Microalbuminuria in type II diabetes; a rising pattern at tertiary care hospital

Shumaila Rafi[1], Shumaila Tasleem[1], Muhammad Arslan[2], Mahnoor[3]

ABSTRACT

Objective: To determine the frequency of microalbuminuria in type II diabetic patients visiting at tertiary care hospital.
Study Design: A cross sectional observational study.
Place and Duration: Al- Tibri Medical College and Hospital Karachi from 1st January 2018 to 30th June 2018.
Methodology: A total of 120 patients of both genders with 35-75 years of age were included in this study. Data were recorded on the basis of demographic variables such as age, gender, duration of diabetes, body mass index etc. and laboratory parameters i.e. fasting blood sugar, random blood sugar, glycosylated hemoglobin and microalbuminuria.
Results: Microalbuminuria was present in 50% of patients. There were total of 60% subjects that had hypertension and more hypertensive subjects were included (83.3% vs. 36.6%) in the microalbuminuria development group (P value <0.001). Microalbuminuria was also statistically significant with poor glycemic control of glycosylated hemoglobin (P value <0.001).
Conclusion: The frequency of microalbuminuria among type II diabetes is about one in every two patients.
Keywords: Diabetes mellitus, Microalbuminuria, Fasting blood sugar, Glycosylated hemoglobin, Hypertension.

How to Cite This:
Rafi S, Tasleem S, Arslan M, Mahnoor. Microalbuminuria in type II diabetes; a rising pattern at tertiary care hospital. Isra Med J. 2019; 11(2): 110-113.

INTRODUCTION

Diabetes mellitus (DM) is defined by chronic hyperglycemia and unsteadiness in carbohydrate, fat, and protein metabolism due to absolute or relative deficiency of insulin secretion or its action[1,2].In diabetic patients, renal disease is characterized by increase in urine albumin excretion with progression to overt albuminuria, and then to the development of end stage renal disease (ESRD). Microalbuminuria is defined as the presence of 30-300mg/day of albumin in the urine and overt albuminuria is the presence of >300mg/day of albumin in urine[3]. The existence of microalbuminuria is further insightful of disperse indiscriminate vasculopathy and endothelial dysfunction leading to atherosclerosis and in the microcirculation, may ensue to the development of insulin resistance[4].

Diabetes mellitus, one of the frequent endocrine disorder and noncommunicable disease, is linked with long standing micro-vascular and macro-vascular complications in addition to metabolic abnormalities[5]. Diabetes mellitus globally is a major cause of impulsive mortality[6]. According to World Health Organization (WHO), DM will be the seventh principal origin of death in 2030[7]. It is anticipated that fifty percent of patients who have type 2 diabetes die prematurely[8]. Microalbuminuria is a premature predictor of diabetic nephropathy and is a self-sufficient risk factor for cardiovascular disease which can progress to overt proteinuria and after sometime, the renal failure[9]. Universally there is troublesome stand still rising of dialysis patients which was 12.7 million in 1990-1991 to 23.6 million in 1998-1999[10]. The estimated cost for dialysis per diabetic subject in Pakistan is around $30000/year[11]. Without any therapeutic measures in Type II Diabetes, it is evident that 20-40% of patients with microalbuminuria progress to nephropathy after 20 years from the inception of DM; approximately 20% develop ESRD[12]. Diabetic nephropathy is a microvascular complication of DM and is the foremost cause of ESRD internationally[13].

The rationale of the study was to measure the percentage of microalbuminuria with diabetes and to manage the patients earlier, to slow the progression of chronic kidney disease and the cost burden for dialysis. The objective of the current study was to determine the frequency of microalbuminuria in type II diabetic patients visiting at tertiary care hospital.

1. Assistant Professor of Medicine
2. Research Officer, Department of Research and Development
3. Statistician, Department of Research and Development

Al-Tibri Medical College, Isra University, Karachi

Correspondence to:
Muhammad Arslan, Research Officer,
Department of Research and Development
Al-Tibri Medical College, Isra University, Karachi.
Email: arslangreat2002@yahoo.com

Received for Publication: 05-09-18
1st Revision of Manuscript: 15-02-19
2nd Revision of Manuscript: 24-03-19
Accepted for Publication: 16-04-19

METHODOLOGY

This cross-sectional study was conducted from 1st January 2018 to 30th June 2018 at outpatient department in Al –Tibri Medical College and Hospital Karachi. Patients between 35-75 years of age of either gender of diagnosed case of type II diabetes based on the screening recommendation by American Diabetes Association (ADA) were included in this study[14]. Patients with macroalbuminuria (urinary albumin excretion > 300mg/d), urinary tract infection and pregnant women were excluded from this study. Total 120 patients met the inclusion criterion. Clinical details of each subject were recorded at a precise proforma especially planned for this study. This includes age, sex, height, weight, systolic and diastolic blood pressure (SBP and DBP), family history of diabetes, duration of diabetes, smoking and details of oral hypoglycemic agents (OHA) and use of insulin recorded as the baseline. Height and weight imitate the average of two measurements (deliberate by the same person, on the same instrument to avoid inter-instrument and interpersonal disparity). Measurements of weight in kilogram and heights in centimeters were recorded using identical techniques and then body mass index (BMI) was calculated using following formula: weight (kg)/height (m^2). Blood pressure was recorded with a manual mercury sphygmomanometer two times in the sitting position following 10 minutes of relaxing and the two readings were averaged. Patients with a known case of hypertension and those who presented with systolic blood pressure of 130 mmHg and/or diastolic blood pressure of 85 mmHg were considered to have hypertension.

A random spot collection was performed for the measurement of the albumin-to-creatinine ratio (ACR) to screen for increased urinary albumin excretion after exclusion of factors that can elevate urinary albumin excretion above baseline values as indicated by recommendation of recent ADA guidelines[14]. These factors include fever, infection, congestive heart failure, menstruation, marked hypertension and exercise within 24 hours may elevate urine ACR independently of kidney damage. Necessary investigations, including plasma fasting blood glucose level (FBS), random blood glucose level [2 hours postprandial] (RBS), glycosylated hemoglobin (HbA1c), serum creatinine and urine DR were done. HbA1C <7% is considered as good glycemic control, FBS 90-130mg/dl and RBS <180mg/dl is considered as controlled[15].

Data Analysis: The calculated sample size was 120 patients**.** The analyses were performed by using Statistical Packages for Social Sciences (SPSS 22). Chi-square Test of independence and Z Test were used for data analysis. For categorical variables frequency and percentage was used. P value ≥0.05 was considered statistically significant.

RESULTS

A total of 120 patients were satisfied with inclusion criteria. The mean ± SD of age was 52.58± 9.71.

There were 67(55.8%) males and 53 (44.2%) females. Microalbuminuria was present in 50% of the patients. Majority 56 (93.4%) of the obese patients were in microalbuminuria positive group. Patients with history of diabetes for 1-10 years had microalbuminuria in 28(46.7%) and the P value was statistically significant of 0.02.A total of 72(60%) subjects had hypertension and more hypertensive subjects 50 (83.3% vs. 36.7%) in the microalbuminuria development group (P value <0.001) as shown in Table-I.

Table-II represents the glycemic control by FBS and RBS and its relationship with the development of microalbuminuria. Subjects with uncontrolled FBS and RBS shows a significant association with microalbuminuria in 40(66.7%) and 54(90%) with a P value of 0.003 and 0.002 respectively.

Table-I: Comparison of demographic and clinical characteristics of diabetics in outpatient department (N=120)

Variables		Number of patients (n=120)	Microalbuminuria (n=60)	No Microalbuminuria (n=60)	P values
Gender	Male	67(55.8%)	29(48.3%)	38(63.3%)	0.098
	Female	53 (44.2%)	31(51.7%)	22(36.7%)	
Diabetes duration	<1yr	12(10%)	04(6.7%)	08(13.3%)	0.02
	1-10yrs	68(56.7%)	28(46.7%)	40(66.7%)	
	11-20yrs	34(28.3%)	24(40%)	10(16.7%)	
	21-30yrs	06(5%)	04(6.7%)	02((3.3%)	
Body Mass Index	18.5-23kg/m2	06(5%)	02((3.3%)	04(6.7%)	0.087
	23-27.5kg/m2	10(8.3%)	02((3.3%)	08(13.3%)	
	>27.5kg/m2	104(86.7%)	56(93.4%)	48(80%)	
Hypertension	Yes	72(60%)	50(83.3%)	22(36.7%)	<0.001
	No	48(40%)	10(16.7%)	38(63.3%)	
Use of Hypoglycemic agents	Only OHA	88(73.3%)	44(73.3%)	44(73.3%)	0.776
	Only Insulin	18(15%)	10(16.7%)	08(13.3%)	
	Insulin and OHA	14(11.7%)	06(10%)	08(13.3%)	
Family History of Diabetes	Yes	90(75%)	50(83.3%)	40(66.7%)	0.035
	No	30(25%)	10(16.7%)	20(33.3%)	

Table-II: Relationship of FBS, RBS and HbA1C with microalbuminuria (N=120)

Glycemic control	Total no. of patients (120)	Microalbuminuria present (n=60)	Microalbuminuria absent (n=60)	P values
Fasting blood sugar(FBS)mg/dl				
90-130	56(46.7%)	20(33.3%)	36(60%)	0.003
>131	64(53.3%)	40(66.7%)	24(40%)	
Random blood sugar(RBS)mg/dl				
<180	26(21.7%)	06(10%)	20(33.3%)	0.002
≥180	94(78.3%)	54(90%)	40(66.6%)	
Glycosylated hemoglobin(HbA1C) %				
<7%	66(55%)	14(23.3%)	52(86.7%)	<0.001
≥7%	54(45%)	46(76.7%)	08(13.3%)	

Microalbuminuria was present in 46(76.7%) with ≥7% as compared to 14(23.3%) with HbA1C <7% (Fig-1).

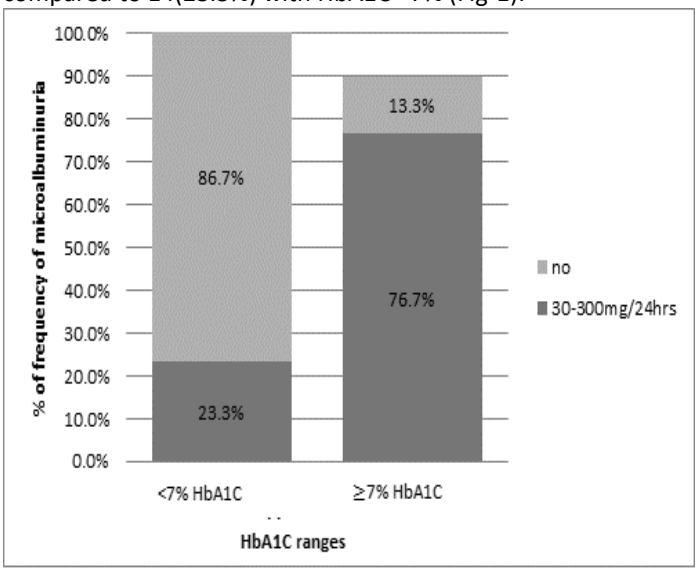

Figure-1: Frequency of HbA1C with microalbuminuria and no microalbuminuria (N=120)

DISCUSSION

Type II DM is a widespread disease in developing countries of South Asia. Internationally, intensification of almost 50%, with the greatest increase in the developing countries of Africa, South America and Asia by the year 2030[16]. One of the micro vascular complications of diabetes is diabetic nephropathy which is characterized by hypertension, a gradual rise in albuminuria and leading towards ESRD.

The prevalence of microalbuminuria in patients with type II DM ranges from 10-61%[17]. It's reported that the prevalence of microalbuminuria is 42% in South Africa, 36.7% in India, 13.6% in Pakistan and 9% in UK population[6]. The highest prevalence of microalbuminuria reported in MAP study in Korea (56.5%) and the lowest (24.2%) in Pakistan[18]. Multiple factors are responsible for huge variations in ranges of microalbuminuria like screening methods, education status, life style, duration of diabetes, cardiovascular risk factors and ethnicity of study population[10].

In the present study, the frequency of microalbuminuria was 50% which is much higher as compare to the previous study (31.56%) in Ahmad et al.[10] and 20% in Adil S et al. study[6]. The enormous variation can be due to difference in the communities of the study population because present study covers the rural areas as compare to urban areas. This need to be explored further into rural areas in future studies. This study rationale is comparable to almost 51.2% in Ali Z study[19].

Hypertension is also a foremost risk factor for microalbuminuria. This study showed a strong relationship between hypertension and microalbuminuria (83.3%) as comparable to one study which was found in (55.6%) with T2DM in microalbuminuria patients[20]. The contradiction to the study that it was a multicentered study in multiple cities with huge sample. Prevalence of microalbuminuria among diabetic hypertensives were high (40.7%) in Buranakitjaroen P et al. study[21]. A contradiction in the study might be due to large numbers of patients were using an angiotensin converting enzyme inhibitor (ACEI) or Angiotensin II receptor blockers (ARBs) treatment and the variation in the sample size.

The foundation of management of diabetes is glycemic control. The Diabetes Control and Comparison Trial (DCCT) study established that the HbA1c is a better predictor of glycemic control. It is valuable to monitor glycemic control as it gives the average blood glucose level of prior 6 to 8 weeks and is not subjected to the ample fluctuations as practically when assaying blood glucose concentrations[1].

This study showed that 76.7% of the patients with poor glycemic control (HbA1C) were associated with microalbuminuria as compare to the 64(91%) in Shah PK et al. study, this difference might be due to the reason that the previous study considered good glycemic control with HbA1C <6.5% while this study considered HbA1C<7.0%[22]. In Ahmad T et al. study the poor glycemic control was associated with microalbuminuria of about 67.4%[10]. This disparity may arise from the variation in the sample size and the fact that they considered microalbuminuria of >20mg/day as comparable to the >30mg/day.

This study was statistically significant for association of FBS with microalbuminuria was present in 66.7%. While it was found to be 62.8 % in Muhammad E et al. study in relation to

microalbuminuria with FBS ≥ 140mg/dl[23]. This study also showed a significant (90%) relation with RBS. No previous study showed the relationship of microalbuminuria with RBS. In future, advance studies are required to explore the relation.

CONCLUSION

The frequency of microalbuminuria among type II diabetes is about one in every two patients.

CONTRIBUTION OF AUTHORS

Rafi S: Conceived Idea, Designed methodology, Data collection, Manuscript writing, Literature search
Tasleem S: Literature review, Data collection
Arslan M: Designed methodology, Data interpretation
Mahnoor: Data interpretation, Statistical analysis

Disclaimer: None.
Conflict of Interest: None.
Source of Funding: None.

REFERENCES

1. Shah PB, Acharya A, Shrestha S, Shrestha S. Role of HbA1C and microalbumin as an early risk marker of diabetic nephropathy. Int J Res Health Sci .2017; 7(2):141-45.
2. Alam MM, Parvez MA, Murtaza M. Microalbuminemia. The Professional Med J. 2017; 24(3):478-81.
3. Chen WZ, Hung CC, Wen YW, Ning HC, Gau BR, Huang YY. Effect of glycemic control on microalbuminuria development among type 2 diabetes with high-normal albuminuria. J Renal failure. 2014; 36(2):171-75.
4. Parchwani D, Singh SP. Microalbuminuria in diabetic patients: prevalence and putative risk factors. Nat J Com Med. 2011; 2:126-29.
5. Pendurthi AK, Karumanchi S. Clinical study of diabetic patients with special reference to their glycemic status. Int J Adv in Med. 2017; 3(2):166-70.
6. Adil S, Farhan S, Nadeem MA, Rasheed S, Mohsin A. Frequency of diabetic nephropathy in tertiary care hospital. Pak Med J Health Sci. 2016; 10(2):402-04.
7. World Health Organization. Global status report on noncommunicable diseases 2010. [Homepage on the Internet]. c2011. Available from https://www.who.int/nmh/publications/ncd_report_full_en.pdf.
8. Sarafidis PA, Bakris GL. Microalbuminuria and chronic kidney disease as risk factors for cardiovascular disease. Nephrol. Dial. Transplant. 2006; 21(9):2366-74.
9. Verma MK, Kumar P, Sharma P, Singh VK, Singh SP. Study of microalbuminuria as early risk marker of nephropathy in type 2 diabetic subjects. Int J Res Medical Sci. 2017; 5(7):3161-66.
10. Ahmad T, Ulhaq I, Mawani M, Islam N. Microalbuminuria in Type-2 Diabetes Mellitus; the tip of iceberg of diabetic complications. Pak J Med Sci. 2017; 33(3):519-23.
11. Ahmedani MY, Hydrie MZ, Iqbal A, Gul A, Mirza WB, Basit A. Prevalence of microalbuminuria in type 2 diabetic patients in Karachi: Pakistan a multi-center study. J Pak Med Assoc. 2005; 55(9):382-86.
12. Munroe WR. Measuring providers. Adherence to the American Diabetes Association screening recommendation for prevention of diabetic nephropathy. [Homepage on the Internet]. c2015. Website [https://uknowledge.uky.edu/dnp_etds/51]
13. Hadjadj S, Cariou B, Fumeron F, Gand E, Charpentier G, Roussel R, et al. Death, end-stage renal disease and renal function decline in patients with diabetic nephropathy in French cohorts of type 1 and type 2 Diabetes. Diabetologia. 2016; 59(1):208-16.
14. American Diabetes Association. Microvascular complications and foot care: standards of medical care in diabetes—2018. Diabetes Care. 2018; 41(Supplement 1): S105-18.
15. Papadakis MA, McPhee SJ. Diabetes mellitus and hypoglycemia. In: Current Textbook of Medicine 56th ed. San Francisco: Mc Graw Hill Education, 2017. P.1210-258.
16. Nilanjan S. Spectrum of diabetic kidney disease in India-A tertiary care centre experience. J Endocrinol. 2017; 1(1):000103.
17. Efundem NT, Assob JC, Feteh VF, Choukem SP. Prevalence and associations of microalbuminuria in proteinuria-negative patients with type 2 diabetes in two regional hospitals in Cameroon: a cross-sectional study. BMC Research Notes. 2017; 10(1):477.
18. Wu AY, Kong NC, De Leon FA, Pan CY, Tai TY, Yeung VT, et al. MAPS Investigators. An alarmingly high prevalence of diabetic nephropathy in Asian type 2 diabetic patients: The MicroAlbuminuria Prevalence (MAP) Study. Diabetologia. 2005; 48(1):17-26.
19. Ali Z, Adnan M, Bashir S, Shabbir I, Rahat T. Microalbuminuria: An early marker of diabetic kidney disease. El Med J. 2014; 2(2):114-16.
20. ACCORD Study Group. Effects of intensive blood-pressure control in type 2 diabetes mellitus. New Eng J Med. 2010; 362(17):1575-585.
21. Buranakitjaroen P, Phoojaroenchanachai M, Saravich S. Microalbuminuria in type 2 diabetic patient with hypertension. Siriraj Med J. 2006; 58(11):1085-90.
22. Shah PK, Chauhan AP. Effect of glycemic control on albumin excretion in urine in diabetics. Int J Res in Med Sci. 2017; 3(11):3202-205.
23. Muhammed E. Cardiovascular risk profile and prevalence of microalbuminuria in patients with type 2 diabetes mellitus: The campaign disease registry results. J Rawal Med Coll.2017; 21(1): 2-8.