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OCCURRENCE AND PATTERN OF DYSLIPIDEMIA IN TYPE 2 DIABETES MELLITUS AND ITS CORRELATION WITH ANTHROPOMETRIC PARAMETERS

Diabetology

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ABSTRACT

Background: Dyslipidemia is one of the major risk factors for cardiovascular disease in diabetes mellitus. Early detection and treatment of dyslipidemia in type 2 diabetes mellitus (T2DM) can prevent risk for atherogenic cardiovascular disorder. The rationale of this study was to detect the lipid abnormality in diabetic patients in association with anthropometric parameter of obesity including Body Mass Index (BMI) and Waist circumference (WC).

Methods: Necessary data was collected from the medical archives of 100 T2DM patients (50 female and 50 male) registered in a tertiary care hospital of Madhya Pradesh.

Results: The mean ages of female and male subjects were 56.22±8.86 and 54.76±10.38 years respectively. Mean duration of diabetes was 5.19 ±5.68 years. Mean BMI of male and female patients were 27.50 ± 5.77and 29.52 ± 5.75kg/m2 respectively. Mean WC of male and female patients were 88.52 ± 12.06 and 93.86 ± 12.3 centimeter (cm) respectively.The mean values of fasting blood sugar (FBS) and postprandial blood sugar (PPBS) in females were187.08 ± 77.45 and 260.84 ± 115.73 mg/dl respectively, while mean values of FBS and PPBS in males were 176.28 ± 80.47 and 252.96 ± 99.63 mg/dl respectively. Results of serum lipids showed that the mean values for total cholesterol (TC), triglyceride (TG), high density lipoprotein cholesterol (HDL-C), and low density lipoprotein cholesterol (LDL-C) in male patients were177.62 ± 51.16, 198.16 ± 97.30, 34.94 ± 8.41 and 105.08 ± 40.28 mg/dl respectively. The mean values for TC, TG, HDL-C, and LDL-C in female patients were 187.66 ± 42.23, 205.00 ± 93.17, 40.00±8.5, and 108.22±31.59 mg/dl respectively. Prevalence of dyslipidemia was 96%. Negative and statistically significant correlation was found between WC and HDL-C. Positive statistically non-significant correlations were found among BMI and WC with TGs.

Conclusions: Based on the study results, it is clear that aggressive dyslipidemia management is the need of the hour in patients with diabetes. We hope our study will pave the way for future research in this area and also help the medical fraternity in consciously taking measures to address these burning issues.

KEYWORDS

Diabetes mellitus, anthropometric parameters, Dyslipidemia

Introduction

Diabetes, recently considered as an epidemic, is a worldwide health problem with ongoing increasing incidence and disabling complications. By the year 2025, the World Health Organization projects more than 300 million cases [(1)]. Even though there is a worldwide increase in the prevalence of both Type 1 diabetes mellitus (T1DM) and Type 2 diabetes mellitus (T2DM), it is estimated that there will be an increase in the incidence of T2DM, the major causes being obesity and decreased physical activity[(2)]. Based on study done by Wild S *et al.* in 2004[(3)], the prevalence of diabetes in year 2000 was 2.8 % around the world, and is estimated to be 4.4 % in year 2030. Atherosclerotic process begins in prediabetic state thus, glycemic control is insufficient to prevent cardiovascular events.[(4-6)]. High total cholesterol and LDL-C levels as well as low HDL-C concentrations are important factors for athero-thrombotic vascular diseases and they can be reduced with proper treatment. During this process continuing over years, atherosclerosis can lead to mortal events; beginning with endothelial dysfunction, than pursuing with fatty streak composition and ending with atherosclerotic plaque.[(7,8)] Dyslipidemia is a well-known factor leading to atherosclerosis. In multiple studies, reducing LDL-C levels leads a decrease in cardiovascular event frequencies [(9, 10)].T2DM is associated with a cluster of interrelated plasma lipid and lipoprotein abnormalities, including reduced HDL-C, a predominance of small dense LDL-C particles, and elevated TGs. These changes might be related with insulin resistance and increased free fatty acids levels.

Coronary Artery Disease (CAD), which is the most common cause of mortality in diabetic patients, is strongly associated with increased levels of serum LDL-C. Diabetic patients are known to have high levels of serum TGs and low levels of HDL-C. Low levels of serum HDL-C might be the missing link, which also has shown to have a strong correlation with Cerebro-vascular disease (CVD). American Diabetic Association (ADA) guidelines recommend maintaining serum levels of TGs below 150 mg/dl, LDL-C below 100 mg/dL and HDL-C of more than 40 mg/dL in males and 50 mg/dl in females.[(11)]

Diagnosis and treatment of dyslipidemia in patients with diabetes is important in reducing the high morbidity and mortality from macrovascular disease. Thus we designed a study to assess the prevalence and pattern of dyslipidemia in T2DM, and also to determine its association with anthropometric parameter including body mass index (BMI) and waist circumference (WC).

Materials and Methods

The present study entitled "occurrence and pattern of dyslipidemia in type 2 Diabetes Mellitus and its correlation with anthropometric parameters" was carried out on T2DM patients in a tertiary care center of Madhya Pradesh.

Study design: This was a non-interventional and observational study.
Study period: November 2017 to February 2018.
Study area: Tertiary care center of Madhya Pradesh
Study population: All T2DM patients coming to the OPD or admitted in the IPD of hospital during the study period formed our study population.

Sample size and sampling technique: We include 100 T2DM patients (50 males & 50 females) in our study. Convenient sampling technique was used for the present study.

Inclusion criteria: Patients fulfilling the ADA criteria for diagnosis of T2DM, age > 20 years and ready to give voluntary consent.

Exclusion criteria: Acute metabolic complications like Diabetic ketoacidosis, Hyperglycemic hyperosmolar state, Acute illnesses, Acute Myocardial Infarction, Cerebrovascular accidents, Acute infections, Chronic alcoholics, Hypothyroidism, Liver disorders (clinical findings/ Abnormal LFT), Renal disease (of non-diabetic etiology), Known inherited disorders of lipids, Secondary dyslipidemia, Pregnancy, Drugs like Beta-blockers, Thiazides, Steroids, Hypo-lipidimic drugs, Oral contraceptive, Anti –coagulants.

Methodology: The patients and their legally acceptable representative were given complete information about the study, its benefits, and its future prospects. After getting their approval for participation in the

study, a voluntary written informed consent was obtained. Patient's detailed history taken along with physical and clinical examination.. Each of the subjects were evaluated for body weight, height, BMI and WC.

Criterias for obesity (BMI) and abdominal obesity (WC) as per Consensus guidelines for Asian Indians[12]:

CATEGORY	BMI
Normal	18.0-22.99 Kg/m^2
Overweight	23.0 – 24.9 Kg/m^2
Obese	25.00 Kg/m^2

GENDER	WC
Male	≥ 90 cm
Female	≥ 80 cm

BMI is calculated by the, BMI = Weight (Kilograms)/height ($meter^2$) formula.

Cut-off value of Total cholesterol, TGs, HDL cholesterol and LDL cholesterol for defining Dyslipidemia:

Lipid parameter	Cutoff for Dyslipidemia
Total cholesterol	≥ 200 mg/dL
Triglyceride	≥ 150 mg/dL
HDL cholesterol	<40 mg/dL for male < 50 mg/dL for female
LDL cholesterol	≥ 130 mg/dL

Fasting peripheral venous blood samples was obtained for estimation of fasting blood sugar levels and serum lipid estimation (S. TGs, S. Cholesterol, serum HDL cholesterol and Serum LDL cholesterol). Venous blood samples was also obtained for HbA1c, PPBS, RFT and LFT. Complete blood count, Serum Thyroid Stimulating Hormone, urine routine and microscopy, was done in all cases. Electrocard iography (ECG), USG for whole abdomen was done for all the patients.

Statistical analysis: The data from the customized proforma was entered into the Microsoft Excel sheet and then transferred to relevant statistical software package for analysis (SPSS). Correlation results between two groups were obtain by applying pearson correlation coefficient, comparison study between two group were done by Unpaired 't' test. *p* value of < 0.05 was taken as statistically significant.

Results

Demographic characteristics and laboratory parameters of all diabetic subjects are shown in Table 1.

Table 1: Demographic characteristics and laboratory parameters of all diabetic subjects

Parameter	Male [Mean±SD]	Female [Mean±SD]	p Value
BMI (kg/m^2)	27.50 ± 5.77	29.52 ± 5.75	0.083, NS
WC (Cm)	88.52 ± 12.06	93.86 ± 12.3	0.031*
FBS (mg/dl)	176.28 ± 80.47	187.08 ± 77.45	0.496, NS
PPBS (mg/dl)	252.96 ± 99.63	260.84 ± 115.73	0.716, NS
HbA1c (%)	9.60 ± 2.65	9.82 ± 2.56	0.674, NS
LDL- C (mg/dl)	105.08 ± 40.28	108.22 ± 31.59	0.665, NS
HDL- C (mg/dl)	34.94 ± 8.41	40.00 ± 8.59	0.004*
Triglycerides (mg/dl)	198.16 ± 97.30	205.00 ± 93.17	0.504, NS
Total-C (mg/dl)	177.62 ± 51.16	187.66 ± 42.23	0.287, NS

NS- non significant p value, *Significant p value

Results of this study showed that among 100 T2DM patients both male and female were 50. Majority of patients (59 %) were in the age group of 41- 60 years, with overall mean age of study population was 56.18 ± 9.49 years. Mean age of males were 54.76 ± 10.38 years and for females 56.22 ± 8.86 years. Mean and SD values of blood sugar, lipid profile parameter and anthropometric measurements of both the genders are shown in table above with p values.

Table 2: Correlation studies between the anthropometric parameter, blood sugar, HBA1c and serum lipid profile variables of diabetic patients

	CHOLESTEROL	TRIGLYSERIDE	HDL-C	LDL-C
BMI	-0.045	0.08	0.068	0
WC	-0.088	0.028	-0.214	-0.02
FBS	0.037	0.057	0.002	0.055
PPBS	0.026	0.104	-0.021	0.035
HBA1C	0.12	0.027	-0.029	0.1

The values expressed as Pearson correlation coefficients.

Our study showed negative but statistically non-significant correlation of HbA1c and PPBS with HDL-C, somehow explaining very high prevalence of low HDL-C with poor glycemic control. FBS, PPBS and HbA1c had positive correlation with LDL-C, TGs and total cholesterol which was statistically non-significant, also favoring that poor glycemia leads to development of dyslipidemia. Negative and statistically significant correlation were found between WC and HDL-C suggesting that increase in abdominal obesity also leads to development of dyslipidemia. Positive statistically non-significant correlations found among BMI and WC with Tgs.

Table 3: Comparison of mean LDL, HDL, Triglycerides and Total Cholesterol between the two genders

Serum Lipid	Mean SD	Patients with deranged lipid
Total cholesterol	182.64±46.94	35%
Triglyseride	201.58±95.01	69%
LDL- C	106.65±36.05	57 %
HDL- C	37.47±8.83	81%

Prevalence of the combined dyslipidemia was 96 %, this discrepancy may be due to high abnormal BMI of our subjects. Dyslipidemia was mainly seen with HDL-C (81%) and with TGs (69%), while only 28 % patients had high LDL-C and 35% had hypercholesterolemia. The female diabetic patients had more deranged lipid profile as compared to male diabetic patients. On comparison of prevalence of individual lipid parameter in our study, very high prevalence was observed for HDL-C.

Discussion

In our study prevalence of obesity (BMI) and abdominal obesity (WC) in diabetic subjects were higher i.e. 78% and 77% respectively, and female diabetic patients were more obese as compared to males and they also had worse lipid parameter. Prevalence of BMI and WC is higher in our study as compared to study done previously (BMI: Bhardwaj *et al.*[14](50.1 %) and Deepa *et al.*[15] (45.9 %) WC: Bhardwaj *et al.*[14](68.9 %) and Deepa *et al.*[15] (46.6 %). Females were more obese as compared to males and results also compared with study done by Bhardwaj *et al.*[14]and Deepa *et al.*[15] In our study, dyslipidemia was mainly seen with HDL cholesterol (81%) and with TGs (69%), while only 57 % patients had high LDL cholesterol and 35% had hypercholesterolemia. Lipid parameters like total cholesterol, HDL-C, and LDL-C were comparable with previous studies by Singh *et al*[16], Shethet *al*[17], Bali *et al*[18] and Sandhya *et al*[19],while mean TGs level was very high in our study as compared to other studies. On comparison of prevalence of individual lipid parameter in our study, very high prevalence was observed for HDL cholesterol, while prevalence of Total cholesterol was comparable with study done by Bali *et al*[18]. Combined dyslipidemia was the most common dyslipidemia pattern observed in our study (96%) and was nearly similar to results observed by Shrewastwa *et al*[20] *(90.7%)*. However it was significantly higher compared to results observed by Bali *et al*[18] *(81.8%)* and Shethe*t al*[17] *(50.27%)*. This discrepancy may be due to high abnormal BMI of our subjects.

Conclusion

Based on the study results, it is clear that aggressive dyslipidemia management is the need of the hour in patients with diabetes. We hope our study will pave the way for future research in this area and also help the medical fraternity in consciously taking measures to address these burning issues.

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REFERENCES

1. King H, Rewers M. Global estimates for prevalence of dia¬betes mellitus and impaired glucose tolerance in adults. WHO Ad Hoc Diabetes Reporting Group. Diabetes Care 1993;16:157-77.
2. Powers AC. Diabetes Mellitus: Diagnosis, Classification, and Pathophysiology. In: Dennis L, Hauser SL, Jameson JL, Fauci AS, Longo DL, Loscalzo J, editor. Harrison's Principles of Internal Medicine, 19th ed. US: Mc Graw Hill Education;2015.p.2400.
3. Wild S, Roglic G, Green A. Global Prevalence of Diabetes: Estimates for the year 2000 and projections for 2030. Diabetes Care 2004;27:1047-53.
4. Kreisberg RA. Diabetic dyslipidemia. Am J Cardiol 1998;82:67-73.
5. Heinecke JW. Mechanisms of oxidative damage of low density lipoprotein in human atherosclerosis. CurrOpinLipidol 1997;8:268-74.
6. Fleal MK. Blood lipid levels in type 2 diabetes: What are the effects of diet? Diabetes Care 1999;22:1605-6.
7. Goldman L, Ausiello MD. Cecil Textbook of Medicine. Güneş Kitabevi 22. baskı 2006; 1424-1452.
8. Chacil TJ, Ginsberg HN. Diabetic dyslipidemia. Endocrinol Metab Clin North Am 2006;35:491-510.
9. 4S Group. Randomized trial of cholesterol lowering in 4444 patients with coronary heart disease: The Scandinavian Simvastatin Survival Study (4S). Lancet 1994;344:1383-9.
10. WOSCOPS Group. Influence of pravastatin and plasma lipids on clinical events in the West of Scotland Coronary Prevention Study (WOSCOPS). Circulation 1998;97:1440-5.
11. American Diabetes Association. Standards of medical care in diabetes—2016. Diabetes Care 2016;39:S1-S112.
12. Misra A, Chowbey PK, Makkar BM, Vikram NK, Wasir JS, Chadha D, et al. Consensus statement for diagnosis of obesity, abdominal obesity and the metabolic syndrome for Asian Indians and recommendations for physical activity, medical and surgical management. J Assoc Physicians India 2009;57:163-70.
13. Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in 70 Adults (Adult Treatment Panel III) Executive Summary". National Heart, Lung, and Blood Institute (NHLBI). National Institutes of Health. JAMA 2001;285:2486-97. Available from: http://www.nhlbi.nih.gov/guidelines/cholesterol/atp3xsum.pdf.
14. Bhardwaj S, Misra A, Misra R, Goel K, Bhatt SP, Rastogi K, et al. High prevalence of abdominal, intra-abdominal and subcutaneous adiposity and clustering of risk factors among urban Asian Indians in North India. PLoS One 2011;6:e24362.
15. Deepa M, Farooq S, Deepa R, Manjula D, Mohan V. Prevalence and significance of generalized and central body obesity in an urban Asian Indian population in Chennai, India (CURES: 47). Eur J ClinNutr 2009;63:259–67.
16. Singh G, Kumar A. Relationship among HbA1c and Lipid Profile in Punjabi Type 2 Diabetic Population. Journal of Exercise Science and Physiotherapy 2011;7:99-102.
17. Sheth J, Shah A, Sheth F, Trivedi S, Nabar N, Shah N, et al. The association of dyslipidemia and obesity with glycated hemoglobin. Clinical Diabetes and Endocrinology 2015;1:6.
18. Bali K, Vij AS. Pattern of dyslipidemia in Type 2 Diabetes Mellitus in Punjab. Int J Res Med Sci 2016;4:809-12.
19. Sandhya AM, Mukkadan JK, Sureshkumar P. Anthropometric and biochemical profile of Diabetes patients and its risk for cardiovascular disease. Int J Adv Res 2016;4: 829-33.
20. Shrewastwa MK, Thanpari C, Yadav NK, Mittal RK. Dyslipidemia in type-2 diabetes mellitus patients in western of Nepal: a hospital based study. Bali medical journal 2013;2:46-50.