

EFFECT OF GLYCEMIC CONTROL ON THE INCIDENCE OF MICROALBUMINURIA IN TYPE II DIABETES MELLITUS INDIVIDUALS

Background: Microalbuminuria documents earliest evidence of diabetic nephropathy and is a major predictor of end stage renal disease. Uncontrolled hyperglycemia has been recognized to be associated with higher incidence of microvascular complications in Type II diabetes mellitus. Studies have shown that severity of nephropathy is correlated with microalbuminuria which depends on sustained mean hyperglycemic level over a prolonged period.

Aims & Objective: To find the role of glycemic control in the presence of microalbuminuria in Type II diabetics.

Materials and Methods: The study comprised of 60 Type II diabetes patients aged between 40-60 years attending Sri Devaraj Urs Medical College, Kolar. Divided into two groups each comprising of 30 individuals: Group I HbA_{1c} < 7% - Controlled Diabetic group and Group II HbA_{1c} > 7% - Uncontrolled Diabetic Group. Compared with Control Group comprising of 30 age-matched healthy participants HbA_{1c} < 6%. Glycosylated Hemoglobin and Microalbuminuria were estimated in all the participants. The results were statistically analyzed by One-way ANOVA and chi-square test.

Results: Uncontrolled diabetics showed higher incidence of microalbuminuria (53.33%) with mean HbA_{1c} 8.47 ± 0.84 compared to Controlled diabetics (23.33%) with mean HbA_{1c} 6.81 ± 0.19. Microalbuminuria also showed a direct relationship with glycemic status of an individual.

Conclusion: Uncontrolled hyperglycemia is associated with higher incidence of microvascular complications like nephropathy in diabetes. HbA_{1c} is an indicator of long-term blood glucose concentrations. Microalbuminuria serves as a warning to achieve good glycemic control and prevent further worsening of diabetes related complications.

Key Words: Type II Diabetes; Glycemic Control; Microalbuminuria

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INTRODUCTION

A state of diminished insulin action is a major cause of morbidity and mortality in persons with Type II DM. Chronic hyperglycemia initiates microvascular complications including nephropathy, retinopathy and neuropathy. These complications are predominantly seen in patients within the age group of 40 to 60 years. Poor glycemic control plays an important role in the development and progression of nephropathy with associated increase in morbidity and mortality.^[1] Studies in this field have suggested a strong association between level of hyperglycemia and the progression of microvascular complications in diabetic patients.^[2] Glycosylated hemoglobin levels were used as a measure of long term glycemic control and have proven to be a more accurate and stable measure than fasting blood glucose level.^[3]

Microalbuminuria, defined as an elevation of urinary albumin excretion in the range of 30-300 mg/24 hr or 20-200 µg/min, is associated with adverse health outcomes in adults.^[4] One of the earliest signs of diabetic nephropathy is microalbuminuria which is strongly associated with endothelial dysfunction, which increases

the risk of nephropathy and other complications in diabetes and microalbuminuria is the best documented predictor of diabetic nephropathy^[5], which is a major cause of end stage renal disease (ESRD)^[6]. Studies of patients with diabetes have shown that those with microalbuminuria are at increased risk for renal progression^[7,8] and excess morbidity and mortality^[9,10]. Microalbuminuria is useful marker of generalized endothelial cell dysfunction and mortality in Type I DM patients and is related to its renal sequelae.^[11,12] Microalbuminuria has also emerged as an important risk factor for left ventricular hypertrophy, myocardial infarction, stroke, peripheral vascular diseases and retinopathy, independent of blood pressure. Strong evidence exists that improved glycemic control is effective at lessening the risks of nephropathy, retinopathy and neuropathy in diabetes.^[13]

MATERIALS AND METHODS

The study is conducted in a group of 90 individuals consisting of 30 normal healthy participants as control and 60 diagnosed cases of Type II Diabetes Mellitus, irrespective of duration of Diabetes and sex taken

randomly from the Outpatient and admitted patients of Medicine department of Sri Devaraj Urs Medical College (SDUMC), Kolar. The Diabetes mellitus patients were further divided into two sub-groups each consisting of 30 patients: Type II Diabetes mellitus patients with good glycemic control (HbA_{1c} < 7%) in Group I and Type II Diabetes mellitus patients with poor glycemic control (HbA_{1c} > 7%) in Group II. The Research and Ethical committee of SDUMC has approved this study and Informed consent was obtained from all patients and control participants participating in this study.

The participants with confirmed Type II diabetes, irrespective of duration since onset, within the age group of 40-60 years were included for the study and among the participants HbA_{1c} < 7% were included in the Group I (Controlled diabetic group) and HbA_{1c} > 7% were included in Group II (Uncontrolled diabetic group).

Participants suffering from hypertension, renal disease and persons on medications altering renal function like ACE-Inhibitors (Angiotensin converting enzyme inhibitors), ARB (Angiotensin receptor blockers), diuretics and NSAID were excluded from this study.

Taking all aseptic and antiseptic precautions, 3 ml of blood is drawn from the Ante cubital vein and 24 hrs urine sample is collected in a sterilized container for estimation of HbA_{1c} and microalbuminuria respectively. Glycosylated Hemoglobin level was estimated by cation-exchange resin method (Recombigen laboratories pvt. Ltd kits) using a Spectrophotometer and Microalbuminuria was detected by Micral test (Roche Diagnostics Ltd), a dipstick method in urine.

STATISTICA 5.0 version statistical package were used for the analysis of the data and Microsoft word and Excel have been used to generate tables. The results obtained were presented in Mean \pm SD and then analysed statistically by one-way ANOVA followed by chi-square test.

RESULTS

The test group comprises of 60 Type II diabetes mellitus patients within the age group of 40-60 years, mean age of controlled diabetic group (n=30) is 51.83 \pm 5.86 years, uncontrolled diabetic group (n=30) is 56.17 \pm 4.18 years and mean age group of control group (n=30) is 53.03 \pm 6.26 years. Mean HbA_{1c} levels between the three groups were shown in Table 1 which shows an elevated level of HbA_{1c} in uncontrolled diabetic group compared to

controlled diabetic group and Control group and which is statistically significant. Our results from table 2 shows 7 microalbuminuria positive participants (23.33%) in the controlled diabetic group (n=30) & 16 microalbuminuria positive participants (53.33%) in the Uncontrolled diabetic group (n=30) but no Microalbuminuria were noticed in any participants of the control group. There is no significance difference found between uncontrolled diabetics and controlled diabetic group. We also found HbA_{1c} levels and percentage distribution among participants with microalbuminuria in table 3.

Table-1: Comparison of mean HbA_{1c} levels between control group, controlled diabetic and uncontrolled diabetic group and significance using one-way ANOVA

Groups	HbA _{1c} Value in % (Mean \pm SD)	p Value
Control	5.75 \pm 0.24	
Controlled Diabetics	6.45 \pm 0.37	<0.001
Uncontrolled Diabetics	8.01 \pm 0.83	

Table-2: Microalbuminuria in control group, controlled diabetic and uncontrolled diabetic group

Groups	Microalbuminuria N (%)	χ^2	p Value
Control (n=30)	0	-	-
Controlled Diabetics (n=30)	7 (23.33)	3.52	>0.05 (NS)
Uncontrolled Diabetics (n=30)	16 (53.33)		

Table-3: HbA_{1c} levels and percentage distribution among participants with microalbuminuria

Microalbuminuria	HbA _{1c} Value in % (Mean \pm SD)	%
Group I (n=7)	6.81 \pm 0.19	23.33
Group II (n=16)	8.47 \pm 0.84	53.33
Total (n=23)	7.96 \pm 1.05	38.33

DISCUSSION

Type II diabetes mellitus is being increasingly recognized as a disease, which is characterized by dysfunction of the endothelium and it occurs in a generalized and widespread manner in diabetic patients.^[5] The severity of the dysfunction is directly proportional to the degree and duration of uncontrolled hyperglycemia. Microalbuminuria marks the onset of endothelial dysfunction related to the kidney. Microalbuminuria serves as a warning for imminent nephropathy.^[6] Diabetic participants with microalbuminuria not only have ongoing progressive nephropathy but are likely to have other endothelial dysfunctions leading to retinopathy, hypertension, CAD and other related complications.^[10]

In our study microalbuminuria was present in a total of 23 participants both from controlled diabetics & uncontrolled diabetic groups; this represented a 38.33% of occurrence of microalbuminuria in the diabetic population. Patel KL et al, Taneja V et al, Jadhav UM et al and Sobngwi E et al in their studies have reported the prevalence of Micro-albuminuria ranging from 25% to

35%.^[14-17] The slightly higher percentage of microalbuminuria in our study can be attributed to poor glycemic control (mean HbA_{1c} 7.96 ± 1.05) and smaller sample population.

In our study 23.33% (n=7) of controlled diabetic group (Group I) with mean HbA_{1c} 6.81 ± 0.19 and 53.33% (n=16) of uncontrolled diabetic group (Group II) with mean HbA_{1c} 8.47 ± 0.84 manifested microalbuminuria. It is evident from the above values that increase incidence of microalbuminuria in the uncontrolled Diabetic Group can be attributed to the poor glycemic status. It is also seen from the above values that even small increments of HbA_{1c} resulted in almost doubling of the incidence of microalbuminuria.

CONCLUSION

Uncontrolled diabetics showed a higher occurrence of microalbuminuria as compared to the control diabetic group. There was a significant association of microalbuminuria in uncontrolled diabetics and microalbuminuria shows to have a direct relationship with glycemic control. HbA_{1c} which is an index of long-term blood glucose concentrations, its value above 7% in this study is associated with higher occurrence of microalbuminuria. Thus Microalbuminuria serves as a warning to achieve good glycemic control and prevent further worsening of diabetes related complications.

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