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Burden of disease – prevalence and incidence of renal disease in India

M. Rajapurkar and M. Dabhi

Department of Nephrology, Muljibhai Patel Urological Hospital, Nadiad, Gujarat, India

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Abstract. Chronic Kidney Disease (CKD) burden is increasing worldwide. In developing countries like India, limited financial resources and lack of infrastructure put a severe strain on existing health policies in the light of the increasing burden of CKD. The exact prevalence of CKD in India is not known due to lack of adequate data recording systems both in the Government and insurance sectors. Recently with the support of the Indian society of Nephrology, a CKD registry has been formed with the hope of generating adequate information about CKD patients in India. Here we have reviewed various published studies on the magnitude of CKD in India. Three studies which have been carried out in different parts of India have been reviewed to examine the prevalence of CKD, which ranges from 0.79% to 1.4%. The incidence of End Stage Renal Disease was estimated to be 181 per million population in 2005 in central India. Many more such efforts are needed across our country in order to determine the exact burden of CKD.

Introduction

Chronic kidney disease (CKD) and end-stage renal disease (ESRD) are associated with increased morbidity and mortality. India has the largest number of people with diabetes in the world, with the projected figure of 57.2 million cases in 2025 [1]. The number of people with hypertension is expected to double from 2000 to 2025 [2]. These will make India the reservoir of CKD. Therapy of CKD and ESRD is very expensive and out of the reach of more than 90% of patients in India [3].

The reported annual incidence of ESRD differs between developed and developing countries, 34 – 240 per million population (pmp) to 98 – 198 pmp, respectively. The available information on prevalence of ESRD depends on estimates from the rest of the world, tertiary care data and the collective experience of senior nephrologists. Previously a figure of 100 pmp was often cited [3]. Exact data of the prevalence of CKD in India are unknown, because of the lack of a comprehensive renal registry. At the behest of the Indian Society of Nephrology a group of nephrologists started a project to analyze the data on CKD patients presenting to practicing nephrologists. In this project called "CKD Registry of India", data submission is voluntary and, it has to be said, the questions were not designed to provide data on the total burden of disease.

While the magnitude of the problem of CKD in India is not known, it can be estimated from various published studies. These studies which were published and some studies whose data, though unpublished, are available from presentations during the annual conferences of the Indian Society of Nephrology, will be discussed and analyzed.

Prevalence of CRF in India

Southern India

Mani [4] from Chennai published the first study on the prevalence of CKD in India. It was a population-based study which was primarily aimed at preventing kidney disease, particularly by the detection and treatment of diabetes and hypertension. He studied 25,000 subjects in a group of villages surrounding Chennai. Girls who had left school were trained as preventive and social health workers. They visited homes by bicycle and ap-

Correspondence to
M. Rajapurkar, MD
Muljibhai Patel
Urological Hospital,
Dr.V.V.Desai Road,
Nadiad-387001, Gujarat,
India
mmrajapurkar@
mpuh.org

plied questionnaires, measured blood pressure and checked urine for protein and glucose. The nephrologist visited once a month. Subjects with abnormal findings on their history, examination, or urine, were further tested for blood urea, serum creatinine and glycated hemoglobin.

Of this original population, 21,062 were screened; hypertension was detected in 5.26% and diabetes was seen in 3.64% whereas renal disease, short of chronic renal failure (CRF) was present in 0.68% and chronic renal failure was present in 0.16% of the population. GFR was calculated from the MDRD equation and CRF was defined as GFR < 80 ml/min. Since serum creatinine was checked only in patients with positive findings in history or on urinalysis, CKD could have been missed in many patients and thus the prevalence underestimated; however it is unlikely that CRF was missed.

This program has recently been expanded to an adjacent area with a population of 21,500. Both the original population and the new population are being surveyed. The glomerular filtration was estimated by MDRD formula. The results of this study [5] were published in 2005. At the time of reporting 6,100 persons from the new area and 20,986 from the old had been studied. The prevalence of GFR < 80 ml/min in original population was 8.6 per thousand and in the new population was 13.9 per thousand.

North India

This study [6] was carried out by the All India Institute of Medical Sciences New-Delhi, India. It is the first community-based epidemiological study to determine the prevalence of chronic renal failure in India. This study was funded by the Indian Council of Medical Research and spanned 3 years. All subjects over 14 years were included. The investigators adopted a multi-stage clustering sampling method. Each area of southern Delhi was divided into clusters. Enrollment started from one direction of the cluster until the required number for each was achieved. If the desired number was not achieved, enrollment started from a different direction.

The team of investigators comprised a doctor, a field supervisor and a laboratory technician. Individuals were studied using a detailed questionnaire, physical examination, and a dipstick urine test for albumin and sugar. Blood testing for creatinine and sugar was done on all subjects. Renal failure was defined as serum creatinine > 1.8 mg%. To confirm chronicity of disease, repeat testing was conducted after 8 – 12 weeks. Hypertension was defined according to JNC VII.

A total 4,972 subjects were evaluated from whom samples for testing were available in 4,712 cases. CRF was detected in 37 patients (0.785%). CRF prevalence was calculated to be 7,852 pmp. The mean serum creatinine among 37 patients identified as having CRF was 2.89 ± 2.2 mg% (range 1.9 – 10.7). Hypertension and diabetes were found in 22.8% and 11.1%, respectively. Diabetic nephropathy was possibly the commonest etiological factor, found in 41% of patients with CRF.

Since this study relies solely on the serum creatinine for defining CRF, and the cut off level was taken as 1.8 mg%, the exact prevalence is likely to be underestimated.

Central India

Modi and Jha [7] reported a study from Bhopal, calculating the incidence of ESRD for 4 consecutive years from 2002 to 2005 among 572,029 subjects residing in the city of Bhopal who were beneficiaries of free health-care in a hospital established after the 1984 Union Carbide Industrial Accident. They reported that the average crude and age adjusted incidence rates of ESRD were 151 and 232 pmp, respectively. The mean age was 47 years and 58% were males. Diabetic nephropathy was cause of ESRD in 44%.

Indian CKD Registry

The Indian CKD Registry is now 3 years old. The number of centers contributing data to the registry has increased to 154, including 38 centers from the Indian Society of Pediatric Nephrology. The total database now has

Table 1. Summary of data from studies of CKD burden from India.

Author	Geographical area	Method of study	No. of subjects	Criteria for CKD	Prevalence
Mani 2003 [4]	South India	Domiciliary	20,986	MDRD GFR < 80 ml/min/1.73 m^2	8.6/thousand (0.86%)
Mani 2005 [5]	South India	Domiciliary	6,100	MDRD GFR < 80 ml/min/1.73 m^2	13.9/thousand (1.4%)
Agarwal et al. 2005 [6]	North India	Screening camp module	4,712	Serum creatinine > 1.8 mg/dl	7.85/thousand (0.785%)
SEEK study	India	Domiciliary, community-based camps, hospital-based camps	5,623	MDRD–III, GFR < 60 ml/min/1.73 m^2 or urine albumin ≥ 1+	17.4% CKD Stage 3 – 5: 6%

data on 38,193 patients. Males constitute nearly 69.6%; the mean age is 47.90 ± 16.8 years in the adult population. The majority of patients reporting to nephrologists were in CKD Stage 4 – 5 groups (73%). Diabetes mellitus as the cause of CKD was found in 31.2% of the patients, Type 2 being responsible in 96.9% of the cases with the duration of diabetes being < 10 years in 44.7% of the cases. Cardiovascular disease was seen more commonly as the stage of CKD progressed; 0.7% in Stage 1 increasing to 48.5% in Stage 5. This registry, as it is now, has some limitations, containing only point data captured when the patient comes to a nephrologist for the first time. As of now, there are no follow-up data. All the data of this registry have until now, have been published on its website www.ckdri.org and presented during the annual conference of the Indian Society of Nephrology.

SEEK study

"Screening and Early Valuation of Kidney Disease" (SEEK) study was started in 2006 by a group of nephrologists, comprising nephrologists from Brigham and Women's Hospital and Harvard Medical School, USA, and 23 Indian nephrologists. The major aim of this study is to determine the prevalence of kidney disease and its major causes and complications in both rural and urban population across India. In addition, this study also has other aims and objectives, including characterizing of the risk factors for CKD, developing predictive risk factor models for CKD, describing the complications relevant to the Indian population, and developing educational material in local languages to educate the population about kidney disease. This study utilized a camp-based approach for inclusion of subjects which may have introduced some selection bias.

The SEEK data have been presented at the Annual Conference of the Indian Society of Nephrology for the last 2 years. At the last presentation, 6,120 adult subjects from 21 centers from 53 community camps had been screened. In this study CKD was defined according to the NKF definition and GFR was calculated from MDRD equation. This study reported a very high prevalence of 17.4% of CKD among 5,623 participants; 1.6% out of these being in CKD Stage 4 and 5. Out of 17.4% with CKD only, 1.6% were in CKD Stage 4 and 5, while 7% were in CKD Stage 1, 4.3% were in CKD Stage 2 and 4, and 5% were in CKD Stage 3. Under the definition of CKD SEEK included all patients with known proteinuria and abnormal urinary findings for more than 3 months with or without reduced GFR. This is probably the reason for high incidence reported in this study. In the urban population CKD prevalence was 25.5% vs. 9.4% in rural settings.

Conclusion

Although the exact burden of CKD in India is still not known, from the above discussion of published and unpublished studies it is possible to estimate prevalence and incidence of CKD in India which is relevant in planning preventive health policies with limited re-

sources in developing countries such as India. Studies have shown the prevalence of CKD ranges from 0.78% to as high as 17.4%, while the incidence is 151 pmp. Difference in prevalence can be explained on the basis of population bias as well as the use of different methodology in defining CKD. The SEEK study has defined CKD according to a new CKD definition which includes patients with normal renal function with abnormal urinary findings. In our view, SEEK is reflecting the real burden of CKD. The burden of end-stage CKD needing renal replacement is probably more than the figure of 0.78% but much less than the figure of 17.4%. Considering the cost of renal replacement and the magnitude of the problem it appears that the best way forward for our country would be to adopt the strategy of prevention, as in the model demonstrated by Mani [4] in Chennai.

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