Original Research Paper

Volume-7 | Issue-10 | October-2017 | ISSN - 2249-555X | IF : 4.894 | IC Value : 79.96

Physiology

TO STUDY FASTING BLOOD GLUCOSE AND SERUM CHOLESTEROL LEVEL IN NON-DIABETIC OBESE ADOLESCENTS

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ABSTRACT

Aims and Objective: 1.To study and compare fasting blood glucose levels in non diabetic obese and non diabetic non obese adolescents of age (13-17 years) including both sexes.
2. To test the hypothesis that, being an overweight or obese is associated with early appearance of glucose and cholesterol abnormalities.
Method: A case control and observational study was carried out in 50 adolescence, out of which 25 were non diabetic obese(cases) and 25 were non diabetic non obese(controls) from societies and schools of Nagpur.
Inclusion criteria- Adolescence of age gr 13-17yrs of both sexes.
Data regarding Dietary information, Physical exercise, Personal history, Family history of Diabetes and Hypertension were collected.
Fasting blood glucose and Serum cholesterol were estimated and waist: Hip ratios and BMI were also calculated.
Result: After complete study we found that-
Mean value of Fasting Blood Glucose in controls was 78.6mg% and in cases was 75.56mg% and Mean value of Serum Cholesterol in controls was 126.4mg% and in cases was 149.72mg%.
Thus, we observed that there was no significant change in average value of fasting blood glucose level amongst controls and cases. But there was increased level of total serum cholesterol in cases as compared to controls and this increase was found to be significant.
Conclusion: Total serum cholesterol levels were significantly increased in non diabetic obese adolescents as compared to non diabetic non obese adolescents.
There was no change in Fasting blood glucose levels amongst above two groups.
The present study suggests that the dyslipidemic changes (eg. Hypercholesterolemia) may be earlier to develop in obese individuals as compared to hyperglycemia/insulin resistance.

KEYWORDS : .Fasting blood glucose, Serum cholesterol, obesity

INTRODUCTION

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health leading to reduced life expectancy and/or increased health problems [1].

According to new obesity guidelines for Indians; those having BMI ≥ 23kg/m2 are termed as overweight and those having BMI ≥ 25kg/m2 are termed as obese [2].

And with this new definition of obesity, currently 15% of Indian population have obesity [2].

Obesity is a health hazard which is becoming more prevalent in children increasing the incidence of its morbidity disorders due to longer exposure. In India (Delhi) prevalence of obesity among adolescent (13-17 yrs) in public schools and government schools are 29% and 11% respectively and overall prevalence was 24.2% [3]. Major cases of obesity in Indian children are because of eating junk food frequently; spending more time in front of TV sets; physical inactivity (i.e. due to long term Positive Energy Balance) [3].

A significant association between Diabetes Mellitus and Obesity has been noted in several epidemiological studies [4]. Studies have shown that- 'Atherosclerosis', an important disease in adults, starts in childhood[5] and children with risk factors for atherosclerosis should be screened by assessing cholesterol and should be treated if level is found abnormal[6,7]. Studies indicate that adolescents between age 13-17yrs old of both sexes with a BMI>85 percentile are at high risk of being overweight and BMI>95 percentile are at high risk of being obese adults and presenting abnormal glucose and cholesterols in adults [8].

Our aim of study is to test the hypothesis that, being an overweight obese is associated with early appearance of glucose and cholesterol abnormalities. We selected 25 non-diabetic obese adolescents (13-17 yrs) and compared their fasting blood glucose andcholesterol level with those of 25 non-diabetic non-obese adolescents of same age group.

METHODOLOGY

Study Design: Case-Control and Observational study.

Study Setting: Department of Physiology and Biochemistry Indira Gandhi Government. Medical College, Central India, Nagpur, Maharashtra.

Study Population: 25 Non-Diabetic Obese (BMI≥25kg/m2) Adolescents and 25 Non-Diabetic non obese (BMI<25 kg/m2) adolescents of both the sexes.

Selection Criteria:
A) Inclusive Criteria: i) Adolescents of age group between 13-17 years.

B) Exclusive Criteria:
i) Subjects who were diagnosed as having Diabetes Mellitus.
ii) Subjects who take non-vegetarian diet.
iii) Subjects taking medications which can affect body weight, lipid profile and blood glucose level.
iv) Smoking and Alcoholism.

Instrument used: XL640 Fully Automated Chemistry Analyzer**.**

PROCEDURE

The procedure was done in two sets:

1) Data collection:
For our study, adolescents including both sexes in age group of 13-17 years were selected from society as well as from different schools both government and private situated in Nagpur city after taking their consent.

The following data was collected in questionnaire pattern and questions were asked. It includes -
1) Name, Age.
2) Diet information.
3) Physical exercise.
4) Personal history regarding smoking and alcohol consumption5)

Family history regarding Diabetes and Hypertension.

BMI were calculated by the formula as weight (kg)/height (m2). Accordingly, the subjects were classified as:

- Group 1- Control (BMI <25 kg/m2)
- Group 2- Obese (BMI≥25 kg/m2).

Waist & Hip ratio were measured.

Waist was measured at the smallest circumference above the umbilicus and the hip circumference was measured at its widest part of buttocks or hips.

They were explained about the nature and purpose of our study and their written consent was taken.

2) Methods:
The subjects were instructed to arrive at Biochemistry department of Indira Gandhi Government Medical College, Hospital (IGGMCH), Nagpur for investigation.

Fasting Blood Sample after 10-12 hrs of overweight fasting was collected in clean and dry container and serum was separated for the estimation of serum cholesterol level by Centrifuge machine. We determined the Blood Glucose Level by Glucose Oxidase and Peroxidase- End Point method and Serum Cholesterol by Cholesterol Oxidase and Peroxidase- End Point method.

OBSERVATION AND RESULT

Table (I) showing comparison of average value of fasting blood glucose level in controls and cases:-

Groups	Mean Values of Fasting blood glucose
Control (n=25)	78.6 mg%
Cases (n=25)	75.56 mg%*

*=P>0.05 (non-significant)

Table (II) showing comparison of average of total serum cholesterol in controls and cases:-

Groups	Mean values of serum cholesterol
Controls (n=25)	126.4 mg%
Cases (n=25)	149.72 mg%*

*=P<0.05 (significant)

Thus, we observed that there was no significant change in average value of fasting blood glucose level amongst controls and cases. But there was increased level of total serum cholesterol in cases as compared to controls and this increase was found to be significant.

DISCUSSION

Above study was done during the period Aug 2013-Sept 2013.

Our study observed that there was no change in fasting blood glucose levels in non-diabetic obese adolescents as compared to non-diabetic non-obese adolescents.

Insulin resistance is the condition whereby the effectiveness of insulin in transporting glucose into the cell is diminished. Fat cells are more insulin resistant than muscle cells therefore one important cause of insulin resistance is obesity.

Initially, Pancreas responds to insulin resistance by producing more insulin. As long as pancreas can produce more insulin to overcome this resistance, blood glucose levels remain normal. This insulin resistance state (characterised by normal blood glucose levels and high insulin levels) can last for years. Once the pancreas can no longer keep producing high level of insulin, blood glucose levels begin to rise resulting in type 2 DM, thus insulin resistance is pre-diabetic condition. [19]

Our study also observed that there was significant increase of serum cholesterol in non diabetic obese adolescents as compared to non diabetic non-obese adolescents.

Obesity is frequently accompanied by dyslipidemia. The increase in adipocyte mass and accompanying decrease in insulin sensitivity associated with obesity has multiple effects on lipid metabolism. Freer fatty acids are delivered from expanded adipose tissue to the liver where they re-esterify in hepatocytes to form triglycerides which are packaged into VLDLs for secretion into circulation.

The increase insulin level promotes fatty acid synthesis in liver. Increased dietary intake of simple carbohydrates (as it usually occurs in obese individuals) also drives hepatic production of VLDLs resulting in elevation of VLDLs and/or LDL in some obese subjects. Plasma level of HDL-c tends to be low in obesity due in part to reduce lipolysis. [20]

SUMMARY AND CONCLUSION

Total serum cholesterol levels were significantly increased in non diabetic obese adolescents as compared to non diabetic non obese adolescents.

There was no significant change in Fasting blood glucose levels amongst two groups.

The present study suggests that the dyslipidemic changes (eg. Hypercholesterolemia) may be earlier to develop in obese individuals as compared to hyperglycemia/insulin resistance.

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