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Frequency and Pattern of Dyslipidemia in Patient Presenting with Type II Diabetes at Tertiary Care Hospital

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ABSTRACT

Background: Dyslipidemia is a major modifiable cardiovascular risk factor frequently seen in type II diabetes mellitus (T2DM) due to insulin resistance and poor glycemic control. This study investigates the frequency and pattern of dyslipidemia in T2DM patients at a tertiary care hospital. **Objective:** to ascertain the distribution and prevalence of dyslipidemia in individuals with type II diabetes and investigate its correlation with age, gender, HbA1c levels, and diabetes duration. **Methodology:** 150 individuals with a diagnosis of type 2 diabetes participated in a cross-sectional study. Lipid profiles, HbA1c values, and the length of diabetes were all gathered. Individuals with concomitant lipid problems or those undergoing lipid-lowering medication were not included. **Results:** The most common anomaly was low HDL-C (69.3%), which was followed by hypertriglyceridemia (60.7%) and high LDL-C (65.3%). Patients with prolonged disease duration and poor glycemic control were more likely to have dyslipidemia. **Conclusion:** In patients with type 2 diabetes, dyslipidemia is quite common and closely linked to both the length of diabetes and poor HbA1c control. To lower cardiovascular risk, early screening and comprehensive management are crucial.

INTRODUCTION

Type 2 diabetes mellitus (DM) is classified as a metabolic disease characterized by hyperglycemia caused by defects in insulin action and insulin secretion or defects in both of them. As estimates of the International Diabetes Federation say, there are 415 million diabetics globally today, and by 2040, it is bound to increase to 642 million. In 2015 diabetes was the leading cause of demise with 5 million mortalities coming out of the illness and its results. High morbidity and mortality rate is the long-term macrovascular effects of diabetes that results in death of up to 80 percent amongst people due to cardiovascular disease (CVD).

Some of the popular CVDs risk factors include DM, age, gender, and hypertension (HT). The other lifestyle factors that predispose a person to CVD include the use of tobacco, excessive consumption of alcohol, sedentary life, and poor diets causing obesity. The non-DM patients often possess abnormal lipoprotein metabolism along with HT (1,4).

Dyslipidemia is considered as one of the primary risk factors of CVD in individuals with diabetes mellitus. The most common dyslipidemia pattern is hypertriglyceridemia, a low level of high-density lipoprotein (HDL) cholesterol, and an increased level of the small dense low-density lipoprotein (LDL) particles. Despite insignificance in the true cause of diabetic dyslipidemia, a lot of evidence shows that insulin resistance is a major factor in the development of this disease. The lipid changes associated with DM are believed to be caused by an increase of the free fatty acids. secondary to insulin resistance in terms of acid flux (2,4).

Based on this, the aim of the clinician should be to reduce the risk of CVD to the patient by regulating hyperglycemia, HT, and dyslipidemia through substance or lifestyle intervention. There are lower blood pressure and lipid goals among the patients with diabetes, as compared to the general population, since in this high-risk group, the major cause of death is due to a macrovascular disease.

HbA1C in the cases of persons with or without diabetes is regarded as an independent risk factor of CVD besides the conventional risk factors as dyslipidemia. It has been shown, that an increase in the absolute HbA1C of 1

percent on diabetic population brings on an increase in the predicted risk of CVD with 18 percent (5).

The use of fasting lipid profile was initially prescribed to be used in clinical practice. But there is not corroborative evidence suggesting that fasting samples would be used instead of non-fasting samples to be able to measure lipid-based cardiovascular risk in a patient. This has led to changes in other countries such as Denmark6 and those by UK NICE guidelines, who have changed their recommendation to base it upon random non-fasting lipid profiles (7). This is better because it is more convenient to the patient which should result in shorter hospital visits and better compliance (8).

Dyslipidemia is one of the leading manageable risk factors in the occurrence of cardiovascular diseases, atherosclerosis, stroke and type 2 diabetes mellitus (T2DM) (9).

Type 2 diabetes is ranked third among non-communicable illnesses in Nepal (10). The prevalence of dyslipidemia is 63.8 percent in the eastern part of Nepal, 90.7 percent in mid-western part, and 61.0 percent in central part of Nepal (11). Vascular complications in diabetics comprise one of the main risk factors of dyslipidemia. Inflammatory adipokines are raised and consequently lead to increases in the free flow of fatty acids due to insulin resistance (12) The chances of cardiovascular disease (CVD) in individuals with type 2 diabetes are multi-fold (13).

Among the most important risk factors contributing to atherosclerosis and coronary heart disease is hyperlipidemia, and diabetes mellitus, especially when glycemic control is not adequate, often causes it (14, 15) A wide variety of dyslipidemia types occur in the general population, but the spectrum of dyslipidemia in diabetes may be primarily assigned to insulin resistance and insulin deficiency; nevertheless, there is a more common type in this type of disease.

The phenotype is associated with high levels of small dense LDL cholesterol particles, low levels of HDL cholesterol as well as high plasma triglycerides (16).

This is research aimed at determining the prevalence and trends of dyslipidemia among people diagnosed with type II diabetes mellitus attending a tertiary care institution. It also examines the relationship between gender, glycemic control and other risk factors and dyslipidemia.

LITERATURE REVIEW

key determinants of the increased risk of cardiovascular disease (CVD) in the said population. The profile, also known as atherogenic dyslipidemia, is characterized by high triglycerides (TG), low levels of HDL-C, and by increasing levels of smaller dense LDL-C particles (17).

Pathophysiology of diabetic dyslipidemia involves insulin resistance that promotes the increase of flow of free fatty acids into liver, which has the effect of increasing the production of very-low-density lipoproteins (VLDL) and hepatic triglycerides. This aggravates the process of atherogenesis due to the reduced level of HDL-C and elevated level of small dense LDL-C (18).

Dyslipidemia is extremely prevalent in diabetic patients with type 2 diabetes on the global scale. In the US population-based study, the prevalence of lipid problem among diabetic individuals was greater than 70 percent (19). Dyslipidemia also was found in 76.8 percent of type 2 diabetics included in a study conducted by Khan et al., and the most common alterations were low HDL-C and hypertriglyceridemia (20). In India, another study conducted by Agarwal et al. also indicated a prevalence rate of 78.9 (21), and the eventual finding was that there was high correlation between the aberrant lipid profiles and poor glycemic management (21).

Gender variations have also been observed. Perhaps, due to hormonal alterations, and differences in distribution of fats, women with diabetes often possess higher levels of total cholesterol and LDL-C than men (22).

Other significant variables are the length of diabetes and the age. Higher abnormalities in lipids, particularly triglyceride and low levels of HDL-cholesterol are associated with longer history of diabetes (23).

As shown in a cross-sectional study in Nepal, there were at least one lipid abnormalities in 63.8 percent patients with T2DM. The significance of nutrition and lifestyle was also mentioned due to the fact that the frequency of occurrence was much higher in the urban populations rather than in the rural ones (24). It might also be regional and genetic with a parallel study being done in Saudi Arabia by Younis et al which showed prevalence of dyslipidemia among diabetes patients at 85.6 % (25).

Poor glycemic control is a significant aggravation of lipid profiles. It seems that there can be direct effect of glucose regulation on lipid metabolism since high levels of HbA1c are adversely correlated to HDL-C and positively correlated to triglycerides and LDL-C (26). United Kingdom Prospective Diabetes Study (UKPDS) records that glycemic and lipid management plays an important role in reducing cardiovascular events among diabetics, as 1 percent reduction in HB1Ac reduces the chances of a myocardial infarction by 14 percent (27).

The guidelines of the American Diabetes Association (ADA) stipulate that all patients with diabetes type 2 should require a regular lipid screening both during diagnosis and regularly thereafter. Management should involve statin medicine and lifestyle changes when the need be (28). The prevalence of dyslipidemia without treatment or poorly controlled dyslipidemia remains extensive in response to such advisories owing to poor consciousness and limited accessibility to healthcare services, especially in emerging and low-income countries (29).

To identify and address those at high-risk appearances and trends of dyslipidemia in persons with type 2 diabetes are significant factors to the early detection and intervention. With the view to reducing cardiovascular burden of diabetic dyslipidemia, research in various nations still confirms the importance of combined approaches to treatment that prioritizes medication, glycemic control and lifestyle adjustment (30).

Research Objective

The basic aim of this study is to determine the prevalence and pattern of dyslipidemia amongst patients presenting at a tertiary care hospital with type II diabetes mellitus. The aim of the study will be to define the frequency in

several lipid abnormalities (high triglyceride, low HDL and elevated LDL), and their association in relation to age, gender, the glycemic control (level of HbA1c) and the duration of diabetes. The objective of the research is to shed some light on the dynamics of the presence and type of dyslipidemia of this high-risk population, to underline the significance of timely diagnosis and specific treatment, and the applicability of appropriate methods of lowering serum lipids. The findings will be used to develop superior risk management protocols and preventive cardiometabolic practices of diabetic patients in a clinical environment.

METHODOLOGY

This is a cross-sectional study that was carried out from April to Sep 2024 in Quetta in a tertiary care hospital with the aim of evaluating the commonness and pattern of dyslipidemia in patients with type II diabetes mellitus. The group size was considered to be 150 patients as random sampling was used during the stated study.

Under inclusion criteria there were adults (at least 18 years of age) and who were confirmed to have type II diabetes mellitus. Patients already taking lipid-reducing medication or those with comorbid conditions that are known-associated effect on lipid metabolism (e.g., hypothyroidism, chronic kidney disease) were not taken. The data were collected through a systematic interviewing procedure which included sections on demographics, variable related to lifestyle, glycemic control (defined as the levels of HbA1c), duration of diabetes, and any experience of a cardiovascular disease. Blood samples were used to analyze lipid profiles containing the values of total cholesterol, triglyceride level, LDL-C, and HDL-C. Ethical approval was given by the research ethics committee of the hospital. All the participants provided their informed consent. The qualitative analysis of the data allowed establishing the trends and prevalence rates of dyslipidemia alongside its correlations with age, gender, and glycemic control.

RESULTS

Table 1

Age and Gender Distribution of Study Participants (n = 150)

Age Group (Years)	Male (n = 80)	Female (n = 70)	Total (%)
18–30	6 (7.5%)	5 (7.1%)	11 (7.3%)
31–45	24 (30%)	18 (25.7%)	42 (28%)
46–60	32 (40%)	28 (40%)	60 (40%)
>60	18 (22.5%)	19 (27.1%)	37 (24.7%)
Total	80 (53.3%)	70 (46.7%)	150

Table 2

Frequency of Different Lipid Abnormalities in Participants (n = 150)

Lipid Abnormality	Frequency	Percentage (%)
Elevated LDL-C (>130 mg/dL)	98	65.3%
Low HDL-C (<40 mg/dL for males, <50 for females)	104	69.3%
Hypertriglyceridemia (>150 mg/dL)	91	60.7%
Combined Dyslipidemia (≥2 abnormalities)	78	52%
Normal Lipid Profile	23	15.3%

Table 3

Dyslipidemia Pattern Based on HbA1c Levels (n = 150)

HbA1c Category	No. of Patients	Dyslipidemia Present	Percentage (%)
<7% (Good Control)	42	19	45.2%
7–8.9% (Moderate Control)	60	42	70.0%
≥9% (Poor Control)	48	43	89.6%
Total	150	104	69.3%

Table 4

Duration of Diabetes and Dyslipidemia Prevalence (n = 150)

Duration of Diabetes	Total Patients	Dyslipidemia Present	Percentage with Dyslipidemia (%)
<5 years	45	23	51.1%
5–10 years	58	43	74.1%
>10 years	47	38	80.9%
Total	150	104	69.3%

DISCUSSION

This research study aimed at determining the prevalence and pattern of incidence of dyslipidemia among type II diabetes mellitus patients that were admitted to a Quetta tertiary healthcare provider. The findings underscore the large economic cost of dyslipidemia in such at-risk population and reveal significant relationships with glycemic control (HbA1c), age, gender and diabetes duration.

Table 1 shows the age and gender of the participants. The type II diabetes and linked lipid issues have been reported to have an occurrence apex during mid- and late-adulthood in the world data, and most samples (40 per cent) fell into the age segment of 46 to 60 years. In the survey, the margin of male (53.3%) was slightly narrower than that of girls (46.7%). This predominance of males falls in line with other research conducted on South Asians, which indicate that a man stands a higher chance of getting medical treatment or a diagnosis earlier due to increased screening on the job.

The occurrence of lipid abnormalities is found in Table 2. Low HDL-C (69.3%) was the most frequent and followed closely by elevated LDL-C (65.3%) and hypertriglyceridemia (60.7 percent). Notably, there was also mixed dyslipidemia (that is, two or more abnormalities of lipids) in 52 percent of patients. These findings are in harmony with the literature that has explained that atherogenic diabetic dyslipidemia is a characteristic of the type II diabetes that is characterized by triglyceride high and low levels of HDL-C and dense LDL particles. The widespread nativity of these abnormalities among diabetic South Asians was also affirmed by the same prevalence patterns of Agarwal et al. in India and Khan et al. in Pakistan.

Table 3 analyzes the correlation between dyslipidemia and the level of HbA1c. Poor glycemic control (HbA1c 9 and above) (89.6%) was more prevalent in patients with dyslipidemia than patients with good control (HbA1c <7%), which was merely 45.2 percent. These findings confirm the direct linkage between lipid metabolisms and glycemic control, as shown earlier by the UKPDS and other extended-period researches. Cardiovascular complications are more prone to the presence of unfavorable control of glycemic levels, since hyperglycemia inhibits the elimination of lipids and promotes disturbances in the structure and composition of lipoproteins.

Table 4 illustrates the connection between the duration of diabetes and dyslipidemia. The tendency to have increased dyslipidemia was more noticeable over a longer period of diabetes development: 51.1 percent among patients whose experience was less than five years, and 80.9 percent among those with over ten. This supports the notion that chronic hyperglycemia and long-term insulin resistance disrupt lipid metabolism more and more, and which requires early intervention. Moreover, danger of cumulative metabolic harm grows with diabetes duration, and it is critical to pay attention to the cholesterol level as soon as possible.

Put together, the outcomes of the study advance the pathophysiology of type II diabetes and dyslipidemia, in particular, in relation to poor glycemic control and the duration of the disease. The high rates of combined dyslipidemia (greater than one-half of the sample) suggest a more complex and more aggressive pattern of lipid profile and higher cardiovascular risk than single defects.

The results of a study conducted in this Quetta tertiary care facility are in tandem with other studies conducted in other South Asian nations and their international counterparts in terms of the levels of dyslipidemia among diabetics denoting regional similarity as far as prevalence is concerned. But considering that 69.3 percent of the diabetics in this research had dyslipidemia either way, the figures also indicate that there is a major need in communications and early identification as many of them might slip without notice in similar low resource environments.

CONCLUSION

The results of the study show that the dyslipidemia prevalence is high in patients with diabetes mellitus type II and in particular, in patients with poor glycemic control and long-standing disease. The most common abnormality of lipids was low HDL-C, elevated LDL-C and hypertriglyceridemia all of which often existed together and substantially increased the chances of developing cardiovascular disease. These outcomes underline the paramount importance of the active management of glucose and lipid levels in patients with diabetes and the need to screen the lipid profiles in a regular way. With early lifestyle modifications, medication and health education of the population, the long-term effects can be reduced. The results are critical in low-resource regions as far as healthcare planning is concerned due to the convergence of prevalence in the region. A rigorous, multifaceted approach is compulsory to competently oversee dyslipidemia, as well as to augment cardiometabolic results with diabetic people.

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