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PREVALENCE OF DYSLIPIDEMIA AND ITS ASSOCIATION WITH GLYCEMIC CONTROL IN INDIAN TYPE 2 DIABETES POPULATION

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Abstract

Background and Aims. *Diabetes mellitus is considered as one of the major health problems in India. With nearly one million diabetic deaths every year, India turned out as the "diabetic capital of the world". Diabetes is considered as one of the seven major controllable risk factors for cardiovascular disease. Dyslipidemia is considered as one of the most important cardiovascular risk factors among type 2 diabetic population. In the current study we aimed to evaluate the prevalence of dyslipidemia and its association with glycemic control among the type 2 diabetic population.* ***Material and methods.*** *The study was conducted from April to December 2015 using random sampling technique among type 2 diabetic patients of Warangal region in Telangana State, India. Every 10th type 2 diabetic patient visiting the clinic were approached to participate in the study. Out of all the approached 126 patients, 108 agreed to participate in the study. Statistical analysis of the data was performed through Graphpad Prism 6.0. A two-tailed p value <0.05 was considered as statistically significant.* ***Results.*** *Prevalence of dyslipidemia, defined as derangement or abnormality in any one of the serum lipids was found to be 97.2% in our study sample. Dyslipidemia in good glycemic control group (HbA1c ≤ 7%) was found to be less compared to that of poor glycemic control group (HbA1c > 7%).* ***Conclusion.*** *Prevalence of dyslipidemia seem to be very high among our study sample. Our study emphasizes the importance of glycemic control in the prevention of serum lipid abnormalities. A better glycemic control among diabetic patients may help in the prevention of early predisposition to dyslipidemia.*

key words: *Type 2 Diabetes, HbA1c, Dyslipidemia, Glycemic control*

Background and Aims

Diabetes mellitus is considered as one of the major health problems in India. With nearly one million diabetic deaths every year, India turned out as the "diabetic capital of the world" [1]. Diabetes mellitus significantly increases the risk of myocardial infarction, amputation, stroke and death [2]. In diabetic patients ageing 65 years or older, approximately 68% of people die from some form of heart disease and 16% die from stroke. Risk of developing heart disease or stroke in adults with diabetes is two to four fold higher compared with that of adults without diabetes.

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American Heart Association considers diabetes as one of the seven major controllable risk factors for cardiovascular disease [3]. Dyslipidemia is considered as one of the most important cardiovascular risk factors among type 2 diabetic population [4,5]. The lipid abnormalities observed in diabetes mellitus are due to increased free fatty acid flux secondary to insulin resistance aggravated by increased inflammatory adipokines [6]. In some of the previous studies it was observed that the most common pattern of dyslipidemia among type 2 diabetic patients is an elevated triglyceride level and a decreased high density lipoprotein cholesterol level [7]. When compared with the non-diabetic population, the overall stroke mortality (first and recurrent) among diabetic population was 4.4-times higher in male and 5.1-times higher in female patients [8]. Youth who were pre-diabetic or who had diabetes were more likely to develop metabolic disorders including obesity, hypertension, dyslipidemia, and metabolic syndrome in young adulthood (19–44 years of age) [9].

Identifying the prevalence of dyslipidemia and establishing its relationship with glycemic control may help us in making necessary implementations in order to reduce the cardiovascular complications associated with diabetic dyslipidemia. Therefore, in the current study we aimed to evaluate the prevalence of dyslipidemia and its association with glycemic control among the type 2 diabetic Indian population.

Material and methods

This cross-sectional observational study was conducted from April to December 2015 to estimate the prevalence of dyslipidemia among diabetic patients of Warangal region in Telangana State, India.

The study group was obtained using random sampling technique. Patients receiving drug therapy for diabetes and not on treatment of dyslipidemia were included in the study. Every 10^{th} type 2 diabetic patient visiting the clinic was approached to participate in the study. Out of all the 126 patients, 108 met inclusion criteria and agreed to participate in the study. Type 1 diabetic patients and type 2 diabetic patients on treatment of dyslipidemia were excluded from the study.

The study was conducted at “Sri Bhadrakali Diabetes Care Centre”. A written ethical approval was obtained from the ethical committee of the hospital. A written informed consent was obtained from all the patients prior to participation in study.

Two venous blood samples were collected from the patients, one after a overnight fasting and the other 2 hours post-prandial. Serum sample was analysed for parameters like fasting blood glucose, post-prandial blood glucose and serum lipids which include total cholesterol, triglycerides, high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL).

Statistical analysis All the obtained data was initially entered into Microsoft® Excel database. Statistical analysis of the data was performed through GraphPad Prism 6.0. The data obtained was found to be abnormal and data was not normally distributed thus, non-parametric analysis was applied to obtain the results. Mann-Whitney test was used to identify any significant relationship between the groups. Kruskal-Wallis test was applied for parameters with more than three groups. Spearman rank correlation was used to identify correlation between any two dependent variables. A two-tailed p value <0.05 was considered as statistically significant.

Results

Out of the total 108 patients who agreed to participate in the study, 49 were male and 59 were female. Detailed demographic distribution of the study sample was depicted in Table 1.

Table 1. Demographic distribution of study group.

S.no	Variable	No. of patients	Percentage
I.	Gender		
	Male	49	45.4
	Female	59	54.6
II.	Locality		
	Urban	44	40.7
	Rural	64	59.3
III.	Age		
	31 – 40 Years	8	7.4
	41 – 50 Years	36	33.3
	51 – 60 Years	39	36.1
	61 – 70 Years	25	23.1
IV.	Occupation		
	Daily Labour	30	27.8
	Employee	27	25
	Housewife	51	47.2
V.	DM since		
	< 1 Year	20	18.6
	1-5 Years	44	40.7
	6 – 10 Years	28	25.9
	> 10 Years	16	14.8
VI.	Hypertension		
	Yes	46	42.5
	No	62	57.5
VII.	Family History of Diabetes		
	Yes	27	25
	No	81	75
VIII.	HbA1c		
	Good Control (≤ 7%)	42	38.9
	Poor Control (>7%)	66	61.1

Median age of the study sample was 55 years with an inter-quartile range of 12. Median values along with inter-quartile ranges of other parameters involved in the study were addressed in detail in Table 2.

The prevalence of dyslipidemia among our study sample is given in Figure 1.

The number of patients with abnormalities in individual serum lipids are presented in detail in Table 3.

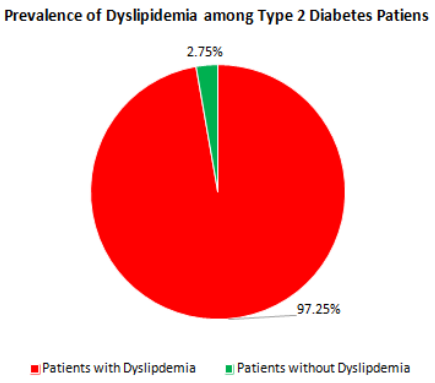

Figure 1. *Percentage prevalence of dyslipidemia in study sample.*

Table 2. Median values of different parameters involved in the study

S.no	Parameter	Median	IQR
1.	Age	55	12
2.	Fasting Blood Glucose	118.5	63.5
3.	Post-Prandial Blood Glucose	183	77
4.	Glycated Haemoglobin	7.6	2.175
5.	Total Cholesterol	143	50
6.	High Density Lipoprotein	36	5.5
7.	Triglycerides	148.5	78
8.	Low Density Lipoprotein	74.5	42
9.	Very Low Density Lipoprotein	29.5	14

Table 3. Number of patients with abnormal serum lipid levels.

S.no	Serum Lipid	Abnormal value	Patients with abnormal levels
1.	TC	> 200 mg/dl	4
2.	HDL	< 40 mg/dl	94
3.	TG	> 150 mg/dl	53
4.	LDL	> 100 mg/dl	25
5.	VLDL	> 30 mg/dl	53

Median serum lipid levels in the good glycemic control group vs. poor control group with the IQR values are given in detail in Table 4.

Table 4. Relationship between glycemic control and serum lipids.

S.no	Serum lipid	HbA1c				P-Value
		Good Control (≤ 7%)		Poor Control (>7%)		
		Median	IQR	Median	IQR	
1.	TC	132.5	42.7	152	56.7	0.02*
2.	HDL	33	6	36	6	0.002*
3.	TG	134	89.7	155	86	0.03*
4.	LDL	75	34	73	48.05	0.17
5.	VLDL	26.50	17.85	31	17.25	0.03*

*Significant (Mann Whitney U test)

Discussion

In the current study we aimed to evaluate the prevalence of dyslipidemia and its association with glycemic control among the type 2 diabetes patients.

We defined dyslipidemia as a derangement or abnormality in any one of the serum lipids. Taking this into consideration, we found a prevalence of 97.2% in our cohort of the Indian population. The findings of our study are in agreement with that of the study conducted in Malaysia by Eid et al. which identified a high prevalence of dyslipidemia in type 2 diabetic patients, about 97% have abnormality at least in one plasma lipid level [10].

Another study conducted in Tanzania showed that the prevalence of dyslipidemia was 95%, with hypertriglyceridemia as the commonest lipid derangement [11]. In our study we found that the most common lipid disorders were that of serum HDL levels (87%) and elevated serum triglyceride levels (49%). This is in agreement with another study conducted by Haffner et al. showing that the most common pattern of dyslipidemia in type 2 diabetic patients is elevated triglyceride levels and decreased HDL cholesterol levels [7].

Prevalence of dyslipidemia among the female population of our study sample was found to be 98.3%, which was very high when compared to that of the study conducted by Jayarama et al., in a rural tertiary care hospital in southern India, which identified the prevalence of dyslipidemia as 86.75% [12].

HbA1c is used as a measure of glycemic control. We classified glycemic control into two groups: good control (HbA1c $\leq$ 7%) and poor control (HbA1c > 7%) based on the recommendations of the American Diabetes Association [13]. Some other researches have also used the same cut-offs for HbA1c [14,15]. However, in a study conducted at King Saud University, Saudi Arabia, the researchers have used different cutoffs and classified the glycemic control into three groups i.e., good (HbA1c < 6%), moderate (HbA1c >6% and <9%) and poor (HbA1c > 9%) [16].

Median levels of TC, HDL, TG and VLDL were significantly higher among the patients with poor glycemic control (HbA1c > 7%) compared with that of patients with good glycemic control (HbA1c < 7%) whereas, no difference was identified in LDL level of the patients. This finding of our study clearly indicates that the tendency to develop dyslipidemia was high among diabetics with poor glycemic control. In a study conducted in Kathmandu, Nepal, no difference in HDL cholesterol levels was identified between the two groups [17].

Recent studies also showed that poor glycemic control may lead to reduced renal function, endothelial dysfunction, nephropathy and dyslipidemia [18]. Therefore, diabetic patients should be advised to maintain good glycemic control in order to prevent the complications associated with diabetic dyslipidemia.

However the glycemic control by itself may not be sufficient to control diabetic dyslipidemia. Along with glycemic control, diabetic subjects may also need direct lipid management [19]. Few anti-diabetic therapies like metformin have also proven to be helpful in maintaining better glycemic control and improving dyslipidemia [20]. Fish oil may serve as a non-pharmacological approach in the treatment of dyslipidemia in diabetes [21].

As our study is single centre, small sample based and confined only to type 2 diabetic population, further studies at a multi-centric level including larger population and focusing on various ethnic groups may yield a better picture.

Conclusion

Prevalence of dyslipidemia seem to be very high among the study sample of the Indian type 2 diabetes population, indicating that there is an important and urgent need to educate patients regarding the associated complications. Our study emphasizes the importance of glycemic control in the prevention of serum lipid abnormalities. Better glycemic control among diabetic patients may help in the prevention of dyslipidemia.

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