

Correlation with Microalbumin and Glycosylated Haemoglobin in Type 2 Diabetes Mellitus

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Conflict of interest: Nil

Background:

Introduction: One of the consequences of type 2 diabetes mellitus that can progress to end-stage renal disease is nephropathy. Microalbuminuria that persists is the strongest indicator of a high risk of diabetic nephropathy. The relationship between HbA1c and microalbuminuria and diabetes duration is unclear.

Material method: The current study is a prospective study conducted at this medical college and hospital's Department of Biochemistry and Department of Medicine. In the present study, the total number of subjects included was 150 having age group between 31-70. The subjects were grouped into following two types Control Group 1: 75 Healthy subject and Study Group 2: 75 Type 2 diabetes mellitus. Written consent form was obtained from every subject involved in this study. Institutional Ethical clearance was obtained for the study.

Result: HbA1c, microalbumin and serum creatinine levels were significantly increased in study group as compared to control group. Significant positive correlation of microalbumin with HbA1c in Diabetic patients ($P < 0.0001$) and significant positive correlation of serum creatinine with HbA1c ($P < 0.0001$)

Conclusion: The Present study concluded that estimation of microalbumin, serum creatinine and HbA1c is required for early detection and treatment of diabetic nephropathy. All diabetic patients should be regularly monitored their glycemic status and renal profile to prevent complications associated with diabetes mellitus.

Keyword: microalbumin, serum creatinine, glycosylated Hb, diabetes mellitus

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Introduction

Diabetes mellitus is a metabolic disorder characterized by persistent hyperglycemia and disturbance of carbohydrate, lipid, and protein metabolism caused by a full or associated absence of insulin synthesis and activity. [1]

Diabetes is classified into two categories. When the immune system mistakenly destroys the beta cells that create insulin in the pancreas, type 1 diabetes is predominantly controlled by the immune system. Insulin-

dependent diabetes mellitus was the prior name for type 2 diabetes. It is the most prevalent kind of diabetes mellitus, and it is characterized by hyperglycemia with insulin resistance and insulin insufficiency. [2] Type 2 diabetes is caused by a combination of variables, including obesity, a sedentary lifestyle, poor eating habits, and environmental factors.

According to the International Diabetes Federation, 415 million individuals worldwide were diagnosed with diabetes in 2015, with that figure anticipated to climb to 642 million by 2040. In 2015, India has 69.1 million individuals with diabetes, making it the world's second-largest country with the disease behind China. [3]

People with diabetes are more likely to acquire chronic diseases that affect several organs and are the cause of many of the diseases connected with diabetes. Vascular problems are one type of chronic complication: Retinopathy, neuropathy, and nephropathy are minor microvascular problems, but macrovascular consequences, such as coronary artery disease and cerebral vascular disease, are more serious. [4]

Diabetes, commonly known as diabetic kidney disease, is a leading cause of end-stage renal disease. Diabetes nephropathy is thought to affect 25-45 percent of diabetic people over the course of their lives. [5] The results of a patient's kidney function test can be used for two purposes. One is to keep track of kidney function, while the other is to look for signs of growing renal failure. Diabetic nephropathy is defined by macro albuminuria of more than 300 mg (protein mostly albumin) in a 24-hour urine collection or macro albuminuria with impaired kidney function as evidenced by serum creatinine and serum urea abnormalities. Proteinuria, decreased glomerular activity (GFR), elevated blood pressure, and a greater risk of cardiovascular disease and death are all symptoms of diabetic nephropathy.

Biomarkers, in particular, in diabetic nephropathy. Hyperglycemia is known to increase in persons with uncontrolled diabetes, and serum urea and creatinine levels are often linked to the severity of kidney impairment. Serum urea and creatinine measurements are commonly available assays for this purpose, and they can aid in the early detection and prevention of diabetic kidney disease, as well as slow the progression of the disease (ESRD). [6, 7]

Glycated hemoglobin (HbA1c) is a key sign of long-term sugar control, and the American Diabetes Association recently endorsed it for use in the diagnosis of diabetes mellitus (DM) (ADA). [8] Diabetes individuals have elevated HbA1c values. There are micro- and macroalbuminuria, and there is significant evidence that poor blood glucose control promotes to albuminuria production. [9]

In patients with type 2 diabetes and high blood pressure, albuminuria is a well-known predictor of renal disease adverse effects. Proteinuria is linked to heart disease in diabetic patients, and it manifests not just renal failure, which is a primary pathogenic element in the illness's progression, but also general vascular damage. [10] Microalbumin levels are typically 30-300mg per day or 20-200g per minute in a 24-hour period. Microalbuminuria is defined as urine collection, and patients with microalbuminuria are believed to have primary nephropathy. [11]

Material method:

The current study is a prospective study, conducted in the Department of Biochemistry and the Department of Medicine at the medical college and hospital.

Study population:

In the present study, the total number of subjects included was 150 having age group between 31-70. The subjects were grouped into following two types:

1. Control Group 1: 75 Healthy subject

2. Study Group 2: 75 Type 2 diabetes mellitus.

Written consent form was obtained from every subject involved in this study. Institutional Ethical clearance was obtained for the study.

Inclusion criteria for Type 2 Diabetes Mellitus

- Diagnosed diabetes mellitus patient as per WHO criteria

Exclusion criteria for Type 2 Diabetes Mellitus

- Patients suffering from chronic disorders like Tuberculosis, HIV, liver Cirrhosis, Acute & chronic kidney failure.

Sample Collection:

Blood was collected in each case by drinking meat in the usual way of collecting blood in an EDTA bottle for HbA1C measurement.

Urine sample was collected in sterile container with preservative (Boric Acid) for microalbumin estimation.

Biochemical Analysis:

- Glycosylated haemoglobin was estimated by HPLC method.
- Urinary Microalbumin was estimated by immune Turbidometry method.

Statistical Analysis:

The data is expressed as a mean (standard deviation). The statistical analysis was performed using SPSS version 17.0 for Windows (SPSS Inc, Chicago). The standard deviation and mean were calculated. It was judged statistically significant because the probability value was less than 0.05 ($p < 0.05$). Pearson correlation was used to examine the relationship between two groups.

Result:

Table 1: comparison of mean levels of HbA1c, microalbumin and serum ceatinine in control and study group

Parameter	Control group (Healthy subject) Mean±SD	Study group (Diabetes Mellitus) Mean±SD	P value
HbA1c %	2.25±0.80	8.38±0.60	P < 0.0001
Microalbumin (mg/l)	16.20±12.10	104.79±80.90	P < 0.0001
Serum ceatinine mg/dl	0.90±0.40	1.28±0.62	P < 0.0001

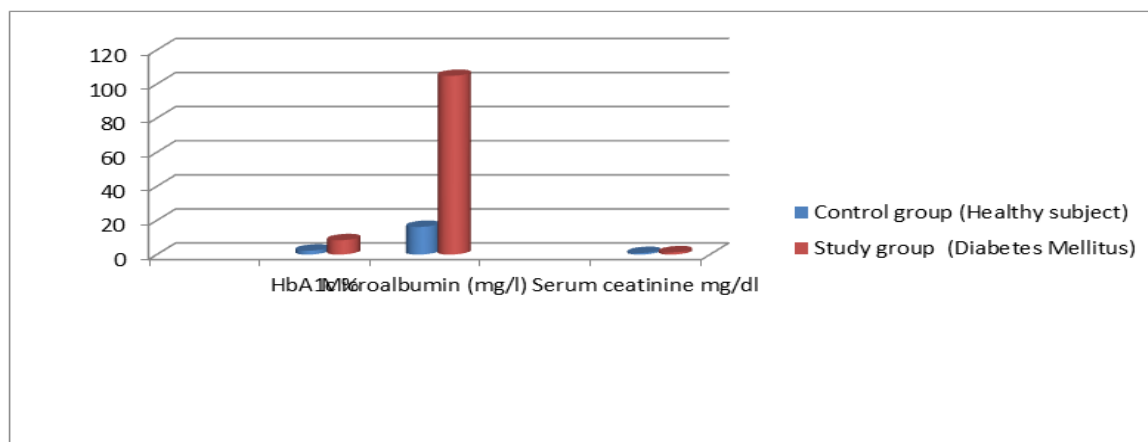


Figure 1: comparison of mean levels of HbA1c, microalbumin and serum ceatinine in control and study group

Table no 1 and figure no 01 showed that the mean levels of HbA1c, microalbumin and serum creatinine levels were significantly increased in study group as compared to control group. Significant positive correlation of microalbumin with HbA1c in Diabetic patients ($P < 0.0001$) and significant positive correlation of serum creatinine with HbA1c ($P < 0.0001$)

Discussion:

Diabetes mellitus is a metabolic disorder characterized by insufficient insulin synthesis, insulin malfunction, or both, and is linked to a variety of illnesses. [12] Diabetes affects more than 170 million people globally, according to the World Health Organization (WHO), and this number is expected to climb to 370 million by 2030. [13,14] Diabetes is well-known as a global epidemic, which represents one of the leading causes of illness and death worldwide. [15]

With hyperglycemia, the risk of chronic problems rises over time. [16] People with diabetes are more likely to acquire chronic diseases that affect several organs and are the cause of many of the diseases connected with diabetes. Complications of vascular microvascular (retinopathy, neuropathy, nephropathy) and macrovascular microvascular (retinopathy, neuropathy, nephropathy) microvascular (retinopathy, neuropathy, nephropathy) (coronary artery disease and cerebral vascular disease) [17] Diabetes control is not reliably measured by traditional blood glucose measurements alone; due to the wide variety. HbA1c provides moderate glycemia 6-8 weeks ago. Typical HbA1c values are 5-7% of adult Hb. [18]

Nephropathy is the most common cause of chronic kidney failure worldwide, and it affects around one-third of patients on dialysis in India. Therefore, if diabetic nephropathy can be diagnosed early with a simple examination, it may be helpful for

timely interventions with special attention to glycemic control. Simple biomarker testing such as serum creatinine and urea and HbA1c dosage may be particularly beneficial for diabetic patients with poor social and economic status. [19] clinically, it could be S. Cr or Urea or both are rated as the first line investigation, depending on the location selection. [20]

In present study we found mean levels of HbA1c levels were significantly increased in study groups as compared to control group. (Table no 01 and graph no 01)

Our finding concurrent with Verma et al. [21] HbA1c, a diabetes biomarker, was shown to be considerably higher in uncontrolled diabetes mellitus compared to control diabetes mellitus and healthy control patients (8.0 1.1 percent vs 7.1 0.9 percent and 5.7 0.4 percent, respectively).

In this investigation, we discovered that mean levels of microalbumin in the study group were considerably higher than in the control group ($P < 0.001$). In diabetic patients, we discovered a significant positive correlation between microalbumin and HbA1c. [24]

Kumar A et al. [22] reported the microalbumin values higher in diabetes (76.26 ± 96.31) as compared to the control group (22.26 ± 4.40) and this difference is statistically significant.

Muralishwaran P et al [23] reported positive correlation ($r=0.5$, $P < 0.05$) between HbA1c and microalbumin in diabetes patients.

Conclusion: The Present study concluded that estimation of microalbumin, serum creatinine and HbA1c is required for early detection and treatment of diabetic nephropathy. All diabetic patients should be regularly monitored their glycemic status and renal profile to prevent complications associated with diabetes mellitus.

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