ORIGINAL ARTICLE

Frequency of Microalbuminuria in Essential Hypertension and type II Diabetes Mellitus in Tertiary Care Hospital

SOMIA TARIQ[1], IRFAN RAHEEM[2], ISHTIAQUE AHMED MAHAR[3], SAMIYA REHMAN[4]
[1]DHQ teaching hospital Sahiwal
[2]City Prime Clinic, New York
[3]JFK North Hospital, West Palm Beach
[4]Department of Biochemistry, University of Okara.
Corresponding author: Somia Tariq

ABSTRACT

Introduction: Hypertension is the growing issues of public health problem of adult population in both developed as well as developing world, affecting single person in every four people.

Objectives: The main objective of the study is to find the frequency of microalbuminuria in essential hypertension in tertiary care hospitals.

Material and Methods: This Randomized Control Trial was conducted in DHQ hospital Sahiwal during 2020 to 2021. Blood sample of all the patients diagnosed with microalbuminuria in hypertension presented to the hospital were taken and sent to laboratory for performing fasting blood glucose and 1st morning Urine sample was taken and analyzed for albumin to creatinine ratio of these patients.

Results: The age range of patients in this research was from 18-75 years. The mean age of patients was 40.35 ± 8.65 years. In group A the mean age of patients was 39.60 ± 10.12 years and in group B was 41.0 ± 8.05 years.

Conclusion: This study concluded that efficacy of losartan is higher than lisinopril for reduction of microalbuminuria in patients with type-2 diabetes mellitus.

Keywords: type II diabetes, microalbuminuria, losartan.

INTRODUCTION

Hypertension is the growing issues of public health problem of adult population in both developed as well as developing world, affecting single person in every four people. The exact cause for hypertension is difficult to predict because hypertension results from a complex interaction of genes and environmental factors [1]. Microalbuminuria (MAU) in essential hypertension is associated with the increased mortality. Microalbuminuria is the independent risk factor to develop cardiovascular and cerebrovascular diseases [2].

Furthermore, MAU has been described as an early sign of kidney damage and a redactor for end stage renal disease (ESRD) and cardiovascular disease. MAU is defined as the increased urinary excretion of albuminuria (30-300 mg/24 h) which cannot be detected by routine protein dipstick method [3]. Measurement of MAU can be done by using random spot urine sample. Due to the variation in urinary flow rate and concentration, the excreted urinary albumin can be adjusted to creatininuria. Thus, obtaining urinary albumin creatinine ratio (ACR) of 30-300 mg albumin/g creatinine, corresponding to 3.4-33.9 mg albumin/ mmol creatine can be considered positive ACR or microalbuminuria [4].

The term microalbuminuria is defined by a urinary albumin excretion (UAE) rate higher than normal but lower than 200 µg/min, the lowest detection limit of proteinuria as measured by standard laboratory methods in the absence of urinary tract infection and acute illness including myocardial infarction [5]. A diagnosis of microalbuminuria can be made by measuring its excretion rate during 24 hours or in an overnight urine collection, or by measuring albumin/creatinine ratio or albumin concentration in the morning or a random urine sample [6]. Determination of UAE in the morning urine sample constitutes the ideal test for screening, and overnight urine collection might be the best choice for monitoring microalbuminuria. The normal urinary excretion of albumin oscillates between 1 and 22 mg/day and varies with posture, exercise, and blood pressure; however, the day-to-day variation is in the range of 31% to 52%. Therefore, a mean of three urine collections has been recommended to determine the UAE level of a given subject [7,8].

Objectives: The main objective of the study is to find the frequency of microalbuminuria in essential hypertension in tertiary care hospitals.

MATERIAL AND METHODS

Study design: This Randomized Control Trial was conducted in DHQ hospital Sahiwal during 2020 to 2021.

Inclusion Criteria:
a. Patients with diagnosed microalbuminuria
b. Age between 18 to 75 years.
c. Both Genders.

Exclusion Criteria:
a. Patients with chronic heart failure
b. Pregnant and lactating female
c. Patients who are being treated with any investigational drug within the last 30 days.

Data collection procedure: Study was started after taking prior approval and permission from the hospital ethical committee. Blood sample of all the patients diagnosed with microalbuminuria in hypertension presented to the hospital were taken and sent to laboratory for performing fasting blood glucose and 1st morning Urine sample was taken and analyzed for albumin to creatinine ratio of these patients. Patients with type II DM and microalbuminuria as defined in operational definition and fulfilling the other inclusion criteria were enrolled for study. By taking informed written consent from all the patient, the thorough physical examination was performed after taking detailed clinical history. All the patients were randomly divided into two groups by the lottery method. Group A was treated with 100 mg of Losartan potassium for 12 weeks while Group B patients were given 5 mg of Lisinopril for 12 weeks. After 12 weeks therapy the efficacy of the drug was determined in both groups as per our operational definition. For this purpose, albumin to creatinine ratio was determined from the hospital laboratory by analysis of 1st early morning urine after 12 weeks of treatment. All the data collection was performed by the trainee researcher himself to main data quality and compliance and study results were recorded in the prescribed proforma attached as annexure I.

Data analysis procedure: Data was entered and analyzed on SPSS version 20.0. Frequency and percentages were computed for qualitative variable like gender and efficacy among two groups. Quantitative variables like Age, fasting blood glucose level, height, weight, BMI & baseline albumin to creatinine ratio (microalbuminuria) and at 12-week therapy were presented by mean and standard deviation. Chi square test was used to compare the efficacy of both groups. P value ≤0.05 was considered significant.

RESULTS

The age range of patients in this research was from 18-75 years. The mean age of patients was 40.35 ± 8.65 years. In group A the mean age of patients was 39.60 ± 10.12 years and in group B was 41.0 ± 8.05 years. As shown in Table I, most of the patients were between 18 to 45 years of age and number of patients were 56 (50.91%).

Table-1: Age distribution for both groups (n=110).

Age (years)	Group A (n=55)		Group B (n=55)		Total (n=110)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
18-45	37	67.27	39	70.91	56	50.91
45-75	18	32.78	16	29.09	34	49.09
Mean ± SD	39.60 ± 10.12		41.0 ± 8.05		40.35 ± 8.65	

There were 110 total patients and out of those 110 patients, the number of males patients were 47 (42.78%) and number of females patients were 63 (57.27%), and as shown in figure I, the male to female ratio were 1:1.3. As shown in Table II, the mean BMI was 29.12 ± 3.41 kg/m^2. Mean height was 165.86 ± 14.76 cm. Mean weight was 75.63 ± 8.35 cm. Most of the patients 64 (58.12%) were with the BMI of ≤30 kg/m^2.

Fig 1: Distribution of patients according to gender.

Table-2: Percentage of patients according to BMI (n=110).

BMI	Group A (n=55)		Group B (n=55)		Total (n=110)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
≤30 kg/m^2	32	58.18	32	58.18	64	58.12
>30 kg/m^2	23	41.82	23	41.82	46	41.82
Mean ± SD	29.15 ± 3.42		29.05 ± 3.34		29.12 ± 3.41	

Efficacy of Group A (losartan group) was seen in 48 (87.27%) patients while in Group B (lisinopril group) was seen in 37 (67.27%) patients as shown in Figure 2 (p-value = 0.012).

Fig 2: Comparison of efficacy in both groups

Stratification of efficacy with respect to age groups is shown in Table III. The P-value of patients with the age group of 28-45 years was 0.350 and 46-75 years was 0.021. Results showed that the age group of 28-45 years showed more positive results compared to the other age group in both group A and Group B. The number of patients in both group A and B was 55.

Table 3: Stratification of efficacy with respect to age groups.

Age of patients (years)	Group A (n=55)		Group B (n=55)		P-value
	Efficacy		Efficacy		
	yes	no	yes	no	
28-45	31	06	27	12	0.350
46-75	17	01	10	06	0.021

Stratification of efficacy with respect to age groups and gender is shown in Table IV. The P-value of the gender male was 0.027 and female was 0.159. Female showed more positive results than male in both Group A and group B. The number of patients in both groups were 55.

Table 4: Stratification of efficacy with respect to gender.

Gender	Group A (n=55)		Group B (n=55)		P-value
	Efficacy		Efficacy		
	yes	no	yes	no	
Male	22	02	15	08	0.027
Female	26	05	22	10	0.159

DISCUSSION

The risk for cardiovascular and renal disease increases in type II diabetes after the growth of microalbuminuria (12-14). In type II diabetes the prevalence rate of renal disease (end-stage) has increased in many areas globally [9]. According to recent studies, for the protection of renal and possibly cardio protection, the main treatment goal is the regularization and reduction of proteinuria [10,11]. In the diabetic animal model, the inhibition of (RAS) renin-angiotensin system (by ACE inhibitors or (AIIAs) angiotensin II antagonists) prevents the growth of proteinuria or lowers the level of proteinuria which results in less damage of renal structure [11]. ACE inhibitor therapy reduces the albumin excretion rate (UAER) in type II diabetic patients with microalbuminuria, and as determined by serum creatinine, it also prevents the growth and development of renal disease. AIIAs selectively block the AT1 receptor which reduces microalbuminuria in these patients to the same level as ACE inhibition [12].

I have conducted this study to compare the efficacy of losartan and lisinopril for reduction of microalbuminuria in patients with type-2 diabetes mellitus. Age range in this study was from 18-75 years with mean age of 40.35 ± 8.65 years. In group A the mean age of patients was 39.60 ± 10.12 years and in group B was 41.0 ± 8.05 years. Majority of the patients 56 (50.91%) were between 18 to 45 years of age. Out of 110 patients, 47 (42.78%) were males and 63 (57.27%) were females, with male to female ratio of 1:1.3. Efficacy of Group A (losartan group) was seen in 48 (87.27%) patients while in Group B (lisinopril group) was seen in 37 (67.27%) patients (p-value = 0.012) [13]. In a recent study, Sandhu GA et al compared the efficacy of ACE inhibitor (Lisinopril) and ARB (Losartan Potassium) in terms of reduction in microalbuminuria in Type II DM patients. Their study results showed that mean microalbuminuria levels (mcg/ mg) at 12 weeks of study was reduced from 193±67.5 to 36.33±54.68 in Losartan potassium group and from 209.5±72.0 to 72±83.42 in lisinopril group. Efficacy of drug was observed in 86.7% patients (n=26) in Losartan potassium group while 66.7% patients (n=20) in lisinopril group [14].

In patients with type II diabetes, the effect of Reno protective on ARB and ACE inhibitors were studied and, in a study, done by Barnett AH, 250 individuals with type II diabetes and initial stage of nephropathy were casually assigned to receive either the ARB telmisartan, in 120 patients (80 mg/d) or the ACE inhibitor enalapril, in 130 patients (20 mg/d). The main endpoint was the difference in the (GFR) Glomerular filtration rate amongst the standard value and the last obtainable value throughout the five years therapy period [15]. GFR reduced after five years with telmisartan by 17.9 ml per minute, per 1.73 m^2 of surface region of body and with enalapril by 14.9 ml per minute, per 1.73 m^2, with a therapy difference of 3.0 ml per min, per 1.73 m^2. In type II diabetic patients this difference was not sufficient (based on predefined criteria) to conclude that telmisartan is better than enalapril in offering long term renoprotection. For decrease in BP in such patients, combination of lisinopril and candesartan was more effective than monotherapy and the similar trend was evident for the decrease in rate of urinary albumin excretion [16,17].

CONCLUSION

This study concluded that efficacy of losartan is higher than lisinopril for reduction of microalbuminuria in patients with type-2 diabetes mellitus. Majority of the patients 56 (50.91%) were between 18 to 45 years of age. Out of 110 patients, 47 (42.78%) were males and 63 (57.27%) were females.

REFERENCES

1. Nazar CMJ. Diabetic nephropathy; principles of diagnosis and treatment of diabetic kidney disease. J Nephropharmacol. 2014; 3:15-20.
2. Tomino Y, Gohda T. The prevalence and management of diabetic nephropathy in Asia. Kidney Dis. 2015; 1:52-60.
3. Ren F, Tang L, Cai Y, Yuan X, Huang W, Luo L, et al. Meta-analysis: the efficacy and safety of combined treatment with ARB and ACEI on diabetic nephropathy. Renal Failure. 2015; 37:548-61.
4. Fiseha T. Urinary biomarkers for early diabetic nephropathy in type II diabetic patients. Bio mark Res. 2015; 3:16-8.
5. Sudhakar A, Pasula S, Simpson GB. Efficacy of drugs in controlling

microalbuminuria of diabetic nephropathy. Int J Basic Clin Pharmocol. 2014; 3:350-3.

6. Sandhu GA, Tahir GA, Ahmad Z, Anjum AM. Microalbuminuria; comparison of losartan potassium and lisinopril in treatment of patients with type ii diabetes mellitus. Professional Med J. 2017; 24:221-7.

7. Huang R, Feng Y, Wang Y, Qin X, Melgiri ND, Sun Y, Li XS. Comparative efficacy and safety of antihypertensive agents for adult diabetic patients with macroalbuminuric kidney disease: a network meta-analysis. PLoS One. 2017;12: e0168582.

8. Xu R, Sun S, Huo Y. Effects of ACEIs versus ARBs on proteinuria or albuminuria in primary hypertension: a meta-analysis of randomized trials. Medicine (Baltimore). 2015;94(39): e1560.

9. Mogensen C. Microalbuminuria predicts clinical proteinuria and early mortality in maturity onset diabetes. N Engl J Med. 1984; 310: 356–360.

10. Dinneen SF, Gerstein HC. The association of microalbuminuria and mortality in non-insulin-dependent diabetes mellitus: a systematic overview of the literature. Arch Intern Med. 1997; 157: 1413–1418.

11. Mattock MB, Barnes DJ, Viberti GC, et al. Microalbuminuria and coronary heart disease in non-insulin-dependent diabetes: an incidence study. Diabetes. 1998; 47: 1786–1792.

12. USRDS Annual Data Report Chapter 2. Incidence and prevalence of ESRD. Am J Kidney Dis. 1999; 34: S40–S50.

13. Pugh JA, Medina RA, Cornell JC, et al. NIDDM is the major cause of diabetic end-stage renal disease: more evidence for a tri-ethnic community. Diabetes. 1995; 44: 1375–1380.

14. Ruggenenti P, Schieppati A, Remuzzi G. Progression, remission, regression of chronic renal disease. Lancet. 2001; 357: 1601–1608.

15. Anderson S, Rennke HG, Brenner BM. Therapeutic advantage of converting enzyme inhibitors in arresting progressive renal disease associated with systemic hypertension in the rat. J Clin Invest. 1986; 77: 1993–2000.

16. Remuzzi A, Perico N, Amuchastegui CS, et al. Short and long-term effect of angiotensin II receptor blockade in rats with experimental diabetes. J Am Soc Nephrol. 1993; 4: 40–49.

17. Ravid M, Savin H, Jutrin I, et al. Long-term stabilizing effect of angiotensin-converting enzyme inhibition on plasma creatinine and on proteinuria in normotensive type II diabetic patients. Ann Intern Med. 1993; 118: 577–581.