ORIGINAL ARTICLE

Burden of chronic kidney disease in an urban city of Pakistan, a cross-sectional study

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Abstract

Objectives: To estimate the prevalence of Chronic Kidney Disease in an urban city and to assess the risk factors associated with the condition.

Methods: The cross-sectional study was carried out from June to December 2012 by arranging health camps for asymptomatic population in Karachi at busy shopping areas frequented by people of all socioeconomic classes. The camps provided free screening tests for the general public. Serum creatinine was checked and estimated Glomerular Filtration Rate was calculated using the Chronic Kidney Disease Epidemiology Collaboration equation. SPSS 17 was used for statistical analysis.

Results: Of the 301 subjects who came to the camps, 293(97%) had their serum creatinine checked. The age range was 30-80 years. Chronic Kidney Disease was found in 75(25.60%)subjects. A significant relationship was found between the disease and Diabetes Mellitus and Hypertension (p=0.006). There was also a significant relationship between Hypertension and Diabetes with mean Glomerular Filtration Rate (p<0.001).

Conclusion: In view of the prevalence rate of Chronic Kidney Disease, early screening and risk factor stratification is recommended.

Keywords: Chronic kidney disease, End-stage renal disease, Glomerularfiltration rate. (JPMA 65: 366; 2015)

Introduction

Chronic Kidney Disease (CKD) is progressive loss of renal function.[1] CKD is a great burden on Pakistan's healthcare resources.[2] Lack of screening and risk identification often result in delayed treatment and implementation of preventive measures.[2] This often results in End-Stage Renal Failure (ESRD), requiring transplant and dialysis therapy.[2] Other complications of untreated CKD include cardiovascular disease (CVD).[3] For a country with an already struggling economy, it is important that the prevalence of CKD be accurately estimated and association with preventable risk factors is determined. Leading authors have advocated concentrated efforts to implement cost-effective strategies for the prevention of CKD, especially in Asia.[4,5]

The current study was planned to estimate the prevalence of CKD in an urban city of Pakistan and to determine its association with preventable risk factors such as Diabetes Mellitus (DM) and Hypertension (HTN).

Subjects and Methods

The cross-sectional study was carried out from June to December 2012 by arranging health camps for asymptomatic population in Karachi at busy shopping areas frequented by people of all socioeconomic classes. The camps provided free screening tests for the general public. Publicity related to the camps was arranged with the help of pamphlets and by volunteers providing information in person. The camps were conducted from 9am to 6pm; one day at each site.

The study population included volunteers aged 30 years or more as the study was intended to asses CKD in adults. People over 80 years of age or those who had already been diagnosed with CKD were excluded and so were all those who reported a prior history of DM or HTN.

A trained medical doctor took two separate readings for blood pressure of the subjects with a 10-15 minute interval. Two consistent readings of systolic >140 and/or diastolic >90 were considered diagnostic of HTN[6] Glycated haemoglobin (HbA1C) value was also checked and DM was diagnosed at HbA1C >6.5%.[7,8]

The sample size was calculated using the Sample Size Determination in Health Studies software provided by the World Health Organisation (WHO).[9] The reported prevalence of decreased estimated GFR (eGFR) in our region is between 15-20%.[10] Using an anticipated population proportion of 25%, a relative precision of 0.05 with 95% confidence interval (CI), the sample size calculated was 272, which allowed us to estimate the prevalence of decreased eGFR to within 5% of the true

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value with 95% confidence.

Serum creatinine level was also checked for all subjects. Using the serum creatinine value, eGFR was calculated using the CKD Epidemiology Collaboration Equation. CKD was divided into stages as given by the National Kidney Foundation Kidney Disease Outcomes Quality Initiative (KDOQI).[11]

Data was checked for errors. After looking at the distribution of continuous variables, summary statistics was generated by computing means ± standard deviation (SD). Frequencies and percentages were computed for categorical variables for the characteristics of participating subjects. Prevalence of CKD with 95% CI was calculated with Epi-Info version 6.04 (CDC, USA). To evaluate the association between CKD and clinical factors, chi square test of independence was carried out. The data was stratified by age and gender to assess the association of CKD with other comorbidities. Similarly, to check the association of eGFR with age, the data was stratified by gender and comorbidities. For contrasts of continuous variables, Independent sample t-test was used to assess the difference in means. Variables of interest were compared in CKD and non-CKD subjects using univariate analysis. All analyses were conducted using SPSS 17 and all p-values were two sided and were considered statistically significant when <0.05.

Results

The initial sample comprised of 301 subjects with 194(65%) of them being males. The overall median age was 48 (interquartile range [IQR] 38-55). Of the 301 subjects, 293(97%) had their serum creatinine checked. Among them, 218(74.40%) had GFR >90, 61(20.81) were in CKD stage 2 with eGFR 60-89, and 14(4.77%) in CDK stage 3 with eGFR 30-59 (Table-1).

These respondents came from diverse educational backgrounds with 69(23.54%) holding intermediate degree equivalent to two years of college and 41(14%) having no formal education at all. The median gross monthly income was US$172 (IQR: $115-344) (Table-2).

Table-1: Chronic Kidney Disease prevalence.

	Number	Percentage
GFR >90	218	74.40
CKD stage 2 eGFR between 60-89	61	20.81
CKD stage 3 eGFR between 30-59	14	4.77

CKD: Chronic Kidney Disease
GFR: Glomerular Filtration Rate
eGFR: Estimated GFR.

Table-2: Baseline Characteristics.

	GFR >90	CKD stage 2-3	P-value
Number	218	75	
Mean Age (years)	45.43 (SD 11.61)	55.43 (SD 12.78)	0.000
Gender (male)	138 (63.3%)	51 (68%)	0.463
Hypertension	49 (22.47%)	27 (36%)	0.021
Diabetes Mellitus	38 (17.43%)	23 (30.66%)	0.015
Education (intermediate)	52 (23.9%)	17 (22.7%)	0.43
Mean Monthly Income (rupees)	173(SD 23)	171 (SD 28)	0.56

D: Chronic Kidney Disease
GFR: Glomerular Filtration Rate

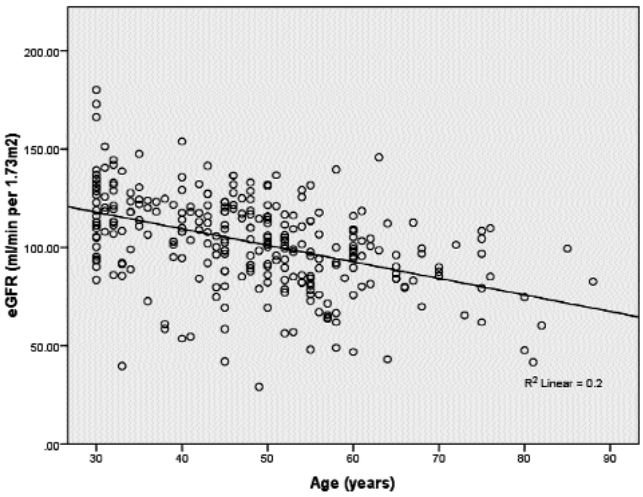

Figure: Correlation between age and estimated Glomerular Filtration Rate.

Furthermore 61(20.8%) patients diagnosed with CKD had DM (p=0.015) and 76(26%) had HTN (p=0.021).

It was found that mean eGFR in pateints diagnosed with DM was 96.4 compared with 105.5 in non-diabetics (p=0.002). Similarly, HTN patients had a lower eGFR compared to non-hypertensives (100 vs 105; p=0.029).

Their was also a negative corelation between age and eGFR while accounting for other variables, raceand comorbidities (r=-0.45; p<0.001) (Figure).

Discussion

Our study shows that the prevalence of CKD is very high in asymptomatic population of Karachi, the largest urban city of Pakistan, that was unaware of the diagnosis of CKD, HTN or DM. The latter two, both potentially preventable risk factors, add to CKD risk. Alarmingly, most of the patients diagnosed with CKD were not receiving any medical care. This highlights the need for routine early screening and risk stratification.

Recent reports have described CKD as a global epidemic.[12] The prevalence of CKD has been found to be 5.09% in China.[13] In the developing countries, CKD is often not diagnosed and patients do not receive any interventions.[14] This can result in the development of ESRD, requiring transplant and dialysis therapy.[14] In Pakistan, where healthcare is a privilege rather than a basic right, access to dialysis therapy is limited owing to financial costs and lack of availability.[15,16] Other challenges such patients include lack of access to transplant centres, quality and safety issues, and exploitation associated with transplant tourism.[17] With limited resources, it is prudent to invest on the prevention of ESRD by implementing healthcare policies to delay the progression of CKD.[18]

CKD has always been thought to exert a great burden on Pakistan, but no large-scale surveys estimating the prevalence in the general population have been done. To our knowledge, the current study is the first such survey to assess the prevalence in asymptomatic population of an urban city in Pakistan. The estimated prevalence of CKD from our survey is much higher than the reported prevalence from Unites States, India and China.[19-21] Our study objectively shows that CKD is a major healthcare problem. We found significant association of HTN and DM, both preventable risk factors with CKD. Hence, it is likely that HTN and DM are the major causes of CKD in urban areas of Pakistan. Furthermore, as CKD is a progressive disease, most patients without treatment will develop ESRD and other metabolic complications.[22] This not only exerts a great burden on the struggling economy, but also affects the productivity of a society. Evidence-based healthcare policies have been shown to be very successful in decreasing the burden of CKD in Brazil, Cuba and Bolivia respectively, and serve as an excellent model for other developing countries.[23-25]

More emphasis is now being laid on health policies directed towards preventive measures to decrease the disease burden. We feel that this shift from sickness and cure to wellness and prevention underlines the fact that debilitating medical conditions can be prevented by evidence-based policies directed at risk stratification and efficient resource allocation.

An accurate identification of the burden caused by CKD and its modifiable risk factors in different regions of Pakistan is necessary for efficient healthcare policies to be formulated for high, moderate and low risk regions through better resource allocation and other policy initiatives.

We feel that the time has come for long-term policies to be formulated to limit the burden exerted by CKD on Pakistani population. Apart from a central CKD registry on the basis of large multi-centred surveys suggested above, mass screening campaigns directed towards early disease identification and risk stratification would be judicial investments. As DM and HTN are major causes of CKD in Pakistan, controlling them would delay progression to ESRD.

With implementation of evidence-based policies, there is a great potential to reduce the burden of CKD in Pakistan.

The study had its limitations. Only serum creatinine of the patients was checked. As urine analysis is required for diagnosing earlier stages of CKD, a lot of patients with stage 1 CKD could have been missed. Hence, only patients with stage 2 or worse were identified. It is apparent that the calculated prevalence in our study was actually an underestimate.

As the study was conducted in a shopping centre, many confounding factors such as fatigue and appetite could have affected blood pressure and creatinine readings. However, the results reflect a very high prevalence of CKD and its preventable risk factors in the target population should be promoted.

Lastly, as we opted for a cross-sectional design, the study could not establish a causal relationship between various diseases such as DM and HTN with CKD.

Conclusion

The prevalence of CKD was significantly higher in the study. However, the calculated prevalence is most likely to be an underestimate as patients with earlier stages of CKD could have been missed. Considering the alarmingly high prevalence of CKD compared to other countries and its impact on morbidity, mortality and financial burden, we recommend that early detection and treatment of the disease should be the priority in healthcare policies of the region.

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