Original Article

Evaluation of Haematological Parameters and Lipid Profile in Patients with Diabetes Mellitus

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ABSTRACT

Background: Diabetes mellitus is now a major health problem including both developed and developing countries throughout the world.

Objective: The main objective of this study is to evaluate hematological parameters and lipid profile in patients with diabetes mellitus.

Materials and Methods: The present study was conducted on 30 subjects of type 2 Diabetes in age group (30-65 years). Hematological parameters like HbA1C, FBS, PLBS, platelet count, APTT and lipid profile were estimated in CAIMS, Karimnagar

Results: There is a significant rise in HbA1C, FBS, PLBS, platelet count, LDL and triglyceride levels and there is a significant reduction in APTT and HDL levels.

Conclusion: Hypercoagulability and dyslipidemia are important complications of diabetes mellitus and are important risk factors for various cardio and cerebrovascular diseases.

Keywords: Type 2 diabetes, HbA1C, APTT, HDL

INTRODUCTION

Diabetes mellitus is now a major health problem including both developed and developing countries throughout the world. The prevalence of diabetes is increasing rapidly in all age groups, for the past 30 yrs. Diabetes is one of the major causes of morbidity and mortality affecting youth and middle aged people. It is affecting younger segments of the population at alarmingly high rates.[1]

Diabetes is an ICEBERG disease. Accroding to WHO report the prevalence of diabetes in adults has risen from 135 million to 300 million from 1995 to 2025. Epidemiological data in India had shown 32 million diabetic subjects in the year 2000 and this number may increase up to 80 million by the year 2030.[2]

Hematological tests like APTT(activated partial thromboplastin time) and platelet counts etc., are relatively inexpensive and can be used as hemostatic markers in diabetics. Reduced APTT indicates the hypercoagulability state in the people suffering with diabetes and also indicates their increased risk for

impending thrombotic, coronary or cerbrovascular diseases. [3]

Hypertriglyceridemia and low HDL levels are constantly associated with diabetics and they can be reversible with strict glycemic control. But these elevated triglyceride levels and reduced HDL poses impending cardiovascular disease complications in the diabetics and can be life threatening.[4]

The main objective of this study is to evaluate haematological parameters and lipid profile in patients with diabetes mellitus in Karimnagar and to enlighten medical faculty and diabetic patients about various hematological and hyperlipedemia related complications in Diabetes, which are major risk factors for cardiovascular and cerebrovascular diseases.

MATERIALS AND METHODS

The subjects for the cases group have been randomly selected for the study. Patients are already known type 2 Diabetic Subjects, without having neuropathy symptoms or having sub clinical neuropathy. The prospective study was conducted on 30 subjects of type 2 Diabetic Subjects in age group (30-65 years) at CAIMS, Karimnagar from June 2017-May 2018.

The subjects for control group have been selected in age group of 30-65 years, seeking for various other medical problems without diabetes and having no major diseases. Prior to study, each subject was informed in detail of its objectives, the aims of the study protocol and the methods to be used. Their consent was obtained in the proforma.

Along with routine general examination, blood pressure height, weight recordings were taken. Blood samples were collected from subjects and controls. Haematological parameters were estimated at CAIMS, Karimnagar. All the information obtained is recorded in case sheet proforma and later analyzed.

Methods adopted for Haematological tests and lipid profile:

1. Estimation of HBA1C is done by high performance liquid chromatography. HBA1C values are expressed as percentage. Normal value of HBA1C - <7% is considered normal.
2. Blood glucose (FBS & PLBS) was determined on the auto analyzer by the Hexokinase method.
   Normal value of FBS : 70-130 mg/dl
   Normal value of PLBS : <180 mg/dl
3. Plate count is done in automatic cell counter.
   Normal value :1.5-4 lakh/mm3
4. Prothrombin time (PT) is estimated by Quick's method.
   Normal value of PT: 10-16 seconds
5. Activated partial thromboplastin time (APTT) is estimated by Kaolin method.
   Normal value of APTT: 30-40 seconds
6. Lipid profile (HDL, TGL, LDL) is estimated by enzymatic method.
   Normal values: HDL -30-60mg/dl
   LDL – 80-100mg/dl
   TGL – 75-150 mg/dl

In this study mean, standard deviation, t-test for difference of means, p value and correlation techniques were taken up in this study and employed separately for all variables. This entire statistical analysis done by SPSS – 16, Minitab-13, Graph pad (Prism 5.0).

RESULTS

The procedure of testing the hypothesis was concluded by accepting the hypothesis or rejecting it. When the statistic t value is computed, we found p value corresponding to it from the tables. If p value is < 0.001 it is considered highly significant and if it is <0.05 it is considered significant, and it is >0.05, then we concluded that the parameters under study are not significantly related.

In case of correlation study, correlation value (r) lies in between -1 and +1. If the r value is -1= r <0-both parameters are negatively correlated If the r value is 0 < r=1 both parameters are positively correlated if the r value is 0, no relation exists between the parameters.

Table 1: Comparison of Hba1c In control group and case group

	HBA1C	
	control	case
Mean	5.5	8.1
S.D	0.76	1.1
t-value	10.5057	
p-value	<0.001	
Result	Significant	

Table 2: Comparision of platelet count in control group and case group

	Platelet count	
	control	case
Mean	2.1	4.4
S.D	0.43	0.59
t-value	17.81	
p-value	<0.001	
Result	Significant	

Table 3: Comparison of prothrombin time in control group and case group

	PT	
	control	case
Mean	13	13
S.D	1.9	1.9
t-value	0.608	
p-value	>0.05	
Result	Not Significant	

Table 4: Comparison of activated partial trhomboplastin time in control group and case group

	PT	
	control	case
Mean	33.53	34.87
S.D	2.52	2.49
t-value	2.06	
p-value	<0.05	
Result	significant	

Table 5: Comparison of FBS in control group and case group

	FBS	
	control	case
Mean	81	136
S.D	9.7	13
t-value	18.61	
p-value	<0.001	
Result	Significant	

Table 6: Comparison of PLBS in control group and case group

	PLBS	
	control	case
Mean	130	212
S.D	9.3	35
t-value	12.57	
p-value	<0.001	
Result	Significant	

Table 7: Comparision of HDL levels in control group and case group

	HDL levels	
	control	case
Mean	72	25
S.D	9.5	3.6
t-value	25.08	
p-value	<0.001	
Result	Significant	

Table 8: Comparison of TGL levels in control group and case group

	TGL levels	
	control	case
Mean	36	161
S.D	7.5	23
t-value	28.35	
p-value	<0.001	
Result	Significant	

Table 9: Comparision of LDL levels in control group and case group

	LDL levels	
	control	case
Mean	82	130
S.D	8.9	28
t-value	8.84	
p-value	<0.001	
Result	Significant	

Table 10: Correlation graph between hba1c and platelet count, pt, aptt, fbs and plbs, tgl, hdl and ldl in cases group

HBA1C (%)	Platelet count (lakh/mm3)	PT (in seconds)	APTT (in seconds)	FBS (mg/dl)	PLBS (mg/dl)	Lipid Profile (mg/dl)		
						TGL	HDL	LDL
Correlation	0.550	0.149	-0.223	0.878	0.806	0.687	-0.304	0.522

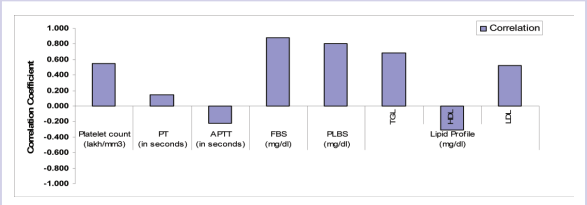

CHART 3

DISCUSSION

The mean value of Glycated hemoglobin (HBA1C) in control group is 5.5% and in cases group it is 8.1%. The estimated p value is <0.001 which is considered highly significant. Measurements of Glycated hemoglobin is effective in monitoring long term glucose control in people with diabetes mellitus.

Analogous correlations between HBA1C and complications were observed in patients with type 2 diabetes in the united kingdom prospective diabetic study (UKPDS) trial.[5] Boden et al (1980) showed that HBA1C

concentration fluctuated little and accurately reflected the degree of diabetic control.[6]

Simon et al (1980) observed that glycosylation of protein occur simultaneously with that of hemoglobin and these changes may be responsible for neuropathy, retinopathy and other complications. Glycation is the non-Enzymatic addition of a sugar residue to amino group of proteins.[7]

In our study HBA1C negatively correlated with subclinical distal sensory peripheral neuropathy subjects. The mean FBS in control group is 81mg/dl and in cases group it is 136 mg/dl the estimated p value is <0.001 which is highly significant. The mean PLBS in control group is 130mg/dl and in cases group it is 212mg/dl. The estimated p value is <0.001 which is considered highly significant.

The mean value of platelet count in control group is 2.1 lakh/mm3 and in cases group it is 4.4 lakhs/mm3. The estimated p value is <0.001 which is considered highly significant. However the studies on platelet count in diabetes mellitus are limited and available material is so less. The relation between platelet count and diabetes mellitus is not established clearly anywhere.

In 1998 Sterner G, Carlson J, Ekberg G, observed that raised platelet levels are common finding in patients with diabetes mellitus complicated by nephropathy. Non-insulin dependent diabetes mellitus is characterized by the presence of abnormally active platelets in the circulation leading to increased incidence of thrombotic complications.[8]

In 2002 Srivastava K, Dash D, studied changes in signaling mechanisms in platelets obtained from NIDDM patients. Singling changes has lead to hyper activation of platelets. The possible mechanism for thrombocytosis in diabetes mellitus type 2 is uncontrolled hyperglycemia. Which may increase the production of megakaryo cytes and there may be excessive stimulation of thrombo poietein.[9]

In our study there is positive correlation between HBA1C and platelet count. Glucoregulation will result in decreased platelet count and decreased incidence of thrombotic complications. The mean prothrombin time in control group is 13 sec and in cases group also it is 13 sec. The estimated p value is >0.05 which is not significant.

The mean activated partial thromboplastin time in control group is 33.53 sec and in cases group it is 37.87 sec the estimated p value <0.05 which is considered significant. Extrinsic pathway and common pathway of coagulation is assessed by PT. APTT is a simple test of the intrinsic and common pathway. APTT has become significant due to the hyper coagulation state of the diabetic subjects.

Activation of coagulation might contribute to the vascular complications in diabetes. Advanced Glycated end products are taken by the AGE receptors present on the endothelium, thereby enhancing permeability and endothelium dependent coagulant activity. In our study there is a positive correlation between HBA1C and PT, negative correlation with APTT.

The mean value of HDL in control group is 72mg/dl and in cases group it is 25mg/dl. The estimated p value is <0.001 which is considered as highly significant. The mean value of triglyceride levels in control group is 36mg/dl and in cases group it is 161mg/dl. The estimated p value is <0.001 which is considered highly significant. The mean value for LDL in control group is 82mg/dl and in cases group it is 130mg/dl. The estimated p value is <0.001 which is considered highly significant.

In our study, we found elevated levels of triglyceride and LDL with decrease in HDL levels. This type of dyslipidemia is most characteristic of type 2 diabetes. Diabetes have a high incidence of coronary, cerebral and peripheral artery diseases caused by dyslipidemias.[10] In the Helsinki Heart study the incidence of myocardial infarction and cardiac death was significantly higher among diabetic than non diabetic subjects.[11]

The Glycation of apoprotein B (Apo-B) decrease the affinity for LDL receptors and may delay in LDL clearance. Glycated LDL is more susceptible to oxidation and oxidized LDL plays a key role in atherogenesis, HDL is also glycated and the glycated HDL turns over more rapidly than native HDL.[12]

In our study HBA1C is negatively correlated with HDL. Each 1% change in HBA1C represents an approximate 35mg/dl change in average blood glucose. Despite the small difference in HBA1C, micro vascular complications were reduced by 25% and 14% for myocardial infarction.

CONCLUSION

Our study concludes that the mean HBA1C, FBS and PLBS levels are elevated in diabetes mellitus. APTT has become significant due to hypercoagulable state of the diabetic subjects. This is an important risk factor for various cardio and cerebrovascular disease which can be detected with less expensive and simple blood screening in diabetic patients. Increased LDL, triglyceride and reduced HDL levels also indicate increased risk for atherosclerotic diseases in diabetics.

CONFLICT OF INTEREST :

The authors declared no conflict of interest.

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