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A Prospective Study of Lipid Profile of Type 2 Diabetes Patients Attending Tertiary Care Hospital

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Abstract:
Introduction: *Patients with diabetes mellitus are at high risk of cardiovascular events because of abnormal lipid status. Dyslipidemia is common in diabetes mellitus and is associated with cardiovascular complications. Early diagnosis and treatment is the main cornerstone in the prevention of its multiple complications. There is scarcity of data on the magnitude and risk factors associated with dyslipidemia among diabetic patients in india.*
Materials and Methods: *A prospective study was conducted from October 2017 to January 2018 involving 100 diabetic patients, who were 30 years and above from the diabetes clinic at Kurnool Medical College, Kurnool. A structured questionnaire was administered to evaluate the socio-demographic and clinical characteristics. Standard procedures were followed for measuring blood pressure, body mass index and waist circumference. Fasting blood samples were taken to measure lipid profiles and glycosylated hemoglobin. Data analysis was done by Statistical Package for Social Science version 21 statistical software and chi-squared test, and multiple logistic regression were used for data analysis and p-value of < 0.05 was considered to be statistically significant.*
Results: ***T****he prevalence of dyslipidemia among diabetic patients was 83%. Among the abnormal lipid profile levels, elevated Low Density Lipoprotein Cholesterol constituted the highest single abnormality having 67.23%. Dyslipidemia was mostly seen in the females (88.9%), advanced age of 50 years and above (86.7%), poor glycemic control (glycosylated hemoglobin >7%) was 60.7% and BMI >25kg/m2 was 91.7%. The multivariate logistic regression showed that BMI was the sole determinant for the development of dyslipidemia*
Conclusion: *The prevalence of dyslipidemia is high. The sole determinant for diabetic dyslipidemia among our study population was increase in the body mass index. There is an urgent need for effective strategies for primary prevention of obesity, diagnosis and treatment of dyslipidemia among diabetic patients*
Key words: Dyslipidemia, Diabetes Mellitus, BMI.

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I. Introduction

Diabetes Mellitus (DM) is a metabolic disorder due to hyperglycemia, thus having disturbances in carbohydrates, lipid and protein metabolism which results from defects in insulin secretion, insulin action and or both.[1] Globally, diabetes mellitus has been a major health care problem. In sub-Saharan Africa (SSA), diabetes represents 4.2% of the global population it is estimated that by 2025, the number will increase by 80%, with a higher prevalence being in the urban areas.[2,3]

Dyslipidemia is a disorder which arises as a result of abnormalities in the plasma lipoproteins. The lipid abnormalities in diabetes include quantitative changes which occur due to an increase of glucose for very low density lipoprotein (VLDL) synthesis and decrease in lipoprotein lipase activity leading to decrease of VLDL from peripheral circulation, increase in low density lipoprotein-C (LDL-C) levels and decrease in high density lipoprotein C (HDLC) levels due to increase in hepatic activity decrease in VLDL clearance. Qualitative changes consists of increase of triglyceride (TG), LDL-C and HDL-C, non-enzymatic glycation of LDL and non-enzymatic glycation of high density lipoprotein(HDL).[4]

Due to the abnormalities in lipoproteins, diabetes mellitus is associated with cardiovascular and cerebrovascular morbidity and mortality worldwide.[5] Dyslipidemia affects approximately 70% to 97% of people with diabetes.[6] World Health Organization (WHO) in 2002 reported that dyslipidemia accounted for 18% of ischemic heart disease, 56% of stroke and over 4million deaths per year globally.[7]

The prevalence of dyslipidemia is terrifyingly high within the Aisa continent. The trend has been seen to increase, in india, the prevalence ranged from 82.6% to 90.7% from 2008 to 2011 respectively [8,9,10] In South Africa the prevalence is over 90%. In Tanzania, the prevalence of diabetic dyslipidemia was 95% in 2007. This

is mainly due to the adopted western diet, sedentary lifestyle as well as physical inactivity resulting to obesity. By determining the prevalence of abnormal lipid profile levels among the diabetic patients, it will provide the need to aggressively manage dyslipidemia among diabetic patients.[11]

II. Materials And Methods

This Prospective study was carried out at the Department of Community Medicine, Kurnool Medical College From October 2017 to January 2018. The study participants included all DM patients who were consecutively recruited, aged 30 years and above receiving treatment at the diabetic clinic during the study period. Patients on lipid lowering agents, pregnant women, HIV/AIDS on treatment and those with renal failure were excluded. Relevant medical history was completed and physical examination was conducted on all subjects who had an overnight fast for at least 8 hours.

Anthropometric measurements, including weight, height and waist circumference were measured with the subjects wearing light clothing and no shoes. Body Mass Index (kg/m2) was calculated as weight (kilograms) divided by squared height in (meters). The study populations were classified as underweight BMI <18.5 kg/m^2, normal BMI 18.5 ≥BMI < 25 kg/m2 and overweight BMI≥25 kg/m^2 and obese BMI ≥30 kg/m2 [14].Central obesity was considered as measurements above 102cm and 88cm in men and women respectively. Blood pressure was measured twice for each patient after at least 5 minutes of rest, by the use of a standardized mercury sphygmomanometer. Glycosylated hemoglobin test was done on the spot using the A1CNOW PLUS kits from the Bayer manufacturer and the results were ready in 5 minutes. Poor glycemic control was defined as glycosylated hemoglobin as >7%.

After an overnight fast, approximately 4 mls of venous blood was obtained from each patient for lipid profile (TC, TG, LDL-C and HDL-C) analysis. The samples were analyzed using the chemical analyzer COBAS INTEGRA 400 Plus serial NO 397672 in the main Kilimanjaro Christian Medical Centre (KCMC) laboratory. Dyslipidemia was taken as derangement in any of the lipid components: TC> 5.2 mmol/l, LDL-C >2.6 mmol/l, HDL-C < 1.1 mmol/l for males, < 1.38 mmol/l for females and TG > 1.7 mmol/l. Data analysis was done using Statistical Package of Social Sciences (SPSS) version16. Analysis of variance (ANOVA), t-test and chi-square test were used. Regression analysis was used to determine the predictors of dyslipidemia. A 95% confidence was used for the determination of significance of probabilities, and p-value < 0.05 was regarded as statistically significant. Patients had to sign the consent form before enrolled in the study. Those found with dyslipidemia were started on lipid lowering agents and advised on the lifestyle changes. Original data and supporting material are available upon request from the publishers.

III. Results

A total of 100 patients with diabetes mellitus type 2 were included in the study. Fifty four (54%) patients were males. The mean (SD, range) age was 58.1(12.2, 27-83) years. Eighty-six (63.7%), were in the range of 50-70 years. Duration of diabetes ranged from 2 months to 28 years with mean (SD) duration of 9.4 (6.6) years. More than half of the patients 91 (76.47%) had diabetes for more than 5 years and 28(23.53%) for up to 5 years. Ninety-six (80.67%) had poor glycemic control HbA1C >7%, Good compliance with treatment was reported among 87 (73%) of the patients.

Of the 119 diabetic patients, 78 (65.55%) were hypertensive and in Eleven (9.2%) patients reported to be smokers and alcohol intake was significant in 34 (28.57%) of the patients. The body mass index (BMI) ranged from 18.8- 45.1 with mean (±SD) of 27.9 (±5.0). About 31 (26%) of the patients had a normal BMI, 56(47%) were overweight and 32(27%) were obese. Among the females, the BMI ranged from18.8- 45.1 with mean (±SD) of 29.4 (±5.5), and in males, the BMI ranged from19.3- 35.5 with mean (±SD) of 26 (±3.8).- Majority of the patients 85 (63.0%) were physically inactive. Among the 119 patients, 86 (63.7%) were on oral hypoglycemic drugs, 34 (25.2%) on insulin only, 9 (6.7%) both insulin and oral hypoglycemic drugs while only 6 (4.4%) were on diet control (Table 1).

Diabetic dyslipidemia was found in (94.1%) patients. The pattern of lipid abnormalities according to sex, age, BMI and central obesity are presented in (Table 2). High TG, high LDL-C, high TC and low HDL-C exhibited an increasing trend in the proportion of patients with dyslipidemia by the BMI and the differences were statistically significant (p< 0.05). A similar trend was observed in the patients with central obesity compared to those without. The difference was statistically significant for high TC and low HDL-C and the overall dyslipidemia (p< 0.05).

The following risk factors namely female sex, age above 50- years, BMI (overweight and obese), poor glycemic control, central obesity and physical inactivity were associated with diabetic dyslipidemia among diabetic patients attending the diabetes clinic, the p-values were statistically significant (Table 3). Other variables namely duration of diabetes mellitus, the type of diabetes mellitus, smoking habits and hypertension were not statistically significant in the association of dyslipidemia.

By multivariate logistic regression analysis, significant predictor for dyslipidemia among the diabetic patients was overweight and obesity (BMI >25kg/m^2), with p-value of 0.040, OR (95%CI) 0.2 (0.1-0.9).

VARIABLE	ATTRIBUTE	NUMBER(PERCENTAGE)
Sex	Females	46(46)
	Males	54(54)
Age(years)	Mean (±SD, Range)	57.1(±12.7, 26-80)
	Females	54.3(±12.1, 25-82)
	Males	60.2(±9.3, 35-76)
	Younger than 50	20(20.3)
	50-70	67(57.6)
	Older than 70	17(15.6)
Type II DM	Type II	100(100)
Duration of DM (years)	Mean (SD, Range)	9.2(6.5, 0-27)
	Up to 5	40(40)
	More than 5	60(60)
Glycemic Control	Good <7%	43(43)
	Poor>7%	57(57)
Compliance on treatment	Good	68(68)
	Poor	32(32)
Hypertension	Yes	80(80)
Smoking	Yes	30(30)
Alcohol intake	Yes	
Body mass Index (kg/m2)	Mean (±SD, Range)	27.9(±4.7, 17-44)
	18.5-24.9	31(31)
	25-30	50(50)
	30 or above	19(19)
Physical Activity	Inactive	80(80)
	Active	20(20)

Table 1: Socio demographic and clinical characteristics

Variable	Total	High TG	High LDL	High TC	Low HDL	Overall
		No (%)	**No (%)**	**No (%)**	**No (%)**	**No (%)**
Sex						
Female	**46**	**34(46.2)**	**51(72)**	**37(56)**	**46(46)**	**64(80.9)**
Male	**54**	**30(47.6)**	**34(54)**	**23(47)**	**34(63.7)**	**28(18.6)**
P-Value		**0.963**	**0.028**	**0.382**		
Age (years)						
<50	**22**	**12(30.4)**	**14(45.6)**	**9(30)**	**15(50.2)**	**21(70)**
50 or Older	**97**	**50(49.5)**	**72(65.6)**	**50(47.6)**	**60(56.7)**	**90(81.6)**
P-Value		**0.358**	**0.001**	**0.001**	**0.007**	**0.002**
Body Mass Index(Kg/m2)						
Normal	**46**	**12(30.7)**	**13(32.5)**	**10(25.2)**	**12(32.5)**	**24(60.5)**
Overweight/obese	**54**	**50(53.2)**	**70(62.6)**	**46(48.0)**	**62(64.5)**	**80(91.4)**
P-Value		**0.014**	**0.001**	**0.007**	**0.001**	**0.002**
Waist Circumference						
Central Obesity	**58**	**40(52.3)**	**50(68.2)**	**39(51.2)**	**52(68.4)**	**60(79.1)**
No Central Obesity	**42**	**21(28.0)**	**32(54.2)**	**20(33.1)**	**23(69.0)**	**42(71.2)**
P-Value		**0.084**	**0.069**	**0.043**	**0.001**	**0.001**

Table 2: The pattern of lipid abnormalities in sex, age, BMI and central obesity among type II diabetic patients

Variable	**Univariate Analysis**			**Multivariate Analysis**		
	OR	(95% CI)	P-Value	OR	(95% CI)	P-Value
Sex	0.4	(0.2-1.0)	0.05	0.4	(0.1-1.7)	0.233
Age (years)	0.4	(0.1-1.0)	0.023	0.4	(0.1-2.0)	0.326
BMI	0.1	(0.1-0.4)	0.001	0.1	(0.1-0.9)	0.04
Glycemic control	3.0	(1.2-7.3)	0.02	3.0	(0.2-3.6)	0.914
Waist circumference	0.2	(0.1-1.0)	0.001	0.2	(0.2-2.5)	0.525
Physical activity	3.3	(1.1-10.4)	0.032	3.3	(0.2-3.2)	0.695

Table 3: Dyslipidemia associated risk factors among type II diabetic patients

IV. Discussion

This study showed a high prevalence of dyslipidemia with the commonest lipid abnormality being elevated LDL-C (64%) followed by low HDL-C (56%). Similar findings were also noted in the Third US National Health and Nutritional Examination Survey and the Behavioral Risk factors Surveillance System where majority DM patients had LDL-C of 58% [19] in Gaborone [20] and in Ghana [21]. Reasoning to this is that within the African ethnicity, African-Americans, it has been observed that the elevated LDL-C levels are a common subclass of dyslipidemia compared with other subclasses [16].

Different observations from other studies where total cholesterol to be the common subclass in dyslipidemia. In Dar es Salaam, Chattanda observed that among the subclasses of dyslipidemia, 95% had high triglycerides [12]. In Kenya, over 70% of the study participants had high total cholesterol levels [22] as well as in Jordan [23]. The observed differences in the subclasses of dyslipidemia could be explained by the difference in ethnicity where Indians who tend to have elevated levels of total cholesterol, presented in the diabetic clinics. Majority of Indians reside in the urban regions within the big cities in Africa. In this case, the different cut off levels in classifying dyslipidemia could have also contributed to the difference. The high frequency of LDL-C among the female patients over 50 years, was over 90% in this study. It can be explained by the fact that over half of the women involved in our study were in the post-menopausal years who tend to lose the protective effect of estrogen on lipid metabolism. Thus this leads to higher prevalence of LDL-C in women compared to men, also mostly observed within the black race. On the other hand, Chattanda did not find any difference between males and females [12]; this could have been due to similar lifestyles in the study population and the racial differences. This is comparable to a study done in Pakistan, where they found that females above 60 years were more likely to have dyslipidemia.

V. Conclusion

Increased BMI was the strongest determinant as it was found to be the sole associated risk factor on the high prevalence of dyslipidemia which is over 83.0% and the commonest dyslipidemia was elevated LDL-C.

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