



A Cross Sectional Study of Coagulation Profile in Type 2 Diabetes Mellitus Patients in Correlation with HbA1c

Authors

Dr T. Arun Kumar¹, Dr Bhimsen Soren², Dr B.N. Sandeep Reddy³, Dr M.Govinda⁴

¹Department of General Medicine

Great Eastern Medical School & Hospital, Srikakulam, AP

²Professor of General Medicine

³Assistant Prof. of General Medicine

⁴Assistant Prof. of General Medicine

Abstract

Introduction: *Diabetes mellitus is a prevalent global health concern associated with increased cardiovascular risk. Hypercoagulability is a prominent feature in diabetic patients, contributing to thrombotic complications.*

This study explores the coagulation profile in Type 2 diabetes mellitus (T2DM) patients, focusing on the correlation with glycated hemoglobin (HbA1c).

Aim: *The study aims to assess coagulation impairment in T2DM through routine prothrombin time (PT) and activated partial thromboplastin time (APTT) measurements, thereby preventing thromboembolic cardiovascular disease (CVD). It further examines the relationship between coagulation parameters, HbA1c, and diabetes duration.*

Materials and Methods: *A cross-sectional study was conducted on 200 T2DM patients aged above 35 years with HbA1c > 7%. PT, APTT, fasting blood sugars, post-prandial blood sugars, and HbA1c were measured. Exclusion criteria included anticoagulant use, hepatic failure, coagulation disorders, and CVD. Data was collected at a medical facility over a one-year period.*

Results: *The study included 200 eligible T2DM patients, primarily over 40 years old. The investigation results were analyzed for the patients.*

Discussion: *Diabetes significantly elevates the risk of atherosclerosis, contributing to macrovascular complications. Hyperglycemia leads to impaired natural anticoagulants, resulting in hypercoagulability. The study found a notable correlation between diabetes duration and coagulation profile. Additionally, patients with poor glycemic control exhibited shortened PT and APTT values.*

Conclusion: *The study highlights that T2DM patients with HbA1c ≥ 7 exhibit distinct coagulation variations, suggesting an increased thrombotic risk. Routine evaluation of PT and APTT is crucial to assess coagulation impairment, aiding in the prevention of thromboembolic CVD in T2DM. Management of hypercoagulability might mitigate micro and macrovascular complications, underscoring the significance of glycemic control.*

Keywords: *Type 2 diabetes mellitus, coagulation profile, HbA1c, thromboembolic cardiovascular disease, glycemic control.*

Introduction

Diabetes mellitus is a common endocrine disease which is global public health problem.

The most common manifestation of diabetic macrovascular complication is cardiovascular disease. Diabetic patients have 2- to 4- fold increased risk for developing coronary artery disease.

Increased risk of thrombotic complications is noted in diabetics and it is due to hyperglycaemia contributing to platelet hyperreactivity, hyperfibrinogenemia, increased thrombin formation and reduced fibrinolysis.

Persistent hyperglycaemia in diabetes mellitus causes coagulopathies due to glycation of haemoglobin, prothrombin, fibrinogen and other proteins involved in the clotting mechanism.

PT and APTT the marker for activation of extrinsic and intrinsic pathway respectively.

The hypercoagulability state demonstrated by shortened PT and APTT in diabetes mellitus may cause occlusive thrombus within coronary artery.

Aim of the Study

- This study aimed to investigate the importance of routine determination PT & APTT in order to assess the coagulation impairment in DM to prevent the thromboembolic CVD.
- This study was designed to evaluate the coagulation profile (activated partial thromboplastin time, prothrombin time) in Type 2 diabetes and to analyze correlations between, glycated hemoglobin (HBA1C) and duration of diabetes with coagulation parameters.

Materials & Methods

Methodology

This is a cross sectional study among 200 Type 2 diabetes mellitus patients attending General medicine outpatient department in Great Eastern Medical School and Hospital.

Design of Study: Cross Sectional Study

Period of Study: One Year

Inclusion Criteria

- All Type 2 Diabetes mellitus patients above 35 years with HbA1c > 7

Exclusion Criteria

- Patients on anticoagulants.
- Patients with hepatic failure.
- Patients with history of coagulation disorders.
- Patients with malignancy, coronary artery disease, cerebrovascular accident.
- Patients with clinical evidence of macrovascular and microvascular complications of diabetes mellitus
- Data is collected from 200 patients of type 2 diabetes mellitus at GEMS hospital.

Investigations

- Fasting blood sugars
- Post Prandial blood sugars
- HBA1C
- PT and APTT

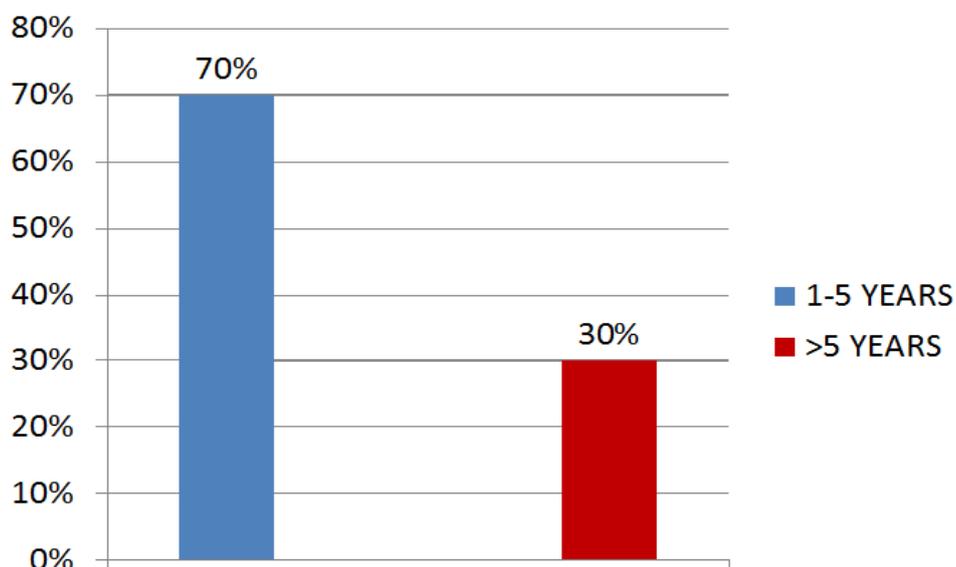
The tests were carried and following results and outcomes were seen.

Observation and Results

- The study populations consists of 200 patients who had fulfilled inclusion and exclusion criteria.
- Most of the cases were > 40 years of age.
- The results are depicted based on investigations done to the patients.

Distribution of patients based on duration of diabetes

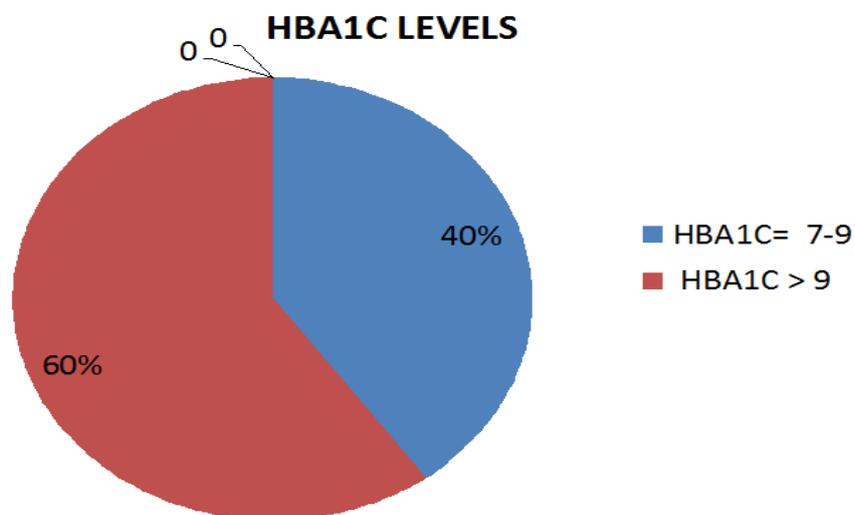
DURATION OF DIABETES	NUMBER	PERCENTAGE
1-5 YEARS	140	70%
> 5 YEARS	60	30%
TOTAL	200	100%



DURATION OF DIABETES
Bar Diagram Depicting Results Based on duration of Diabetes

Distribution of patients based on HbA1c results

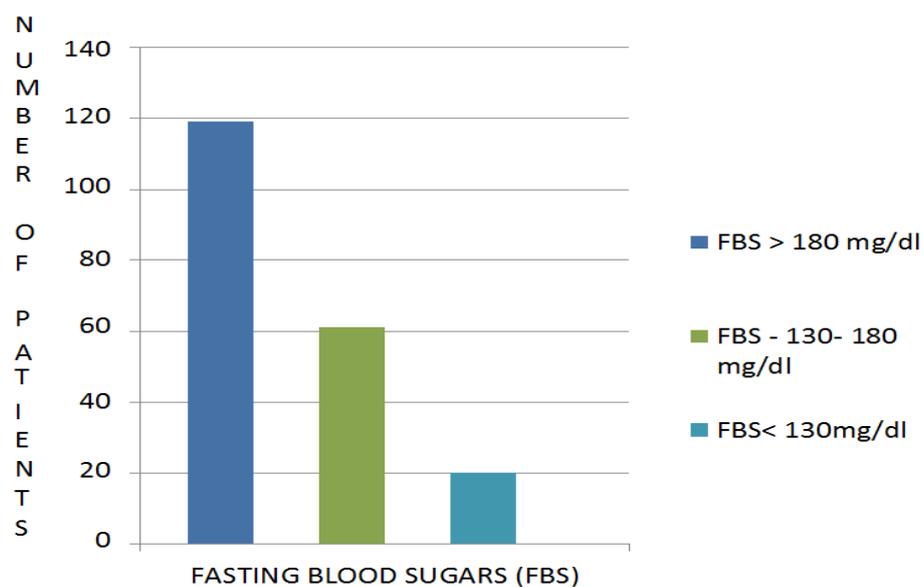
HBA1C	NUMBER OF PATIENTS	PERCENTAGE
7-9	80	40%
> 9	120	60%



Pie Diagram Depicting Results Based on HbA1c Levels

Distribution of patients based on fasting blood sugar results

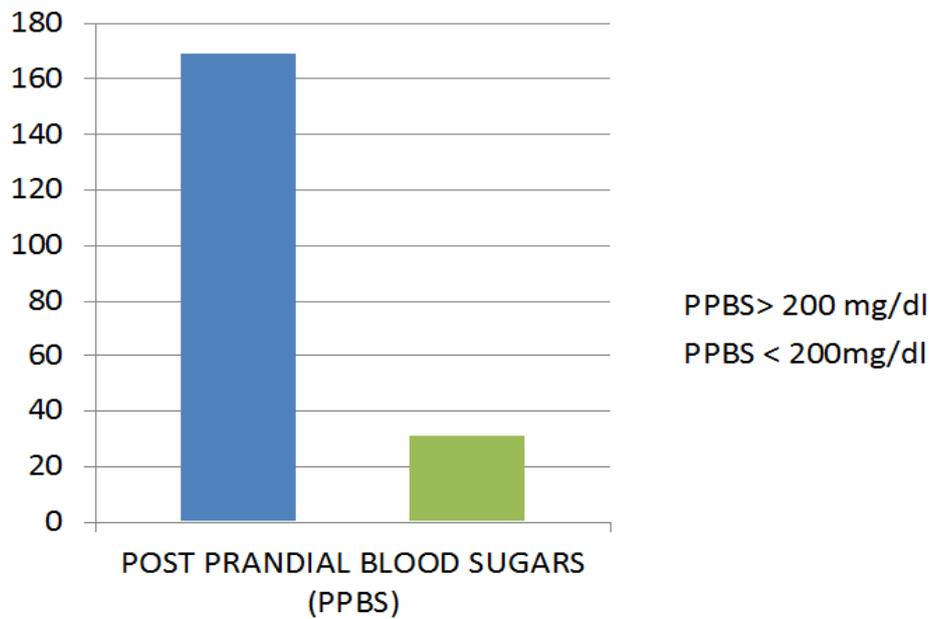
FBS	NUMBER	PERCENTAGE
> 180 mg/dl	119	59.5%
130-180 mg/dl	61	30.5%
<130 mg/ dl	20	10%
TOTAL	200	100



Bar Diagram Depicting Results Based on FBS Levels

Distribution of patients based on Post Prandial Blood Sugar results

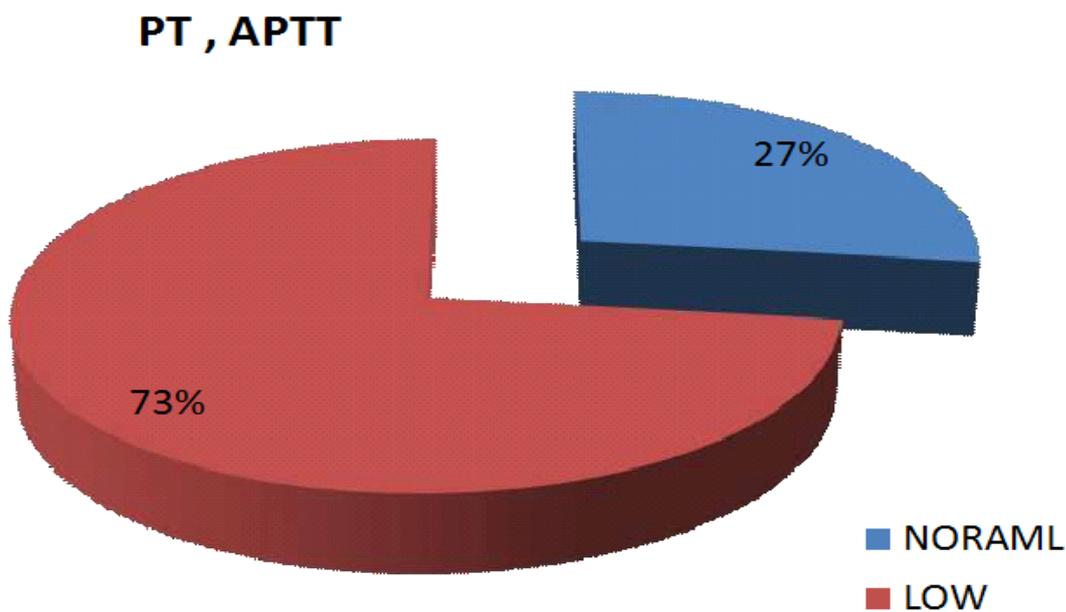
PPBS	NUMBER	PERCENTAGE
> 200 mg/dl	169	84.5%
< 200 mg/dl	31	15.5%
TOTAL	200	100



Bar Diagram Depicting Results Based on PPBS Levels

Distribution of patients based on PT AND APTT values

PT AND APTT	NUMBER	PERCENTAGE
NORMAL	54	27%
LOW	146	73%
TOTAL	200	100%



Pie Diagram Depicting Results Based On PT AND APTT levels

Statistical Analysis**Difference in PT Values Between in duration of Diabetes**

DURATION OF DM	MEAN	S.D
1- 5 YEARS	10.5	1.2
> 5 YEARS	9.3	1.3

P value – 0.002 , therefore study shows significant correlation between PT and duration of diabetes.

Difference in PT Values Between HbA1c Categories

HBA1C	MEAN	S.D.
7-9	10.5	1.2
> 9	9.2	0.9

P value – 0.001 , therefore study shows significant correlation between PT and HBA1C

Difference in APTT Values between Duration of Diabetes

DURATION OF DM	MEAN	S.D
1- 5 YEARS	31.3	5.7
> 5 YEARS	20.8	4.3

P value – 0.003, therefore study shows significant correlation between APTT and duration of diabetes.

Difference in APTT Values Between HbA1c Categories

HBA1C	MEAN	S..D
7-9	27.2	7.2
> 9	19.5	1.5

P value 0.001, therefore study shows significant correlation between APTT and HBA1C levels.

Discussion

- Atherothrombotic disease is the leading cause of morbidity and mortality in patients with diabetes which is usually associated with both metabolic and vascular abnormalities.
 - Diabetes considered to be the independent risk factor for the development of atherosclerosis.
 - Therefore, atherosclerosis is the main cause of macrovascular complications, causes increased platelet activation, activation of coagulation factors, and hypo fibrinolysis significantly associated with an increased risk of cardiovascular disease.
 - It has been suggested that natural anticoagulant antithrombin III keeps the natural procoagulant inhibited. In addition protein C inactivates factors Va and VIIIa.
 - Hyperglycemia causes non enzymatic glycation of this antithrombin III and depressed its biological activity and also directly decreases the concentration of protein C.
 - Therefore impaired function of natural anticoagulants activate clotting factors and contribute to the onset of hypercoagulability in DM2.
1. The influence of duration of diabetes on the effect of coagulation profile was studied .
 - Of about 200 diabetic patients 60 patients were having diabetes for more than 5 years , remaining 140 patients were having duration of diabetes between 1 to 5 years.
 - There is significant correlation between duration of diabetes and coagulation profile

established.

- The HbA1c levels of diabetic patients with coagulation profile was studied .
 - Out of 200 patients 120 patients were having HbA1c >9 and 80 patients were having HbA1c between 7to 9.
 - The statistical difference in the P value was 0.001 which wasfound to be significant.
2. Most of the patients with poor glycemic control were having shortened PT and APTT values.
- A study conducted in Egypt and Sudan showed that PT between T2DM and controls had no significant difference. The reason for this variation might be due to sample size variation, variation in study design, and the variation in the study population.
 - On the other hand, a study finding in Nigeria showed PT was significantly elevated in T2DM as compared to controls.²³ This variation might be due to the presence of elevated levels of in vitro inhibitor of coagulation such as D-dimer, thrombin- antithrombin complex, and prothrombin activation fragment .

Conclusion

- The present study showed that, among the diabetic people, those with HbA1c ≥ 7 revealed marked variations in coagulation profile.
- Therefore, T2DM may be related to increased risk of thrombosis indicated by reduced PT and APTT.
- From the present study it may be concluded that patients with diabetes mellitus are more prone to develop hyper coagulationstate.
- Therefore, routine examinations of PT & APTT are important to assess coagulation impairment in DM in order to prevent thromboembolic Cardiovascular disease in DM.

- The treatment of hypercoagulable state may have a preventive role in micro and macrovascular complications in patients with diabetes mellitus.
- Thus the effective control of glycemic status which leads on to the alteration in the coagulation profile should be emphasized.

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