

4.3 EPIDEMIOLOGY OF CHRONIC KIDNEY DISEASE IN SRI LANKAN POPULATION: EXPERIENCE OF A TERTIARY CARE CENTRE

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Renal Data from Asia-Africa

Epidemiology of Chronic Kidney Disease in a Sri Lankan Population: Experience of a Tertiary Care Center

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ABSTRACT. Chronic kidney disease (CKD) is a growing problem in Sri Lanka. Diabetes and hypertension are the main contributors to the disease burden. A new form of CKD of uncertain etiology (CKD-u) is the predominant form of CKD in certain parts of Sri Lanka, threatening to reach epidemic proportions. A cross-sectional descriptive study was carried out over a three-month period at the National Hospital of Sri Lanka to identify the underlying etiologic factors for the disease in a cohort of patients with CKD. A total of 200 patients were studied with a mean age of 50.57 years. Of them, 108 (54%) were in CKD stage V. Majority of the patients were from the western province (137, 68.5%) with only five (2.5%) from provinces with high prevalence of CKD-u. The most common underlying causes of CKD were diabetes (88, 44%) and hypertension (34, 17%). However, in patients younger than 40 years of age the most common cause was glomerulonephritis (20, 42.6%). Diabetes was the most common cause of CKD among patients from the western province (74, 54%). The prevalence of CKD-u was twice as high in patients from areas outside the western province compared with patients from this province ($P > 0.05$). The low prevalence of CKD-u in the study population could be the result of poor representation of patients from provinces with high prevalence of CKD-u.

Introduction

Chronic kidney disease (CKD) is fast becoming a global epidemic.¹ Data from the United States suggest that for every patient with end-

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stage renal disease (ESRD), there are more than 200 with overt CKD (stage III or IV) and almost 5000 with covert disease (stage I or II).² Unfortunately, such data are not available for most of the developing countries, including Sri Lanka.

CKD is a growing problem in Sri Lanka. Hospital admissions due to diseases of the genitourinary system have nearly doubled during the period between 1990 and 2007.³ During the same period, hospital deaths due to diseases of the genitourinary system has risen from 2.6 to 9.1

per 100,000 population.³ CKD has been the predominant contributor to this rise in in-hospital morbidity and mortality.

The increased incidence of CKD is mainly attributed to the rise in prevalence of type-2 diabetes mellitus and hypertension among the Sri Lankans.^{4,5} Additionally, an apparently new form of CKD of uncertain etiology (CKD-u) has recently emerged from certain parts of Sri Lanka. This entity is the chief contributor to the increasing number of CKD patients originating from north and north central provinces of the country.⁶ The observation that diseases of the genitourinary system are the leading cause of in-hospital deaths in Anuradhapura and the second leading cause in Polonnaruwa and Vavuniya, in comparison to them being the ninth leading cause of in-hospital deaths overall in Sri Lanka, highlights the impact of CKD-u in these provinces.³

Diabetes and hypertension are considered to be the chief causes of CKD in areas outside the CKD-u provinces. However, with the recent liberation of the northern territory from the clutches of civil war, more and more patients from these areas are seeking treatment from tertiary care centers in Colombo and Kandy (which are situated outside these CKD-u provinces).

Therefore, the epidemiology of CKD in these non-CKD-u areas is also changing. Hence, research on CKD should be extended to all parts of the country without confining only to the CKD-u areas.

Subjects and Methods

A cross-sectional descriptive study was carried out in the medical wards and the renal clinic of the university medical unit of the National Hospital of Sri Lanka. Consecutive consenting patients with CKD who were admitted to the wards and all patients with CKD who attended the clinic and who gave consent were recruited over a period of three months.

Patients with serum creatinine more than 120 $\mu\text{mol/L}$, either persisting for more than three months or associated with ultrasound evidence

of CKD, were considered as having CKD.

An interviewer-administered questionnaire was used to gather information related to CKD. Additional information was gathered from the bed head tickets of the patients and from their follow-up notes and clinic records.

Diabetes was considered the presumptive underlying cause of CKD if a patient had clinically and biochemically confirmed diabetes mellitus and one of the following criteria in the absence of indicators of any other etiologies: long duration of diabetes before the onset of CKD (minimum of five years) or the presence of diabetic retinopathy on fundus examination.

Hypertension was considered the presumptive underlying cause if a patient with CKD had hypertension associated with any of the following criteria in the absence of indicators of any other etiologies: long duration of hypertension (at least five years), presence of concentric left ventricular hypertrophy, or the presence of hypertensive retinopathy at the time of diagnosis of CKD.

A diagnosis of glomerulonephritis was made based on renal biopsy findings. Other etiologic factors were diagnosed on the basis of renal imaging and biopsy findings.

The stage of CKD was established based on the estimated glomerular filtration rate (GFR) according to the Kidney Disease Outcomes Quality Initiative (K/DOQI) guidelines.⁷ The estimated GFR was calculated using the abbreviated MDRD equation.⁸

Differences in patient characteristics between the two groups for categorical variables were assessed by the Chi-square test. For continuous variables, a *t* test for independent samples was done. The level of significance was set at $P < 0.05$. All analyses were done with the SPSS 16.0 statistical software.

Results

A total of 200 patients were included in the study with male to female ratio of 2.1:1. The mean age was 50.57 years with a range from 10 to 85 years. A total of 108 patients (54%) had CKD stage V, whereas 42 (21%) and 26 (13%)

Table 1. Relationship of age groups with different etiologies of chronic kidney disease.

Etiology	Overall number n (%)	Over 40 years n (%)	Under 40 years n (%)	P value
Diabetes	88 (44)	83 (54.2)	5 (10.6)	0.0001
Hypertension	34 (17)	30 (19.6)	4 (8.5)	0.076
Glomerulonephritis	24 (12)	4 (2.6)	20 (42.6)	0.0001
Chronic pyelonephritis	1 (0.5)	—	1 (2.1)	—
Obstructive uropathy	11 (5.5)	8 (5.2)	3 (6.4)	ns
Polycystic kidney disease	12 (6)	9 (5.9)	3 (6.4)	ns
Hereditary	9 (4.5)	5 (3.3)	4 (8.5)	ns
Miscellaneous	2 (1)	—	2 (4.3)	—
Uncertain	19 (9.5)	14 (9.2)	5 (10.6)	ns
Total	200	153	47	

patients had CKD stage IV and III, respectively.

The common underlying causes for CKD included diabetes, seen in 88 patients (44%) followed by hypertension, seen in 34 (17%) (Table 1). However, the most common cause for CKD in patients younger than 40 years was glomerulonephritis, seen in 20 patients (42.6%). The difference in the prevalence of CKD due to diabetes between the older and younger age groups was statistically significant (54.2 vs 10.6%, $P < 0.05$). Similarly, the difference in the prevalence of CKD due to glomerulonephritis between the two groups was statistically significant (2.6 vs 42.6%, $P < 0.05$). Majority of the patients, numbering 137 (68.5%), were from the western province. Only five patients (2.5%) were from north and north central provinces where CKD-u has a high prevalence. Diabetes was the cause of CKD in 74 patients (54%) from the western province compared with only 14 (22.2%) from elsewhere (Table 2). Hypertension

was the cause of CKD in 18 patients (28.6%) from areas outside the western province compared with only 16 (11.7%) from the western province. Both these differences were statistically significant.

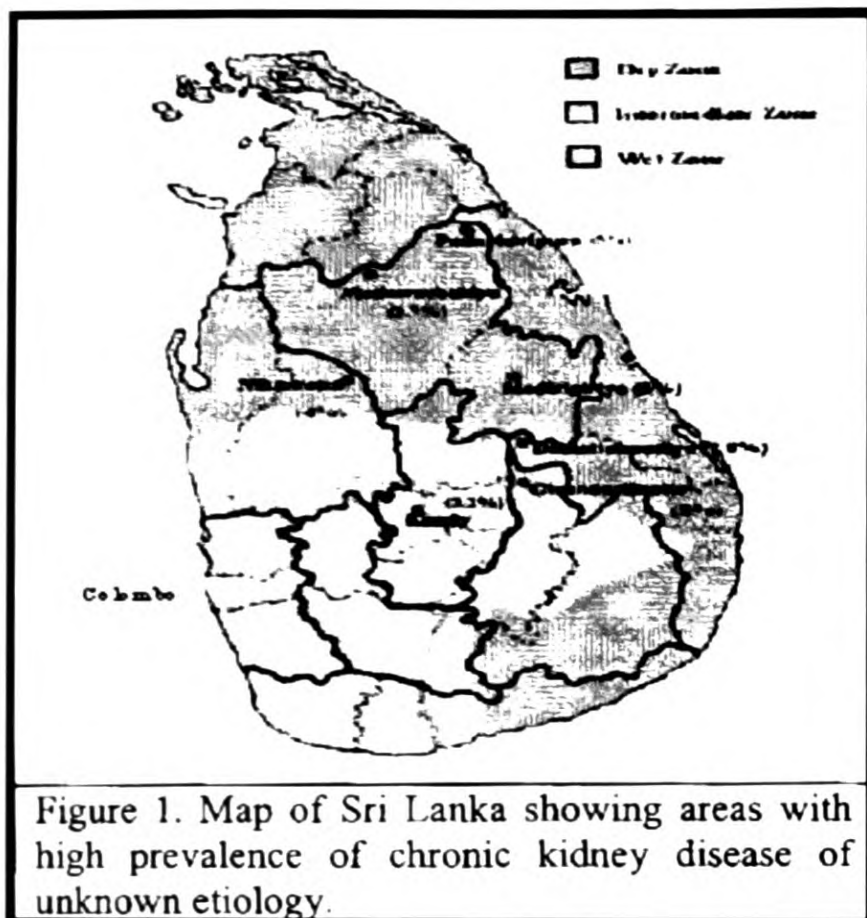
The prevalence of CKD without any apparent cause was only 19 (9.5%) in the population studied. The prevalence of this entity was almost twice as high in patients who were from areas outside the western province compared with patients who were from this province (9, 14.3% vs 10, 7.3%). However, this difference was not statistically significant.

Discussion

CKD is reaching epidemic proportions in Sri Lanka. In this background, knowledge of the etiologic factors for CKD in Sri Lanka is important. Diabetes and hypertension are on the rise in Sri Lanka in line with other Asian

Table 2. Comparison of etiology of chronic kidney disease between patients from the western province and elsewhere.

Etiology	Western province n (%)	Outside western province n (%)	P value
Diabetes	74 (54%)	14 (22.2%)	0.001
Hypertension	16 (11.7%)	18 (28.6%)	.006
Glomerulonephritis	12 (8.8%)	12 (19%)	ns
Chronic pyelonephritis	1 (0.7%)	-	-
Obstructive uropathy	10 (7.3%)	1 (1.6%)	ns
Polycystic kidney disease	6 (4.4%)	6 (9.5%)	ns
Hereditary	7 (5.1%)	2 (3.1%)	ns
Miscellaneous	1 (0.7%)	1 (1.6%)	ns
Uncertain	10 (7.3%)	9 (14.3%)	ns
Total	137	63	



countries.^{4,5} This observation is further highlighted in our study. These findings were similar to the results of the previous study conducted three years earlier in the same institute.⁹ In that study, conducted by Gooneratne et al, at the National hospital of Sri Lanka in 2006, diabetic nephropathy was the leading cause of CKD with a prevalence of 30.6%. Prevalence of hypertension as a cause of CKD was 13.2%.

However, there are significant differences in the results between the two studies. The prevalence of diabetic nephropathy had risen by almost 50% from 30.6% to 44% during the 3-year period. There had been a smaller rise in the prevalence of hypertensive nephrosclerosis (13.2%–17%).

The prevalence of CKD of uncertain etiology in our study population was only 9.5%. This was much lower than the figure three years back, which was 25.6%. Several factors could have contributed to this. Firstly, our study contained a higher number of patients from the western province compared with the previous study (western to elsewhere ratio of 2.2:1 vs 1.4:1). Secondly, only five patients (2.5%) were from provinces with high prevalence of CKD-u. Thirdly, better diagnostic work-up might have resulted in a higher number being diagnosed as having a specific cause for their disease (eg,

hereditary causes, glomerulonephritis).

CKD of uncertain or unknown etiology is an entity described in certain provinces of Sri Lanka. The geographic distribution of CKD-u appears to be based toward the northern regions of the country in which the north central, part of north western, and part of Uva provinces are included. The population at risk are scattered in the north central region with high prevalence observed at Medawachchiya, Padaviya, Dehiattakandiya, Girandurukotte, Medirigiriya and recently Nikawewa (Figure 1).

This entity was discovered when several studies failed to identify a specific cause for CKD in the vast majority of the patients from these areas. For example, a recent study which was carried out among CKD patients attending the outpatient clinics of Kandy and Anuradhapura hospitals, which provide services for most of these CKD-u areas, revealed that 54% and 82% of patients, respectively, were not identified to have a specific cause for the disease.⁶ This is in contrast to the reported prevalence of CKD of uncertain etiology in other parts of the world, which ranges from 6.2% to 14.7%.¹⁰ The majority of the affected patients were young males engaged in paddy farming who belonged to low socioeconomic communities.

The presence of high levels of fluoride, widespread use of agrochemicals, presence of heavy metals, such as cadmium, lead, and uranium in soil and water could be postulated as contributory factors. As demonstrated in some studies, mycotoxins, use of herbal/ayurvedic medicines, smoking, and a history of snake bite are some other factors to be considered.¹¹

However, no convincing evidence for a specific cause for this entity has yet been found. A study funded by the World Health Organization is currently underway in Sri Lanka in order to resolve this issue.

Our study was conducted at the National Hospital of Sri Lanka, which is the largest hospital in the country, situated in the capital Colombo, mainly functioning as a referral center for specialized care of patients. It also provides general medical services for a large proportion of inhabitants of Colombo and a similar number

visiting the city on a daily basis. It has eight general medical units, including our unit. In addition, our unit functions as a specialized nephrology, dialysis, and transplant unit. We provide inpatient care, outpatient care, and referral services.

The specialized nature of our nephrology services resulted in majority of the study patients belonging to advanced CKD. In addition, certain etiologic factors, such as glomerulonephritis and hereditary diseases may have been over-represented in the study population, especially among the young.

Since the study was institution-based, other variables such as the health-seeking behavioral patterns of the patients, the distance to the hospital, the socioeconomic status of the patients, and the ability to afford travel, would have affected the results. Therefore, these results may not represent the true epidemiologic pattern of the CKD in the area concerned.

We used the inclusion criterion of serum creatinine value of 120 $\mu\text{mol/L}$ while selecting patients for the study. Thus, we might have missed patients with early stages of CKD and would have confined our study only to patients with advanced CKD. This is a limitation in our study. In conclusion, diabetes and hypertension are the leading causes for the CKD in the western province of Sri Lanka. Post-War changes in population demographics do not seem to have influenced the epidemiology of CKD in areas outside the CKD-u provinces. Larger multicenter studies involving units caring for CKD patients in both CKD-u and non-CKD-u provinces should be carried out in order to understand the true burden of the disease in Sri Lanka.

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