



ORIGINAL RESEARCH PAPER

Medical Science

CORRELATION OF HbA1c & UREA CREATININE IN DIABETES MELLITUS TYPE 2 PATIENTS

KEY WORDS:

Shikhar Kumar

Lamia Fatma

Khushbu Katariya

Parul Singhal

P. K Garg

Adreena Mittal

ABSTRACT

Background: Diabetic nephropathy is one of the most severe complications of diabetes mellitus characterised by decrease in glomerular filtration rate and increase in levels of serum creatinine and urea. HbA1c is suggested as means to assess glycaemic control. **Aim and Objective:** To evaluate association of glycated hemoglobin with urea and creatinine in type 2 diabetes mellitus patients. **Materials and Methods:** An observational study was conducted in Department of Pathology of Saraswathi Institute of Medical Sciences, Hapur. A total of 200 diabetic patients and 20 normal subjects are taken into consideration for this study.

INTRODUCTION

Diabetes mellitus is characterised by chronic hyperglycaemia due to derangement in carbohydrate, fat and protein metabolism which mainly occurs because of insufficient insulin function, insulin secretion or both. Hyperglycaemia is the characteristic feature of diabetes mellitus has potential to cause dysfunction, damage or failure of different organs, involving the blood vessels, heart, eyes, nerves and kidneys. The wide spectrum of complications of diabetes mellitus include neuropathy, retinopathy, diabetic foot, ketoacidosis, nephropathy etc. Diabetic nephropathy is one of the most frequent and severe complication of DM. Measuring glycated haemoglobin (HbA1c) has been suggested as a means of assessing glycaemic control in patients with diabetes. On the basis of HbA1c the patients would be divided good glycaemic control which ranges from 6-7% and poor glycaemic control which is more than 8.2%. In diabetic nephropathy, biochemical markers serum urea and creatinine are known to be raised with hyperglycemia in uncontrolled diabetics and usually correlates with severity of kidney damage. Blood tests for blood urea nitrogen and creatinine are the simplest way to monitor kidney function. Urea is a byproduct of protein breakdown. In kidney disease, these substances are not excreted normally, and so accumulate in the body thus causing an increase in blood levels of urea. Serum creatinine is primarily a metabolite of creatinine. The normal level of creatinine is 0.8 to 1.4 mg/dl. Increased serum creatinine level is associated with an increased risk of type 2 diabetes. This study is done to investigate the association of glycated haemoglobin (HbA1c) with serum urea and creatinine in patients with type 2 diabetes mellitus.

MATERIALS AND METHODS

The present study was conducted in the department of Pathology, Saraswathi Institute of Medical Sciences. A total of 200 diabetic patients and 20 normal subjects with normal control subjects with normal renal function test and normal HbA1c were selected as controls. The study included both sexes male and female.

The following parameters were done :

- Urea and creatinine sample were collected in yellow top vacutainer with clot activator and gel for serum

precipitation.

- Glycosylated hemoglobin (HbA1c) sample was collected in lavender top vacutainer with K2EDTA.

Method

- Glycosylated hemoglobin (HbA1c) done in a semi automated analyser
- Urea in an automated analyser
- Creatinine in an automated analyser

Table 1: Reference Ranges

S.no.	Parameters	Units	Reference Range
1	HbA1c	%	<6% Normal 6-7.0% Good glycaemic control 7.1-8.2% Fair glycaemic control >8.2% Poor glycaemic control
2	Urea	mg/dl	15-40
3	Creatinine	Mg/dl	0.5-1.1 (Females) 0.7-1.3(Males)

Group I: Normal control

Group II: Diabetes with good glycaemic control HbA1c between 6-7% Group III: Diabetes with fair glycaemic control HbA1c between 7-8.1%

Group IV: Diabetes with poor glycaemic control HbA1c >8.2%

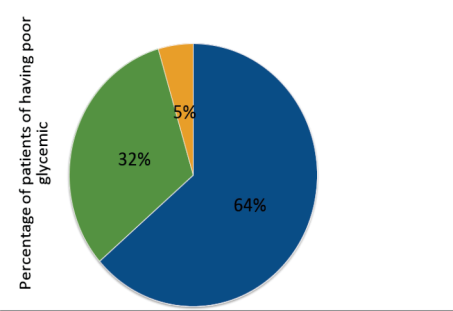
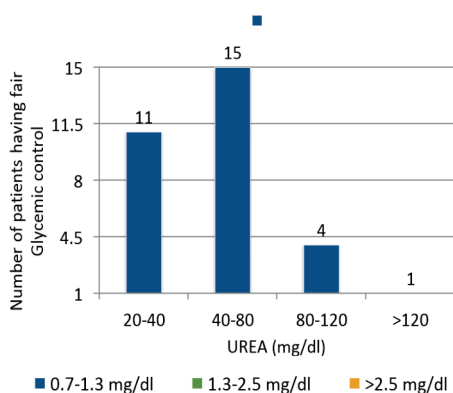
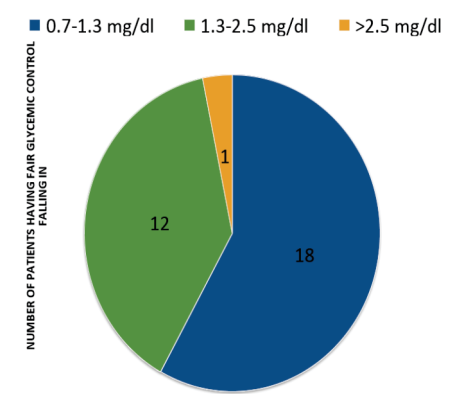
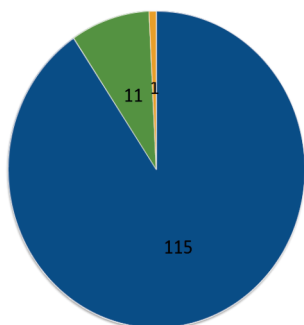
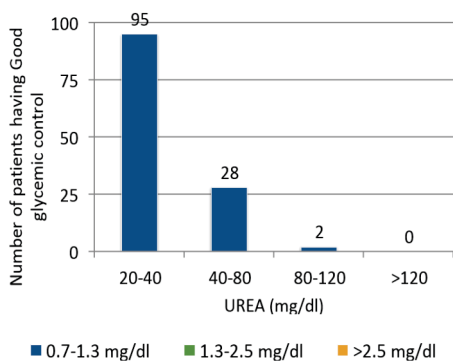
Table 2: Comparison Study for HbA1c

Parameters	Groups	Mean + SD
HbA1c	Group I	4.76+0.49
	Group II	6.25+0.39
	Group III	7.55+0.30
	Group IV	9.83+1.77

Table 3: Comparison Among Study for Urea and Serum Creatinine

Parameters	Groups	Mean + SD
Urea	Group I	30.72+22.7
	Group II	33.61+14.53
	Group III	52.93+27.03
	Group IV	45.43+26.52

Parameters	Groups	Mean + SD
Creatinine	Group I	1.00+0.33
	Group II	1.01+0.36
	Group III	1.46+0.75
	Group IV	1.30+0.55



Review Of Literature

1. A Retrospective study was conducted for the past 10 years who were attending diabetic clinic at MES Medical college and hospital, Perinthalmanna, MALAPPURAM DISTRICT , KERALA. It was concluded that elevated levels of serum urea and creatinine were seen in patients with type 2 DM which are the direct markers of kidney damage. HbA1c can be considered as an indirect predictor for kidney diseases in addition to as a biomarker for glycemic control.
2. A cross sectional study was conducted at medical laboratory ,health polytechnic Jakarta III, INDONESIA. It was concluded that there is correlation between HbA1c levels of type 2 diabetes mellitus with the age of respondent but there is no correlation between HbA1c levels of type 2 diabetes mellitus with urea levels of type 2 diabetes mellitus and there is no correlation between HbA1c levels with creatinine levels of type 2 diabetes mellitus patients.
3. Present study was conducted in the department of Biochemistry ,Princess Esra Hospital , and Deccan college of medical sciences, total of 40 diabetic patients and 40 normal control subjects with normal renal function and normal random blood glucose. It was concluded that blood sugar, blood urea and serum creatinine levels were significantly higher in diabetic patients with poor glycemic control compared to a diabetic patients with good glycemic control . Strong relationship of blood urea and serum creatinine levels was found with blood sugar and HbA1c levels.

RESULTS

It has been observed that there have been 125 patients under good glycemic control i.e. 6-7% out of which, 95 patients have urea levels ranging from 20-40 mg/dl, 28 patients having levels ranging 40 - 80 mg/dl and 2 patients having urea levels of 80 - 120 mg/dl. We further evaluated with creatinine levels. It has been observed that 115 patients have creatinine levels ranging 0.7-1.3 mg/dl and 11 patients fall under range of 1.3 - 2.5 mg/dl and 1 patient having creatinine levels of more than 2.5 mg/dl. There are 31 patients having fair glycemic control i.e. 7.1-8.2 % out of which, 11 patients have urea levels ranging from 20-40 mg/dl, 15 patients having levels ranging 40 - 80 mg/dl and 1 patient having urea levels of 80 - 120 mg/dl.

Evaluation of creatinine for this group show that 18 patients have creatinine levels ranging 0.7-1.3 mg/dl and 12 patients fall under range of 1.3 - 2.5 mg/dl and 1 patient having creatinine levels of more than 2.5 mg/dl. There are 44 patients with poor glycemic control i.e. >8.2 % out of which, 24 patients fall under urea levels ranging from 20-40 mg/dl, 16 patients having levels ranging 40 - 80 mg/dl and 3 patients having urea levels of 80 - 120 mg/dl and one patient having urea levels of >120 mg/dl. If we observe creatinine , results show that 32% patients have creatinine levels ranging 0.7-1.3 mg/dl and 64% patients have creatinine levels of 1.3 - 2.5 mg/dl and 5% patients having creatinine levels of more than 2.5 mg/dl.

DISCUSSION

HbA1c assay indicates glycemic control in diabetic mellitus patients. Glucose in the blood sticks to hemoglobin, a protein in your red blood cells. As your blood glucose levels increase, more of the Hb will be coated with glucose. A1c test measures the percentage of red blood cells that have glucose coated with Hb. An A1c test can show average glucose levels for past three months because it sticks to hemoglobin for as long as the red blood cells are alive and red blood cells life span is for about 3 months. Urea and creatinine levels are early indicators of renal dysfunction. Diabetic nephropathy is a common complication of type 1 and 2 diabetes mellitus. In a patient suffering from diabetes mellitus certain factors which can increase complication of diabetic nephropathy such as hypertension, smoking, high blood cholesterol, obesity and

family history. Diabetic nephropathy can lead to various complications which includes fluid retention, leading to edema around arms and legs, hyperkalemia diabetic retinopathy, diabetic ketoacidosis and endstage renal disease. End stage renal disease is also one of the complications of diabetic nephropathy and in that case dialysis and renal dialysis are the treatment options available for esrd. Renal transplantation is considered the treatment of choice for esrd and offers benefits over dialysis. One of the main benefits of renal transplant is an increased life expectancy. Our study shows significant increase of blood urea and serum creatinine levels in diabetic patients which comes under poor glycemic control therefore they have to undergo further evaluation for renal insufficiency.

Our study shows increased levels of blood urea and serum creatinine which indicates hyperglycemia and causes irreversible damage to the nephrons of kidney. It has been observed that fair glycemic control patients have deranged RFT levels which indicates that in spite of fair control patients need to be monitored for quarterly assessment of renal function test. It has been observed that 95% of patients of good glycemic control has normal ranges of blood urea and serum creatinine levels.

The elevated level of HbA1c can be lowered by intensive treatment plan, but elevated level of urea and creatinine which are set on increase due to permanent damage to the kidneys would be difficult to reverse because damage to kidney is permanent phenomenon. The elevated levels of serum urea and creatinine are the measures of glomerular damage which can in no way be reversed by intensive treatment plan and only way to control this progressive damage would be early detection and intervention.

There was statistically significant increase in serum urea and creatinine levels in Type 2 diabetic subjects compared to non-diabetic subjects. There was a correlation of levels of serum urea and creatinine with HbA1c. Serum Urea and creatinine useful and simple biomarkers which can serve as a predictor tests for assessing kidney function (Diabetic nephropathy) in diabetic patients.

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