Original Article

Causes, comorbidities and current status of chronic kidney disease: A community perspective from North Kerala

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Abstract

Context: Chronic kidney disease is an upcoming public health problem characterized by premature mortality and expensive treatment in low resource settings where diabetes is highly prevalent. **Aim:** To find out the causes and comorbidities and to explore the community support systems for treatments availed. **Settings and Design:** Community based cross sectional design. **Materials and Methods:** Interview of known chronic kidney disease patients above 18 years registered under palliative clinics. **Statistical Analysis Used:** Mean, SD, proportions, and 95% Confidence interval, chi square test at significance level $P = 0.05$. **Results:** Majority of patients were males, below 60 years. Mean duration was 5.26 years and mean age at onset was 48.6 years and 62% were in advanced stages of disease. The commonest cause was diabetic nephropathy (44.6%) followed by hypertensive nephropathy (33.3%).The comorbidities included hypertension (61.4%), diabetes (47.3%), cardiovascular disease (30.6%), Chronic obstructive pulmonary disease (10%) malignancies (2.6%), and retinopathy (28%). Considering treatment status 60.6% were on dialysis 13.3% had undergone transplantation, mostly from private institutions with help of public donations and both at significant underutilization by women. Though 44.6% were protected by social security schemes, the median monthly cost of disease management amounted to Rs. 10,500 which was unaffordable for the majority who were below the poverty line. **Conclusions:** There is an impending need for strengthening management, high-risk screening among diabetic and hypertensive patients and provision for specialist care to delay the onset of end-stage renal disease. The social security support system should be improvised for our setting to facilitate dialysis and transplantation to minimize out of the pocket expenditure.

Keywords: Causes, chronic kidney disease, community support, comorbidities, cost, gender, treatment

Introduction

Chronic kidney disease (CKD) is an emerging public health problem. Global disease burden report of 2015 pointed that is CKD is the 12th most common cause of death with a 37.1% rise in mortality over 10 years.[1,2] Even in western world, the health care cost and financial burden due to CKD is huge and unsustainable.[3] Due to rapid life style changes, increased life expectancy, and high prevalence of non-communicable diseases, chronic kidney disease is uniformly affecting low and middle income countries including India. As we have no renal registry or a standardized diagnostic method the actual burden is still unknown and it varied widely from 2.9% to 16.54% in different studies using different methods.[4,5] Lack of both awareness and treatment facilities make diagnosis possible, only at late stages of 4 or 5. Our health care system is not well equipped for management of CKD and many patients die without appropriate treatment.[6] CKD affects mostly males in their productive age groups. The commonest cause of

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Received: 19-06-2019 **Revised:** 19-06-2019 **Accepted:** 01-08-2019

Access this article online

Quick Response Code:

Website: www.jfmpc.com

DOI: 10.4103/jfmpc.jfmpc_478_19

How to cite this article: Jacob SR, Raveendran R, Kannan S. Causes, comorbidities and current status of chronic kidney disease: A community perspective from North Kerala. J Family Med Prim Care 2019;8:2859-63.

CKD is diabetic nephropathy and a good fraction develop it within 10 years after being diagnosed with diabetes.[7] Kerala, well known for good health care seeking behavior, has a high prevalence of type 2 diabetes mellitus, hypertension, and its risk factors with an early onset making the population vulnerable for CKD.[8,9] Out of pocket expenditure is also high.[10] In government setting the availability of nephrologists, facilities for haemodialysis and renal transplantation is limited. Major care provider in kidney disease management is private sector, a little higher than in general health care. Government has provided specific financial assistance schemes namely Karunya benevolent fund, Rashtriya Swasthya Bhima Yojana for CKD patients. In this northern district of Kerala, treatment support for kidney disease patients from non-governmental sources were channelized through palliative care clinics. This study was conducted with the objectives to identify the common causes of CKD, existence of comorbidities, present treatment status and its cost and utilization of support systems among known CKD patients who were registered under palliative care clinics of northern Kerala.

Subjects and Methods

It was a community based cross sectional study. Patients registered under palliative care clinics of a block in north Kerala district were included in the study. We included known CKD patients above 18 years registered under palliative care clinics who were not critically ill and willing to participate. They were interviewed at their home after prior information using a pretested and validated questionnaire in local language. We calculated sample size as 150 taking prevalence of commonest comorbidity at 95% confidence interval and 20% precision based on a south Indian study.[11] Data collection was done from February 2018 to July 2018 using a semi structured interviewer administered schedule. For study purpose a patient is defined to have chronic kidney disease if he/she is having a structural or functional kidney damage based on Glomerular Filtration Rate or kidney markers, or having diagnosed with chronic kidney disease by a physician or a nephrologist for a period of 3 months or more from a government or private hospital and categorized as same in palliative care register.[12] Data was collected on socio demographic and clinical profile, aetiology, coexisting illness, and current treatment. Previous history of diabetes mellitus, hypertension and other comorbidities were verified from case records. General treatment expense and utilization of social security schemes were assessed.

Descriptive ststistics were described using Mean, Standard Deviations, proportions, and 95% Confidence intervals and median for skewed distributions.Association of treatment status with socioepidemiological variables were assessed using *Chi square* test and *P* value at significance level 0.05 using IBM SPSS trial version.Study was conducted with approval from institutional ethical and research committees and after getting written informed consent from participants.

Results: Socioepidemiologic Characteristics

There were 150 patients in age range from 18 yr to 88 yrs with mean age 53.63 yrs (±14.5) and half of them in 40–60 yrs range, the productive age group. Elderly patients included 32%. There was male predominance of 74%. Before onset of disease 65% of them were manual labourers, 43.3% working within locality and 14.6% as heavy labourers in gulf countries and 8.6% developed disease while pursuing their studies. Despite majority being in the working age group, presently 13.6% had some income who were mainly patients in stage 1 CKD and 5 persons receiving pension. Among 20 transplanted patients, only 6 (15%) were employed. Majority belonged to low socio economic status including 25.3% from high priority subsidized group and only 11 persons (7.3%) belonged to above poverty line as per ration card. Most of them (62%) were from extended family. 45.3% were having education upto higher secondary and above and 84.7% were currently married. Smoking was the commonest past addiction as reported by 59 patients (39%) and secondly alcoholism by 11 patients (7.3%). The socioepidemiologic characteristics are described in [Table 1].

Clinical profile and etiology

Among 150 study participants, 62% were in advanced stages of CKD namely 4 and 5 including one post transplant patient in stage 5. Mean duration of CKDwas 5.29 (±4.21) yrs. It ranged between 3 months and 22 yrs in one patient who had undergone successful transplantation.Among 20 persons who had undergone transplantation 19 persons were having normal renal function. Mean age at onset of CKD was 48.6 yrs which was similar for both males (49.27 + 14.9) and females (46.63 + 19.37). Family history of kidney disease was reported by 8%. Previous history of recurrent UTI was reported by 14%, urinary stone by 3.3% and NSAID use over 1 month by 18.7%. Main reasons for NSAID use was generalised pain and toothache.Only 1.3% reported having symptoms in child hood suggestive of nephrotic syndrome.

We tried to analyze the common causes of CKD in this population by verifying their case records. Proportion distribution of major causes and 95%CI among this population were namely diabetic nephropathy 39.3% (31.48, 47.12), hypertensive nephropathy 28% (20.81, 35.19), both 5.3 % (1.71, 8.89). Other causes included Immune mediated causes like IgA nephropathy and lymphocyte predominant nephritis among 10.6%, infections among 4.6%, congenital (Alport syndrome and single kidney disease) for 3.3%, toxic nephropathy for 2.6% and one transplant rejection.

Comorbidities

We tried to explore the coexisting conditions that may have an impact on course of CKD both in terms of cost and progression of disease.In addition to CKD, 46.7% had at least one comorbidity.Though not directly causative for CKD onset, viral hepatitis was the commonest past infection and 4 had Hepatitis C and Hepatitis B at present. Apart from hypertension and diabetes

other coexisting diseases were coronary heart disease, Chronic Obstructive Pulmonary Disease (COPD), stroke, malignancies and psychiatric illness. The percentage proportion across both sexes and 95% CI distribution of prevalence among total is shown in [Table 2]. Mean duration of diabetes was 10 yrs and 92% were on regular treatment either from private or government hospital. Diabetic retinopathy was reported by 60.56% of diabetics and 11.26% had peripheral neuropathy. Mean duration of hypertension was 9.4 yrs.

The burden of cardiovascular and cerebro vascular attacks were found to be more among females.

Treatment status

Considering disease status, 4.7% were in stage 1 CKD and 54% in stage 5 of CKD excluding 19 on post transplant follow up. 57.3% were on hemodialysis and 3.3% (5 males) on peritoneal dialysis and 13.3% had undergone transplantation. Majority (63.9%) were doing hemodialysis from private hospitals and 65% had to undergo dialysis thrice weekly. Reasons for resorting to private facilities was lack of dialysis unit in nearby secondary hospitals and long waiting periods at government facilities. There was significant gender difference in treatment status.We analyzed the association of present treatment status among gender, age group, socioeconomic status, and presence of comorbidity and found that proportion of females among hemodialysis and transplanted groups were lower and those on predialyis were higher and the difference was statistically significant too. More of younger age group had undergone renal transplantation. Though hemodialysis is costly, our observation was that more of BPL patients were on hemodialysis and had renal transplantation. The findings were described in [Table 3].

Table 1: Sociodemographic characteristics of study participants (*n*=150)

Characteristic		*n* (%)
Gender	Male	112 (74.7)
	Female	38 (25.3)
Age group	18-40yrs	27 (18)
	41-60yrs	75 (50)
	>60 yrs	48 (32)
Education	Upto HS	140 (93.3)
	Degree & Above	8 (5.3)
	Illiterate	2 (1.3)
SES as per ration card	Most backward	38 (25.3)
	BPL	80 (53.3)
	APL	32 (21.3)
Marital status	Married	127 (84.7)
	Widow/widower/divorcee	14 (9.3)
	Unmarried	9 (6)
Family type	Joint	57 (38)
	Nuclear	93 (62)
Stage *(*n*=131)	1	7 (4.6)
	2	10 (6.6)
	3	20 (1.3)
	4	12 (8)
	5	82 (54)

*(19 (12.6%) healthy on followup after renal transplantation)

Cost and utilization of support systems

Among our study partipants 20 (13.3%) had undergone renal transplanation. Of these 70% of renal transplantations were done at private hospitals including 25% outside state. Only one government medical college had facilitated 6 transplantations. Even now only 32.1% were doing dialysis from govt sector. We analyzed costs of transplantation, dialysis, drugs, and travel. Median cost of transplation was Rs 3,00,000 and most of this was undertaken with public donation. Thrice weekly was the most common frequency for hemodialysis. These patients on dialysis had to spend a median cost Rs 10,500 per month management of CKD alone. Medication cost for dialysis procedure was Rs 9000 and expense for travel related to dialysis was Rs 3000. Majority of transplant patients were receiving immunosuppressants from palliative clinics, the median monthly cost on drugs was Rs 2750. Apart from CKD, 46.7% had other comorbidities namely CVA (23.4%) and COPD, and 4 had hepatitis infection escalating further the cost of dialysis.

Only 44.68% were well protected by govt schemes mainly by RSBY (31%) and Karunya benevolent fund (14%) which provide dialysis at subsidized rates till annual allottment of Rs 30,000 is exhausted. Palliative care clinics are providing erythropoetin injection, dialyzer, and immuno suppresants with voluntary donations which is the major treatment support for these patients. None of them discontinued treatment except for a few delayed dialysis sessions, but continue to survive with

Table 2: Sex wise distribution of past and present comorbidities

	Males *n*=112	Females *n*=38	Total *n*=150	95% CI of proportion
Hypertension	68 (60.7)	23 (60.5)	92 (61.4)	(53.61,69.19)
Diabetes	53 (51.7)	18 (47.3)	71 (47.3)	(39.3,51.94)
Coronary heart disease*	22 (19.6)	11 (28.9)	33 (22)	(16,29.4)
COPD	13 (11.6)	2 (5.2)	15 (10)	(5.2,14.8)
CVA*	9 (8.03)	4 (10.52)	13 (8.6)	(4.11,13.09)
Malignancy	3 (2.6)	1 (2.6)	4 (2.6)	(.07,6.7)
Hepatitis C/Hepatitis B	2 (1.7)	2 (5.2)	4 (2.6)	(.07,6.7)
Viral hepatitis†	20 (17.8)	3 (7.8)	23 (15.3)	(9.54,21.06)
Recurrent Urinary tract infection†,*	14 (12.5)	7 (18.4)	21 (14)	(8.45,19.55)
Urinary calculi†,*	3 (2.6)	2 (5.2)	5 (3.3)	(0.44-6.16)

*More among women, †Past history

Table 3: Association of present treatment status and sociodemographic factors

Characteristic	Predialysis 39 (2.6)	Dialysis 91 (60.6)	Transplanted 20 (13.3)	χ^2 and *P*
Gender				χ^2=7.161*
Male	23 (20.5)	72 (64.3)	17 (15.2)	df=2
Female	16 (42.1)	19 (50)	3 (7.9)	*P*=0.028
Age group				
18-40 yrs	7 (25.9)	12 (44.4)	8 (29.6)	χ^2=13.085*,†
41-60 yrs	16 (21.3)	48 (64)	11 (14.7)	df=4
>60 yrs	16 (21.3)	31 (64.6)	1 (2.1)	*P*=0.011
No comorbodity	20 (25)	47 (58.8)	13 (16.3)	χ^2=1.263‡
Comorbidity	19 (27.1)	44 (62.9)	7 (10)	*P*=0.532
BPL	29 (24.6)	73 (61.9)	16 (13.6)	χ^2=0.583‡
APL	10 (31.3)	18 (56.3)	4 (12.5)	*P*=0.747

*Statistically significant, †11% cells have count <5, ‡statistically not significant

loans and help of charity organizations one of which provided free transportation for dialysis. 61.4% were hypertensive 46.8% were diabetic patients have to rely on health centre for its regular medication and followup. Though a minority, a few still reported irregular treatment of diabetes and hypertension with the background information that diabetic nephropathy was the commonest etiology behind CKD second only to hypertensive nephropathy.

Discussion

In Kidney disease Screening Project done in south Indian community using proteinuria and decreased GFR as criteria, mean age of patients was 52.73 + 17.08 years with male predominance (58.7%) similar to our findings. But their main age group was 60–69 yrs. Our study being based on people surviving with CKD we found prominent age group as 40–60 yrs. Though illiteracy was higher for them, a similar 80% unemployment status was noted among our CKD patients. The prevalence of hypertension was 59.54% and DM 9.92% by blood pressure measurement and fasting blood sugar estimation respectively. In our study, prevalence of hypertension was 61.4% and diabetes 47.3% among CKD patients. They found increasing age (OR = 1.04) male sex (OR = 1.69), presence of hypertension (OR = 1.69), and diabetes (OR = 2.05) as variables associated with chronic disease.[4] In a hospital-based study, there was male predominance with relatively similar mean age pattern as in productive age in our study. Though a lesser prevalence probably due to a smaller sample size, they too reported contributing comorbidities as hypertension, diabetes mellitus and a history of chronic consumption of NSAID for 9.8%.[13] We observed that female patients with CKD had significantly lesser access to all types of treatments be it transplantation or haemodialysis or peritoneal dialysis. As observed in other low and middle income countries the common cause of CKD was found to be diabetic nephropathy followed by hypertension among our study participants. Though there is country wide variations other causes were glomerulonephritis, hypertension, adult polycystic kidney disease, and toxic kidney injury.[14] Just like our observation, gender disparity in awareness, late initiation of dialysis, and lesser chance for transplantation among women was observed by Carrero *et al.*[15]

Among other co-existing conditions cardiovascular disease was commonest which could be a consequence of hypertension as reported by majority making these patients at higher risk of mortality.[16,17] Our study population constituted 58% below 60 years of age. Of this 20% had transplantations. A follow up study by Alan S suggested that longitudinal measurement of estimated glomerular filtration rate was found to be more accurate that serum creatinine alone for assessing risk of death.[18] So provision for uninterrupted maintenance haemodialysis's and regular biochemical tests are very important for maintaining their lives. It is also reported that when diabetes, hypertension and CVD exist together, the risk is even multiplied. Mortality among CKD patients is often listed with other causes like CVD. It is a major concern in our study participants as reported percentages for these was very high among them.[2] Hence we may have to focus on high risk screening among diabetics and hypertensive patients for early detection of CKD and primary care settings should be strengthened with provision for tests, cost effective methods to delay progression to ESRD along with proper management of diabetes as part of NCD programme. In management of patients with moderate to advanced CKD the possibility of shared primary and secondary care should be considered where nephrologists can review patients remotely by using biochemical test results and clinical data recorded in primary care. Though diabetics have double fold chance for developing CKD, the control of modifiable risk factors could delay progression into CKD.[19,20] Once ESRD is established, the possible treatment options are maintenance hemodialysis, peritoneal dialysis and renal transplantation. Even though peritoneal dialysis was suggested as an ideal renal replacement therapy for resource poor India, it is underutilized as adopted by 5 patients only among our study participants.[21]

As government facilities are inadequate to meet the heavy patient load, private hospitals including charitable dialysis centres are saving patient's lives.[22] In our study also, majority of dialysis and transplantation were being done from private sector. One charitable dialysis center provided free transportation too. Yet there was out of pocket expenditure, lesser comparing to one study among hospitalized patients where cost of transplantation was Rs 392920 and monthly cost of haemodialysis was Rs 61170.They observed that cost is higher among diabetics.[23] Another hospital based study from the same state among participants of similar age and comorbidity distribution, observed that 88% were having private dialysis, and 91% had catastrophic expenditure. In our study 70% dialysis was from private hospitals and 28% of them belonged to subsidized group. As 44% in our population were utilizing government schemes expenditure was comparatively lesser. Our study included patients registered under palliative clinic only. Probably they were more aware and better users of available services.[24] We understand that even among them the long term management of kidney disease will be difficult. In the background of very high prevalence of diabetes and hypertension we need clinical research to find out a screening test for early detection at primary levels

and suggest life style modifications and provision of specific anti hypertensives. It is high time that we should strengthen the existing Non communicable Disease program for better management of diabetes and hypertension to delay the onset of complications. As community support systems may not be a long-standing solution and treatment expenses will be on even increasing side, initiatives to reduce the incidence are the need of the hour.

Acknowledgements

The authors acknowledge Malappuram Initiative in palliative care and underlying clinics, District Pariraksha Program for their support for data collection.

Financial support and sponsorship

State Board of Medical Research.

Conflicts of interest

There are no conflicts of interest.

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