

Early detection and prevention of chronic kidney disease (CKD)

Definition:

Chronic kidney disease (CKD) as defined by the National Kidney foundation – kidney disease outcomes and quality initiative (NKF – K/DOQI) workgroup and accepted internationally is as follows:

“The presence of markers of kidney damage for ≥ 3 months as defined by structural or functional abnormalities of kidney with or without decreased Glomerular filtration rate (GFR) manifest by either pathological abnormalities or other markers of kidney damage including abnormalities of composition of blood or urine and/or abnormalities in imaging tests.

or

The presence of GFR < 60 ml/min/1.73 m² for ≥ 3 months with or without other signs of kidney damage as described above”

Based on the above definition and staging of chronic kidney disease by NKF. K/DOQI, (Table I) in representative samples of USA population, it has been found that about 1 person in 10 in the general population has some form of kidney disease which when extrapolated to India would suggest that at least 100 million people in INDIA if not more, have some form CKD (Table I). Globally more than 500 million individuals have some degree of chronic kidney disease.

The common causes of CKD in India are Diabetic nephropathy, hypertension, chronic glomerulonephritis and chronic interstitial diseases.

Early detection is possible by doing simple laboratory tests in the high-risk individuals like urinalysis, spot urine protein / albumin to creatinine ratio and serum creatinine and estimated GFR using MDRD or Cockcroft & Gault formula. (Table 2)

The consequences of undetected CKD is progressive loss of kidney function leading to kidney failure and need for dialysis & transplantation which are expensive treatment modalities. The other important consequence is premature death due to cardiovascular events. The mortality of a patient on dialysis is more than 100 times than in the general population. A 25 year old person in general population on dialysis has similar mortality as in an eighty year old person. What has been very striking is that even in early stages of CKD like GFR < 70 ml/min vs > 90 ml ml/min the relative risk of death is 1.68. This is at a stage when serum creatinine level may not be higher than in the normal range. Mortality rates even among the subjects with urinary protein levels more than 300 mg/dl vs < 30 mg/dl are six times higher.

These revealing data during the last five years have highlighted that even small increases in serum creatinine levels suggesting minimal deterioration of kidney function either in form of proteinuria or deterioration of GFR have a huge impact on cardiovascular mortality. Kidney function has been emphasized by these data, as the most important factor determining cardiovascular events. Thus there is a need for early detection and possible prevention.

The costs of end stage kidney disease are escalating worldwide. More than 1.5 million people are currently alive through either hemo or peritoneal dialysis or transplantation. Over the next decade the cost is predicted to exceed more than one trillion dollars. The economic burden could strain healthcare budgets worldwide, more so in the developing countries. For lower income countries it is impossible to meet such costs. With epidemics of diabetes and hypertension worldwide, the greatest growth and impact of these is likely to be in the developing world, thus greater need for early detection and prevention in these countries including India.

Strategies for early detection and prevention

Screen subjects at high risk for chronic kidney disease. These are

- i) Patients with diabetes mellitus and hypertension
- ii) Patients with history of kidney disease
- iii) Obese individuals or those who smoke.
- iv) Individuals above 50 years of age
- v) Individuals with family h/o diabetes, hypertension and kidney disease

What should you do in these high risk subjects ?

Spot urine albumin protein to creatinine ratio – which will pick up individuals with microalbuminuria (30 – 300 mg /gm of creatinine); overt albuminuria (> 300 mgms /gm creatinine); serum creatinine and estimate GFR, and if need be imaging tests.

Those with microalbuminuria or overt albuminuria and early CKD especially with diabetes & hypertension should be given ACE inhibitor's or ARB's and monitored regularly for target blood pressure levels of less than 130/80 mmHg, glycosylated hemoglobin (HbA1c) of < 7 %. The dose of ARB's or ACEI's should be targeted to decrease or normalization of proteinuria / or microalbuminuria and target blood pressure levels. These strategies have reduced the burden of disease from CVD, diabetes, hypertension & CKD at a relatively less cost.

Thus it is possible to detect & diagnose early CKD with easy to do tests in the clinic and institute cost effective preventive therapies so that need for more expensive therapeutic modalities for kidney failure is lessened.

Table 1

Stages of Chronic Kidney Disease

Stage	Description	GFR	Estimated burden in India
1.	Kidney damage with normal or ↑ GFR	> 90	28 million (2.8 %)
2.	Kidney damage with mild ↓ GFR	60 – 89	28 million (2.8 %)
3.	Moderate ↓ GFR	30 - 59	37 million (3.7 %)
4.	Severe ↓ GFR	15 – 29	1.3 million (0.13 %)
5.	Kidney Failure	< 15 (or dialysis)	2 million (0.2 %)

Table – 2

GFR Estimation from s.creatinine

(i) Cockcroft & Gault formula

CCr in Men	$\frac{(140 - \text{age}) \times \text{wt}}{72 \times \text{P. creat.}}$
CCr in Women	0.85 x value from above
(Age	In years
Wt	Kgs
P.Creat.	Mg/dl)

(ii) Abbreviated MDRD study equation

$$\text{Estimated GFR (mL/min/1.73m}^2\text{)} = 186 \times (\text{Scr})^{-1.54} \times (\text{Age})^{-0.203} \times (0.742 \text{ if female}) \times (1.1210 \text{ if African - American})$$

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