Research Paper

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Urinary Microalbumin-Creatinine Ratio for Early Detection of Renal Damage in Patients with Type II Diabetes

Medical Science

KEYWORDS : Microalbumin, Type 2 Diabetes Mellitus.

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ABSTRACT

Objectives: The aim of the study was to assess urinary Micro albumin – Creatinine ratio for early detection of renal damage in patients with type II diabetes

Study Design : observational & prospective

Place and Duration of Study : The study was carried out in Department of Biochemistry and department of Medicine, MGM Medical college, Navi Mumbai .

Methodology : Total 90 subjects comprising of male and female aged between 33 to 77 years. They are divided into 3 groups .

To estimate levels of urine albumin , urine creatinine and UACR ratio in subjects with Type II Diabetes mellitus with HbA1c levels <7% (group I), in Type II Diabetes mellitus subjects with HbA1c levels between 7% to 9% (group II) and in Type II Diabetes Mellitus Subjects with HbA1c levels <9% (group III) along with their follow up after three months. To evaluate the levels of fasting and postprandial plasma glucose and glycosylated Hb, in all the three groups and their follow up.

Results : A significant (0.05) correlation exits between blood glucose levels and microalbumin creatinine ratio as the results show that with increase in FBS and HbA1c, Microalbumin creatinine ratio were increased in the follow up groups compared to baseline groups.

INTRODUCTION

Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease.[1,2] In 2000, India (31.7 million) topped the world with the highest number of people with diabetes mellitus followed by China (20.8 million) with the United States (17.7 million) in second and third place respectively. According to Wild et al. the prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030 with a maximum increase in India. It is predicted that by 2030 diabetes mellitus may afflict up to 79.4 million individuals in India, while China (42.3 million) and the United States (30.3 million) will also see significant increases in those affected by the disease. [3,4]

Diabetes is the fourth commonest non-communicable disease.[5] It is a group of metabolic diseases characterized by hyperglycaemia due to defects in insulin secretion, insulin action or both.[6] Type 2 diabetes accounts for at least 90% of all the cases of diabetes seen worldwide.[7]

Type 2 diabetes mellitus is associated with a high rate of complications related to cardiovascular disease and diabetic nephropathy, retinopathy, and neuropathy. Chronic kidney disease (CKD) is a devastating complication of diabetes. It has been recognized for a long time that a significant proportion (20%–40%) of all diabetes patients will develop kidney involvement characterized by a progressive urinary loss of albumin and deteriorating creatinine clearance.[8]

In the diabetic kidney, there are increases in the perfusion and the GFR and probably also in intraglomerular capillary pressure. Microalbuminuria is a marker of an increased risk of diabetic nephropathy. Albumin, a protein having molecular weight of 50,000 is not easily filtered and is not excreted into urine. This makes albumin excretion into the urine a useful indicator of early glomerular disease[4]Increase in urine albumin seen with diabetic nephropathy can be attributed to degradation of the glomerular basement membranes & hypertension both characteristics of Diabetic Nephropathy.[5]

In estimating diabetic nephropathy risk, Albumin-Creatinine Ratio is most important and should be done frequently by considering age, sex, glycemia, diet, albumin-creatinine ratio and treatment. Early screening for incipient diabetic nephropathy is important in optimising the renal outcome of patients with type 2 diabetes mellitus

Hence, Diabetic nephropathy is the chief cause of morbidity and premature mortality in patient with diabetes mellitus. This complication is first manifested as an increase in urinary albumin excretion (microalbuminaria) which progresses to overt albuminuria and then to renal failure.

MATERIALS AND METHODS

Sources of the data

The study group was comprised of 90 newly detected type 2 diabtes patients in the age group of 33-77 years visiting medicine out Patient department of MGM Hospital, Navi mumbai .The present study was the prospective study, carried out in the Department of Biochemistry, MGM Medical College, Kamothe , Navi Mumbai.

- Group 1: 30 patients with controlled diabetes and HbA1c levels <7%.
- Group 2: 30 patients with diabetes and HbA1c levels between 7% and 9%.
- Group 3: 30 patients with diabetes and HbA1c levels >9%.

Sample collection

- Fasting and postprandial blood sample will be collected in fluoride bulb for Glucose estimation.
- Blood samples will be collected in EDTA bulb for Glycosylated Hb estimation.
- 24 hr urine sample was collected from each patient in a

sterile container for estimation of urine albumin and urine creatinine.

Inclusion criteria

- 90 patients diagnosed with Type II Diabetes Mellitus as per ICMR criteria attending diabetic OPD were enrolled with HbA1c <7% between 7-9% & >9%.
- Diabetes Mellitus patients willing to participate in the study.

Exclusion criteria

- Refusal of consent.
- Chronic smokers.
- Pregnant women.
- Chronic alcoholics.
- Patients with chronic diseases of other organs will be excluded.

Statistical analysis

- Statistical analysis of the data will be carried out with SPSS, version 16;
- Data will be reported as mean ± SD.
- The comparisons between two groups will be tested by student t-test.
- Correlation between two outcomes will be studied by Pearson's correlation.

RESULTS

The Clinical parameters of Group I, Group II & Group III are shown in the **Table. No. 1**

Table 1: Shows parameters of all the three groups at baseline

S.No.	Parameter	GROUP I	GROUP II	GROUP III	P-Value
1.	FBS	113.35	168.32	196.07	< 0.001*
2.	PPBS	135.95	228.12	231.14	< 0.001*
3.	HbA1c	6.30	8.14	10.82	< 0.001*
4.	U.Microalbumin	2.6	4.3	6.1	0.226*
5.	U. Creatinine	50.42	41.98	37.51	< 0.001*
6.	Ratio	65.84	139.50	321.79	< 0.001*

Table No. 2 : Shows parameters of all the three groups at Follow up

S. No.	Parameter	GROUP I	GROUP II	GROUP III	P- Value
1.	FBS	120.92	181.51	213.80	< 0.001*
2.	PPBS	147.56	226.19	237.85	< 0.001*
3.	HbA1c	6.43	8.81	10.87	< 0.001*
4.	U.Microalbumin	2.80	4.56	6.21	0.226*
5.	U. Creatinine	48.80	35.73	34.08	< 0.001*
6.	Ratio	77.62	188.10	354.85	< 0.001*

Table 3. Shows Correlation between some parameters in all baseline study groups.

Baseline	HbA1C
Microalbumin	r= 0.9
Urine Creat.	r= -0.18
MA Ratio	r= 0.63

Table 4. Shows Correlation between some parameters in all Follow up study groups.

Baseline	HbA1C
Microalbumin	r= 0.9
Urine Creat.	r= -0.16
MA Ratio	r= 0.61

Figure No. 1 : Correlation between HbA_1C and U. Microalbumin in Baseline study groups.

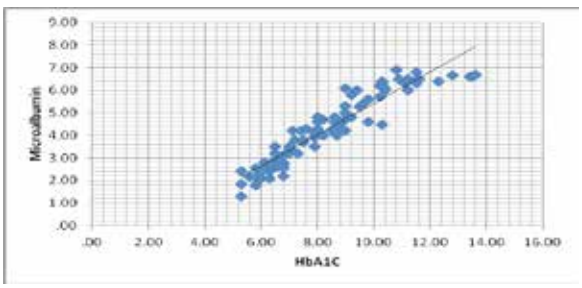
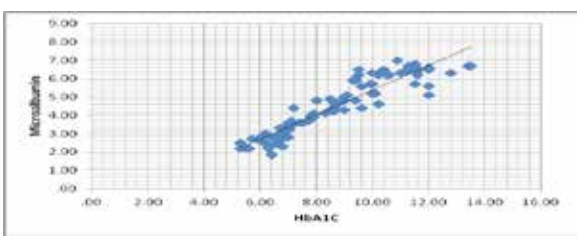


Figure No. 4 : Correlation between HbA1c and Microalbumin in all follow up groups.



DISCUSSION

Patients with diabetes mellitus have higher susceptibility to develop a variety of chronic complications of these the most common is Nephropathy, which is the major risk factor for End Stage Renal Disease (ESRD). Diabetic nephropathy is one of the most common microvascular complications of diabetes. [9] The present study was mainly conducted to further understand the role of those risk factors in the diabetic nephropathy, which may provide new strategies for monitoring diabetic patients even before the onset of this disease. In the present study, Total 90 patients between the age group of with 33 year to 77 year old were selected and were placed in three study groups as per protocol. The mean and SD of Age for 30 patients in Group I was 59.423±9.799. The mean and SD of Age for 30 patients in Group II was 57.618±11.127. The mean SD for 30 patients in Group III was 62.853±7.552 as shown in Table 1 & Fig 1. In Group I, out of 30 patients 20 were males & 10 females. In Group II, out of 30 patients 18 were males & 12 females. In Group III, 30 patients 24 were males & 6 females as shown in the Table 2. In the present study we estimated glucose levels in both Fasting state and Post Prandial state and found that FBS and PPBS levels were significantly increased in all the three study groups at the time of follow up when compared to baseline. In Group I we found 66% of patients showed increase in the baseline. In Group II, we found 93.3% patients showed increase in FBS at the time of follow up when compared to baseline & 73.3% of the patients showed increase in PPBS at the time of follow up when compared to baseline. In Group III, there were 90% patients with increase in FBS at the time of follow up when compared to baseline & 83% patients showed increase in both PPBS at the time of follow up when compared to baseline. The mean and SD for Baseline Group I FBS was 113.35 ±17.96. The mean and SD for Baseline Group II FBS was 168.32± 38.09. The mean and SD for Baseline 43 Group III FBS was 196.07±72.46. All the three study groups

showed statistically higher significance for Baseline (p120mg/dl & 80% of diabetic patients having PPBS > 250 mg/dl.Kundu et. al in 2013 revealed similar results in which FBG & PPBS values were higher and are statistically significant (p120mg/dl & 64% Type 2 Diabetes Patients with PPBS levels >210mg/dl.[10] In Group II,15 patients during baseline 48 compared to 10 patients at the time of follow up were positive for microalbuminuria.

In Group III, 25 patients during baseline and 28 patients from follow up study group were positive for microalbuminuria. Microalbuminuria is present in very early stages of Diabetes Mellitus at a time when glomerular filteration rate may be normal and when there is no evidence of abnormal glomerular filteration, Hence, in early Diabetes Mellitus Microabluminuria may be a marker of the subsequent development of proteinuria and diabetic Nephropathy. [11] Studies reveal that long standing elevation of blood glucose causes complication of diabetes-Premature atherosclerosis (including cardiovascular diseases and stroke), retinopathy, nephropathy and neuropathy. [12] In addition, whereas one positive microalbuminuria test was decided as the criterion for microalbuminuria in the previous study. [13] two positive microalbuminuria tests over three months were used as criteria for microalbuminuria in the present study. Correlation of HbA1c with Urine Microalbumin, Urine Creatinine and Urine Microalbumin-creatinine Ratio was carried out in the present study. Correlation of HbA1c with Microalbumin levels, with Urine Creatinine levels and with Urine Microalbumin Creatinine Ratio of Baseline study groups was carried out as shown in the Table 3 and Graphs .In the present study there was a positive correlation between HbA1c and Urine Microalbumin levels in the three study groups at the time of Baseline (r= 0.9). This indicates that there was a significantly positive correlation between HbA1c levels and Urine Microalbumin levels as shown in the Graph 1 and Table 3. A Negative correlation was observed between HbA1c and Urinary Creatinine (r= -0.18) in the three study groups at the time of baseline. There was a significantly positive correlation 49 obtained between HbA1c & Urine Microalbumin Creatinine Ratio (r= 0.63. Similarly our study states that patients with uncontrolled glycemic levels have HbA1c levels > 9% as well as increased microalbumin-creatine ratio (p=<0.05) which increases the susceptibility for Diabetic Nephropathy.

Thus present study states that along with monitoring of glucose and HbA1c levels, monitoring of UACR plays an important role as a predictor for developing nephropathy among Diabetic patients which may further lead to End Stage Renal Damage (ESRD).

CONCLUSION

A significant association exists between high HbA1c, Urine Mircroalbumin , Urine Creatinine & Urinary Microalbumin-creatinine ratio. Hence, it is recommended that all patients with Diabetes should be screened early for the presence of microalbuminuria along with uncontrolled glycemic status and therapeutic interventions should be performed to prevent further complications. We conclude that urine microalbumin creatinine ratio is a better indicator for detection of Renal Damage in Type 2 Diabetes Mellitus patients and it may be implemented as an early marker for the same.

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