CORRELATION OF BLOOD GLUCOSE LEVELS WITH DYSLIPIDEMIA AMONGST PATIENTS WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

Objective: To find out the correlation of blood glucose with serum triglycerides and serum cholesterol levels in patients having T2DM.

Material and methods: This cross sectional descriptive study was conducted from August to October 2019 in the medical out-patient department of Khyber teaching hospital Peshawar, which is a 1600 bedded tertiary care hospital in Khyber Pakhtunkhwa, a province of Pakistan. Patients with T2DM were categorized into two groups. Group A with HbA1c from 6.5-8% and group B with HbA1c of more than 8%. Fasting serum cholesterol and fasting serum triglycerides were correlated in these groups with the level of HbA1c. The data so collected, was analyzed through statistical package for social sciences, SPSS version 23, chi-square test was applied to find out the relationship between the 2 groups and p-value of 0.05 or less was considered significant for correlation.

Results: Amongst 319 patients with T2DM, 220 (68.96%) were females and the rest of 99 (31.04%) were males. Serum cholesterol was raised in 106 (33.22%) patients with T2DM. It was raised in 35.16% of patients in group A and in 32.45% in group B (p-value of 0.6). Serum triglycerides level was raised in 22.25% of patients with T2DM (with 23.07% in group A and in 21.92% of patients in group B) with a p-value of 0.8.

Conclusions: The levels of fasting serum cholesterol and fasting serum triglycerides were not having any significant correlation with the levels of glycosylated hemoglobin (and hence diabetic control) in our patients having Type 2 Diabetes Mellitus.

Key words: Serum Cholesterol, serum Triglycerides, Type 2 diabetes mellitus

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INTRODUCTION

Though Type 2 Diabetes Mellitus (T2DM), a heterogeneous group of disorders, usually occurs in adults but may occur in children and adolescents. Almost all patients with T2DM have to some extent insulin resistance[1,2]. T2DM results from complex interaction of both genetic and environmental factors[3]. The risk of developing T2DM, increases with increasing age[4,5], obesity[6,7] and lack of physical activity[5,8]. About 6% of the world population is suffering from T2DM[9]. Currently Pakistan stands at position 7 amongst the top ten countries having Type 2 Diabetes Mellitus patients[9]. Individuals having insulin resistance (metabolic syndrome) are at much higher risk for developing T2DM. These individuals usually have raised serum triglycerides and small dense low density lipoproteins (LDL), lower high density lipoproteins (HDL), raised blood pressure, central obesity[10-12], hyperuricemia, raised serum plasminogen activator inhibitor type 1 (PAI-1) and higher serum levels of pro-inflammatory cytokines e.g., IL-[6] and TNF-alpha. Elevated serum triglycerides have been claimed to elevate the serum glucose level[5]. It has further been observed that for lipid toxicity to develop hyper-triglyceridemia is essential, in other words lipotoxicity and glucotoxicity are interlinked and are essential for each other[13]. It has further been reported that diet rich in glucose cause prolonged elevation in serum triglycerides in patients with T2DM[14]. Correction of obesity and hyperglycemia, by exercise, diet modification and hypoglycemic agents is the main treatment of lipid abnormalities in diabetic patients[15,16].

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Several studies have shown the correlation of blood glucose with serum triglycerides and serum cholesterol level in patients with T2DM[5-6,17-19]. In up to 95% of cases such studies have been conducted on T2DM[5]. But studies of this kind have not been conducted in population of Peshawar region. Therefore in order to find out the correlation blood glucose with serum triglycerides and serum cholesterol level in patients with T2DM presenting to a tertiary care hospital of this province, we embarked on this study. This study will help us in understanding the relationship of dyslipidemias with diabetic control.

MATERIAL AND METHODS

After getting approval from the ethical committee of Khyber Teaching Hospital, Peshawar, this cross sectional descriptive study was conducted in medical out-patient department of Khyber Teaching Hospital Peshawar, from 10th august to 24th october 2019. A total 319 patients, having T2DM for more than two years, were included in the study.

Diabetes mellitus was diagnosed when fasting plasma glucose was equal to or more than 126 mg%, or random plasma glucose was equal to or more the 200 mg%, or HbA1c was more than 6.5%. Patients having history of T1DM or using insulin, below 15 years of age and those patients taking statins or fibrates, having comorbid conditions, blood disorders e.g. haemoglobinopathies, pregnant ladies and those who declined consent, were excluded from our study.

Upper limit of normal for serum cholesterol and serum triglycerides in our laboratory were 220 mg%, and 160 mg% respectively. In order to correlate the blood glucose level with fasting serum cholesterol and fasting serum triglycerides, we divided the patients into two groups, Group A with HbA1c between 6.5-8% (means fair control), and Group B with HbA1c level more than 8% (means poor control).

The data collected as per specially designed proforma, was entered & analyzed through statistical package for social sciences (SPSS version 23). The Chi-square and Pearson's R correlation tests were used for establishing statistical significance.

RESULTS

A total number of 1807 patients were assessed out of which 319 patients were having Type 2 Diabetes Mellitus, where males were 99 and females were 220. The mean age of the patients with T2DM was 55.07 +-9.78 years see table 1, 2 ,3 for details.

DISCUSSION

Out of 1809 patients who visited the out-patient department, 319(17%) patients had type 2 diabetes mellitus, this figure is slightly higher than the recently reported figure of 11.7%, in the same settings[18], reflecting an increase in the percentage of population suffering from T2DM. A similar study conducted few years ago, in the same province, revealed that the percentage of both female and male patients were equal 50/50%[19], but in our study the ratio of percentage of females to males was 68.96/31.04% roughly 3/1. The difference is probably because of more

Table 1: Demographics of the patients with T2DM

	Patient without T2DM	Patient with T2DM	p value
Frequency of the patients presenting to medical OPD with T2DM			
	1488	319	
Age wise distribution of the patient presenting to the medical OPD			
Mean + SD	47.18 + 16.42	55.07+ 9.78	0.000
Gender wise distribution of the patient presenting to the medical OPD			
Male	490	99	0.52
Female	998	220	
Total (n=1807)	1488	319	

Table 2: Correlation of Blood Sugar with lipid profile of the patients

Diabetic Status	Within normal limits	Elevated	Pearson's R
Correlation of cholesterol with diabetic status of the patient			
Group a (n = 91)	59 (64.83%)	32 (35.16%)	0.644
Group b (n = 228)	154 (67.54%)	74 (32.45%)	
Total (n = 319)	213 (66.77%)	106 (33.22%)	
Correlation of triglyceride with diabetic status of the patient			
Group a (n = 91)	70 (76.92%)	21 (23.07%)	0.825
Group b (n = 228)	178 (78.08%)	50 (21.92%)	
Total (n = 319)	248 (77.75%)	71 (22.25%)	

Table 3: Blood Sugar Levels with Lipid profile of patients

Mean + S.D	
HbA1C	8.62 +0.07
Serum Glucose Levels	229.90 + 91.09
Serum Cholesterol Levels	197.66 + 51.24
Serum Triglyceride Levels	194.29 +53.44

sedentary life style of female population in our culture.

Serum cholesterol was raised in 106 (33.22%) which is much lower than the 94% reported by another research conducted in another city of same province[19]. The reason is not clear but may be that with the passage of time most of the people have become aware about the metabolic abnormalities and have modified their life style and food habits to some extent and are taking medications.

On the other hand, Sheikh MA[20] has found high serum cholesterol in just 38% of the patients in his study, the figure is slightly higher than our finds. While going into further details, we observed that, though T2DM is in itself a risk factor for hypercholesterolemia, there was no significant statistically difference in the level of serum cholesterol whether the HbA1c was less than 8% or more than 8%, thus there was no correlation of serum cholesterol to blood glucose level.

In our study serum triglyceride was raised in 71 (22.25%) of our patients with T2DM, which is again much lower than the 78%[17] and 60% in a study conducted in Jamshoro/ Hyderabad[20]. We have further observed that hypertriglyceridemia was present in only 21 (23.07%) of patients in Group A (HbA1c from 6.5-8%) and was raised in 50 (21.92%) of patients in Group B (HbA1c more than 8%), reflecting no significant difference in the level of serum triglycerides whatever is the level of HbA1c.

However, both of these figures were much lower than a similar study in which hypertriglyceridemia was observed in 64% of patients with HbA1c less than 8%, and in 92% of patients with HbA1c level more than 8% by Ahmad N et al[19], though both the studies were conducted in the same province, but study population had varied life style.

This study, however, found no correlations between the level of dyslipidemia and diabetic control which is contrary to many studies done worldwide, but one of the reason is that it is limited to a single center and small sized population.

CONCLUSION

Our study has proved that serum cholesterol and serum triglyceride are having no correlation with glycemic control in T2DM. Further large scale and multicenter studies are needed for early interventions which could possibly circumvent health complications and harsh outcomes in later years of life.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Iqbal S: Study idea, concept

Yousaf M: Statistical Analysis

Asad L: Data collection

Iqbal MD: Material and methods

Iman N: Study supervision and critical revision

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.