EDITORIAL

Chronic Kidney Disease in India

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India has a population of 1.2 billion and in the recent years has registered impressive economic growth. The mean per capita gross national product has grown; however approximately 70% of the population still lives on less than Rupees 60 per day. It is evident that an epidemiologic transition is taking place in India with a decline in the burden of infectious diseases along with a significant rise in non-communicable diseases. Reddy et al1 in a review pointed out that in the year 2005 at least 53% of deaths in India were attributed to chronic disease.

The epidemiologic transition has been fuelled by rapid economic development and globalization, leading to rapid urbanization, major lifestyle changes, and altered eating habits. This has been paralleled by a rapid spurt in the incidence and prevalence of non-communicable or so-called lifestyle diseases such as hypertension, diabetes, coronary artery disease, malignancies and chronic kidney disease (CKD). It is now well recognized that the prevalence of CKD is increasing all over the world. The global annual growth of number of ESRD patients is reported at 7%1,2. In view of the high disease burden, its uneven distribution, expensive treatment and because of the fact that organised preventive strategies are not in place in most countries, CKD has assumed the proportions of a significant public health problem4. A disproportionate burden of the global increase in prevalence of CKD is being increasingly borne by the economically backward countries as a result of the increase in the prevalence of the CKD risk factors, namely, diabetes, hypertension, obesity, and increasing life-expectancy.

Accurate estimation of the burden of CKD and ESRD in India is not possible at present due to the lack of a comprehensive CKD registry. The Indian CKD registry (www.ckdri.org) is purely voluntary, and captures only a very small proportion of CKD reaching nephrologists in India.
Diagnosis and staging of CKD is based on estimated glomerular filtration rate (eGFR) using estimation equations. These equations were derived after systematic study in several parts of the world using serum creatinine as the parameter to estimate renal function. It is well accepted that GFR is determined by body composition, muscle mass and diet. Almost all the equations including the Modification of Diet in Renal Disease (MDRD) equation and the more recent CKD – EPI (Chronic Kidney Disease Epidemiology Collaboration) formula were derived in Caucasian and African-American subjects. Validation studies of these equations in Japan and China has demonstrated the need for applying ethnicity specific correction factors in these population, suggesting the need for similar validation studies in India before adopting these equations. It is a cause of concern that such a validation study has not yet been undertaken in India, potentially compromising the application of these equations in classification of CKD stages in Indians.

It may appear that estimating the incidence and prevalence of ESRD is easy, due to the fact that patients will be symptomatic and the life threatening nature of the disease will force almost all patients to seek medical care. However, this is not the case in India and the incidence and prevalence of even ESRD is not known. The incidence was suggested to be 100 per million population (pmp) by single center studies from tertiary care hospitals and from experience of opinion leaders. The closest estimate of ESRD incidence from any region in India is possibly from Bhopal; in a population based study by Modi and Jha the average crude annual incidence and age adjusted incidence were found to be 151 and 229 pmp, respectively. This study suggested that the actual incidence is likely to be much higher than previous estimates.

Two studies reported the prevalence of CKD (not ESRD) in India. The prevalence was reported to be 0.79% in study from Delhi which screened 4972 adults. This study used a serum creatinine cut off>1.8mg/dl to define CKD and hence underestimating the prevalence. Another study by Mani et al in a South Indian village reported the prevalence of GFR < 15ml/min (CKD stage V) to be 0.09%.

Based on the current Indian population of 1.2 billion, even a conservative estimate of ESRD burden in India would suggest that about 1,650,000 to 2,200,000 people develop ESRD every year. Out of these, only about 10% or less receive renal replacement therapy.

Chronic glomerulonephritis and chronic interstitial nephritis were reported to the most common cause of ESRD in India in older, single center based reports. The spectrum seems to be changing, with more recent literature reporting diabetic
nephropathy as the commonest cause of ESRD in India. Data from the CKD registry of India reveals that diabetic nephropathy accounts for 31.2% of CKD in India (Table 01).

It is important to appreciate that the clinical spectrum of CKD in India is different from the western world. The average age of ESRD population in India is 50 years; this is approximately 20 years less than that reported in the USRDS and some European countries. The reasons for this are to be addressed in more studies. It has been suggested that diabetes, the commonest cause of CKD, sets in at a younger age and its complications appear earlier in the south Asians. More rapid progression of CKD due to lack of access to medical facilities, delayed referral to nephrologists and poor management of risk factors may be another reason. High incidence of CKD of unknown etiology has been reported from many parts of India and parts of Sri Lanka.

Table 01: Etiology of CKD in India compared with other countries

<table>
<thead>
<tr>
<th></th>
<th>India20</th>
<th>Pakistan20</th>
<th>Sri Lanka21</th>
<th>Nepal22</th>
<th>USA23</th>
<th>Australia24</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN</td>
<td>31.2</td>
<td>33.3</td>
<td>30.6%</td>
<td>18%</td>
<td>45%</td>
<td>35%</td>
</tr>
<tr>
<td>UD</td>
<td>16.4</td>
<td>25.6%</td>
<td>13%</td>
<td>6%</td>
<td></td>
<td>6%</td>
</tr>
<tr>
<td>CGN</td>
<td>13.8</td>
<td>33.6</td>
<td>9.9%</td>
<td>6%</td>
<td>12.3%</td>
<td>22%</td>
</tr>
<tr>
<td>HT</td>
<td>12.8</td>
<td>12.7</td>
<td>13.2%</td>
<td>54%</td>
<td>28%</td>
<td>14%</td>
</tr>
<tr>
<td>TID</td>
<td>7.0</td>
<td>1.5</td>
<td>2.5%</td>
<td>None</td>
<td></td>
<td>5%</td>
</tr>
<tr>
<td>Obst</td>
<td>3.4</td>
<td>1.3</td>
<td>8.3%</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADPKD</td>
<td>2.5</td>
<td>3.3</td>
<td>5.8%</td>
<td>2%</td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td>RVD</td>
<td>0.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graft loss</td>
<td>0.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>others</td>
<td>11.7%</td>
<td>12.5</td>
<td>-</td>
<td>-</td>
<td></td>
<td>12%</td>
</tr>
</tbody>
</table>


In a country like India where large areas still lack basic amenities like safe drinking water and basic sanitation, the most elementary form of health care is often unavailable,
especially in rural areas. Unlike in developed countries, the major challenge facing India is how to contain the enormous cost of renal replacement therapy and improving access to therapy, with ESRD care remaining either unavailable or beyond the reach of the impoverished population.

The public sector healthcare spending continues to be very low. The public sector hospitals provide subsidized or even free treatment, including dialysis and kidney transplantation services and are often overcrowded and are often ill equipped. Moreover, the dialysis facilities in these hospitals are often overwhelmed by patients with acute renal failure. Dialysis is often offered only to patients who are transplant candidates. The private sector has stepped in to fill this healthcare void and has registered an exponential growth. Private / corporate sector hospitals are usually expensive and inaccessible to the poor. However they are often well equipped, better staffed and offer maintenance dialysis services and transplantation services with short waiting periods. The acceptance rate of ESRD patients for RRT in India is only 3-5 per million population\textsuperscript{25,26}.

India lacks adequate number of nephrologists to take care of the huge population of CKD, at present. It is estimated that there are over 900 nephrologists and about 700 dialysis units in India, and constantly growing. It is pertinent to note that more than 85% of this manpower and facilities are in the private sector. Late referral of CKD patients to nephrologist is almost the norm in India, when the patient has already developed advanced uremia and related metabolic complications necessitating emergency initiation of dialysis with a temporary central venous catheter\textsuperscript{27}. In the absence of state support for dialysis except in a limited way in states like Tamil Nadu and Andhra Pradesh, the cost of therapy has to be borne by the patient’s family. The economic status of the majority of patients precludes the possibility of any form of long term therapy resulting in poor outcomes. More than 60% of patients started on HD drop out within 3 months, presumably due to inability to afford long-term treatment\textsuperscript{28} and only a small minority remain on dialysis for 24 months or more.

If the availability of renal replacement therapy is poor, the quality of available dialysis services leaves much to be desired. The primary reason for this is that the paying capacity of the patient often takes precedence over the clinical need of the patient in dialysis prescription. Hemodialysis is typically done twice a week (against thrice a week) with a large number of patients undergoing dialysis less frequently only when a life threatening complication develops, like pulmonary edema or hyperkalemia. However, there are also centres which report quality of dialysis comparable to the developed countries, in India; these centres are typically in the
private sector. Many dialysis centres have rudimentary water treatment facilities and monitoring quality of water used for dialysis is often neglected.

Despite availability since the 90s and aggressive marketing strategies by the service providers, only a small proportion of ESRD patients are started on PD in India. Given the fact that the majority of population resides in rural areas without access to RRT facilities and PD requires little infrastructure, PD would appear to be the more suitable option for RRT in ESRD patients residing in such areas. However, it is estimated that there are only about 6000 patients on CAPD in India, most of them affluent or supported by their employers. There is widespread perception that PD is more expensive than HD in India. PD is often considered as a last option of RRT for patients who are elderly, with multiple comorbidities and unsuitable for transplantation or who are unable to tolerate HD or develop problems on HD like lack of vascular access. Majority of patients are on empirical prescription of 3 exchanges per day of 2 litres each, infection (peritonitis) rates and dropout rates are high.

Infections, especially by hepatotropic viruses transmitted in the dialysis units are a major concern and contribute to morbidity and mortality. Implementation of universal precautions in dialysis units is often inadequate. The incidence of hepatitis B infection has decreased due to better awareness and better implementation of vaccination.

Hepatitis C virus infection is a bigger and more vexing problem, the prevalence is quite high at 16 to 82% in different units. Some of the units do not routinely screen for infections and when they do, mostly use serologic tests which may miss recent infections.

There is rampant malnutrition among dialysis patients, the reported frequency vary from 44 to 77%. Inadequate dialysis results in poor appetite, stringent dietary restrictions also add to the malnutrition. Malnutrition may be associated with increased incidence of peritonitis and decreased survival in patients on CAPD.

With the limited availability, poor quality of life and huge expenses involved in dialysis, kidney transplantation is undoubtedly the more viable option for long term treatment of ESRD. More than 4000 kidney transplants are performed in India every year, the overwhelming majority are using kidney from a living donor. The Transplantation of Human Organs Act (THOA) provided a legal framework for deceased donation and outlawed buying organs from living donors and was adopted in India in 1994 and subsequently amended in 2008.
However, organ sharing networks and deceased donor organ transplantation are still limited to certain pockets in the country. Some encouraging trends have been noticed recently, with some states showing increased organ retrieval rates, mostly through the efforts of Non-governmental organizations. Even after undergoing transplantation, patients need to take immunosuppressive medicines lifelong. The medicines are expensive and non-compliance resulting in graft loss and infections remain a major concern.

The expense for HD varies significantly across the country, from Rs 600 to Rs 1500. Reuse of dialyzers is the norm, this helps in reducing dialysis cost. However, it should be appreciated that the cost of other medicines needed for these patients like erythropoietin, newer phosphate binders and vitamin D analogues and intravenous iron preparations are quite high and expenditure for the same may exceed the cost of dialysis itself. The monthly expenditure for PD may be up to Rs 22000, with 3 exchanges performed per day. Kidney transplantation incurs an expenditure of about Rs 1 lakh in government hospitals while the same may cost more than 3.5 to 4 lakhs in private/corporate sector hospitals. The cost of immunosuppression depends upon the drugs used and with the usual combination of tacrolimus, mycophenolate and prednisolone, approaches Rs16000 – 18000 per month.

The prohibitive expenditure involved in making RRT widely available and sustaining the program for an ever growing ESRD population means that we need to look at strategies targeted at reducing the incidence of ESRD while making RRT accessible. Detection of CKD early in its course followed by appropriate intervention may retard progression of CKD and delay ESRD. India needs to shift its focus from promoting RRT aggressively to more cost effective preventive strategies. The WHO has designed an ‘Innovative Care for Chronic Conditions Framework’ model for redesigning health care systems in accordance with local resources relevant to low and middle income countries. Central to this model is a partnership triad among the patient, the health care team and the community, with a background of organized and well equipped health care teams and a positive policy environment. Key to the success of the preventive approach will be awareness programs for both the public and the medical fraternity and continuing medical education programs for the primary care providers and physicians. Even though there is agreement on the need for early detection program for CKD, population wide screening will be next to impossible in a country like India. It may be more appropriate to screen the high risk population with diabetes, hypertension, the elderly and those with relatives with CKD, as suggested by K/DOQI.
Supporting the preventive strategy are reports of successful screening program from India\textsuperscript{17} (The Kidney Help Trust, Chennai) and Nepal\textsuperscript{36} (BP Koirala Institute of Health Sciences, Dharan). Such programs need to be implemented on a larger scale in India.

Despite very successful preventive efforts, the need for RRT is expected to continue and even grow, with better access to medical care with better economic growth. Hence efforts at making RRT more accessible should go hand in hand with preventive strategies. Some of the states in India like Andhra Pradesh, Goa and Tamil Nadu have initiated program aimed at providing RRT to the entire population and if successful, may serve as models for widespread implementation of the same.

Researchers should collaborate with biomedical engineers and the industry in developing indigenous technology eventually leading to local manufacturing of dialysis equipment and consumables, which is expected to go a long way in reducing cost and improving accessibility. Rectifying shortcomings in the organ transplantation act, capacity building in kidney transplantation services and establishing an efficient and transparent organ procuring and distribution system will all help in better care of patients with ESRD.

In summary, the problem of CKD and ESRD is most likely underestimated and under-recognized in India. The burden of CKD is expected to increase with the epidemiologic transition underway in our country. India lacks trained manpower, facilities and economic prowess to ensure universal availability of ESRD care. There is an urgent need to initiate a comprehensive and efficient early detection and prevention program to reduce the burden of CKD and ESRD in India.

6. Imai E, Horio M, Nitta K, \textit{et al.} Modification of the Modification of Diet in Renal Disease (MDRD) Study


27. Geda SB, Parthasarathy S, Sakhuja V, Jha V. Referral pattern of patients with end stage renal disease and its impact on


34. [http://www.who.int/diabetesactiononline/about/ICCC/en/](http://www.who.int/diabetesactiononline/about/ICCC/en/), accessed on 05.04.12
