STUDY OF WAIST CIRCUMFERENCE WITH FASTING SERUM TRIGLYCERIDE AND FASTING INSULIN LEVELS AMONG SCHOOL-GOING OBESE CHILDREN IN CHITTAGONG CITY

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Abstract

Background : Waist circumference were determined and its relation with fasting serum TG and insulin were scored among the school going children in Chittagong. **Materials and methods :** The study population were divided into two groups- Group A, cases (with increased waist circumference for age) and Group B, controls (With normal waist circumference for age). **Results :** Mean waist circumference in cases and controls were 90.19 ± 6.05 cm and 72.44 ± 5.15 cm respectively. In the same way fasting serum TG and serum insulin were 178 ± 6.11 mg/dL & 20.2 ± 6.90 IU/mL in cases and 111.35 ± 4.23 mg/dL & 10.34 ± 3.91 IU/mL in controls respectively. The differences were highly significant (p < 0.001) and fasting serum TG and insulin levels was well-correlated with waist circumference. **Conclusion :** This observation may suggest the waist circumference as a measure of central obesity and may be used in an attempt to score the risks of future cardio-metabolic complications in children.

Key words

Triglyceride; Insulin; Obese child.

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Introduction

The prevalence of abdominal obesity and insulin resistance are increasing among children and adolescents[1]. Abdominal obesity is closely related with metabolic syndrome. Increased intra-abdominal fat accumulation increases the risk of CVD and type 2 DM[2,3]. Secular trends show that the prevalence of overweight and obesity increasing rapidly throughout the Asia-pacific region is most likely due to decreasing level of physical activity and increasing availability of energy-dense foods[4]. Asian people have higher percentage of body fat for any given BMI[5]. So waist circumference seems to be a highly sensitive and specific measure of obesity in pediatric population of this region. According to the NCEP ATP III definition, metabolic syndrome is present if three or more of the following five criteria are met: waist circumference ≥94 cm for male and ≥80 cm for female, blood pressure over 140/85 mm Hg, fasting serum triglyceride over 150 mg/dL, fasting HDL-C less than 40 mg/dL (Male) or 50 mg/dL (Female) and fasting blood sugar over 100 mg/dL[6].

Obesity has reached epidemic proportions globally. More than 1 billion adults are overweight and at least 300 million of them are clinically obese[7]. Obesity is increasing rapidly and significantly in developing countries undergoing rapid nutrition and lifestyle transitions. This rising prevalence of obesity is largely due to rapid urbanization and mechanization which has led to reduction in the energy expenditure. It is also accompanied with an increase in energy intake due to increased purchasing power and availability of high-fat or energy-dense fast-foods[6]. The high prevalence of obesity in children can also be attributed to lack of knowledge about the adverse effects of unhealthy nutrition in urban school-going children[8-10].

So there is a need to identify waist circumference as one of the risk factors leading to condition of metabolic syndrome and or central obesity and prepare systematic and scientific approach for its prevention at childhood with the assistance of government and non-government initiatives in Bangladesh.

Materials and methods

A cross sectional comparative study was conducted in the Department of Biochemistry Chittagong Medical College from July 2014 to June 2015 among 100 school going children within the age group of 10-17 years in Chittagong city.

Proper permission was taken for this study from the Ethical Review Committee of Chittagong Medical College, Chittagong.

Considering the cost, nature of study and length of time, the sample size was limited. Total 100 subjects were included in this study. Among them 50 were Cases (Group A with increased waist circumference for age) and 50 were Controls (Group B with normal waist circumference for age).

Inclusion Criteria : (BMI >95th percentile for age & gender percentile)

Exclusion Criteria: Obese children suffering from diabetes mellitus, hypothyroidism, cushing's syndrome

Chemiluminescence enzyme immunometric assay for the quantitative determination of human insulin concentrations in human serum by Siemens immulite 2000 systems. Serum Triglyceride (TG) was estimated by enzymatic method by auto analyser.

The Statistical Package for Social Sciences (SPSS) version 20.0 was used for the statistical analyses. Students t test and chi-square test were done. A p value of < .05 was considered significant.

Results

Table I : Distribution of age among the study groups

	Study Group	N	Mean	± SD	Range
Age (Years)	Group A	50	13.11	2.03	10.0 – 17.0
	Group B	50	12.32	1.90	10.0 – 16.0
	TOTAL	100	12.71	2.00	10.0 – 17.0

Table I shows that mean age of cases was 13.11 ± 2.03 years and that of controls was 12.32 ± 1.90 years.

Table II : Distribution of waist circumference among the study groups (with T-test of significance)

	Study Group	N	Mean	± SD	Range
Waist circumference (cm)	Group A	50	90.19	6.05	73.6 - 119.38
	Group B	50	72.44	5.15	60.58 - 78.81
T value = 6.253, p < 0.001 (Highly significant)					

Table II shows that mean waist circumference of cases was 90.19 ± 6.05 cm and that of controls was 72.44 ± 5.15 cm. Difference in means was significant.

Table III : Distribution of fasting serum TG level among the study groups (With T-test of significance)

Study Group	N	Fasting serum TG (mg/dL) (Mean ± SD)	T-test significance
Group A	50	178 ± 6.11	P <0.001
Group B	50	111.35 ± 4.23	(Highly significant)

Table III shows that mean fasting serum TG level of cases was 178 ± 6.11 mg/dL and that of controls was 111.35 ± 4.23 mg/dL. Difference in means was significant.

Table IV : Distribution of fasting serum insulin level among the study groups (With T-test of significance)

Study Group	N	Fasting serum insulin (µIU/mL) (Mean ± SD)	T-test Significance
Group A	50	20.2 ± 6.90	P < 0.001
Group B	50	10.34 ± 3.91	Highly Significant

Table IV shows that mean fasting serum insulin level (20.2 ± 6.90 µIU/mL) was significantly higher in cases with increased waist circumference than that of controls with normal waist circumference (10.34 ± 3.91 µIU/mL).
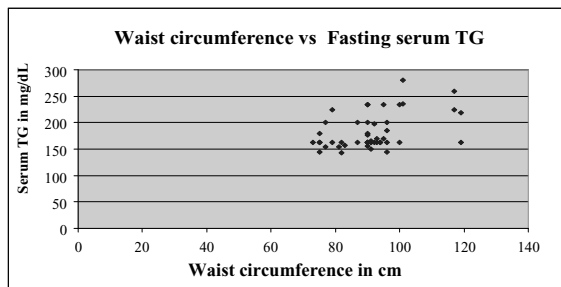
Fig 1 : Scatter diagram showing positive correlation between waist circumference and fasting serum TG among cases.
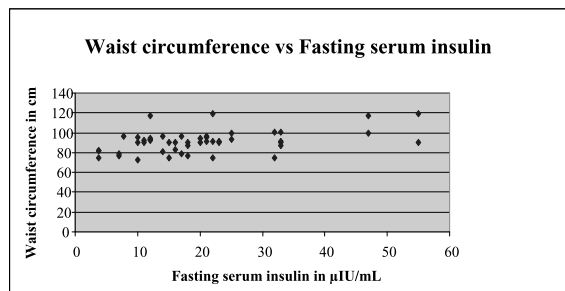

Fig 2 : Scatter diagram showing positive correlation between waist circumference and fasting serum insulin among cases.

Discussion

In the designed study it is clearly seen that there is increased fasting serum TG and insulin levels in children with increased waist circumference than those in control group (As seen in different figures and tables). So it may be said that waist circumference may be a useful index in children for identifying future risk of metabolic syndrome. Although waist circumference in children is not usually used for this purpose (mainly due to the lack of data to indicate appropriate cut-offs), there are some general recommendations1[1-13.] An Indian study suggests that the 75th percentile of waist circumference may be used as an "action point" for Indian children to identify obesity1[3.] Another study reported that cardiovascular disease risk increases in 12–19 year olds with a waist circumference between 66.8–87.5 cm and above for boys, and 71.5–87.2 cm and above for girls. The ranges are so large due to ethnicity and age differences1[2.] According to a recent study carried out in five major Indian cities comprising 10,842 children risk of metabolic syndrome increases in 9+ to 17+ year old with a waist circumference between 68–87.9 cm and above for boys, and 67.9–85.9 cm and above for girls1[1.] Similarly, in the present study increased fasting serum TG and insulin level was observed to be correlated with

increased waist circumference in the school going children. This assumption as scripted in hypothesis may induce more effective studies for better formulation of cardio-metabolic risk from central obesity.

Conclusion

The finding and observation suggested in this study revealed that waist circumference was positively correlated to fasting serum Triglyceride and fasting plasma Insulin in school going obese children. It indicates the risk of metabolic syndrome that may complicate the health status of future citizen beginning from their formative period.

Disclosure

All the authors declared no competing interest.

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References

1. Li C, Ford ES, Mokdad AH, Cook S. Recent trends in waist circumference and waist-height ratio among US children and adolescents. Pediatrics. 2006;118:e1390-1398.

2. Boyko EJ, Fujimoto WY, Leonetti DL, Newell-Morris L. Visceral adiposity and risk of type 2 diabetes: a prospective study among Japanese Americans. Diabetes Care. 2000;23:465-461.

3. Kuk JL, Katzmarzyk PT, Nivhaman MZ, Church TS, Blair SN, Ross R. Visceral fat is an independent predictor of all cause of mortality in men. Obes Res. 2006;14:336-341.

4. Du S, Lu B, Zahi F, Popkin BM. A new stage of the nutrition transition in China. Public Health Nutr. 2002;5(1A):169-174.

5. Wang Y, Rimm EB, Stampfer MJ, Willett WC, Hu FB. Comparison of abdominal obesity and overall obesity in predicting risk of type 2 diabetes among men. Am J Clin Nutr. 2005;81:555-563.

6. Executive summary of the third report of NCEP expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (ATP III). JAMA 2001;285(19):2486-2497.

7. de Onis M, Blossner M, Borghi E. Global prevalence and trends of overweight and obesity among preschool children. Am J Clin Nutr. 2010;92:1257-1264.

8. Abu S, Mir M R, Nurunnahar F, Parvin A K, Hajera M et al. Childhood diabetes in a Bangladeshi population. J Dia Mell. 2013;3:33-37.

9. Mejbah uddin B, Shahaduz Z, Tahmeed A. Risk factors associated with overweight and obesity among urban school children and adolescents in Bangladesh: A case control study. BMC Pediatrics. 2013;13:72.

10. Rahim MA, Hussain A, Azad Khan AK et al. Rising prevalence of type 2 diabetes in rural Bangladesh: A population based study. Diabetes Res Clin Pract. 2007;77:300-305.

11. Khadilkar A, Ekbote V, Chiplonkar S, Khadilkar V, Kajale N, Kulkarni S, Parthasarathy L, Arya A, Bhattacharya A, Agarwal S. Waist circumference percentiles in 2-18 years old Indian children. J Pediatr. 2014;164(6):1358-1362.

12. Messiah SE, Arheart AL, Lipshultz SE, Miller TL. Body Mass Index, waist circumference, and Cardiovascular Risk Factors in Adolescents. J Pediatr. 2008;153(6):845-850.

13. Kuriyan R, Thomas T, Lokesh DP, Sheth NR, Mahendra A, Joy R et al. Waist circumference and waist for height percentiles in urban South Indian children aged 3-16 years. Indian Pediatr. 2011;48:765–771.