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Lipid Profile in Diabetic Patients Attending A Tertiary Care Hospital In Western Uttar Pradesh

Anurag Prasad[1*], Chakrapani Bhardwaj[2], Sarvesh Kumar[3]

ABSTRACT

Background: Dyslipidemia is a prevalent condition frequently observed in diabetic individuals, leading to cardiovascular complications. **Objective**: To identify lipid irregularities in patients with diabetes. **Methods**: This research was performed at the department of Medicine, Santosh Medical College, Ghaziabad**,** Uttar Pradesh over the duration from January 2008 to Aug 2008. We analyzed the lipid profiles and fasting blood sugar levels of 100 type-1 diabetic patients, 100 type-2 diabetic patients, and 50 healthy controls after obtaining informed consent. Serum samples were evaluated for fasting blood glucose (FBG), total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL), and high-density lipoprotein cholesterol (HDL) utilizing standard biochemical techniques. Data were gathered using a pre-designed, pre-tested proforma and assessed with SPSS 17.0 (Trial version). **Results**: The highest number of individuals (37% and 44%) were within the age range of 20-29 years for type-1 DM and 50-59 years for type-2 DM, respectively. 53% of type-1 DM cases and 70% of type-2 DM cases exhibited fasting blood sugar levels below 140 mg/dl. Conversely, 49% of type1 DM patients and 30% of type-2 DM patients reported postprandial blood sugar levels exceeding 200 mg/dl. A significant majority of type-2 DM patients (72%) had elevated serum cholesterol levels, while only 12% of type-1 DM patients demonstrated high cholesterol levels. Moreover, 95% of type-1 DM patients maintained normal serum triglyceride levels (10-190 mg/dl), in contrast to only 26% of type-2 DM subjects. Serum LDL levels were elevated (>160 mg/dl) in 78% of type-2 DM patients, while only 19% of type-1 DM patients exhibited higher values. All type-2 DM patients presented with normal serum HDL levels.**Conclusions**: The prevalence of elevated cholesterol, triglycerides, and LDL levels was significantly greater in the diabetic population, highlighting their higher susceptibility to dyslipidemia, which may contribute to cardiovascular disorders.

Keywords: Dyslipidemia, Diabetes, Serum cholesterol, Serum triglyceride, Lipid profile, Serum LDL

INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic diseases characterized by elevated blood glucose levels due to defects in insulin secretion, insulin action, or both. The number of diabetes cases is increasing and is of concern, especially in developing countries. The number of people with diabetes worldwide is estimated to be more than 175 million. Diabetes is the seventh leading cause of death and the third leading when all fatal complications are considered. Patients with type 2 diabetes are at increased risk of cardiovascular disease associated with atherosclerotic dyslipidemia.[1] Coronary heart disease, especially heart attacks, is the leading cause of morbidity and mortality worldwide. Hyperglycemia and atherosclerosis are associated in type 2 diabetes. Diabetes not only increases the risk of coronary heart disease, but also increases the incidence of cerebrovascular stroke. Moreover, it is the most common cause of acquired blindness, and is responsible for more than 25% of end-stage renal failure cases and more than 50% of non-traumatic lower limb amputations. Diabetes, as a pan-metabolic disorder, is characterized by quantitative and qualitative changes in the lipid profile. Prolonged hyperglycemia causes glycosylation of all proteins, especially collagen cross-links and matrix proteins of the arterial wall[2]. This ultimately leads to endothelial cell dysfunction and contributes to atherosclerosis. The prevalence of dyslipidemia in diabetes is 95%. Dyslipidemia is an important risk factor for coronary heart disease (CHD). Cardiovascular disease is the cause of morbidity and mortality in patients due to the destruction of lipoproteins.Serum triglycerides (TC) 69%, serum cholesterol 56.6%, low-density lipoprotein cholesterol (LDL) 77%, high-density lipoprotein cholesterol (HDL) 71%[3]. In uncontrolled diabetes, serum triglycerides are very high. Both fasting and post-solid meal low-density lipoprotein (VLDL) and cholesterol levels were increased. After a mixed meal, chylomicron fragments and low-density

[1*]Associate Professor, Department of Medicine, Santosh Medical College, Ghaziabad, Uttar Pradesh , India.
[2]Assistant Professor, Department of Medicine, Santosh Medical College, Ghaziabad, Uttar Pradesh , India.
[3]Resident, Department of Medicine, Santosh Medical College, Ghaziabad, Uttar Pradesh , India.

***Corresponding Auther-** Dr. Anurag Prasad
*Associate Professor, Department of Medicine, Santosh Medical College, Ghaziabad, Uttar Pradesh , India.

lipoproteins (LDL) remain elevated longer than normal. In one third of patients, total cholesterol and LDL are slightly to moderately elevated, whereas HDL remains significantly low, especially in patients with type 2 diabetes and central obesity. Among the changes in lipoprotein composition, small, dense, triglyceride-rich LDL molecules and a high proportion of glycol-oxidation products of LDL are considered to be the most atherogenic[4]. The age-adjusted incidence of coronary heart disease is 3-5 times higher in male and female diabetic patients compared to the general population. Patients with diabetes may have various forms of dyslipidemia, which leads to increased cardiovascular risk due to hyperglycemia. Therefore, lipid abnormalities should be proactively identified and treated as part of comprehensive diabetes care. The aim of this study was to detect lipid abnormalities in patients with diabetes.

METHODS

The study was carried out from January 2008 to Aug 2008 at the department of Medicine, Santosh Medical College, Ghaziabad,Uttar Pradesh. A total of 200 diabetic patients were selected for the study from the Out-Patient Clinic and Inpatient Ward, consisting of 100 type 1 diabetic patients aged 13-56 years and 100 type 2 diabetic patients aged 35-74 years. For the control study, 50 normal healthy volunteers aged 13-75 years were selected.

A detailed medical history was recorded. Relevant laboratory tests and all routine examinations were performed. Informed consent was obtained from each patient after the procedure was fully explained to them. Each patient was encouraged to fast overnight for at least 12-14 hours, and the next morning (before breakfast) a 5 ml venous blood sample was drawn in a disposable syringe to measure serum lipid profile and fasting blood glucose (to assess blood glucose levels). Lipid profile was assessed. In known cases of type 2 diabetes, blood glucose levels (controlled or not) were also examined based on HbA1C levels. Data were collected using a pre-designed and pre-tested pro forma model and analyzed using SPSS 16.0 .

RESULTS

The largest proportion of individuals (37% and 44%) belonged to the age category of 20-29 years in type-1 diabetes mellitus (DM) and 50-59 years in type-2 DM respectively. The average age within the type 1 DM cohort was 32.6 years, whereas the type 2 DM cohort averaged at 53.2 years. A noteworthy 40% of type 2 DM cases reported a positive family history, in contrast to only 13% of type 1 DM cases indicating the same. A significant number of type 2 DM patients (16%) were diagnosed within the past 5 years, while most type 1 DM patients (43%) received their diagnosis over 10 years ago. Among type 2 DM individuals, 68% were classified as obese, while merely 11% of type 1 DM patients fell into the obese category. Fasting Blood Sugar (FBS) levels were less than 140 mg/dl in 53% of type 1 DM cases and 70% of type 2 DM cases. A concerning 49% of type 1 DM patients and 30% of type 2 DM patients exhibited Post Prandial Blood Sugar (PPBS) levels exceeding 200 mg/dl. A majority (72%) of type 2 DM patients displayed elevated serum cholesterol levels, contrasting with just 12% in type 1 DM patients. In the control group, all individuals maintained normal serum cholesterol levels (**Table 1**). Moreover, 90% of type 1 DM patients recorded normal serum triglyceride levels (10-190 mg/dl), in comparison to only 24% of type 2 DM subjects achieving normal levels (**Table 2**). Serum LDL levels were elevated (>160 mg/dl) in 78% of type 2 DM patients, with only 19% of type 1 DM patients showing increased values (**Table 3**). In type 1 DM patients, 90% had normal serum HDL levels (less than 40 mg/dl), while 10% exhibited higher values. All type 2 DM patients had normal serum HDL levels (**Table 4**). When examining the lipid profiles of type 1 DM patients, all mean values fell within normal limits across both genders. Females displayed slightly elevated mean serum cholesterol, triglyceride, LDL, and HDL levels compared to males (**Table 5**).

Table 1: Distribution of the controls and patients according to their serum cholesterol level.

Serum cholesterol level (mg/dl)	Control group	Type 1 DM	Type 2 DM
<150	00	03	00
151-250	50	85	28
251-300	00	12	45
301-350	00	00	18
351-400	00	00	09
Total	50	100	100

Table 2: Distribution of the controls and patients according to their serum triglyceride level.

Serum triglyceride level (mg.%)	Control group	Type 1 DM	Type 2 DM
<150	50	90	24
150-199	00	06	28
200-499	00	02	34
≥500	00	00	14
Total	50	100	100

Table 3: Distribution of the controls and patients according to their serum LDL level.

Serum LDL	Control	Type I DM	Type 2 DM
<130	24	23	03
130-159	26	58	19
>160	00	19	78
Total	50	100	100

Table 4: Distribution of the controls and patients according to their serum HDL level.

Serum HDL (mg/dl)	Control	Type I DM	Type 2 DM
<40	48	90	100
≥60	02	10	00
Total	50	100	100

Table 5: Gender wise distribution of lipid profile of type-1 DM patients .

Sex	Serum cholesterol mg% mean	Serum triglyceride mg% mean	S. HDL mg% mean	S. LDL mg% mean
Female	205	139.07	52.11	126.99
Male	199.88	125.77	48.19	125.25

DISCUSSIONDiabetes is linked to an increased risk of mortality from cardiovascular diseases (CVD), which is widely recognized as dyslipidemia. This condition is marked by elevated triglyceride levels, decreased high-density lipoprotein, and an increase in small, dense low-density lipoprotein particles. Dyslipidemia may manifest at the time of diagnosis for type 2 diabetes mellitus and constitutes a key element of metabolic syndrome. Abnormal levels of serum lipids are likely to play a significant role in elevating the risk of coronary artery disease among diabetic individuals[4]. Lipid disorders are prevalent among diabetics and are frequently observed in those with type 2 diabetes. Dyslipidemias render diabetics susceptible to the development of coronary heart diseases (CHD) and various complications associated with atherosclerosis. Our research indicates that a significant majority (72%) of patients with type 2 diabetes exhibited elevated serum cholesterol levels, in contrast to only 12% of type 1 diabetes patients showing similar findings. The CDC reports that 97% of adults with diabetes experience one or more lipid irregularities, while other studies have found the prevalence of diabetic dyslipidemia ranging from 25% to 60%[7].

This fluctuation in prevalence might result from variations in body mass index (BMI) and possibly genetic differences. A study carried out at Nishtar Hospital, Multan, by Ahmad et al. revealed that 21% of individuals with type 2 diabetes had elevated serum cholesterol (>200 mg/dl), and 34.2% had increased triglycerides in serum (>150 mg/dl). In our investigation, serum triglyceride levels were raised in 48% of the type 2 diabetes patients, with values aligning with those mentioned in previous studies. The disparity in serum cholesterol levels may be attributed to variations in dietary practices among the populations[6]. These small, dense lipoprotein particles are absorbed by macrophages in the arterial walls, promoting atherogenesis.HDL aids in the removal of cholesterol from peripheral tissues, thereby reducing the total cholesterol pool in the body. Type 2 diabetes is typically associated with reduced plasma levels of HDL-C[9].Within our study, all type 2 diabetes patients exhibited normal or low serum HDL levels. Low concentrations of HDL-C are frequently linked to elevated triglyceride levels, as observed in this study and others and this combination has a strong correlation with an increased risk of coronary heart

disease (CHD)[8].

CONCLUSION

Hyperlipidemia represents the most frequent complication of diabetes mellitus, predisposing individuals to early-onset atherosclerosis and macrovascular complications. Common lipid abnormalities observed in diabetes include elevated triglycerides, increased serum LDL, elevated serum cholesterol, and decreased serum HDL. The significant influence of dyslipidemia on cardiovascular complications necessitates focused attention throughout the progression of the disease.

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