RELATIONSHIP OF GLYCAEMIA AND TRIGLYCERIDES WITH BMI IN DIABETIC PATIENTS

Arshad Parvez, Ihsanullah*, Ahmad Rafiq*, Nisar Ahmad*, Ejaz Hassan Khan*
Department of Pathology, Khyber Girls Medical College, *Khyber Teaching Hospital, Peshawar, Pakistan

Background: Diabetes mellitus (DM) is a metabolic disorder characterised by chronic hyperglycaemia with disturbances in carbohydrate, fat and protein metabolism arising from defect in insulin secretion or action or both. The clinical guidelines recommend measurement of BMI as "vital signs" for evaluating the obese and diabetic patients. **Methods:** This study was carried out on 160 diabetics, which were divided on the basis of BMI into obese (120) and non-obese (40) diabetics from Peshawar district. All patients had their triglycerides and glucose checked after over night fast. **Results:** The serum triglyceride in diabetics having BMI >30 (obese) was increased as compared to patients having BMI <30 (non-obese). The comparison of serum glucose level in obese diabetics was found to be significantly raised as compared to non-obese diabetics. **Conclusions and Recommendations:** It was concluded that dyslipidemia is common in all diabetics. The abnormal triglyceride level can improve with good glycaemic control, but do not reach the normal state. Good glycaemic control, Reducing BMI, periodic checkups of lipids and blood glucose are recommended for all diabetics in order to avoid complications.
Keywords: Triglyceride, BMI, obese, non-obese, type 2 diabetics

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder characterized by chronic hyperglycaemia with disturbances in carbohydrate, fat and protein metabolism arising from defect in insulin secretion or action or both.[1] The term diabetes mellitus is broadly divided in type 1, type 2 and other types. Type 1 presents acutely in younger people with symptoms developing over a period of days or few weeks and was formerly called juvenile onset diabetes. There is destruction of pancreatic β cell and eventually no insulin secretion. Type 2 DM tends to present more chronically in middle aged and elderly with symptoms developing over months or even longer.[2]

A family history is a major risk factor for the disease. One of the reasons to screen for diabetes is that it has a prolong asymptomatic phase, which includes impaired fasting glucose, impaired glucose tolerance at the early stages.[3]

Several mechanisms are involved for insulin resistance, including cytokines, non esterified fatty acids, mitochondrial dysfunction, glucotoxicity, lipotoxicity and amyloid formation for β cell dysfunction. The disease has a strong genetic component, although only a handful of genes have been identified so far.[4]

Dyslipidemia is very common in type 2 diabetes and it is characterised by hypertriglyceridemia and low levels of high density lipoprotein cholesterol (HDL-C), an important cause of morbidity.[5] Diabetes has emerged as a major health problem in Pakistan. Diabetes mellitus is usually associated with hypertriglyceridemia more frequently when serum triglyceride exceed more than 5.2 mmol/l (200 mg/dl) and obesity as well.[6] Type 2 diabetes and obesity are often comorbid.[7] Hypertriglyceridemia is associated with an increased risk of cardiovascular events and acute pancreatitis.[8] The incidence of hypertriglyceridemia increases with poor glycaemic control and prolonged duration of diabetes mellitus. The statistical unit used for obesity measurement is the body mass index, (BMI). Body mass index equals to a person's weight in kilograms divided by height in meter squared ($BMI=Kg/m^2$).[9] BMI is the measurement of choice for many physicians and researcher studying obesity.[10]

The American Institute for Cancer Research takes a BMI between 18.5 and 25 to be an ideal target for a healthy individual and BMI more than 30 is being obese.[11] The clinical guidelines recommend measurement of BMI as 'vital signs' for evaluating the obese patient. In our diabetic population, lipid control is usually poor due to various reasons like ignorance, socioeconomic and false beliefs of treatment, hence it is noted that in our population complications of diabetes are more pronounced and higher as compared to the West.

This study was designed to assess hypertriglyceridemia in obese and non-obese diabetics and to understand the relationship of hypertriglyceridemia with severity of obesity and BMI in diabetics in our community.

MATERIAL AND METHODS

Patients were randomly selected from the Department of Pathology, Khyber Girls Medical College, Peshawar. One hundred and sixty subjects were included in this study and data was recorded on a proforma. All Patients included in this study were established type 2 diabetics, of both sexes. Patients

with primary hyperlipidemia, hypertension, Cushing syndrome, thyroid diseases, liver diseases, nephrotic syndrome, acromegaly and chronic pancreatitis following pancreatic surgery were excluded because they affect lipid status. Patients using drugs which may affect lipid metabolism, like beta blockers, steroids, and statins were also excluded. Quality of data was given enough attention in terms of calibration of instruments and avoidance of raters' bias. Besides other data evaluation included serum triglyceride levels. The samples were taken after 12 hour fasting. Data was analysed using SPSS-13.0.[12] Data was described in terms of frequencies and percentages for categorical variables, whereas Mean±SD were calculated for quantitative variables. Chi-square test at $p \leq 0.05$ level was used for significance testing.

RESULTS

Patients aged 40–80 years. Diabetic patients included 120 obese having BMI more than 30, and 40 non-obese with BMI less than 30. The mean serum triglyceride (TG) was 238.02±94.55 with a range of 85–650. The levels of serum triglycerides were significantly different between obese and non-obese diabetics ($p<0.05$).

Table-1: Serum triglycerides in obese and non-obese diabetic patients

Serum Triglyceride Levels	Obese diabetics n (%)	Non-obese diabetics n (%)	*p*
<100-	8 (6.67)	5 (12.5)	<0.05*
100-200	39 (32.5)	17 (42.5)	
200+	73 (60.83)	18 (45)	
Total	120	40	

Mean serum glucose level in 160 subjects was 135.67±67.76 ranging from 55 to 470. Statistically there was significant difference between obese diabetics and non-obese diabetics with respect to serum glucose levels ($p<0.05$).

Table-2: Serum glucose levels in obese and non-obese diabetic patients

Serum Glucose	Obese diabetics n (%)	Non-obese diabetics n (%)	*p*
<110	66 (55)	13 (32.5)	<0.05*
110–126	10 (8.3)	2 (5)	
>126	44 (36.6)	25 (62.5)	
Total	120	40	

DISCUSSION

Dyslipidemia in diabetes have been described many time in numerous studies with consistent findings and few differences.[13] A major confounding factor in interpretation of lipid levels in studies carried out on type 2 diabetics is the presence of obesity; having BMI>30 the latter is not only more frequent in type 2 diabetes, but is also associated with raised triglycerides. Amongst dyslipidemia the hypertriglyceridemia is the most predominant abnormality, it is more common in type 2 diabetics than type 1.[14] It is more common in diabetics as compared to non-diabetics due to four fold increase in VLDL triglyceride.[15] It predisposes the patients to life threatening complications like diabetic ketoacidosis, coronary artery disease and lipaemia retanalis. In another study hypertriglyceridemia has been found in 42.4% of diabetic patients, out of which 30% had hypertriglycerdemia.[16]

CONCLUSION

Hypertriglyceridemia with BMI>30 is at a high risk as compared to hypertriglyceridemia with BMI<30 in diabetic patients. Good glycaemic control, weight reduction (decreasing BMI), periodic checkups of lipids and blood glucose are recommended for all diabetics in order to avoid complications like atherosclerotic changes, retinopathies, nephropathies and cardiac complications. Early diagnosis and diet modifications are usually enough for preventing and treating hypertriglyceridemia in diabetes mellitus. Exercise is strongly recommended as it not only reduces the serum lipids level but also potentates the effect of diet or drug therapy of glucose metabolism in diabetic patients.[17] Strict diet modification, control of blood pressure, avoidance of smoking and control of over weight and obesity. We strongly recommend 'Lipid and diabetes awareness programme' for our population.

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Address for Correspondence:

Dr. Arshad Parvez, Department of Chemical Pathology, Khyber Girls Medical College, Peshawar, Pakistan. **Cell:** +92-300-5948390