

Chronic kidney diseases: A realm for preventive nephrology

Rahul Pal¹, Vinay Rathore², Abhiruchi Galhotra³, Varun Mamidi²

¹Senior Resident Department of Community and Family Medicine, All India Institute of Medical Sciences, ²Assistant Professor Department of Nephrology, All India Institute of Medical Sciences, Raipur, ³Additional Professor, Department of Community and Family Medicine, All India Institute of Medical Sciences, Raipur, India

ABSTRACT

Chronic Kidney Disease (CKD) is emerging as a major public health priority worldwide. It is a chronic condition influenced by lifestyle and behavior. The risk factors for CKD are highly prevalent among the Indian population, and the number of Indians at risk is increasing. Preventive measures focusing on reducing the prevalence of CKD by limiting exposure to risk factors could be cost effective in a country like India. Kidney diseases disproportionately affect disadvantaged populations and reduce the number of productive years of life. Furthermore, the prospect of financial burden discourages many patients from undergoing treatment, thereby leading to preventable morbidity and death. The management of patients with CKD is focused on early detection or prevention, treatment of the underlying cause (if possible) to curb progression and attention to secondary processes that contribute to ongoing nephron loss. Blood pressure control, inhibition of the renin-angiotensin system and disease-specific interventions are the cornerstones of therapy. Health literacy and self-management are critical to improving the outcomes of chronic conditions such as chronic kidney disease. Primary Care and Family physicians act as a bridge between the nephrologist specialist and the CKD patients; which will help in improving the quality of life, reduce physical and psychologic limitations and complications associated with CRF, and help patients return to their families, jobs, and social lives

Keywords: Chronic kidney disease, complications of CKD, end stage renal disease, preventive nephrology

Introduction to the Spectrum of Chronic Kidney Diseases

Chronic kidney disease (CKD) is emerging as a major public health priority worldwide. There is an upward spiral in both the incidence and prevalence of kidney diseases. These cover a gamut of diseases with varied etiologies, clinical course, and functional severity, from acute kidney injuries (AKIs) to CKD from stage 1 to stage 5, and include end stage renal disease (ESRD) requiring chronic dialysis and renal transplantation.^[1]

Address for correspondence: Dr. Abhiruchi Galhotra, Additional Professor Department of Community and Family Medicine, AIIMS, Raipur, India.
E-mail: abhiruchigalhotra@aiimsraipur.edu.in

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A recently published article estimates that, more than 850 million individuals have kidney disease; of which around 3.9 million individuals are on renal replacement therapy (RRT).^[1]

In 2016, this disease was 13th on the list of causes of death on a world scale, and by 2040, it is anticipated to be the 5th leading cause of years of life lost.^[1]

According to the Global Burden of Disease (GBD) 2017, there were 697.5 (95% uncertainty interval (UI) 649.2 to 752.1) million cases of CKD in the world; of which 115.1 million cases [106.8 to 124.1] live in India. Estimates of the prevalence of CKD was 9.1% in the world's population. CKD stages 1-2 accounted for 5% (95% UI 4.5 to 5.5), stage 3 for 3.9% (95% UI 3.5 to 4.3), stage 4 for 0.16% (95% UI 0.13 to 0.19), stage 5 for 0.07% (95% UI 0.06 to 0.08), dialysis for 0.041% (95% UI 0.037 to 0.044), and kidney transplantation for 0.011% (95% UI 0.010 to 0.012).^[2]

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CKD is a chronic condition influenced by lifestyle and behavior. As the risk factors for CKD are highly prevalent amongst the Indian population, the number of Indians at risk is increasing.

CKD prevalence of 8.7% to 16.4% has been reported in contemporary studies in India.^[3-5] Focusing on limiting exposure to risk factors of CKD could be the most cost-effective preventive measure for a developing country like India.^[6]

Treatment and Prognosis of CKD

The clinical course of CKD is a continually progressive loss of nephron function ultimately, leading to ESRD requiring some form of RRT. CKD is usually clinically asymptomatic in preliminary stages and therefore diagnosed in late stages. There is no clear data on factors that affect its progression; although etiology, stage of CKD, albuminuria, metabolic acidosis hyperuricemia, hyperphosphatemia, dyslipidemia, etc., affect the progression. There is no remedy for CKD, but identification and addressing the individual risk factors and treatment can halt the progression as well as prevent other complications.

In the early stages of kidney disease, a proper diet, healthy lifestyle, and medications may help to retard the progression of CKD and maintain the critical balances in the body that the kidneys would usually control. Failure of the kidney leads to the accumulation of waste products of metabolism and fluids which need to be eliminated from the body. This situation demands RRT shown in Figure 1.

The provision of RRT is vital for the survival of ESRD patients. The shortage of nephrologists, late referral of patients, inadequate health awareness about preventive measures, and a lack of more cost-effective alternatives like renal transplantation or peritoneal dialysis (PD) are important aspects in the provision of care to ESRD patients.^[7,8] A significant barrier to equitable provision of RRT to all the divisions of the society is the uneven distribution of nephrologists in large urban conglomerates.^[9,10] In India, 174,478 patients are on chronic dialysis, and in 16 states and 4 Union Territories, kidney transplantation is available. Thirteen of 29 states and 3 of 7 Union Territories have an active deceased donor program. At present, there are 1584 dialysis units, 12,881 dialysis machines, and 233 transplant centers.^[11] Pradhan Mantri National Dialysis Programme that provides free dialysis services in public hospitals was launched by Govt of India recently.^[12]

Rationale for Preventive Nephrology

As ESRD is not curable; people need to care for it for the rest of their lives. If detected well in time, patients' progress to kidney failure can be halted. CKD can activate other morbidities as cardiovascular diseases (heart attack and stroke), leading to premature death or disability. Caring for ESRD is costly, the resources for it are limited for a developing country like India and significantly impact the quality of life (QOL) of the individual and his/her caregivers.

Kidney diseases disproportionately affect disadvantaged populations and reduce the number of productive years of life. The affected tend to seek treatment; undergoing huge economic costs, i.e. out of pocket expenditure (OOPE). This financial burden demoralizes many patients from undergoing treatment, which leads to preventable morbidity and death. This is corroborated by a study, which states that 90% of patients requiring RRT die because of failure to bear the cost of care. Those that start care, 60% dropout due to financial burden.^[13] In wealthy nations, ESRD absorbs 2-3% of the healthcare budget.^[14,15]

The actual load of ESRD is unknown. Universal access to RRT is lacking. There are a handful of committed kidney care centers. Taking into account the enormous burden of ESRD and its financial implications, prevention is indispensable. Prevention of ESRD will involve principles of both primary and secondary prevention, i.e.,

1. Early identification of kidney disease and its risk factors
2. Prompt treatment of the amenable abnormalities
3. Halt the progression to renal failure.

These simple measures will slow down the progression of kidney disease, prevent complications and thereby improve the QOL.

Caring for a large number of ESRD patients demands-resources and skills (personnel and health care infrastructure) that do not exist as of now in India. So, prevention of CKD and halting its progression to ESRD becomes the cornerstone for providing the most cost-effective care.^[16,17] This can start with the screening and detection of a silent disease, which gives years of opportunity for discovery and modification of its natural history. Kumar *P et al.*^[18] have suggested that if CKD can be detected earlier, in stages 2 and 3, a drastic lifestyle change may help in the prevention and progression of CKD. Additional steps can also be taken to reduce/prevent the complications of kidney disease.

At present, generally, a nephrologist sees patients who are in the late stages of CKD when progression to ESRD cannot be prevented. Also, number of nephrologists compared to the number of kidney disease patients is limited.

So, the emphasis should be on primary care (screening for early identification of CKD & its management). This will enable the establishment of a continuum of care for CKD patients and have an impact in the early stages of CKD.

Preventive strategies

Health and diseases are a part of the continuous process. The natural history of CKD offers various preventive strategies at a different point during the timeline of CKD [Figure 2].

Primordial prevention/Primary prevention

This strategy focuses on the entire population and aims to reduce the average risk for the development of CKD. It targets a healthy population without any risk factors for CKD [Figure 3].

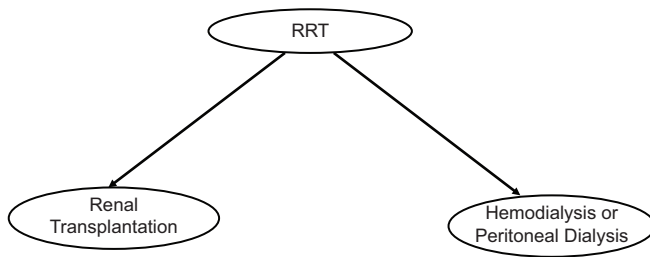


Figure 1: Forms of RRT

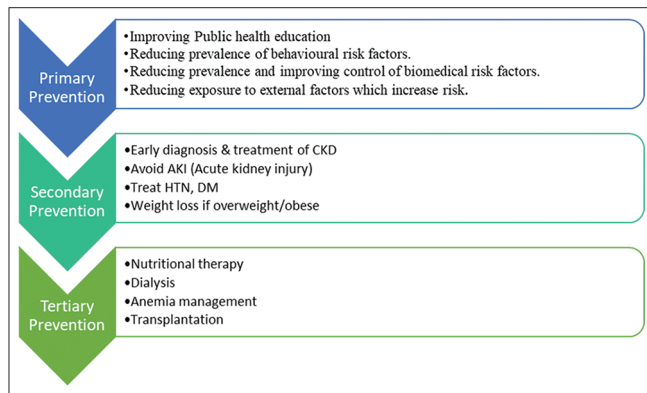


Figure 2: Prevention strategies for CKD



Figure 3: Health promotion strategies for CKD

Carefully planned community surveillance system programs are an essential part. The major causes of CKD (diabetes mellitus and hypertension) are non-communicable diseases, and the underlying cause of these diseases is an increase in lifestyle-related risk factors, which result from cultural, psychological, economic, social, and political change. Public awareness/advocacy of the link between lifestyle and health is minimal in India. A particular focus on this aspect is the need of the hour.

There is no CKD-specific primary prevention program, a planned strategy of other NCDs primary prevention efforts related to NCDs such as obesity, hypertension, and diabetes is likely to be of benefit to people with CKD, given the overlap in risk factors between CKD.

It is crucial to promote “Prevention” of Kidney diseases with specific educational programs especially for those at risk of kidney disease. Awareness and understanding about the renal disease are insufficient. Education about this will help in self-management and patient-centered care.^[19]

Early detection and secondary prevention

CKD is often symptom-free in its early stages and is often missed. However, if detected early and managed appropriately, the rate of deterioration in kidney function can be reduced by as much as 50%, and may even be reversible.

Screening tool

CKD can be diagnosed and staged based on glomerular filtration rate (GFR) and level of albuminuria. GFR can be easily estimated by Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) formula using age, sex, ethnicity, and serum creatinine level. The level of albuminuria can be assessed by either 24-hour urinary albumin excretion or by spot albumin: creatinine ratio.

Screening population

Mass screening is not cost-effective, however opportunistic screening of healthy individuals and screening of above-mentioned risk groups is recommended.

Evidence-based early interventions include:

- Screening of high-risk groups
- Blood pressure control
- Glycemic control
- Smoking cessation
- Medication management in relation to kidney disease
- How best to treat at an early stage to halt a rapid decline in GFR or stabilize the CKD progression.

Barriers to greater uptake of secondary preventive activities at the primary care level include:

- Lack of awareness of the disease by healthcare providers (HCPs) and the community
- Historical practice of CKD being treated in hospital—often as ESRD by nephrologists
- Lack of CKD-specific prevention/management education opportunities for HCPs
- Lack of adequate workforce such that HCPs are multitasking
- Failure to retain trained HCPs—lost to the private sector or moved to other areas despite being trained and being highly knowledgeable in specific areas
- Lack of focus on wellness/self-management support.

Tertiary prevention

Preventive nephrology is still important in higher stages of CKD stage 3 and above. It involves the prevention of infectious diseases including vaccinations, preventive steps directed towards cardiovascular diseases, appropriate diet and lifestyle modification to avoid complications of CKD.

Table 1: Vaccination in patients with Chronic Kidney diseases^[20]

Vaccine	Age	Dose	Schedule/ROA*	Booster dose
Hepatitis B	≥20 years	40 mcg	0,1,2 and 6 months/IM	Yes, when anti-HBs <10 m IU/ml
	<20 years	10 mcg	0,1 and 6 months/IM	Yes, when anti-HBs <10 m IU/ml
Varicella	1-12 years	0.5 ml	One single dose/SC	No
MMR	>18 years	0.5 ml	One single dose/SC	No
Pneumococcal	>18 years	0.5 ml	Start with 1 dose of PCV13 then ≥8 weeks later Administer 1 dose of PPSV23/IM	a single booster dose of PPSV23 ≥5 years later
Influenza	3-8 years	15 µg	Each year/IM	No
	9-12 years	15 µg	Each year/IM	No
	>12 years	15 µg	Each year/IM	No
Hepatitis A	>17 years	1 ml	0, 6–12 months/IM	No
Inactivated poliovirus	<18 years	0.5 ml	Three doses with an interval of 1-2 months	No (revaccination 1 year after the third dose)
Diphtheria and tetanus toxoids	7 years	0.5 ml	Three doses/IM	No

Immunization [Table 1]

Infections are an important cause of morbidity and mortality among patients at all stages of CKD. Prevention through vaccination remains the best strategy to minimize the adverse consequences associated with these infectious diseases in this and all populations. The early utilization of vaccines in at-risk populations for CKD and increase antigen dose and frequency of vaccination in targeted patient populations has improved clinical outcomes by reducing many viral and bacterial infections in the CKD population.

Rehabilitation and improvement in patient quality of life

Patients with CKD are charged with assimilating complex treatment regimens, including monitoring blood glucose and blood pressure, maintaining physical activity, changing eating patterns, adhering to complicated medication regimens, and avoiding nephrotoxins.

CKD registry

This will facilitate the setting up of a CKD hospital-based registry. A periodic analysis of this will allow evidence-based public health decision-making and evaluation of the impact of the interventions on the burden of CKD in the population.

Conclusions

Health literacy and self-management are critical in improving the outcomes of chronic conditions such as CKD. Health literacy is a key determinant in increasing patient self-management and has been linked to improving outcomes for chronic conditions including CKD. The World Kidney day 2020 theme “Kidney Health for Everyone Everywhere-From Prevention to Detection and Equitable Access to Care” stresses upon the importance of preventive interventions-be it primary, secondary or tertiary.^[19]

Primary care physicians are at the forefront of efforts for early recognition of CKD and its management to control its progression. They can act as a bridge between the nephrologist specialist and the CKD patients, which will help in improving

the quality of life, reduce physical and psychological limitations and complications associated with CRF, and help patients return to their families, jobs, and social lives.

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Conflicts of interest

There are no conflicts of interest.

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