overweight (6.4 ± 0.8) ($p < 0.001$) children and adolescents than in the controls (4.9 ± 0.9). The serum neopterin levels showed a positive correlation with the BMI ($r = 0.79$), WHR ($r = 0.5$), systolic ($r = 0.44$) and diastolic blood pressures ($r = 0.25$), insulin ($r = 0.57$), HOMA-IR ($r = 0.55$), total cholesterol ($r = 0.35$), triglycerides ($r = 0.20$) and LDL-C ($r = 0.27$) and they showed a negative correlation with HDL-C ($r = -0.15$) and fasting glucose ($r = -0.3$).

We found that there were 57%, 54% and 21% family history of obesity, 31%, 35% and 14% family history of diabetes, 38%, 32% and 10% family history of hypertension and 8%, 10% and 3% family history of heart diseases in group I, II and III respectively. Mangge et al¹² in their study serum neopterin concentrations and early metabolic and pre-atherosclerotic symptoms were analyzed in 295 obese juveniles and 101 normal weight controls of similar age. Additionally, the influence of a 12 months weight

reduction program on neopterin levels was investigated in 31 obese juveniles. Intima-media thickness of common carotid arteries (IMT) and the concentrations of C-reactive protein (CRP) were increased in the obese juveniles ($P < .001$). Also, triglycerides, oxidized LDL, fasted insulin levels, HOMA-index, leptin, liver transaminases and uric acid were increased compared to the controls. However, serum neopterin was decreased in the obese versus non-obese juveniles ($P < .03$). The intervention consisting of regular sports, nutritional devices, and a psychologic attendance led after 12 months to an increase of neopterin concentration ($P < .05$; paired test). Conclusions. Neopterin concentrations in juvenile obesity behaved considerably different from what was demonstrated in adults, levels did not correlate with metabolic and pre-atherosclerotic symptoms found in early phases although early vascular burden and chronic low- grade inflammation was indicated by increased IMT and CRP. Neopterin concentrations increased after a 12 months intervention program.

The shortcoming of the study is small sample size.

CONCLUSION

The results of this investigation showed a positive correlation between the biochemical and anthropometric parameters and serum neopterin. Therefore, regular camps at schools to counsel and advise the children who have been recognized as overweight or obese to engage in physical activity and eat a balanced diet should be organized.

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