Association between Hyperglycemia and Lipid Profile in Prediabetic and Diabetic Patients

Poorsoltan N*, Ahmadi R, Foroutan M, and Khosravy S

Abstract-- Increased blood sugar is a pivotal factor contributing to diabetes and exerts important effects on body biochemistry. The main aim of this study was to determine the effects of increased blood glucose on lipid profile in patients with high fasting blood sugar. Blood samples of 200 male or female patients with high blood glucose level (100 patients with fasting glucose between 115 and 180 mg/dl, and 100 patients with fasting blood glucose higher than 180) and, of 100 male or female subjects with normal fasting blood glucose (70-115 mg/dl) were biochemically analyzed for serum triglyceride, cholesterol, LDL, HDL and creatinine levels. The normal subjects were correlated with patients with respect to age, sex, diet and habitat. Data were compared statistically between the groups using one-way analysis of variance. Our findings showed that increased fasting blood sugar can significantly raise the serum level of triglyceride \( (P<0.01) \) which is partly because of its effects on biochemical pathways involving in converting extra glucose to triglyceride.

Keyword-- Fasting Blood Sugar, Lipid Profile

I. INTRODUCTION

DIABETES is a group of metabolic disease characterized by hyperglycemia and metabolic changes which could be the result of insufficiency or defect in insulin secretion, insulin action or both [1], [2]. In fact, it’s a worldwide prevalence disease with growing trend. According to the studies, diabetes is the results of interaction between genetical and environmental factors [3]. Among environmental factors, chronic underlying disease and inflammation [4], [5], stress and depression [6], [7], obesity, low physical activity and sedentary lifestyle [8], [9] are mentioned. Increased blood sugar is a pivotal factor contributing to diabetes and exerts important effects on body biochemistry and cause complications. Long term complications of diabetes induced by hyperglycemia are nephropathy, retinopathy and peripheral and autonomic neuropathy which is associated with gastrointestinal [10], hepatic [11], urinary and cardiovascular disease [12] and dislipidemia [13]. Dislipidemia is characterized by high triglyceride and low HDL cholestrol levels that triglyceride and cholestrol levels in diabetes are more than healthy individuals [14]-[19]. High triglyceride level in diabetic patients could be more important risk factor for cardiovascular disease in contrast to high LDL cholestrol [20]-[22]. LDL cholestrol level in diabetic women are higher than non-diabetic women. Moreover, such relation is not seen in men [23].

There are also studies indicating that increased serum levels of glucose can influence enzymes asuch as serum glutamat oxsalooacetat transaminase (SGOT), aspartate aminotransferase (AST), alkaline phosphatase (ALP) and cratine kinase (CK) and change the normal serum levels of such enzymes bringin about disturbances in body normal physiology and biochemistry [24]-[34].

The main aim of this study was to determine the effects of increased blood glucose on lipid profile in patients with increased blood sugar known as prediabetic and diabetic.

II. MATERIAL AND METHODS

A. Participants

We carried out a retrospective, cross-sectional study. 200 male or female patients with high blood glucose level (100 patients with fasting glucose between 115 and 180 mg/dl (as prediabetic), and 100 patients with fasting blood glucose higher than 180 (as diabetic)) and, of 100 male or female subjects with normal fasting blood glucose (70-115 mg/dl) were recruited in our study. Patients were admitted to hospitals or medical centers.

B. Blood sample

After written informed consent form, blood samples were obtained, then were analyzed biochemically for fasting blood glucose and lipid profile.

C. Statistical Analysis

All values are presented as mean±SEM. Statistical significance was evaluated by one-way analysis of variance (ANOVA) using SPSS 19. Differences with \( P<0.01 \) were considered significant.

III. RESULTS

Table I represents serum triglyceride, cholesterol, HDL and LDL levels in control, prediabetic and diabetic patients. Statistical analysis suggests that mean serum TG levels in prediabetic and diabetic groups were significantly higher than control group \( (P<0.01) \). There was no significant difference in
serum cholesterol, HDL, LDL and creatine levels between patients and control group.

Table I: Serum triglyceride (TG), cholesterol (Chol), HDL and LDL levels in control, prediabetic and diabetic patients.

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Prediabetic</th>
<th>Diabetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>TG (X±SEM) (mg/dl)</td>
<td>132.5±12.8</td>
<td>193.6±19.1</td>
<td>401.1±101.1</td>
</tr>
<tr>
<td>Chol (X±SEM) (mg/dl)</td>
<td>204±5.6</td>
<td>N.S.</td>
<td>N.S.</td>
</tr>
<tr>
<td>HDL (X±SEM) (mg/dl)</td>
<td>42.78±15.1</td>
<td>N.S.</td>
<td>N.S.</td>
</tr>
<tr>
<td>LDL (X±SEM) (mg/dl)</td>
<td>80.68±36.32</td>
<td>N.S.</td>
<td>N.S.</td>
</tr>
</tbody>
</table>

The data are indicated as mean ± SEM. P values are expressed in comparison with control group. N.S. represents no significant difference compared with control group.

Table II also represents serum creatine levels in control, prediabetic and diabetic patients.

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Prediabetic</th>
<th>Diabetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cr (X±SEM) (mg/dl)</td>
<td>0.97±0.089</td>
<td>0.96±0.037</td>
<td>0.98±0.084</td>
</tr>
</tbody>
</table>

The data are indicated as mean ± SEM. P values are expressed in comparison with control group. N.S. represents no significant difference compared with control group.

IV. DISCUSSION

The results of current research show that mean serum TG levels in diabetic and severe diabetic group is significantly higher than control group, while there was no significant difference in serum cholesterol, HDL, LDL and creatine levels between patients and control group. There are many studies indicating lipid profile abnormalities in diabetic and severe diabetic patients [17], [35], [36]. Moreover, in accordance to our study, results of other studies reveal that hypertriglyceridemia is a complication of diabetes leading to acute pancreatitis and hyperviscosity syndrome in severe condition [37]. It has been also suggested that liver insulin resistance in diabetes may result in elevated glucose production because of impaired ability of insulin to suppress the expression or activity of gluconeogenic enzymes. This abnormality coexists with increased triglyceride synthesis and reduced free fatty acid oxidation [38].

V. CONCLUSION

Our findings showed that increased fasting blood sugar can significantly result in elevated serum level of triglyceride which is partly because of its effects on biochemical pathways involving in converting extra glucose to triglyceride.

ACKNOWLEDGMENT

This research has been financially supported by Islamic Azad University-Hamedan Branch. We appreciate all who helped us to exert the present study.

REFERENCES


Nooshin Poorslotan. Received her BS degree in Nutrition Science and at present she is MSc student in International Branch of Shahid Beheshti Medical University, Tehran, Iran.

Dr. Rahim Ahmadi. Received his PhD degree in basic physiology and at present he is assistant professor in Islamic Azad University, Hamedan Branch. He is author of more than 30 books and more than 100 scientific papers in local language or in English published in journals or international conference proceedings. He is also senior member of APCBEE.