Original Article

Microalbuminuria in Type II Diabetes Mellitus With Good Glycemic Control

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ABSTRACT

Objective: To determine the frequency of microalbuminuria in Type 11 Diabetes Mellitus with good glycemic control in a tertiary care hospital of Karachi

Study Design: Descriptive / cross sectional study.

Place and Duration of Study: This study was conducted at the Department of Internal Medicine, Liaquat National Hospital Karachi from Feb 2018 to July 2018.

Materials and Methods: A total of 140patients of type 11 diabetes mellitus with good glycemic controlwere selected. Urine for micro albumin level was sent to the institutional laboratoryto assess microalbuminuria. All the collected information was entered in the prescribed Performa.

Results: A total of 140 type 2 DM patients with good glycemic control were included in our study. Out of 140 patients 63 (45%) were female and 77 (55%) were male with mean age of 44.47±4.99 years. Mean duration of DM was 4.21±0.94 years. Mean HbA1c level was 6.897±0.1779. Twelve patients (8.6%) were found to have microalbuminuria

Conclusion: Type 11 diabetic patients are at increased risk of developing microalbuminuria even when they have a good or moderately good glycemiccontrol. This complication invariably leads to the development of overt nephropathy over a period of time. In order to prevent this complication, intense Screening protocols should be employed to check for microalbuminuria and HbA1c in both the newly and already diagnosed type 11diabetic, so that the progression of micro and macro vascularcomplications can be halted by timely intervention.

Key Words: Microalbuminuria (MA) Type 11Diabetes Mellitus, GoodGlycemic control (6.7-7)

Citation of articles: Zehra SN, Ali H, Karim S, Zaidi FF. Microalbuminuria in Type II Diabetes Mellitus With Good Glycemic Control. Med Forum 2019;30(7):54-58.

INTRODUCTION

Diabetes mellitus was reported to be the sixth leading cause of death listed on US death certificates in 2010.[1] Ramachandran and Colleagues in 2012 documented that Prevalence of diabetes mellitus in Pakistan is 7.7% in rural and 10.6% in urban population with more than 7.2 million people suffering from this illness.[2,3]The prevalence of diabetes and prediabetes increased with age and were more frequent among men.

Diabetes mellitus is a group of metabolic diseases characterized byhyperglycemia resulting from defects ininsulin secretion, insulin action or both.[4]

Microalbuminuria is defined as a urinary albumin excretion ranging from 30 to 299 mg/24 h, and is a marker for renal damage and a risk factor for the progression of chronic kidney disease, cardiovascular disease, cerebrovascular disease and mortality.[5]

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Received: January, 2019
Accepted: April, 2019
Printed: July, 2019

Hyperglycemia and duration of diabetes are known risk factors for diabetic nephropathy, and the presence of microalbuminuria is a strong indicator of impending nephropathy.[6] Diabetic nephropathy is the leading cause of end stage renal disease in United States[7] and a leading cause of diabetes mellitus related morbidity and mortality. The laboratory test for early detection of diabetic nephropathy is the measurement of micro albumin in urine. Microalbuminuria may not be associated with abnormal serum creatinine, but can be an important warning signal which if ignored can result in irreversible renal damage.[8]moreover it is a worldwide public health problem and puts a substantial burden on health care resources. In Pakistan the burden ofdiabetes Mellitus is increasing with passing years,diabetic patients usually present to us with overt nephropathy when it's already late to halt the impending complications. Here because of low per capita income of average population patients mostly fall in the lower income bracket and the resources are constraint, thus prevention of diabetic complications are the need of the hour. Checking for microalbumiuria in our local patients suffering from diabetes mellitus type II seemed to be a very logical rationale for our study, which was expected to give us an idea about the magnitude of problem in our patients and would help us make stringier protocolsfor routinely checking for micro albuminuria in every diabetic patient on first visit

so that diabetic nephropathy is caught earlier and renal complications are prevented.

MATERIALS AND METHODS

After approval from hospital ethical committee, 140patients fulfilling selection criteria were included in the study from Medical OPD of department of Internal Medicine Liaquat National hospital and Medical College Karachi Pakistan. Informed consent, demographic data and history regarding name, age, durationof DM was taken. Venous blood was collected in a test tube with ethylene diamine tetra acetic acid (EDTA) anticoagulant for HbA1c. Twenty four hours urine was collected for estimation of MA. HbA1c is estimated by boronate affinity chromatography (HPLC) which separately totals glycated hemoglobin by binding to solid-phase dehydroxylationusing Nycocard immunoassay kit (USA).In order to measure urinary albumin concentration accurately, patients were trained regarding the collection of urine samples by researcher himself. When no evidence of infection and / or heamaturia is found in the urinalysis, urine samples were examined for microalbuminuria. Urinary albumin was measured with an autoanalyzer (analyzer medical system, Italy) using Randox kits (urinary albumin measured with immunoturbidimetry method, UK). A second 24-hours urine sample was obtained and examined for microalbuminuria, if the first measurement exceeded 30mg of albumin. The diagnosis of microalbuminuria was confirmed when > 30mg/dl albumin was found in the second sample. 24-hours urinary albumin concentration of < 30mg were considered as normal (Normoalbuminuria), 30 - 300mg as microalbuminuria and > 300mg as macroalbuminuria (Overt proteinuria). Exclusion criteria were followed to control bias in the study results. Patient comfort was taken care of during clinical examination. All the information from the patients was recorded on proforma which is attached at the end.

Data was analyzed by using SPSS version 22. Mean and standard deviation was computed for quantitative variables like age, duration of type II DM, HbA1c level. Frequency and percentages was calculated for qualitative variables like gender, microalbuminuria. Effect modifier like age, gender and duration of diabetes was controlled through stratifications. Post stratification Chi-square test was applied to see the effect of these on outcomes (i.emicroalbuminuria) by taking P- Value ≤ 0.05 was considered significant.

RESULTS

A total 140 patients having Type 2 Diabetes Mellitus with good glycemic control were included in our study.

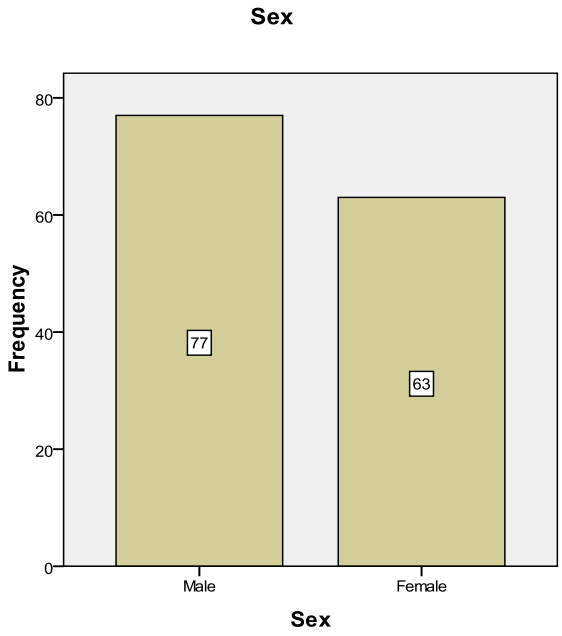
The mean age of 44.47±4.99 years. The descriptive statistics of age is presented in Table-1. 63 (45%) were female and 77 (55%) were male, as mentioned in graph-1.

Mean duration of Diabetes Mellitus (DM) was found to be 4.21±0.94 years. The descriptive statistics of duration of DM is presented in Table-I. The frequency and percentages are presented in Graph-II.

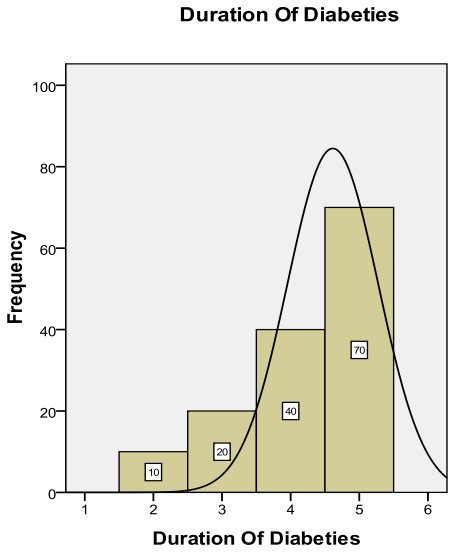
Mean HbA1c level was found to be 6.897±0.1779. The descriptive statistics of HbA1c is presented in Table-I.

Twelve patients (8.6%) type 2 DM patients with good glycemic control were found to have microalbuminuria. The frequency distribution of microalbuminuria is presented in Table-II.

Microalbuminuria was predominant in female gender and was more common in age group of 45 to 50 years, as shown in Table-III & table-IV.



Graph No.1: Frequency distribution of Gender



Graph No.2: Frequency distribution of Duration of Diabetes mellitus

Table No.1: Frequency distribution of Age, Duration of Diabetes mellitus& HbA1c level. (n=140)

Variables	Statistics		
	Minimum	Maximum	Mean & standard deviation
Age (Years)	30	50	44.47±4.99
Duration of Diabetes mellitus (years)	2	5	4.21±0.94
Serum HbA1c level (%)	6.7	7.5	6.897±0.1779

Table No.2: Frequency distribution of Micro-albuminuria(n=140)

Microalbuminuria	Frequency n=(140)	Percentage (%)
No	128	91.4%
Yes	12	8.6%
Total	140	100%

Table No.3: Microalbuminuriaaccording to Age. (n=140)

	Microalbuminuria			
Age	No (n=128)	Yes (n=12)	Total	P-value
30-40 years	24	2	26	0.005
44-50 Years	104	10	114	
Total	128	12	140	

Table No.4: Microalbuminuriaaccording to gender (n=140)

	Microalbuminuria			
Gender	No (n=128)	Yes (n=12)	Total	P-value
Male	73	4	77	0.120
Female	55	8	63	
Total	128	12	140	

DISCUSSION

Diabetes mellitus is a global health problem. Majority of patients diagnosed are in the young and middle age group[9]. It is a major health problem in Pakistanwhere, its prevalence range from 3-14%, this prevalence rate varies in the urban and rural areas[10].Microalbuminuria is an early marker of diabetic nephropathy;it may be present at the point of initial diagnosis of type 2 diabetes. It progresses to overt nephropathy and eventually leads to decline in glomerular filtration rate and end stage renal disease or premature cardiovascular mortality.[11]The exact cause of diabeticnephropathy is unknownbut various postulated mechanisms are hyperglycemia,and advanced glycation products and activation of cytokines.[28]Diabetic nephropathy rarely develops before 10 years after the onset of disease, but striking epidemiological variations exist even in the European countries about the incidence of diabetic nephropathy. A study from Neitherland shows that diabetic nephropathy is under diagnosed[29]other studies have shown that early signs of impending nephropathy appear much earlier in the shape of microalbuminuria in not only patients with poor glycaemic control but also in patients who had good glycemic control[20].Therefore screening of type 2 diabetics for microalbuminuria should begin at the time of diagnosis to retard the progression and perhaps reversion to normoalbuminuria at an early stage of disease. Once sustained microalbuminuria develops then urinary albumin excretion rate increases by 10-20% per year to overt nephropathy over a period of 10-15 years. The rate of fall of glomerular filtration rate in patients of diabetes with overt nephropathy in type 2 diabetes is variable ranging from 2–20ml/min/yr.[23] Therapeutic and non-therapeutic intervention can reverse the process at this stage but if untreated then will lead to end stage renal disease and cardiovascular mortality

Good evidence suggests that early treatment delays or prevents the onset of diabetic kidney disease[30]The frequency of microalbuminuria in our study in type 2 DM with good glycemic control was 8.57% as compare to 29.5% in one study and 24-34% in others[12-16,20]. Presence of micro albuminuria in subjects who had a comparatively good glycemic control that is a hemoglobin A1C in the range of 6.7-7 is an alarming finding which underlines the fact that renal damage may start appearing when HbA1c crosses the line anywhere above 6.5, the latest cut off for diagnosing diabetes mellitus[10]. The other reasons for this finding might be that although we excluded the patients with hypertension from our study by taking blood pressure measurements initially at the time of induction as well as taking thorough history of hypertension but may be these patients had silent hypertension not yet clinically diagnosed,secondly it is found in some studies that the cause of microalbuminuria might be some non-diabetic renal diseases (NDRD)[31]This calls for dealing with newly diagnosed diabetic patients with intensive and focused screening for microalbunuria**so** that steps are taken to treat that in time by keeping a blood pressure in the safe range of less than or equal to 120/85 , life style modifications, weight monitoring and introducing antihypertensive drugs especially ACE inhibitors or ARBs to avert proteinuria and by maintaining lipid profiles in the optimum range so that macro and microvascular complication could be averted.

Our study showed that females were major suffers ofmicroalbuminuria as compared to males out of the total 140 cases 04 cases were male while females were08.Similar female dominancy has been noted by otherstudies.[20,17,18] this could be because of the fact that femalesin our study had higher BMI than males owing to increased central obesity,this could be explained by

the fact that thepurda observing women in our society have less opportunities of exercising due to social norms of restraining to homes and repeated child birth result in increased central obesity which can lead to greater insulin resistance, many studies have linked insulin resistance and microalbuminuria[27]

Our study showed higher frequency of micro albuminuria in patients between 40–50 years of age. Similar results were also reported by another study[19]this is in keeping with the fact that,diabetic nephropathy rarely develops before 10 years. The peak incidence (3%/y) is usually found in persons who have had diabetes for 10-20 years, after which the rate progressively declines. However some studies showed diabetic patients had micro albuminuriaeven when the duration of diabetes was less than 11 years[20,24]. Which again stresses the fact that early detection of diabetic nephropathy is important so that pharmacological and non-pharmacological interventions could be done to stop the progression to end stage renal disease.

Haemoglobin A1c is a measure of erythrocyte hemoglobinglycation and reflects mean glycemic value for the previous 03months.[25]This variable was also been measured in this study. Our study since was done in patients with good glycaemic control was expected to find very low incidence of microalbuminuria , but contrary to our expectations we found significant number of patients with this complications despite being with good controls of blood sugar levels over the past three months. Such results were seen in another study also which showed presence of 10% of microalbuminuria in good glycemic control (HbA1c <7) group[11]. This finding can be explained on the basis that either some people are more predisposed to microalbumiuria the moment HbA1c crosses the threshold of 6.5 which calls for tighter control of blood sugar levels in order to halt future nephropathy or the patients studied might be suffering from some non-diabetic cause of albuminuria as has already been found in literature search[31],these causes might be genetic predisposition,socioeconomic factors ,dietary patterns ,covert hypertension, subclinical urinary tract infections etc for which we have to undertake further studies.

Acknowledgement: We thanks our colleagues of Liaquat national hospital who supported us during the course of our study period

CONCLUSION

Microalbinuria the first sign of diabetic nephropathy can be found in DM type II patients with good glycaemic control hence Screening formicroal buminuria and HbA1c test should be done both in newly and already diagnosed type 11 diabetic patients to detect an early marker of renal dysfunction.

Author's Contribution:

Concept & Design of Study:	Syeda Nosheen Zehra
Drafting:	Hamid Ali
Data Analysis:	Shahid Karim, Farheen Fatima Zaidi.
Revisiting Critically:	Syeda Nosheen Zehra, Hamid Ali
Final Approval of version:	Syeda Nosheen Zehra

Conflict of Interest: The study has no conflict of interest to declare by any author.

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