Prevalence of Dyslipidemia among Type 2 Diabetes Mellitus Patient in Combined Military Hospital, Sylhet

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Abstract

Introduction: Diabetes mellitus is a group of metabolic disorders that are caused by deficiency of insulin secretion or decreased ability of insulin to act effectively on target tissues, particularly muscle, liver and fat. Diabetes is associated with high risk of cardiovascular diseases and underlying lipid abnormalities. Its early identification can make aggressive cardiovascular preventive management possible.

Objectives: To determine the prevalence and pattern of lipid abnormalities in type 2 diabetes mellitus.

Methods: A Retrospective, descriptive cross-sectional study was conducted in Combined Military Hospital, Sylhet, Bangladesh over a period of 2 years from January 2018 to December 2019. Diagnosed patients of type 2 diabetes mellitus of different age group and both sex were selected for this study according to inclusion and exclusion criteria. The lipid profiles and fasting blood sugar values of 85 known diabetics were studied. Their serum samples were assessed for fasting blood glucose (FBG), total cholesterol (TC), triacylglycerol (TG), low density lipoprotein cholesterol (LDL-C) and high density lipoprotein cholesterol (HDL-C) by using standard biochemical methods.

Results: Present study comprised of 85 diagnosed patients of type 2 diabetes mellitus. Out of those 78.8% were male and 21.2% were female. The age range was from 26 to 85 years with an average of 50.4±13.9 years. The average fasting blood glucose was noted as 10.787±4.2053mmol/l. The average total cholesterol, triglycerides, LDL and HDL were 194.35±177.07mg/dl, 226.18±115.19mg/dl, 91.08±26.79mg/dl and 39.75±9.51 mg/dl respectively. The prevalence of dyslipidemia in the present study was found as 81.2%, 14.1% were having hypercholesterolemia, 65.88% patients were having hypertriglyceridemia, 25.88% patients were having increased LDL levels and 43.52% patients were having reduced HDL levels. In respect of pattern of dyslipidemia, we found isolated and combined dyslipidemia.

Conclusion: In the diabetics higher frequencies of high TC, high TG and high LDL-C levels were noted indicating diabetic patients were more prone for dyslipidemia which may lead to cardiovascular disorders.

Key words: Type II diabetes mellitus, Dyslipidemia, Cholesterol.

Introduction

The latest data from the International Diabetes Federation revealed that there were 387 million diabetic patients worldwide in 2014. In high-income countries, type 2 diabetes accounted for 85%-95% of diabetes which might be higher in middle-income and low-income countries. By the year 2035, the number of diabetic patients is expected to increase by 55% which is around 600 million. The burden of diabetes is growing more severe as a result of the increasing number of deaths from diabetes with its complications[1]. Diabetic patients often combined with metabolic disorders like hypertension and hyperlipidemia that lead to cardio-cerebrovascular diseases such as coronary heart disease (CHD) and stroke which is a risk factor leading to death[2]. Elevated level of certain lipids in blood stimulates atherosclerosis which is documented as the foremost risk factor for stroke, peripheral vascular and coronary heart disease. Pathogenic character of cholesterol is determined not only by its blood level but also its distribution in lipoproteins. Low density lipoprotein (LDL) carried cholesterol is potentially pathogenic and the high-density lipoprotein (HDL) carried one is index of a shielding role of lipoproteins against atherosclerosis[3]. The imbalance status of one or more types of lipoproteins in blood is known as dyslipidemia and considered as an established independent major risk factor for CHD[4]. It might even be a prerequisite, occurring before other major risk factors come into play. Low concentrations of HDL-C and high concentrations of Triglycerides (TGs) have been implicated as possible independent predictors of CHD[5] and combinations of these two conditions have been defined as atherogenic dyslipidemia (AD)[6]. A specific assessment of the pattern

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of dyslipidemia is important to design and planning for health services need and preventive measures to reduce the mortality and morbidity rates. Hyperlipidemia and diabetes are independent risk factors of cardiocerebrovascular diseases[7,8]. The coexistence of the two can increase the risk of cardiocerebrovascular diseases[9,10]. Measurement of serum lipid levels in diabetics is now considered as a standard of the diabetics care[11]. Characteristic abnormalities in lipids in type 2 diabetes mellitus include elevated TG levels, decreased atheroprotective HDL-C levels and increased levels of LDL-C[12,13]. Lipid profile assays form one of the special investigations in diabetics in most clinical laboratories worldwide. A specific assessment of the pattern of dyslipidemia is important to design and planning for health services need and preventive measures to reduce the mortality and morbidity rates. Hence the present work was taken up to assess the prevalence and pattern of lipid abnormality on type 2 diabetes mellitus patients.

Materials and Methods

A Retrospective, descriptive cross-sectional study was conducted in Combined Military Hospital (CMH), Sylhet, Bangladesh over a period of 2 years from January 2018 to December 2019. Diagnosed patients of type 2 diabetes mellitus of different age group and both sex were selected for this study according to inclusion and exclusion criteria. Inclusion criteria were patients of all ages and both sexes with diagnosed patients of type 2 diabetes mellitus. The exclusion criteria were patients already taking drugs for lipid lowering and patients having conditions altering the lipid level (e.g. Thyroid disease) were excluded from the study. A total of 85 cases who met the enrolment criteria were included in this study.

All the patients were instructed for at least 12 hours overnight fasting and the 5ml of venous blood was collected before breakfast for the fasting blood glucose (FBG) and the serum lipid profile. After collecting the blood from the patients, 3ml of blood was transferred into serum tubes for lipid profile and 2ml of blood was transferred into sodium fluoride tubes for blood glucose estimation.

The blood glucose estimation was done by GOD-PAP method. To evaluate the dyslipidemia the serum total cholesterol (TC), triglycerides and HDL levels were measured using CHODPAP method, GOD-PAP method, CHOD, PAP methods respectively. LDL was calculated by total cholesterol–HDL–(serum triglyceride/5) in mg/dl. The mean and standard deviations were calculated for FBG, TC, triglycerides, HDL and LDL in both males and females separately. The guidelines of

national cholesterol education programmed (NCEP) adult treatment panel III (ATP III) were followed for the interpretation of serum lipid reference values. NCEP-ATPIII guidelines defines hypercholesterolemia as TC>200mg/dl, high LDL-C when value>100mg/dl, hypertriglyceridemia as TAG >150mg/dl and low HDL-C when value is <40mg/dl. Percentage wise variation in the incidence of dyslipidemia in the male and female diabetic patients was noted. Statistical analysis of the results was obtained by SPSS-21. The results were presented in tables, figures, charts and diagrams.

Results

Present study comprised of 85 diagnosed patients of type 2 diabetes mellitus. Out of those, 67(78.8%) were male and 18(21.2%) were female. The male and female ratio was 3.7:1 (Figure-1). The age range was from 26 to 85 years with an average of 50.4±13.9 years. The cases were divided into six age-groups, the highest number of patients to be within 36 years to 45 years (Figure-2). The average fasting blood glucose was noted as 10.787±4.2053mmol/l. The average total cholesterol, triglycerides, LDL and HDL were 194.35± 177.07mg/dl, 226.18±115.19mg/dl, 91.08±26.79mg/dl and 39.75±9.51mg/dl respectively (Table-I).

In the present study, most of the patients had dyslipidemia with many of them more than one lipid abnormality. The prevalence of dyslipidemia in the present study was found as 81.2%. In the present study, out of 85 diabetic patients, 12(14.1%) were having hypercholesterolemia, 56(65.88%) patients were having hypertriglyceridemia, 22(25.88%) patients were having increased LDL levels and 37(43.52%) patients were having reduced HDL levels.

In respect of pattern of dyslipidemia, we found isolated and combined dyslipidemia. In case of isolated dys-lipidemia, we found high triglycerides in 20(23.5%) patients, high LDL in 6(7.1%) patients and low HDL in 7 (8.2%) patients. In case of combined dyslipidemia, we found high Triglycerides + high LDL in 4(4.8%) patients, high Triglycerides + low HDL in 17(20%) patients, high Triglycerides + high LDL + low HDL in 3(3.5%) patients, high total Cholesterol+high Triglycerides + high LDL in 2 (2.4%) patients, high total Cholesterol + high Triglycerides + low HDL in 3(3.5%) patients, high total Cholesterol + high Triglycerides + high LDL + low HDL in 7(8.2%) patients.
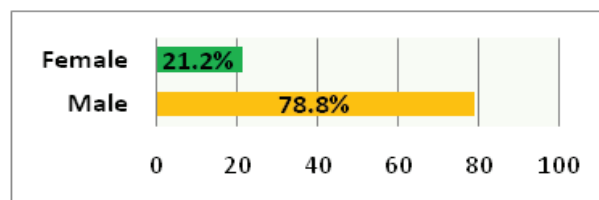

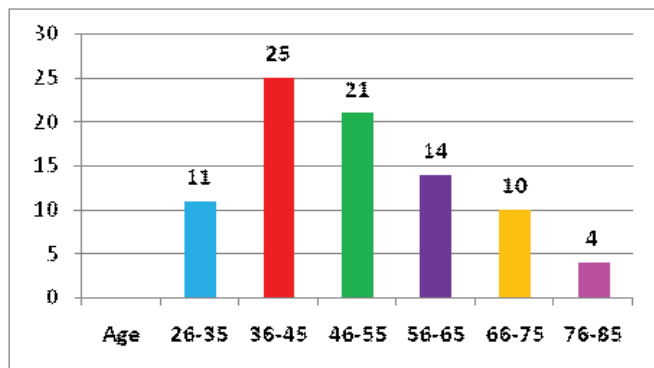**Figure-1:** Pie chart showing distribution of patients by sex (n=85)

Figure-2: Bar diagram showing distribution of patients by age (n=85)

Table-I: Mean FBS, Total cholesterol, Triglycerides, LDL, HDL

	Total	
	Mean	SD
FBS (mmol/l)	10.787	4.2053
Total cholesterol (mg/dl)	194.35	177.07
Triglycerides (mg/dl)	226.18	115.19
LDL (mg/dl)	91.08	26.79
HDL(mg/dl)	39.75	9.51

Table-II: Variation in the incidence of dyslipidemia in the male and females diabetic patients

	Male		Female		t- table value	p value
	Mean	SD	Mean	SD		
FBS (mmol/l)	10.460	4.1451	12.006	4.3221	10.787	4.2053
Total cholesterol (mg/dl)	199.30	198.907	175.94	29.688	194.35	177.07
Triglycerides (mg/dl)	217.60	111.327	258.11	126.793	226.18	115.19
LDL (mg/dl)	91.76	28.210	88.56	21.222	91.08	26.79
HDL(mg/dl)	40.28	10.475	37.78	3.964	39.75	9.51

Table-III: Variation of dyslipidemia

Type of Dyslipidemia	n	%
No Dyslipidemia	16	18.8
↑ Triglycerides alone	20	23.5
↑ LDL only	6	7.1
↓ HDL only	7	8.2
↑ Triglycerides, ↑ LDL	4	4.8
↑ Triglycerides, ↓ HDL	17	20
↑ Triglycerides, ↑ LDL ↓ HDL	3	3.5
↑Total Cholesterol, ↑Triglycerides, ↑ LDL	2	2.4
↑Total Cholesterol, ↑Triglycerides, ↓ HDL	3	3.5
↑Total Cholesterol, ↑Triglycerides, ↑ LDL, ↓ HDL	7	8.2
Total	**85**	**100**

Discussion

Present study comprised of 85 diagnosed patients of type 2 diabetes mellitus. Out of those 67(78.8%) were male and 18(21.2%) were female. The male and female ratio was 3.7:1. Go el et al found male 63% and female 37%[14]. The age range was from 26 to 85 years with an average of 50.4±13.9 years. The cases were divided into six age-groups, the highest number of patients to be within 36 years to 45 years. Rabeya et al found the proportion of dyslipidemia was higher among the 36 to 45 years age group 52.5%[15].

The average fasting blood glucose was noted as 10.787±4.2053mmol/l. The average total cholesterol, triglycerides, LDL and HDL were 194.35±177.07 mg/dl, 226.18±115.19mg/dl, 91.08±26.79mg/dl and 39.75±9.51 mg/dl respectively. The average fasting blood glucose was noted as 172.28±42.62mg/dl. The average total cholesterol, triglycerides, LDL, HDL and VLDL were 200±42mg/dl, 169.62±89.79mg/dl, 132.45±36.38 mg/dl, 39.1±16.6mg/dl and 35.85±17.09mg/dl respectively[16].

In the present study, most of the patients had dyslipidemia with many of them more than one lipid abnormality. The prevalence of dyslipidemia in the present study was found as 81.2% which was coinciding with other studies done by Dayakar et al, Kolhar U et al, Pandya H et al, Tagoe DN et al and Jayarama N et al which showed prevalence of 86.9%, 90%, 85%, 93% and 91% respectively[16-20].

In the present study, out of 85 diabetic patients, 12 (14.1%) were having hypercholesterolemia, 56(65.88%) patients were having hypertriglyceridemia, 22(25.88%) patients were having increased LDL levels and 37(43.52%) patients were having reduced HDL levels. Study by Bali K et al, the incidence of dyslipidemia in type 2 diabetic patients of Punjab population was reported hypercholesterolemia as 36.5%, hyper-triglyceridemia as 57.2%, high LDL levels as 59.3% and low HDL as 34.4% patients where the hyper-cholesterolemia and high LDL level incidence were high and reduced HDL incidence was less compared to the present study[21].

In respect of pattern of dyslipidemia, we found isolated and combined dyslipidemia. In case of isolated dyslipidemia, we found high triglycerides in 20(23.5%), high LDL in 6(7.1%) and low HDL in 7(8.2%) patients. In case of combined dyslipidemia, we found high triglycerides +high LDL in 4(4.8%), high Triglycerides+low HDL in 17 (20%), high Triglycerides+high LDL+low HDL in 3(3.5%), high total Cholesterol+high Triglycerides+high LDL in 2(2.4%), high total Cholesterol+high Triglycerides+low HDL in 3(3.5%), high total Cholesterol+high Triglycerides + high LDL+low HDL in 7(8.2%) patients. Bekele et al found Low HDL-C 6.3%, High TC 0.4%, High LDL-C 6.7%, High TG 4%. Combined HDL-C and LDL-C 12(5.4%) HDL-C and TG 24(10.7%) HDL-C, LDL-C, and TG 13(5.8%) HD-C, LD-C and TC 6(2.7%) LDL-C and TC 8(3.6%) LDL-C and TG 7(3.1%) TG and TC 1(0.4%) LDL-C, TC, and TG 12(5.4%) HDL-C, LDL-C, TG and TC 11.2%[22]. Nazik et al found High LDL-C 12.8%, Low HDL-C 6.6%, High triglycerides 3.4%, High LDL-C+high TG 4.8%, High LDL-C+low HDL-C 9.0%, High TG + low HDL-C 7.0%, High total cholesterol + high LDL-C + low HDL-C + high TG 13.5%[23].

Conclusion

In the diabetics higher frequencies of high TC, high TG and high LDL-C levels are noted indicating diabetic patients were more prone to dyslipidemia which could cause cardiovascular disorders as well as stroke also. That is why need to check FBG and lipid profile on a regular basis. They might be able to better control of dyslipidemia, there by reduced mortality and morbidity.

References

1. International Diabetes Federation. Diabetes Atlas, Sixth ed, 2014:1-7. http://www.doc88.com/p-7394581233404.html.

2. Sun B, Cheng X, Lc M et al. Relationship between metabolic diseases and all-cause and cardiovascular disease death in elderly male diabetics during a 10-year follow-up. Nat Med J China. 2014; 94:591–5.

3. Natarajan P, Ray KK, Cannon CP. High density lipoprotein and coronary heart disease. J Am Coll Cardiol. 2010; 55(13):1283-99.

4. Smith S, Lall AM. A Study on lipid profile levels of diabetics and non-diabetics among Naini region of Allahabad, India. Turkish J Biochem. 2008; 33(4):138–41.

5. Amarenco P, Labreuche J, Touboul PJ. High density lipoprotein-cholesterol and risk of stroke and carotid atherosclerosis: A systematic review. Atherosclerosis. 2008; 196(2):489–96.

6. Fruchart JC, Sacks F, Hermans MP et al. The Residual Risk Reduction Initiative: A call to action to reduce residual vascular risk in patients with dyslipidemia. Am J Cardiol. 2008; 102(10):1–34.

7. Lin PJ, Kent DM, Winn A et al. Multiple chronic conditions in type 2 diabetes mellitus: Prevalence and consequences. Am J Manag Care. 2015; 21:23–34.

8. Crawford AG, Cote C, Couto J et al. Prevalence of obesity, type II diabetes mellitus, hyperlipidemia and hypertension in the United States: Findings from the GE centricity electronic medical record database. Popul Health Manag. 2010; 13:151–61.

9. Tadic M, Cuspidi C. Type 2 diabetes mellitus and atrial fibrillation: From mechanisms to clinical practice. Arch Cardiovasc Dis. 2015; 108:269–76.

10. Ritzenthaler T, Derex L, Davenas C et al. Safety of early initiation of rivaroxaban or dabigatran after thrombolysis in acute ischemic stroke. Rev Neurol (Paris). 2015; 171:613.

11. The American Diabetes Association. The management of dyslipidemia in adults with diabetes. Diabetic care. 1999; 22 (suppl-I):56-9.

12. Beckman JA, Creager M, Libby P. Diabetes and atherosclerosis, Epid, Pathophysiology and management: Review article. Journal of the American Medical Association. 2002; 287(19):2570-81.

13. Navab M, Berliner JA, Watson AD et al. The yin and yang of oxidation in the development of the fatty streaks: A review based on the 1994 George Lyman Duff Memorial Lecture. Arterioscler Thromb Vasc Biol. 1996; 16:831-42.

14. Goel S, Garg PK, Malhotra V et al. Dyslipidemia in Type II Diabetes Mellitus- An assessment of the main lipoprotein abnormalities. Bangladesh Journal of Medical Science. 2016; 15(1):99-102.

15. Rabeya R, Nabi MH, Chowdhury AB et al. Epidemiology of dyslipidemia among adult population of Bangladesh. Romanian Journal of Diabetes Nutrition & Metabolic Diseases. 2019; 26(2):99-106.

16. Dayakar E, Sree CS, Sanjay E. Study on the prevalence of dyslipidemia in type 2 diabetes mellitus. Int J Adv Med. 2019; 6:786-9.

17. Kolhar U, Priyanka P. Study of serum lipid profile in type 2 diabetes mellitus patients and its association with diabetic nephropathy. Int J Adv Med. 2017; 4(6):1513-6.

18. Pandya H, Lakhani JD, Dadhania J et al. The prevalence and pattern of dyslipidemia among type 2 diabetic patients at rural based hospital in Gujarat, India. Indian J Clinic Pract. 2012; 22(12):36-44.

19. Tagoe DN, Amo-Kodieh P. Type 2 diabetes mellitus influences lipid profile of diabetic patients. Annals of Biological Research. 2013; 4(6):88-92.

20. Jayarama N, Reddy M, Raj SD. Prevalence and pattern of dyslipidemia in type 2 diabetes mellitus patients in a rural tertiary care centre, southern India. Glob J Med Public Health. 2012; 1:24-8.

21. Bali K, Vij AK. Pattern of dyslipidaemia in type 2 diabetes mellitus in Punjab. Int J Res Med Sci. 2016; 4(3):809-1

22. Bekele S, Yohannes T and Mohammed AE. Dyslipidemia and associated factors among diabetic patients attending Durame General Hospital in Southern Nations, Nationalities and People's Region: Diabetes, metabolic syndrome and obesity. Targets and Therapy. 2017; 10:265-71.

23. Abdel-Aal NM, Ahmad AT, Froelicher ES et al. Prevalence of dyslipidemia in patients with type 2 diabetes in Jordan. Saudi Med J. 2008; 29(10):1423-8.

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