

## Prevalence of High Lipid Profile in Diabetes Mellitus Patients: A Study in a Tertiary Care Centre

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### Abstract

**Introduction:** Diabetes mellitus is a group of metabolic diseases characterized by increased blood glucose levels resulting from defects in insulin secretion, insulin action, or both. It is also associated with interrelated plasma lipid and lipoprotein abnormalities, including reduced HDL cholesterol, elevated triglyceride and LDL levels. Each of these dyslipidemic features is associated with increased cardiovascular risk and as a result, mortality.

**Materials and Methods:** 476 patients between 18 – 80 years were selected randomly and included into the study. The patients were divided into 2 groups, one with blood sugar levels below 110mg/dl and the other within normal limits. Biochemical tests such as fasting blood sugar, post prandial blood sugar, lipid profile including triglyceride levels, HDL cholesterol, LDL cholesterol and total cholesterol were done for all the patients.

**Results:** Out of 476 patients, 249 were diabetic with fasting blood sugar above 110mg/dl and 227 patients had FBS levels within the normal limits. Out of the diabetic patients, 51% were males and 49% were females. In the controls group, there were 52.4% males and 47.6% females.

**Conclusion:** There is a high prevalence of high degree of elevated lipid and lipoprotein levels among the diabetic patients showing that they are more prone to these abnormalities.

**Keywords:** Diabetes mellitus, lipid levels, lipoproteins, cholesterol, triglycerides

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### Introduction

Diabetes is one of the highly prevalent diseases around the world. Along with its complications, diabetes is a significant cause of morbidity and mortality as well as an increased burden to the health sector's economy<sup>1</sup>. According to the International Diabetes Federation Diabetes Atlas, it is estimated that about 194 million people had diabetes in the year 2003 and about 2/3rd of the people lived in developing countries<sup>2</sup>.

In India, the number of diabetic patients is so high that it is no more considered an epidemic but in fact a pandemic. According to the International Journal of diabetes in Developing Countries, India is considered to be the Diabetic capital of the world. The International Diabetes Federation estimates that the number of diabetic patients in India has doubled from 19 million in 1995 to 40.9 million in 2007 and it is projected to increase to 69.9 million by 2025<sup>2,3</sup>. Some studies in India have shown a threefold rise in the diabetic prevalence in rural as well as the urban areas<sup>4,5</sup>.

Diabetes mellitus is a group of metabolic diseases characterized by increased blood glucose levels resulting from defects in insulin secretion, insulin action, or both<sup>6</sup>. The chronic hyperglycemia of diabetes is associated with long term damage, dysfunction and failure of many organs, especially the eyes, kidneys, nerves heart and blood vessels<sup>7</sup>.

Diabetes is also associated with interrelated plasma lipid and lipoprotein abnormalities, including reduced HDL cholesterol, elevated triglyceride and LDL levels<sup>8</sup>. There is evidence that each of these dyslipidemic features is associated with increased cardiovascular risk and as a result, mortality<sup>9</sup>.

The measurement of the lipid profile of the diabetic patients is needed to investigate how their lipid mechanism is affected by diabetes. Hence this present study was undertaken to assess the lipid profile in diabetic patients in comparison with non-diabetic patients.

### Materials and Methods

This cross-sectional study was conducted on patients who attended the outpatient departments of Medicine, Surgery and Gynecology at ACSR Government Medical College over a period of two years 4 months. 476 patients between 18 – 80 years were selected randomly and included into the study. Children below the age of 18 years and patients with other chronic diseases which have effect on the weight of the patient were excluded from the study.

Detailed demographic details such as age, weight, height, smoking and alcoholic status, previous medical history and family history were taken. Biochemical tests such as fasting blood sugar, post parandial blood sugar, lipid profile including triglyceride levels, HDL cholesterol, LDL cholesterol and total cholesterol were done for all the patients. All the tests were done on fully automatic analyzer. Glucose was tested by GOD-POD method, and the lipids were performed by enzymatic method as per the manufacturer’s instructions.

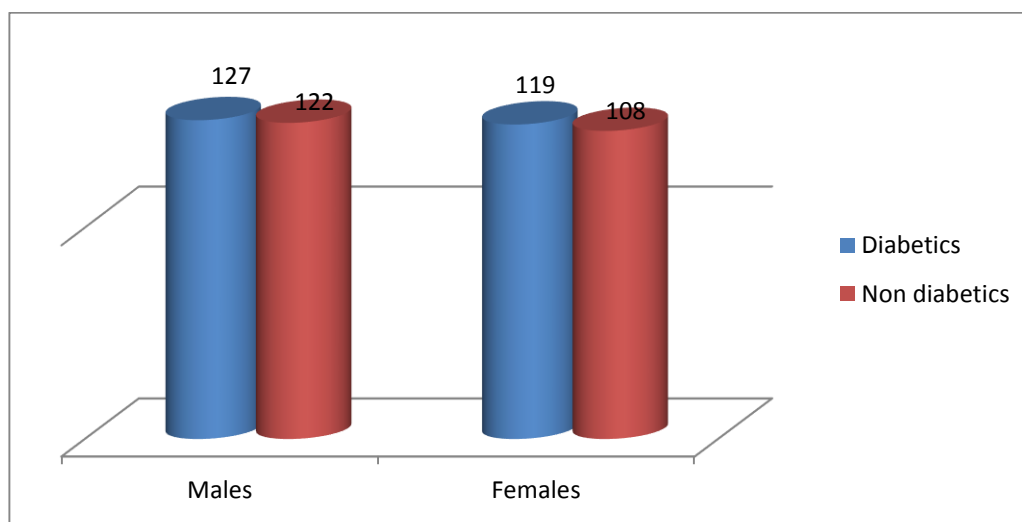
Ratio of TC/ HDL and LDL/HDL were calculated to assess the cardiovascular risk. Based on the glucose

levels, the patients were divided into 2 Group – 249 in Diabetic group and 227 in the non-diabetic group.

Chi square test and t test were done for statistical analysis.

**Results**

Out of 476 patients, 249 were diabetic with fasting blood sugar above 110mg/dl and 227 patients had FBS levels within the normal limits. Out of the diabetic patients, 127 (51%) and 122 were females (49%). In the controls, there were 119 (52.4%) males and 108 (47.6%) females (Fig: 1).



**Fig: 1: Gender wise distribution of diabetic patients and controls.**

13.4% among the males and 11.8 % among the females in the diabetic group had high levels of total cholesterol as against 5.7% and 4.6% in males and female controls respectively. High triglyceride levels were observed in the diabetic patients with 40.2% of the males and 55.5% of the females. Similar was the case with LDL cholesterol (Table: 1).

**Table 1: Lipid profile in Diabetic and controls.**

| Parameter                 | Men               |                  | Women             |                  |
|---------------------------|-------------------|------------------|-------------------|------------------|
|                           | Diabetics (n=127) | Controls (n=122) | Diabetics (n=119) | Controls (n=108) |
| Total Cholesterol (mg/dl) |                   |                  |                   |                  |
| Normal range (<200)       | 81 (63.8%)        | 97 (79.5%)       | 74 (62.2%)        | 86 (79.6%)       |
| Borderline (200 -239)     | 29 (22.8%)        | 18 (14.8%)       | 31 (26.1%)        | 17 (15.7%)       |
| High (≥ 240)              | 17 (13.4%)        | 7 (5.7%)         | 14 (11.8%)        | 5 (4.6%)         |
| Triglycerides (mg/dl)     |                   |                  |                   |                  |
| Normal range (<150)       | 49 (38.6%)        | 86 (70.5%)       | 24 (20.2%)        | 79 (73 .2%)      |
| Borderline (150 -199)     | 27 (21.3%)        | 19 (15.6%)       | 29 (24.4%)        | 21(19.4%)        |
| High (≥ 200)              | 51 (40.2%)        | 17 (13.9%)       | 66 (55.5%)s       | 8 (7.4%)         |
| HDL-C (mg/dl)             |                   |                  |                   |                  |
| Low (<40)                 | 86 (67.7%)        | 28 (23%)         | 68 (57.1%)        | 14 (13%)         |
| Borderline (40 - 59)      | 32 (25.2%)        | 36 (29.5%)       | 27 (22.7%)        | 32 (29.6%)       |
| High (≥ 60)               | 9 (7.1%)          | 58 (47.5%)       | 24 (20.2%)        | 62 (57.4%)       |
| LDL-C (mg/dl)             |                   |                  |                   |                  |
| Optimal (<100)            | 48 (37.8%)        | 67 (54.9%)       | 46 (38.7%)        | 91 (84.3%)       |
| Borderline (100 - 159)    | 65 (51.2%)        | 44 (36.1%)       | 38 (31.9%)        | 9 (8.3%)         |
| High (≥ 160)              | 14 (11.0%)        | 11 (9.0%)        | 33 (27.7%)        | 8 (7.4%)         |

## Discussion

There are many complications associated with diabetes including elevated levels of LDL, Triglycerides, low levels of HDL. Hyperlipidemia is relatively a common problem among the patients with diabetes. This abnormality is exaggerated among the patients with poor diabetic control. This could be because insulin plays a very important role in the regulation of intermediary lipid metabolism and fluctuations in the degree of metabolic control thus produce variable effects on plasma lipoprotein metabolism<sup>10</sup>. Many non-insulin dependent diabetic patients are obese, and obesity may lead to the development of hyperlipidemia. Also, although diabetes and hyperlipidemia represent different genetic disorders, each of these disorders is common in the population and the two disorders may coexist by chance in the same individual<sup>11</sup>.

Our study shows a predominance of males to females among the diabetic patients although this was not of any significant value as the patients were randomly selected which was in accordance to a study by Vinter-Repalust et al<sup>12</sup>, who also reported no significant difference in the prevalence of diabetes in males and females. On the other hand, Albrink et al<sup>13</sup> have reported that diabetes is more in males as compared to females, and Shivanand et al<sup>14</sup> reported a prevalence of diabetes in 70% of the males and 30% of the females.

Lipid and the lipoprotein profiles were more among the diabetic patients than the controls. This was similar to the findings reported by Idogun et al<sup>15</sup> and Albrink et al<sup>16</sup>. The triglyceride levels in our study was high in around 40% in males and around 55% in females, while in controls only around 13% of the males had high levels of triglycerides, while it was less than 8% in the females. This difference of the triglyceride levels over the controls was observed in a similar study by Samatha et al<sup>17</sup>. They observed the elevated levels of triglycerides in diabetics in comparison to the controls. Among the males, the levels of triglycerides was much higher than that of the females showing that the metabolism is slower in males. The levels of HDL were low in 67% of the males and 57% of the females, while in controls 23% and 13% were seen in males and females respectively. Similar results were observed in a study by Samatha et al<sup>17</sup>.

HDL is known to act by enhancing the removal of cholesterol from the peripheral tissues and thus reduces the body's cholesterol pool. Diabetes associated with low HDL was usually accompanied by high Triglyceride levels as observed in our study. This has been strongly associated with CHD<sup>18</sup>.

Total cholesterol levels in our study were also higher among the diabetic in both males and the females. This high levels of total cholesterol, and triglycerides and low levels among the diabetic patients

were reported by Samatha et al among a rural population in Andhra Pradesh.

The relative insulin efficiency which occurs in diabetes impairs the action of lipoprotein lipase resulting in the lowering of HDL levels and increasing the total cholesterol and triglyceride levels. This is said to improve with proper glycaemic control<sup>9</sup>.

Although we have not included magnesium and HbA1C levels in our study, a significant correlation was found between HbA1C and cholesterol and triglycerides. Dietary supplementation with magnesium was found to be effective in preventing or delaying the diabetic complications<sup>1</sup>.

## Conclusion

We therefore conclude that there is a high prevalence of high degree of elevated lipid and lipoprotein levels among the diabetic patients showing that they are more prone to these abnormalities and if uncontrolled can result in cardiovascular diseases and other complications.

**Conflict of Interest: None**

**Source of Support: Nil**

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