ORIGINAL ARTICLE

Prevalence and Associated Factors of Albuminuria in Apparently Healthy Individuals in Lahore

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ABSTRACT

Aim: To determine the prevalence of albuminuria in apparently healthy individuals of Lahore and find the association of risk factors with albuminuria
Study design: Cross sectional survey.
Place and duration of study: PHRC Research Centre NHRC, Shaikh Zayed Medical Complex, Lahore from 1st January 2019 to 29th February 2020
Methodology: Survey was conducted after the ethical clearance from IRB of SZMC and permission from TMOs, Heads of union councils and commandant of DHA in Lahore. Two thousand and forty two subjects fulfilling the inclusion criteria were enrolled and interviewed to fill-up the questionnaire. All subjects were tested for Albumin: Creatinine ratio in morning spot urine sample.
Results: Overall prevalence of albuminuria was found to be 20.57%. Factors like old age (24.1% with p=0.004), obesity (26.6% with p< 0.0001) showed significant association with the presence of albuminuria. A positive family history of chronic kidney disease, diabetes and hypertension were also found to be strongly associated with albuminuria (p-values=0.0001, 0.002 and 0.002, respectively).
Conclusion: All at risk healthy individuals should be screened for albuminuria for early diagnosis of chronic kidney disease.
Keywords: Albuminuria, Microalbuminuria, Chronic kidney disease, Renal impairment, Albumin creatinine ratio

INTRODUCTION

Screening for albuminuria in general population is useful to identify individuals with accelerated loss of renal function or at increased risk for renal replacement therapy (RRT). Early diagnosis and treatment of chronic kidney disease (CKD) help to implement interventions to reduce cardiovascular morbidity, which is the main cause of death in these patients' worldwide[1].

Chronic Kidney Disease (CKD) is oftentimes quiet in its beginning phases, and the patient may have no signs or indications that can caution for its essence. The deferral in finding delays treatment and favours undesirable results. In beginning phase of renal impedance, CKD can without much of a stretch be recognized through generally accessible and cheap research facility tests, to ease back the movement to RRT, distinguishing proof and treatment of the most well-known confusions, and avoidance of early death.[2] The National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKFKDOQI) suggests screening for microalbuminuria and not standard pee dipstick for people who are at expanded renal hazard, since pee dipstick protein strategies are not touchy enough to identify microalbuminuria[3,4]. Almost 40 to 50% of individuals with microalbuminuria do not have one of the listed risk factors, therefore screening of the general population rather than targeted screening of those at increased risk is suggested with an albumin:creatinine ratio from a random urine specimen as valid screening tool because these are easy and relatively inexpensive to detect albuminuria which emerges early in the evolution of generalized vascular disease.

Albuminuria (>30 mg/day) based on 24 h urine albumin excretion is one of the criteria for CKD and a predictor of cardiovascular disease (CVD). Differences in urine albumin concentration and creatinine excretion rates between Indo-Asians and other populations may require different threshold values for detection of albuminuria. It was suggested that both urine albumin concentration and albumin to creatinine ratio are acceptable tests for population screening for albuminuria in Indo-Asians.[5] In another study in Pakistan the correlation of "random single voided urine protein: creatinine ratio" to "twenty four hour urine protein" at different levels of glomerular filtration rate (GFR) was determined, and it was suggested that random single voided urine protein : creatinine ratio" may be used as an alternative to "24 hour urine collection for protein" at all levels of GFR in Pakistani population[6].

A slightly elevated level of protein in the urine, or microalbuminuria, is one of the earliest markers of kidney disease. The microalbumin test can detect kidney damage when no other symptoms are present, to help patients and their physician's attention to slow disease progression in clinical practice, research and public health. Whereas Patients at increased risk for CKD should be screened for microalbuminuria at least annually, while those with confirmed microalbuminuria may require even more frequent monitoring depending on their response to treatment[7].

The prevalence of diabetes, hypertension and cardiovascular diseases are increasing, therefore it is

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important to diagnose renal impairment, at early stage through inexpensive laboratory tests as the delay in diagnosis postpones treatment and favours unwanted outcomes. In this study apparently healthy individuals from general community were screened for CKD using albumin:creatinine ratio. The albumin: creatinine ratio from a spot urine specimen is valid screening tool which highlights early vascular disease when no other symptoms are present.

MATERIALS AND METHODS

This cross sectional survey was conducted at PHRC Research Centre NHRC, Shaikh Zayed Medical Complex Lahore from 1st January 2019 to 29th February 2020. Two thousand and forty two subjects were tested for Albumin: Creatinine ratio in morning spot urine sample. Subjects of either sex, age range between 20–50 years, who have no previous history of kidney diseases were included. Known diabetics, hypertensive, and CAD patients of either sex as well as pregnant and menstruating women were excluded. After the ethical clearance from IRB of Shaikh Zayed Medical Complex, permission was taken from TMOs Lahore and Commandant DHA for conducting the project in 10 randomly selected union council and 10 blocks of DHA. In next phase permission from heads of selected union council were obtained for conducting the study in respective union council. A uniform study proforma was used as study tool to collect the data. Awareness banners highlighting the importance of screening was displayed a week before conducting the study in the respective union council. The study participants meeting the inclusion criteria were enrolled. The enrolled participants were provided with urine containers (20 ml) for morning spot urine samples. All urine samples were brought to the lab, and stored in two aliquots at -20 C with proper labels till further analysis. Urinary albumin: creatinine ratio was determined using microalbuminuria ELISA kit and creatinine levels were determined using biochemical kit (Fortress UK).Reports were delivered to the enrolled participants within 3 weeks after enrolment. Data was entered and analyzed using SPSS version 22.

RESULTS

There were 1019 males and 1023 females. Majority of participants were belong to age group 25-55 years (Table 1). Positive family history of diabetes was the most common characteristic which was found to be 23.9% among the participants of the study, followed by family history of hypertension as 17.6% and positive family history of kidney disease as 14.2%, whereas only 3.3% individuals had positive history of cardiovascular disease. On BMI evaluation 36.8% individuals were over-weight, class I obesity was found in 16.5% of participants, only 1.6% participants were found to have morbid obesity with BMI >40 (Table 2). Out of 2042 participants, 184 participants were found to be positive for macroalbumninuria (albumin:creatinine ratio >300mg/dl) whereas 236 were found to have microalbuminuria i.e. albumin:creatinineratio in the range of 30-300mg/dl. Overall prevalence of micro/macro albuminuria was found to be 20.57%. It was observed that albuminuria (albumin:creatinine ratio >30mg/g) was more common among female participants as compared to male participants (Table 3).

On evaluation of risk factors association with albuminuria, most significant association was observed with positive family history of kidney disease with P value of <0.0001.Out of 2042, 289 individuals were found to have positive family history of kidney disease. Out of these 289 participants, 36 (12.5%) had macroalbuminuria while 15 (5.2%) participants had urinary excretion of protein in the range of microalbumin (Table 4). Positive family history of hypertension and diabetes had almost equal association with albuminuria p value 0.002, butno significant association was observed between positive family history of cardiovascular disease and albuminuria (p=0.881). Obesity was another significantly associated factor with P value of <0.001. 1561 participants out of 2042 were found to have BMI <30, while 481 participants had BMI >30.Most of the participants were less than or equal to 45 years old (n=1253). Older age >45 years was significantly associated with presence of albuminuria (albumin:creatinine ratio >30mg/g) among all participants (p=0.004).

Table 1: Distribution of population according to age and gender

Age (years)	Male	Female	Total
< 25	166(16.3%)	184(18.0%)	350(17.1%)
25-40	303(29.7%)	381(37.2%)	684(33.5%)
41-55	355(34.8%)	316(34.8%)	671(32.9%)
56-70	162(15.9%)	125(12.2%)	287(14.1%)
>71	33(3.2%)	17(1.7%)	50(2.4%)
Total	1019(100%)	1023(100%)	2042(100%)

Table 2: General characteristics of study participants according to their gender

Variable	Gender		
	Male (n=1019)	Female (n=1023)	Total (n=2042)
Family history of kidney disease			
Yes	182(17.9%)	107(10.5%)	289(14.2%)
No	837(82.1%)	916(89.5%)	1753(85.8%)
Family history of hypertension			
Yes	203(19.9%)	156(15.2%)	359(17.6%)
No	816(80.1%)	867(84.8%)	1683(82.4%)
Family history of diabetes			
Yes	208(20.4%)	281(27.5%)	489(23.9%)
No	811(79.6%)	742(72.5%)	1553(76.1%)
Family history of cardiovascular disease			
Yes	32(3.1%)	35(3.4%)	67(3.3%)
No	987(96.9%)	988(96.6%)	1975(96.7%)
Body mass index			
< 18.5	40(3.9%)	33(3.2%)	73(3.6%)
18.5-24.9	430(42.2%)	305(29.9%)	735(36.0%)
25.0-29.9	385(37.8%)	365(35.8%)	750(36.8%)
30.0-34.9	130(12.8%)	206(20.1%)	336(16.5%)
35.0-39.9	25(2.5%)	87(8.5%)	112(5.5%)
40+	9(0.9%)	24(2.3%)	33(1.6%)

Table 3: Status of albuminuria according to genders of participants

Gender	Albumin:Creatinine Ratio (mg/g)			Total
	>300	30-300	<30	
Male	98	94	827	1019
Female	86	142	795	1023
Total	184	236	1622	2042

Overall prevalence of albuminuria (micro/macro) is 20.57%

DISCUSSION

In developing countries including Pakistan, the burden of CKD is growing mainly due to lack of community awareness. Although immense work has been done to establish the role of early screening of renal failure in patients with existing comorbidities, yet there is a lot more room for development of widely accepted screening tools and recommendations in general population. A recent report from Karachi, Pakistan, where general population was screened for using albuminuria in addition to serum creatinine, reported that the burden of CKD is comparable to neighbouring developing countries. Based on the results it was suggested that there is an urgent need for early recognition and prevention strategies based on risk factors and disease trends determined through longitudinal research[8].The significance of the current study lies in the fact that microalbuminuria is an early indicator of progressive renal disease in subjects with and without risk factors. While enormous data and preset guidelines are now available to screen patients with diseases like diabetes, hypertension, CAD and the like, for early detection of renal failure, only a handful of research has been done to establish guidance for screening general population to catch renal failure earlier.

Presence of albuminuria (micro / macro) is amongst one of the best clues towards the prompt detection of deranging renal function as is also evident from a well conducted study by Karoshia[9]. Multiple studies have stressed upon the detection of microalbuminuria as an appropriate screening method for early diagnosis of kidney disease[9-14]. Keeping this fact in view, we conducted a study in which we screened general population without any previous comorbidities for microalbuminuria.In our study overall prevalence of albuminuria (micro / macro) was found to be 20.5%, which is far more than Indian population(9.96% from study.[15] Our study depicted significant association of microalbuminuria with obesity (P<0.001)which is close to the findings from study done in China,[16] While our findings were in complete disagreement with the findings of study done in Japan where no significant association was observed between obesity and microalbumuria[17].

It is quite reasonable to predict the association of microalbuminuria with age more than 45 years and as a result of our study we were able to find a relevant link between microalbuminuria and old age (P=0.004).Similar findings were observed from population based studies done in China and India.[15,16] Positive family history of CKD was one of the significant association which we established in our study (P=0.0001), Likewise family history of diabetes and hypertension were also found to be associated with albuminuruia (P=0.002). Not many studies from the literature are available for the comparison but Weir[18]found 66% positive family history for one of the risk factors for CKD in people with albuminuria. Exact comparison is not possible as we only inquired about positive family history for CKD, diabetes and hypertension separately rather than family history of one of the risk factors for CKD. We are well known to the fact that microalbuminuria is considered a herald sign for the development of systemic manifestations of various illnesses like diabetes, hypertension, cardiovascular diseases as also supported earlier[14,19] but its role as an indicator of initiation of a disease process has also been looked into the recent past. Many studies from the past have established the relationship between microalbuminuria and renal failure. A cohort study with a follow up of 9 years proved a strong association in this regard with 40 percent of the subjects with albuminuria without any known comorbidity, ultimately leading to renal failure and requiring renal replacement therapy.[14]

Table 4: Association of different risk factors with albuminuria

Risk factors	Albuminuria (Measured as Albumin:creatinine Ratio) mg/g						Chi sq.	P value
	< 30		>30		Total			
	No.	%	No.	%	No.	%		
Obesity								
< 30.00	1270	81.4	291	18.6	1561	100.0	17.946	<0.001
>30.00	353	73.4	128	26.6	481	100.0		
Age								
≤ 45	1024	81.7	229	18.3	1253	100.0	11.268	0.004
>45	599	75.9	190	24.1	789	100.0		
Family history of hypertension								
Yes	297	82.7	62	17.3	359	100.0	12.089	0.002
No	1326	78.8	357	21.2	1683	100.0		
Family history of diabetes								
Yes	364	74.4	125	24.6	489	100.0	12.555	0.002
No	1259	81.1	294	18.9	1553	100.0		
Family history of cardiovascular disease								
Yes	52	77.6	15	22.4	67	100.0	0.254	0.881
No	1571	79.5	404	20.4	1975	100.0		
Family history of kidney disease								
Yes	238	82.4	51	17.6	289	100.0	16.463	<0.0001
No	1385	79.0	368	20.9	1753	100.0		

According to one study done on Australian population, detection of microalbuminuria in general population can be utilized as a primary prevention tool for preventing end stage renal disease[4] which goes in concordance with our study. A comprehensive meta-analysis suggested ACR 1·1 mg/mmol (10mg/g) or more to be one of the risk factors for developing renal impairment in the general population[12] and our results proved similar outcomes.

In the light of aforementioned facts and analogies it would be justified to state that our study depicts a noticeable prevalence of microalbuminuria in subjects with family history of predisposing risk factors.

CONCLUSION

Early detection of microalbuminuria in otherwise healthy subjects can help reduce the morbidity and mortality of diseases like diabetes, hypertension, renal failure, CVD and the like.

Recommendation: All apparently healthy individuals who are obese and have positive family history of kidney diseases, diabetes or hypertension should be screened for albuminuria for early detection of chronic kidney disease.

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