

Role of Lipid Profile in Obesity and Diabetes Mellitus Type 2 with Obesity

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ABSTRACT

Introduction: Diabetes Mellitus (DM) comprises a group of metabolic disorders characterized by Hyperglycaemia due to insufficient or inefficient insulin. There occur various types of DM that are caused by the interaction of genetics, environmental factors and life-style choices. Diabetes Mellitus is the seventh leading cause of death in United States. It affects about 9.3% or 29.1 million American population. The complication of DM affects the retina, kidney, and nervous system.

Material and Methods: The present study has been conducted at the Department of Biochemistry, Shri Ram Murti Smark Institute of Medical Sciences (SRMS IMS), Bareilly U.P. India. The estimation of fasting blood sample (FBS) by GOD-POD method as described by Trinder (1969). Estimation of Total Triacylglycerol, serum cholesterol and HDL-c level was done by enzymatic method (fully auto analyzer, siemens).

Result: The FBG level between obese with DM Type 2 and without DM Type 2 in highly significant. The difference in the FBG level between normal subjects (control group) and obese with DM-2 is highly significant.

Conclusion: In obese without DM-2 in comparison to normal healthy subjects-No change in serum TG, LDL, VLDL and total cholesterol is seen. In obese with DM-2 in comparison with normal healthy subjects. TG is increased, HDL and VLDL decreased, while no change is seen in TC and LDL.

Keywords: FBG - Fasting Blood Glucose, DM - Diabetes Mellitus, FFA- Free Fatty Acid, IR- Insulin Resistance

INTRODUCTION

DM and obesity have a complex relationship, with type 2 diabetes strongly associated with obesity.¹ Obesity stands out as a risk factor for type 2 DM, but we see some lean adult type 2 diabetes subject probably having latent autoimmune diseases. Thus obesity may be a precursor for type 2 DM, followed by insulin resistance.²

Many patients with DM type 2 are asymptomatic and their disease remain undiagnosed for many years. Studies suggests that typical patients with new onset DM type 2 has had diabetes for at least 4-7 years, before it is diagnosed.³

In obesity the excess 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. People are considered obese when their body mass index (BMI) exceeds 30kg/m. Obesity is the root of several chronic diseases like type 2 DM progressing to hypertension, proteinuria, nephritis, cataract, delayed wound healing, increased frequency of infection, moderate ketosis, early ageing, peripheral neuritis, heart diseases, obstructive sleep apnea, and osteoarthritis.⁴

The genetic factors varying from individual to individual i.e. number of fat cells, level of anabolic hormones, hunger signals, leptin are also responsible for obesity. Increased concentration of plasma FFA can induce IR in humans through inhibition of glucose transport activity, this may be a consequence of decreased IRS-1 associated PI-3 kinase activity.⁵

We aimed to find out changes in the lipid profile (TG, TC, HDL-c, LDL-c, HDL/LDL-c ratio) in the serum of control, obese persons without type 2 DM and obese with type 2 DM.

MATERIAL AND METHODS

The present study has been conducted at the Department of Biochemistry, Shri Ram Murti Smark Institute of Medical Sciences (SRMS IMS), Bareilly U.P. India.

Materials

30 Adult normal persons, 30 Adult obese persons without DM type 2 and 30 Adult obese persons with DM type 2 were selected for the study. The Subject chosen were not on any drug treatment during days of blood collection. Age of the subject was between 25-65 years. Subjects were taken from out-patient Department and Indoor-patient Department of Medicine, SRMS IMS Bareilly U.P. India. Subjects were of both sexes coming from reasonable distance around Bareilly city, U.P. India. They were from lower and middle class of rural area having moderate physical activities, with vegetarian as well as non-vegetarian dietary habits. The Height (meters), weight (kg) and BMI were recorded.

Exclusion Criteria

1. Cases taking same drug treatment for same disease.
2. Cases suffering from chronic diseases.

Sample Processing:- Before collecting venous blood sample using standard venipuncture into vial subjects were asked to have a fasting period of 12 hrs. for the standardization blood was drawn in sitting position from anticubital vein. These samples were collected in two different vials. One plain vial for measuring the lipid profile (Total cholesterol,

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TG, LDL-c, VLDL-c, and HDL-c), one for measuring Blood glucose (fasting) in sodium fluoride vial. Blood was allowed to clot and was immediately centrifuged at 5000 rpm for 10 minutes. Serum was collected and stored immediately at -20c until assay performed. The estimation of fasting blood sample (FBS) by GOD-POD method as described by Trinder. (1969). Estimation of Total Triacylglycerol, serum cholesterol and HDL-c level was done by enzymatic method (fully auto analyzer, siemens)

Serum VLDL – Cholesterol Estimation

Estimation by calculation, VLDL- Cholesterol is 1/5th of Triglyceride.

VLDL-c= TG/5

Serum LDL – Cholesterol Estimation:

LDL-c were calculated by Friedwald and fredricksons formula;⁶

LDL- c = Total cholesterol- (TG/5 + HDL - Cholesterol)

If TG level in more than 400 mg/dl then LDL-c cannot be calculated by this formula

RESULT

For the present study 30 normal (control) and 60 obese cases were taken. Out of 60 obese cases, 30 were found to be without DM Type-2 and 30 cases with DM Type-2. This is shown in Table-1

Table 2, shows the difference in the FBG level between obese with DM Type 2 and without DM Type 2 in highly significant (p value 0.0001). The difference in the FBG level between normal subjects (control group) and obese with DM-2 is highly significant (p value 0.0001). but the difference in the FBG level between control group and obese without DM-2 is not significant (p value 0.11)

Table 3, The difference in the level of Serum Triglyceride and VLDL between obese with DM Type-2 and obese without DM-2 is significant (p value <0.01). The difference in the level of Serum Triglyceride, HDL-c and VLDL between obese with DM Type-2 and control group in significant (p value <0.01). The difference in the level of Serum Triglyceride, serum cholesterol, LDL-c, VLDL-c and HDL/LDL ratio between obese without DM-2 and control group is not significant.

The difference in the level of Serum Cholesterol, HDL-c, LDL-c and HDL/LDL ratio between obese with DM Type-2 and obese without DM-2 is not significant. The difference in the level of Serum Cholesterol, LDL-c and HDL/LDL ratio between obese with DM Type-2 and control group is not significant . The difference in the level of HDL-c between obese without DM Type-2 and control group is significant (p value <0.01)

DISCUSSION

Diabetes is already a costly disease in individual, social and economic terms and the global burden of diabetes is increasing. Proper treatment of diabetes is not costly; not treating diabetes properly is very costly . Diabetes is associated with premature morbidity and mortality and it should never be considered to be a 'mild' condition. Many people with

Group	BMI (kg/m2)	No of cases
Control	<25	30
Obese	>25	60
Obese without DM Type 2	>25	30
Obese with DM Type 2	>25	30

Table-1: The distribution of cases taken

Group	FBS(n=30)	p-Value
Obese without DM Type 2	99.90±10.95	0.0001*
Obese with DM Type 2	206.33±78.58	
Obese with DM Type 2	206.33±78.58	0.0001*
Control	95.23±11.47	
Obese without DM Type 2	99.90±10.95	0.11
Control	95.23±11.47	

Table-2: Statistical analysis of Fasting Blood Sugar (FBS) level with Control, Obese with DM Type 2 and Obese without DM Type 2.

	Obese without DM Type-2 (n=30)	Obese with DM Type-2 (n=30)	Control group (n=30)	p-value	Control Group (n=30)	p-value
TG	157.75±65.7	228.77±145.53	148.10±42.12	0.005*	148.10±42.12	0.50
TC	172.08±27.12	170.67±62.05	177.39±32.85	0.91	177.39±32.85	0.50
HDL-C	30.64±7.17	31.43±12.92	23.5±38.18	0.77	23.5±38.18	0.004*
LDL-C	100.50±40.79	93.19±46.63	108.32±32.26	.52	108.32±32.26	0.42
VLDL-C	30.04±12.27	45.74±29.12	30.88±7.12	.009*	30.88±7.12	0.75
HDL/LDL	0.46±.70	0.40±0.25	.40±0.24	.66	.40±0.24	0.66

Table-3: Statistical analysis of level of TG, TC, HDL-C, LDL-C, VLDL-C and HDL/LDL ratio with Control, Obese with DM Type-2 and Obese without DM Type-2.

diabetes have asymptomatic disease, and it is hoped that with improved screening procedures and better treatments . the long term outlook for these individuals will be greatly improved.⁷

Diabetes Mellitus is a global problem. This disease affected presently 150 million people worldwide. Asian Indian phenotype has an increased susceptibility to diabetes mellitus. WHO has reported that Southeast Asian countries have the highest burden of diabetes mellitus.⁸ India comprises of 85% of the adult population in South East Asia and hence major contributor of diabetic population in South East Asia.⁹

According to Joshi SR (2007)⁸, India has been described as the diabetes capital of the world, every fifth diabetic in the world is an India. According to the diabetes atlas published by international diabetes federation, India is currently having over 40 million diabetic patients, which is predicted to increase to 70 million by the year 2025. In India more than 50% of the diabetic cases have the onset below 50 years of age.⁹

The difference in the mean serum TG level between normal and obese groups was statistically insignificant. The mean serum TG level was higher in diabetic cases in comparison to non diabetic cases irrespective of obesity. Difference in mean serum TG level between obese with diabetes type 2 and obese without DM Type 2 was statistically highly significant. The difference in serum cholesterol level between normal and obese cases was however not significant statistically. There was insignificant difference in the mean serum cholesterol level between diabetic obese and non diabetic obese. There was significant difference in the mean serum HDL-c between normal and obese group. Mean average level of serum LDL-c was also similar, suggesting that the obesity is not associated with change in serum LDL-c level. There was insignificant difference in mean serum LDL-c level between obese group with diabetes type 2 and without diabetes type 2. The present study showed that serum VLDL-c level in obese group is only marginally higher than normal group.

There was highly significant difference in the mean serum VLDL-c level in obese cases with diabetes type 2 than the cases without diabetes type 2. Therefore it can be concluded that the increases in VLDL-c is not associated with obesity but with diabetes type 2 developed due to obesity. Serum TG level and serum VLDL-c level is increased in diabetes type 2 obese subjects but serum LDL-c and serum HDL-c level is not changed in diabetes type 2 obese cases.

CONCLUSION

Following conclusion can be drawn from the present study. In obese without DM-2 in comparison to normal healthy subjects- No change in serum TG, LDL, VLDL and total cholesterol is seen. In obese with DM-2 in comparison with normal healthy subjects. TG is increased, HDL and VLDL decreased, while no change is seen in TC and LDL.

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