

Research Article



Assessment of Contribution of Fasting and Post Meal Plasma Glucose to Increased Glycated Hemoglobin in Diabetes Mellitus - A Comparative Study

Priyambada Panda¹, Tapaswini Mishra¹, Dipti Mohapatra¹, Manasi Behera¹, Nibedita Priyadarshini¹, Sitansu Kumar Panda², Kiran Dukhu¹

¹Department of Physiology, IMS and SUM Hospital, Siksha 'O' Anusandhan University, K8, Kalinga Nagar, Bhubaneswar, India.

²Department of Anatomy, IMS and SUM Hospital, Siksha 'O' Anusandhan University, K8, Kalinga Nagar, Bhubaneswar, India.

*Corresponding author's E-mail: sitansupanda2011@gmail.com

Accepted on: 31-05-2015; Finalized on: 30-06-2015.

ABSTRACT

Diabetes causes about 5% of all deaths globally each year¹. According to the World Health Organization, approximately 220 million people worldwide have type 2 diabetes mellitus. Prevalence of D.M. has been steadily increasing in urban as well as rural areas in India & it will be one of the major cause of death in India in 21st century. The aim of this study is to determine the correlation between fasting plasma glucose, postprandial glucose and glycated haemoglobin in patients with type-1 and type-2 diabetes mellitus. GHb % were found to be higher in both type-1 & type-2 diabetics than that in control groups.

Keywords: Diabetes mellitus, blood glucose, Glycosylated hemoglobin.

INTRODUCTION

Diabetes mellitus is a common metabolic disorder resulting from defect in insulin secretion or action or both; is characterized by hyperglycemia often accompanied by glycosuria, polydipsia, polyuria.

Diabetes causes about 5% of all deaths globally each year¹. According to the World Health Organization, approximately 220 million people worldwide have type 2 diabetes mellitus.

Prevalence of D.M. has been steadily increasing in urban as well as rural areas in India & it will be one of the major cause of death in India in 21st century. It is now well recognized that diabetes is an epidemic disease in most countries that are undergoing socio-economic transitions. Worldwide, an estimated 150 million people are affected by the year 2025 if successful strategies are not implemented for its prevention and control². In normoglycemic subjects a carbohydrate moiety is attached to a small proportion of hemoglobin A forming glycated hemoglobin. In sustained hyperglycemia, such as in diabetes mellitus, the percentage of hemoglobin that is increased substantially³.

Glycosylated hemoglobin (HbA1c) expressed as a percentage of total blood haemoglobin concentration gives a retrospective assessment of the mean plasma glucose concentrating during the preceding 6-8 weeks.

Its measurement is therefore discussed as good method of assessing glycemic control⁴.

On the other hand, there are also insufficient data to determine accurately the relative contribution of the FBS and PPBS to HbA1c.

It appears that FBS is somewhat better than PPBS in predicting HbA1c, especially in type 2 diabetes.

However, there is still an argument whether postprandial glucose monitoring is superior to fasting blood sugar.

The aim of this study is to determine the correlation between fasting plasma glucose, postprandial glucose and glycated haemoglobin in patients with type-1 and type-2 diabetes mellitus.

Protocol of the study

Duration of study

From June 2012 to June 2013.

Nature of study

Comparison study of clinical diabetic outdoor and indoor patients attending SUM Hospital, Bhubaneswar, Odisha.

Place of work

This study is performed at IMS & SUM Hospital, outdoor & indoor department, Department of Physiology, Pharmacology, Biochemistry & Central Laboratory, Research Center, BBSR.

MATERIALS AND METHODS

Subjects

The study included 30 patients suffering from type-2 diabetes (18 males and 12 females) aged between 36 and 66 years. And 30 patients with type 1 diabetes (16 males and 14 females) aged between 9 and 32 years. Two separate control groups, control-1 for type-2 (30) and control-2 for type-1 (30), comparable with respect to sex and age of the diabetic patients were selected. Exclusion criteria:

Subjects who had serious medical condition such as above stage 2 hypertension, coronary heart disease, arrhythmias, recent stroke/cerebrovascular accident and chronic renal failure, serious diabetic complications and psychiatric illnesses; Subjects who had medical conditions



that are known to alter HbA1c levels (haemolytic diseases and haemoglobinopathies) Plasma glucose.

Blood was collected into sodium fluoride/potassium oxalate containers and then sent immediately to the laboratory for measurement of plasma glucose using glucose oxidase method on a Chemistry Analyser (COBAS Integra 200- Roche Diagnostics). HbA1c:- It was measured in heparinized whole blood using cation-exchanged, high performance liquid chromatography method using D-10-Hb testing system with Rack Loader machine.

RESULTS

It is a retrospective study, including 120 study subjects. Out of them, 30 were suffering from DM1 included in group A; 30 were suffering from DM2 included in group B. Remaining 60 consists of 2 separate groups; control 1 and control 2. Each having 30 number of subjects comparable with group A and group B; with respect to age and sex of the diabetic patients selected.

The mean, standard deviation, range (min-max) values for HbA1c, FBS, PPBS in all groups along with p-value is given in Table-1.

DISCUSSION

- In this study, we correlated glycated hemoglobin with fasting as well as post meal plasma glucose in both type-1 and type-2 diabetic patients.
- GHb % were found to be higher in both type-1 & type-2 diabetics than that in control groups.
- Moreover GHb% were found to be higher in type-2 diabetics as compared to type-1 diabetics which suggested that glycemic control was poorer in type-2 diabetics than that in type-1 diabetic patients; which was correlated with the findings of many workers like Palmer AJ⁵, Fonseca^{6,7}.

Table 1

	FBS (mg/dl)		PPBS (mg/dl)		HbA1c (%)	
	Range (Max-Min)	Mean± SD	Range (Max-Min)	Mean± SD	Range (Max-Min)	Mean± SD
DM-2 (gp-A)	120-240	174.2 ± 55.078	112-279	254.9 ± 80.414	6.2-12.7	8.933 ± 1.899
Control-1 (gp-C)	89-124	106.167 ± 9.191	95-144	119.333 ± 9.094	5.2-6.7	5.346 ± 0.401
DM-1 (gp-B)	131-287	182.8 ± 41.313	138-388	231.733 ± 65.623	5.8-12.7	8.243 ± 1.949
Control-2 (gp-D)	72-117	97.133 ± 10.871	93-123	113.333 ± 8.599	4.1 -5.4	4.783 ± 0.440

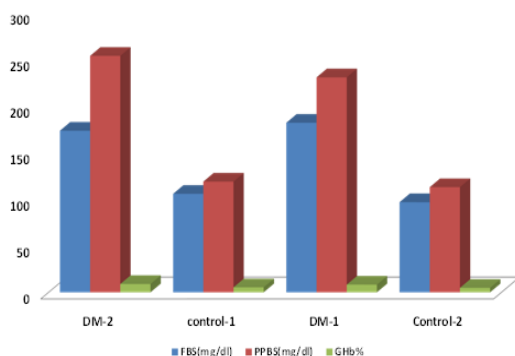
Table 2

	PPBS (mg/dl)	HbA1c (%)	Correlation of coefficient (r)
DM-2 (gp-A)	254.9 ± 80.414	8.933 ± 1.899	0.362 (*)
Control-1 (gp-C)	119.333 ± 9.094	5.346 ± 0.401	0.297
DM-1 (gp-B)	231.733 ± 65.623	8.243 ± 1.949	0.491 (**)
Control-2 (gp-D)	113.333 ± 8.599	4.783 ± 0.440	0.042

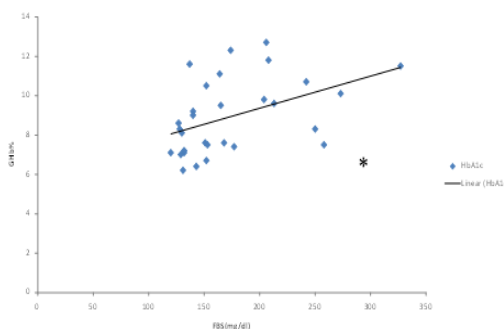
Table 3

	FBS (mg/dl)	HbA1c (%)	Correlation of coefficient (r)
DM-2 (gp-A)	174.2 ± 55.078	8.933 ± 1.899	0.448 (*)
Control-1 (gp-C)	106.167 ± 9.191	5.346 ± 0.401	0.040
DM-1 (gp-B)	182.8 ± 41.313	8.243 ± 1.949	0.378 (*)
Control-2 (gp-D)	97.133 ± 10.871	4.783 ± 0.440	0.245

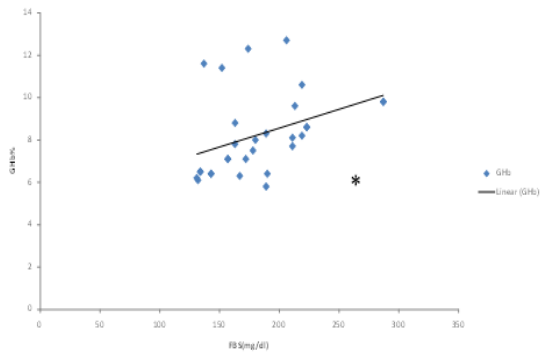
bar diagram showing mean levels of different parameters in all 4 groups



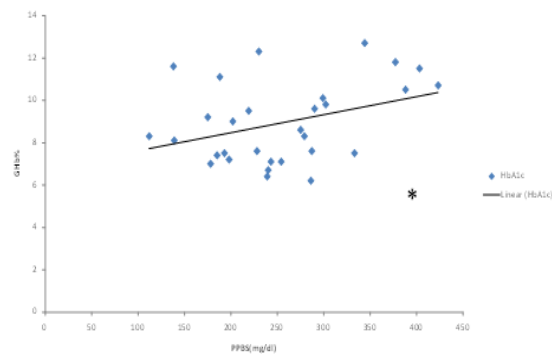
Graph showing Correlation between FBS and HbA1c levels in type-2 DM



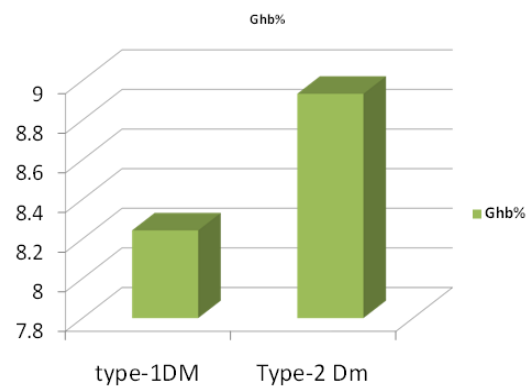
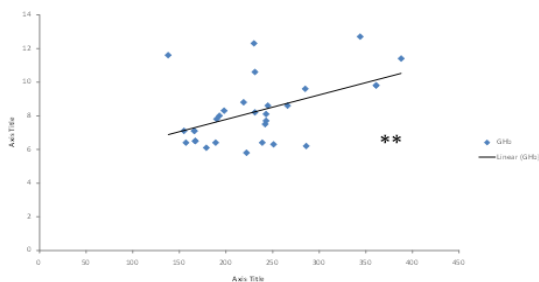
Graph showing Correlation between FBS and HbA1c in Type-1 DM



Graph showing Correlation between PPBS and HbA1c in Type-2 DM



Graph showing Correlation between PPBS and HbA1c in Type-1 DM



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Source of Support: Nil, Conflict of Interest: None.