ORIGINAL ARTICLE

Gender Specific Comparison of C-reactive Protein and Hypercholesterolemia in Obese Children of Karachi

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ABSTRACT

Aim: To determine gender specific comparison of C-reactive protein and hypercholesterolemia in obese children of Karachi.

Methods: This descriptive study was carried out in 100 children (5-16 years) by arranging free camp in government higher secondary school in north Karachi in November 2010 to April 2011. Waist-hip ratio and BMI were measured by the criteria given by national heart lung and blood institute. The blood samples were collected to analyse lipid profile and C-reactive protein. Lipid profile was measured by Randox (enzymatic method); CRP is estimated by immunochormatographic method.

Result: It was observed that body mass index was slightly increased in boys 28.05 ± 0.33 than girls 27.94±0.34, whereas waist-hip ratio was significantly increased in girls 1.399 ± 0.08 when compared with boys 1.89± 0.074. Body mass index and waist- hip ratio in children was calculated by Z score). The lipid profile including, cholesterol (280.4±3.44) and LDL (175.15±3.085) was high in boys as compared with girls, cholesterol (271.54±5.72) and LDL (168.86±5.88), whereas HDL (25.27±1.35) was increased in girls as compared with male case (19.75±1.035). It was also observed that increased level of triglycerides was observed in both cases boys (177.85±4.06) and girls (177.85±4.06). Whereas as C-reactive protein was high 14.2± 0.45 in boys as compared to girls 13.5± 0.47.

Conclusion: There is significant rise of inflammatory marker, C-reactive protein, triglycerides and Low-density lipoprotein in obese boys as compared to girls.

Keywords: Lipid profile, C-reactive protein, Hypercholesterolemia, Obese children

INTRODUCTION

Adipose tissue of children who are obese contains activated macrophages. In the visceral adipose tissues they are known to release the cytokines. As a result the subsequent local inflammation results in innumerable metabolic disorders that go along obesity, include systemic inflammation and atherosclerosis.[1] These adipokines related to inflammation are adiponectin, leptin, tumor necrosis factor alpha, interleukin-1 & 6, vasoactive substances including leptin, angiotensinogen and endothelin, and the molecules that could contribute to insulin resistance such FFA, TNF-*α* and resistin. IL-1 signaling requires the type I Interleukin 1 receptor. Interleukin 1 receptor antagonist an anti-inflammatory cytokine stick to IL-1R in competing with the pro-inflammatory cytokine IL-1.[2,3] These cytokines when liberated in the circulation by the adipose tissue, stimulate C-reactive protein (CRP) production from liver.[4] The prime marker of chronic inflammation is CRP which is known to directly participate in the coronary and aortic atherosclerosis and leads to cardiac events[5].

C-reactive protein fix to the plasma membrane of the impaired cells activating complement cascade which lead to cell death.[6] Other molecules derived from adipocytes including prostaglandins and adiponectin affect metabolic functions and can cause damage to the cardiovascular system[7].

Visceral fat produces adipokines vigorously as compared to the subcutaneous adipose deposits. An increase in abdominal visceral deposits, make these persons more susceptible to metabolic and cardiovascular problems[8]. The pathophysiology of the atherogenic dyslipedemia is increased secretion of VLDL from liver and compromised clearance of VLDL and chylomicrons. An important consequence of delayed clearance is prolonged plasma retention of both VLDL and chylomicrons. The remnants, like cholesterol-enriched intermediate-density lipoproteins (IDLs), are especially atherogenic in humans. Resistance is produced to the action of insulin in the peripheral tissues which may contribute to increased

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triglyceride and LDL levels[9].

Insulin resistance, may also be responsible for decreased level of high density lipoproteins (HDL) as noticed in type-2 diabetes patients and even with boost in HDL synthesis, the plasma HDL concentration was significantly decreased in patients having type-2 diabetes as compared to control subjects. The decrease HDL in plasma is assumed for exclusively by an increase in the rate of apolipoprotein breakdown, which surpass the elevated rate of its synthesis[10].

MATERIALS AND METHODS

This descriptive study was conducted by arranging free camps for obesity in government higher secondary school in North Karachi from November 2010 to April 2011. Patients having history of over eating and weight gain were included. Those patients who have renal dysfunction and diabetes mellitus are excluded. History and physical examination was done. BMI is calculated same as adults which is by dividing the person's weight (Kg) by the squares of height in meters. For children and teens BMI at over the 85th and below the 95th percentile for children and teenage.[11] According to WHO classification underweight (less than5th percentile or 3SD 18.5kg/m^2), Normal and healthy (5th percentile to less than 85th percentile or 2SD equivalent to BMI 22kg/m^2), over weight (85th percentile to less 95th percentile or 1SD equivalent to BMI 5kg/m^2), obese (Equal to and greater than the 95th percentile or > 2SD equivalent BMI 30kg/m^2).[12] The measurement of BMI, and waist hip ratio and some biochemical parameters of lipid profile and CRP were included in this study. Lipid profile was measured by enzymatic method by Randox; CRP is estimated by ICT method (immunochromatographic method). All values expressed as mean ± SEM of that mean and all parameters were statistically analyzed by SPSS version 20. To evaluate the significance of the difference between the compared means, two – tailed paired student test was done. ($P < 0.001$) was considered significant.

RESULT

During studies it was observed that the statistical analysis of anthropometrics study was noted in both genders of children. It was observed that body mass index was slightly increased in boys 28.05±0.33 as compare to girls 27.94±0.34, whereas waist hip ratio was significantly increased in girls 1.89±0.074 as compared to boys 1.39±0.08 (Table1). The lipid profile including, cholesterol (280.4±3.44) and LDL (175.15±3.085) was high in boys as compared with girls, cholesterol (271.54±5.72) and LDL (168.86±5.88), whereas HDL (25.27±1.35) was increased in girls as compared to boys (19.75±1.035). It was also observed that increased level of triglycerides was observed in both cases of boys (177.85±4.06) and girls (177.85±4.06) (Table 2). The statically analysis was also applied on C - reactive protein was slightly high 14.2±0.45 in boys as compares with girls 13.5± 0.47 (Table 3).

Table 1: Comparative study of waist hip ratio & Body mass index in children

Parameter	Boys (n=20)	Girls (n=18)	P value
Body mass index	28.05±0.33	27.94±0.34	P > 0.05
Waist-Hip ratio	1.399± 0.08	1.89± 0.074	P>0.05

Table 2: Comparative study of cholesterol, TG, HDL, LDL levels in obese children

Parameter	Boys (n=20)	Girls (n=18)	P value
Cholesterol (mg/dl)	280.4±3.44	271.54±5.72	P>0.05
Triglycerides (mg/dl)	177.85±4.06	177.31±3.04	P>0.05
HDL (mg/dl)	19.75±1.035	25.27± 1.35	P>0.05
LDL (mg/dl)	175.15±3.08	168.86±5.88	P<0.05

Table 3: Comparative study of C- reactive protein in obese children

Parameter	Boys (5-10 years) (n=20)	Girls (5-10 years) (n=18)	P value
C-reactive protein	14.2± 0.45	13.5± 0.47	P>0.05

DISCUSSION

Our study was conducted for gender specific comparison of C-reactive protein and hypercholesterolemia in the obese children of Karachi. In this study we observed the significance of hypercholesterolemia and C-reactive protein in obese children especially in boys as compared to girls. The significance of hypercholesterolemia and C-reactive protein was same as other studies but there is a little bit difference in that, we found increase level of C-reactive protein in girls as compared to boys, but

other studies shows increased C-reactive in girls as compared to boys[12].

Insulin resistance, hypertension, and dyslipedemia[13] are metabolic abnormalities in obese children which may lead to cardiovascular diseases and diabetes. The pathophysiology of being obese in childhood and adolescence is significantly related to insulin resistance[14]. Resistance to insulin boosts the hepatic lipase activity. The hepatic lipase is responsible for the hydrolysis of phospholipids in LDL and HDL particles. Insulin resistance decreases HDL and enhances the rate of synthesis of Adipocytes. The adipose tissues stimulate the hepatic production of C-reactive protein[15]. Other studies which were conducted in hypercholesterolemia and C-reactive also emphasizes, that childhood weight gain needs early attention because the resistance in insulin along with dyslipidemia and inflammation increases the danger of cardiovascular diseases in children. CRP and adipocytokine are positively correlated with the inflammation which may be a staunch predictor of obesity in the children[16]. We also found that lipid profile and insulin sensitivity domains, predominantly exists in the datas collected of children with obesity. These disciplines may be practiced to foresee the outcomes of cardiovascular diseases[17].

CONCLUSION

A significant rise of inflammatory marker C-reactive protein, triglycerides and Low-density lipoprotein was observed in obese boys as compared to girls. We found that hypercholesterolemia and CRP levels were slightly increased in boys as compared to girls.

REFERENCES

1. Momiyama Y, Ohmori R, Fayad ZA, Kihara T, Tanaka N, Kato R, et al. Associations between plasma C-reactive protein levels and the severities of coronary and aortic atherosclerosis. J Atheroscler Thromb 2010; 17(5): 460–7.
2. Wang Z, Nakayama T. Inflammation, a link between obesity and cardiovascular disease. Mediators of Inflamm 2010;2010:535918.
3. Barat P , Meiffred MC, Brossaud J, Fuchs D4, Corcuff JB, Thibault H, Capuron L. Inflammatory, endocrine and metabolic correlates of fatigue in obese children. Psychoneuroendocrinology 2016;74:158-63.
4. Alberga AS, Prud'homme D, Kenny GP, Goldfield GS, Hadjiyannakis S, Gougeon R, et al. Effects of aerobic and resistance training on abdominal fat, apolipoproteins and high-sensitivity C-reactive protein in adolescents with obesity: the HEARTY randomized clinical trial, Int J Obes (Lod) 2015; 39(10): 1494–500.
5. Navarro P, de Dios O, Gavela-Pérez T, Jois A, Garcés C, Soriano-Guillén L. High-sensitivity C-reactive protein and leptin levels related to body mass index changes throughout childhood. J Pediatr 2016; 178: 178–82.
6. Ahrens W, Pigeot I, Pohlabeln H, De Henauw S, Lissner L, Molnár D, et al. Prevalence of overweight and obesity in European children below the age of 10. Int J Obes (Lond) 2014; 38: 99–107.
7. Lobstein T, Jackson-Leach R, Moodie ML, Hall KD, Gortmaker SL, Swinburn BA, et al. Child and adolescent obesity: part of a bigger picture. Lancet 2015; 385(9986):2510–20.
8. Santos S, Oliveira A, Lopes C. Systematic review of saturated fatty acids on inflammation and circulating levels of adipokines. Nutr Res 2013; 33(9): 687–95.
9. Calder PC. Marine omega-3 fatty acids and inflammatory processes: effects, mechanisms and clinical relevance. J Biochim Biophys Acta 2015; 1851: 469–84.
10. Choi J, Joseph L, Pilot L. Obesity and C-reactive protein in various populations: a systematic review and meta-analysis. J Obese Rev 2013; 14:232-44.
11. Chang CJ , Jian DY, Lin MW, Zhao JZ, Ho LT, Juan CC. Evidence in obese children: contribution of hyperlipidemia, obesity-inflammation, and insulin sensitivity. PLoS One 2015;10(5):e0125935.
12. Urbina EM, Khoury PR, McCoy CE, Dolan LM, Daniels SR, Kimball TR. Triglyceride to HDL-C ratio and increased arterial stiffness in children, adolescents and young adults. Pediatrics 2013;131(4):e1082-90.
13. Wolters M, Schlenz H, Börnhorst C, Risé P, Galli C, Moreno LA, et al. Desaturase activity is associated with weight status and metabolic risk markersin young children. J Clin Endocrinol Metab 2015;100(10):3760-9.
14. Jacobs S, Schiller K, Jansen EH, Boeing H, Schulze MB, Kröger J. Evaluation of various biomarkers as potential mediators with type 2 diabetes in the European Prospective Investigation into Cancer and Nutrition-Potsdam Study. Am J Clin Nutr 2015; 102:155–64.
15. Cho JS, Baek SH, Kim JY, Lee JH, Kim OY. Serum phospholipid monounsaturated fatty acid composition and Δ-9-desaturase activity are associated with early alteration of fasting glycemic status. J Nutr Res 2014; 34:733–41.
16. Takkunen MJ, de Mello VD, Schwab US, Ågren JJ, Kuusisto J, Uusitupa MI. Associations of erythrocyte membrane fatty acids with the concentrations of C-reactive protein, interleukin 1 receptor antagonist and adiponectin in 1373 men. Prostaglandins Leukot Essent Fatty Acids 2014;91(4):169-74.
17. Cook DG, Mendall MA, Whincup PH, Carey IM, Ballam L, Morris JE, et al. C-reactive protein concentration in children: relationship to adiposity and other cardiovascular risk factors. Atherosclerosis 2000;149(1):139-50.