FREQUENCY OF MICROALBUMINURIA IN THE MIDDLE AGE AND OLDER POPULATION OF PESHAWAR CITY

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ABSTRACT

Objectives: To determine the frequency of micro albuminuria in the middle age and older population of both genders in Peshawar city of Pakistan.

Study Design: Random control study.

Place and Duration of Study: This study was carried out from Jan 2017 to Feb 2017 in Khyber Teaching Hospital (KTH), Peshawar Pakistan.

Material and Methods: The study was conducted on 118 subjects (Female: 48 & 70 male) aged 45-75 years. Spot urine sample from each subject was quantified for micro albumin and creatinine. The results for micro albuminuria were expressed as ACR (Albumin creatinine ratio/gram of creatinine). Patients were categorized according to ACR results as norm albuminuria (ACR = 20 mg/g Cr), micro albuminuria (ACR = 30–299 mg/g Cr), or macro albuminuria (ACR ≥300 mg/ g Cr).

Results: The percentage of hypertensive (60%) and macro albuminuria patients (8.33%) were higher in female subjects than the male subjects (hypertensive; 25.71%) and macro albuminuria patients (2.86%). The prevalence of micro albuminuria was higher in male (25.71%) than the female subjects (25%).

Conclusion: Micro albuminuria was found to be more prevalent in male than in female while macro albuminuria patients were higher in female than in male.

Keywords: Creatinine, Hypertension, Micro albuminuria.

INTRODUCTION

Non-communicable diseases (NCDs) including chronic kidney disease present a significant global health burden on the public exchequer and is one of the major leading cause of premature death worldwide[1]. In Pakistan, the burden of CKD is on the rise due to illiteracy, poor health & above all lack of health care facilities[2,3]. A very recent population based study from India found a prevalence rate of about 0.02% of end stage renal disease in Bhopal[4,5]. In Pakistan there is no authentic prevalence data about CKD. A recent population based study from Karachi Pakistan found a prevalence rate of 25.3% with 5% having a GFR <60 ml/min[6]. Micro albuminuria is one of the important markers of progression to end stage renal diseases and also increases the risk of cardiovascular disease (CVD)[7,8]. Worldwide, populations based studies show a high prevalence rate of micro albuminuria and hence there is a growing concern to manage the risk factors associated with micro albuminuria. The high prevalence rate is found in subjects having high blood pressure, elevated triglycerides & low high-density lipoprotein cholesterol (LDL-C)[5]. Thus, it is important to determine the prevalence rate of micro albuminuria and its associated risk factors like obesity, hypertension & diabetes to prepare effective strategies to reduce costs on health care system and improve the quality of life due to substantial increase in renal disease[9]. However, limited data is available about the prevalence rate of albuminuria and associated risk factors in the Pakistani population in general and Khyber pakhtunkhwa in particular. The objective of the present study is to determine the prevalence rate of albuminuria in the adult population of Peshawar city in Khyber Pakhtun Khwa.

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MATERIAL AND METHODS

The study population consists of 118 subjects (Female: 48 & 70 male) aged 45-75 years, visiting outpatient department of Khyber Teaching Hospital (KTH). Institutional ethical approval letters no 504-07/ KTH/HR was issued by the competent authority. Data was collected from each individual on informed consent on predesigned proforma using purposive sampling method. Systolic and diastolic blood pressures were measured thrice in setting position and the mean of the readings was used in the analysis. Patients having systolic blood pressure level ≥140 mm Hg, diastolic blood pressure level of ≥90 mm Hg or taking anti-hypertensive agent were labeled as hypertensive[10]. Body mass index (BMI) was calculated by dividing weight (in kg) by height squared (in m^2). Both males and females were divided on the basis of BMI as Underweight BMI<18.5 (kg/m^2), Normal, BMI= 18.5-22.9 (Kg/m^2), Overweight, BMI=23-25 (Kg/m^2), Obese, BMI >25 (Kg/m^2)[11].

Urinary Albumin and Creatinine Measurement

Spot urine sample from each subject was quantified for micro albumin by using solid phase sandwich ELISA on Dia 710 micro plate reader (Made in Australia)[12] and creatinine by modified Jaffe method on chemistry autoanalyser (Erbamannhein Germany)[13]. The results for micro albuminuria were expressed as ACR (Albumin Creatinine Ratio/gram of creatinine). Patients were categorized according to ACR results as norm albuminuria (ACR =20 mg/g Cr), micro albuminuria (ACR = 30–299 mg/g Cr), or macro albuminuria (ACR≥300 mg/ g Cr)[14].

Statistical Analysis

Statistical analysis of the data was carried out on SPSS for windows 21.0 software (SPSS Inc. Chicago, IL, USA) and MS Excel. The values were reported as Mean ± Standard Deviation (SD). Pearson's correlation analysis of ACR with age (years), BMI (kg/m^2), Systolic, Diastolic and Height (cm) was also performed to determine the association between these parameters with ACR. A two-tailed *p*-value <0.05 was considered statistically significant.

RESULTS

Comparison of the baseline line characteristics of the two genders

The mean age, BMI, ACR, systolic, diastolic pressure and height (cm) of the two genders are given in table-I. The mean values of age (60.48 years), ACR (56.64 mg/g Cr) and Height (169.86 cm) were higher in male than female (Mean age; 55.75 years, Mean ACR; 47.21 mg/g Cr, Mean height; 162.50 cm. The mean values of BMI (25.26 kg/m^2), systolic (139.58 mm of Hg) and diastolic (96.25 mm of Hg) were higher in female than the corresponding values in male (BMI; 24.53 kg/m^2, systolic; 134.58 mm of Hg and diastolic; 96.25 mm of Hg).

Comparison of the BMI of the two genders

Table-II shows the comparative BMI of the study population. The percentage of Obese (37.5% (18)) & Over weight (37.5% (18)) subjects were higher in female than in male population (Obese; 17.14% (12) & Over weight; 28.57% (20)).

Prevalence of hypertension & proteinuria in the two genders

Table-III show the comparative prevalence rate of hypertension and proteinuria in the two genders. The percentage of hypertensive (60%) and macro albuminuria patients (8.33%) were higher in female subjects than the male subjects (hypertensive; 25.71%) and macro albuminuria patients (2.86%). The prevalence of micro albuminuria was higher in male (25.71%) than the female subjects (25%)

Correlation analysis

Pearson correlation analysis of ACR with different parameters of the two genders is given in table-IV. ACR was positively correlated with age, systolic and diastolic pressure and negatively correlated with BMI and Height (cm) in female. A very strong positive correlation was found between ACR, systolic (p=0.003) and diastolic pressure (p=0.002) and insignificant negative correlation with Height (cm) in male.

DISCUSSION

The present questionnaires based survey includes anthropometric measurement and laboratory analysis of urinary albumin & creatinine. Data about family history of diabetes, hyperlipidemia, hypertension coronary heart disease and renal diseases were collected on a predesigned proforma. The three basic questions regarding the awareness about hyper tension, renal diseases and diabetes were asked from the male and female participant of the study. The awareness response in percentages is shown in the table-V. The table show that 51% female & 23% male of the total study population were aware of their hypertensive status but we found rather a higher % age of hypertensive states in female (60%) & male (25%). Similarly 22% of female & 10% of the male population were aware about their renal health, while we found a higher prevalence rate of micro albuminuria (25%) and

Table-I: Comparison of the mean values of age, BMI, ACR, syst, diasto and height.

S No.	Parameter	Female (n=48)				Male (n=70)			
		Min	Max	Mean	SD	Min	Max	Mean	SD
1	Age (year)	46.00	75.00	55.75	7.55	48.00	83.00	60.48	11.04
2	BMI (kg/m²)	19.40	32.30	25.26	3.86	17.90	41.10	24.53	4.01
3	ACR mg/gCr	8.00	300.00	47.21	80.88	10.00	1000.00	56.64	167.79
4	Systolic	120.00	190.00	139.58	20.10	120.00	190.00	134.00	17.18
5	Diastolic	80.00	140.00	96.25	15.27	80.00	120.00	91.71	11.24
6	Height (cm)	143.00	182.00	162.50	9.86	80.00	182.00	169.86	17.32

ACR; Albumin Creatinine Ratio/ gram of creatinine

Table-II: BMI of the study population.

S No.	BMI	Female (n=48)	Male (n=70)
1	Normal	25% (12)	51.43% (36)
2	Obese	37.5% (18)	17.14% (12)
3	Over weight	37.5% (18)	28.57% (20)
4	Under weight	0 % (0)	2.86% (02)

Table-III: Frequency distribution of hypertension & proteinuria in the two genders.

S No.	Parameter	Category	Female % (n)	Male % (n)
1	BP	Normotensive	58.33 (28)	74.28 (52)
		Hypertensive	60 (20)	25.71 (18)
2	ACR	Norm albuminuria (ACR=20 mg/g Cr)	66.66 (32)	71.43 (50)
		Micro albuminuria (ACR=30-299 mg/g Cr)	25 (12)	25.71 (18)
		Macro albuminuria (ACR ≥300 mg/ g Cr)	8.33 (04)	2.86 (02)

Table-IV correlation analysis of ACR with different parameters of the two genders.

S No.	Parameter	Female (n=48)		Male (n=70)	
		ACR		ACR	
		R	P	R	P
1	Age (years)	0.137	0.523	0.176	0.312
2	BMI (kg/m²)	-0.025	0.908	0.171	0.326
3	Systolic	0.323	0.123	0.488**	0.003
4	Diastolic	0.195	0.362	0.510**	0.002
5	Height (cm)	-0.017	0.936	-0.009	0.960

*Correlation is significant at the 0.05 level (2-tailed), **Correlation is significant at the 0.01 level (2-tailed).

Table-V: Level of awareness about hypertension, renal disease and diabetes in the study population

S No.	Disease	Female	Male
1	Hypertension	51%	23%
2	Renal	22%	10%
3	Diabetes	45%	36%

macro albuminuria (8.33%) in female than in male (micro albuminuria=25.71% and macro albuminuria=2.86%). The low level of awareness among the general population is due to low literacy rate in Pakistan in general & Khyber pakhtunkhawa in particular[15]. Hypertension is considered as one of the major risk factor of cardiovascular disorders worldwide and may cause a mild to moderate rise in serum creatinine and/or micro albuminuria and hence may derange renal function. The association between micro albuminuria and hypertension is well understood since 1974. Micro albuminuria is better quantified in term of albumin to creatinine ratio (A:C ratio) in the morning or spot urine sample than measuring albumin concentration only[16]. According to the latest recommendations of ADA 2001, 17 A: C ratio is the most reliable test to detect micro albuminuria. Thus, we measured urinary albumin by using random urine samples and expressed it as ratio A:C of mg of albumin per gram of creatinine. Based on this index we found a higher prevalence rate of micro albuminuria in female subjects than in the male subjects (prevalence rate of micro albuminuria (25%) and macro albuminuria (8.33%) in female; Male (micro albuminuria = 25.71% and macro albuminuria = 2.86%) which was much higher than those reported from Australia (6.0%), Europe (7%) and US (7.8%)[18-20]. These differences may be due to the differences in the size and nature of the populations under study or method applied for the quantification of micro albuminuria. More over the difference in prevalence of micro albuminuria in our results and those of other studies may be due to higher average age in our study population as micro albuminuria increases with age. There is large variation in the published data about the prevalence rate of micro albuminuria worldwide ranging from 4.7% to 40%[21]. The recently reported prevalence rate is 19.7% and 25.5% in south and north of India, respectively[22,23]. This result from India is very close to our prevalence rate because of similarities in our culture, dietary habits and same social and economic status. A recent study from Kuwait found a very high prevalence of micro albuminuria (27.3%) individuals with type 2 diabetes[24]. Several studies have reported an association of micro albuminuria with CVD risk factors, including hypertriglyceridemia, hypertension, and diabetes[25]. The association of micro albuminuria & hypertension is well established[26,27] and is also evident from the results of our study. Older age is itself an independent risk factor for micro albuminuria and CKD, even in normal subjects[28]. We evaluated the association of ACR with different variables like Age (years), BMI (kg/m^2), systolic, diastolic & Height (cm). Pearson correlation analysis of ACR with different parameters of the two genders shows that ACR was positively correlated with age, systolic and diastolic pressure and negatively correlated with BMI and Height (cm) in female. A very strong positive correlation was found between ACR, systolic (p=0.003) and diastolic pressure (p=0.002) and insignificant negative correlation with Height (cm). Similar results have been reported by Nishijo *et al* who found strong association between urinary albumins, systolic and diastolic blood pressure, in a study conducted on 245 non-diabetic Japanese men[28]. We suggests from the results of our study that a screening and awareness campaign should be launched to collect data about the prevalence rate of micro albuminuria in hypertensive subjects undergoing treatment in various government owned hospitals of Khyber pakhtunkhawa, providing an easy screening program me for micro albuminuria, and educate the hypertensive patients to change their life style and dietary habits to possibly reduce the incidence of end stage renal failure. Although it is the first study reporting the prevalence of micro albuminuria and its associated factors from Khyber Pakhtun khwa. The results of our study showed a higher prevalence of micro albuminuria in Pakistan than in Western population but were comparable to those reported from Asian countries. However, the high prevalence of micro albuminuria in our population is a matter of grave concern because

this condition may increase the chances of death due to kidney failure or CVD events. Therefore, it is necessary to identify and manage the risk factors in individual with micro albuminuria and preventive steps should be adopted because albuminuria is believed to be a risk factor of adverse outcomes even in general populations.

LIMITATION OF STUDY

There are some limitations of the study. The first is that a single urine albumin creatinine ratio result was used in this analysis which may be misleading in categorization of albuminuria and CKD stages. Secondly the sample size was too small limited to one center only. Lastly anti hypertensive drugs which some of the subjects in the study population were using might, have influenced the results of micro albuminuria.

CONCLUSION

Micro albuminuria was found to be more prevalent in male than in female while macro albuminuria patients were higher in female than in male.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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