Global Dialysis Perspective: India

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**Introduction**

The number of deaths attributable to chronic kidney disease (CKD) in India rose from 0.59 million in 1990 to 1.18 million in 2016. Data on incidence and prevalence of kidney failure remain estimates since there are no kidney failure registries. The Million Death Study estimated the number of kidney failure deaths to be 136,000 in 2015. A 2018 estimate put the number of patients on chronic dialysis in India at about 175,000, giving a prevalence of 129 per million population. A systematic review estimated that about two-third of all patients with kidney failure died without receiving dialysis in 2010.

The burden of kidney failure deaths in India is greater in comparison to other low-middle income economies with similar sociodemographic index, suggesting possibility of improvement in mortality rates even with existing resources. Both in absolute and relative terms, the proportion of patients with kidney failure who have access to treatment and are covered by an insurance scheme is lower than China, the only country more populous than India.

According to a 2012 report from the Indian CKD registry, diabetes, hypertension and glomerulonephritis were the commonest identified causes of kidney failure, whereas the cause was not discernible in about 16% of cases. Dubbed CKD of unknown etiology (CKDu), such cases are reported from all over the country with the states of Andhra Pradesh, Odisha, Maharashtra, Goa and Tamil Nadu reporting particularly high burden. The exact etiology of CKDu is a topic of ongoing research, with recurrent dehydration as a result of outdoor work in hot and humid weather, consumption of water contaminated with heavy metals and exposure to pesticides being implicated most frequently.

There are few data on the burden of comorbidities and complications of kidney failure. Hypertension was reported in 85-97%. CKD-mineral bone disease is widely prevalent with most patients taking calcium-based phosphate binders, and there is a high prevalence of malnutrition. Cardiovascular disease and infections are responsible for two-thirds of overall mortality. The commonest infections include those related to dialysis catheter and tuberculosis. About 7-10% of dialysis patients get tuberculosis with atypical extrapulmonary presentations being common. The reported prevalence of hepatitis B and C in dialysis units varies between 1.52-42% and 4.3-45%, respectively.
Dialysis services in India

Hemodialysis (HD) is the most common KRT modality in India. The first HD was performed at Christian Medical College, Vellore, Tamil Nadu in 1961 on an erstwhile Maharaja under the supervision of Dr Satoru Nakamoto, who had flown in from Seattle, WA. Until 1970, only patients with acute kidney injury were dialyzed at 4 centers across the country, and maintenance HD was available at 6 centres in India till 1978. Growth in the following years was slow and HD was largely restricted to a few public and private hospitals in large cities until the 1990s. The number and distribution of HD units has increased over the last 20 years, and dialysis is available now in all 28 states and 8 union territories.

The number of HD stations in India was estimated at 12,881 in 2018. The 2016 National Dialysis Program envisages setting up an 8-station dialysis facility in all 688 districts of the country to provide HD to poor patients. If patients were dialysed twice-a-week (commonly done in India), just about 50,000 new patients (representing about one third of the current requirement) would be accommodated under this program, even without future growth.

Like much of secondary and tertiary level health-care services, dialysis service in India is predominantly private sector driven, reflecting low public spending on healthcare. Public sector hospitals largely manage critically sick patients and those with acute kidney injury, leaving limited capacity for accommodating patients on maintenance dialysis.

Large inequities exist in access to dialysis. Two-thirds of the population of India lives in rural areas where the availability of HD is limited. According to one study, almost 60% of dialysis patients had to travel more than 50 km to access HD, and nearly a quarter lived more than 100 km away from the facility. The burden of travel increases costs and exacerbates loss of wages. Further, women are under-represented, and there are few pediatric dialysis services. Shared decision making is practiced infrequently and access to conservative care is virtually non-existent.

There is variability in frequency, session length and HD prescription. The globally accepted standard of thrice-a-week dialysis delivery is restricted to affluent patients getting dialysis in corporate hospitals. Twice-a-week HD is the most common practice, delivered in majority of centers. About one-quarter patients receive once a week or “as-needed” dialysis for financial feasibility. Dialysis sessions are usually 3-4 hour long. The adequacy is not uniformly reported.
A study on 463 patients reported single pool Kt/V of >1 in only 50% of sessions.\textsuperscript{16} In another study on 50 patients on twice weekly treatment, only 28% had a standardised Kt/V of 2 per week.\textsuperscript{17} The long-term effects of twice-a-week dialysis has not been examined. According to one report from a state-wide database,\textsuperscript{15} about 48.6% patients stopped and 13.2% died within 1 year. The reasons for poor outcomes are unclear but are postulated to be a mix of financial burden, multiple comorbidities, poor access and poor dialysis quality. An incremental dialysis approach has been suggested, but not been rigorously studied. Close monitoring of residual kidney function might support this practice to optimize resource utilization.\textsuperscript{18}

Vascular access care is an area of concern, resulting from a combination of factors including poor vessel protection, high and prolonged temporary catheter use, shortage of intervention nephrologists, surgeons and radiologists skilled in creating permanent vascular access and managing access-related complications.\textsuperscript{19}

In 2009, the Indian Society of Nephrology published recommendations for setting up and running hemodialysis units which were endorsed by the Union Ministry of Health.\textsuperscript{20} These include all aspects of care, including technical specifications for HD equipment and water treatment, human resource needs and quality standards. However, there are no enforcement mechanisms, and the degree of compliance with the recommended standards is unknown. Most centers use combined deionization and reverse osmosis water treatment system, but water quality standards are not mandatorily monitored in many centers. Most units have separate areas for dialysing hepatitis B and/or hepatitis C positive patients. Dialyser reuse (manual or automated) is common, especially in publicly funded facilities. Reuse numbers vary, and can go up to 25 times. Some private centers provide single use service, but at a higher cost.

Despite its potential advantages (no requirement to set up expensive infrastructure, avoid long travel to dialysis centers and allow patient-friendly home-based therapy), PD penetration is poor – there were just about 8,500 patients on PD in India in 2019.\textsuperscript{3} The reasons for poor utilization include high cost of supplies, deprioritization by nephrologists due to lower reimbursement for PD, and fear of complications. The number of patients on home HD is less than 50 in the entire country.
Even as a large proportion of the population remains disenfranchised from dialysis, the use of more expensive convective therapies such as hemodiafiltration is increasing in corporate hospitals that cater to rich patients and to those with access to insurance.

In recent years, HD services have grown in public-private partnerships (PPP) mode. In this model, governments contract private entities to finance, build, and operate dialysis units against an agreed-upon rate. PPP offers several advantages, such as economies of scale through strategic purchasing and process efficiencies, scalable training of workforce, opportunities to implement standardized SOPs and monitoring of quality. PPP transfers responsibilities and risks of infrastructure and service delivery to the private sector but at taxpayer expense, and therefore requires strong oversight and governance. No formal evaluation of these programs has been undertaken so far. Currently, there are around 10 large dialysis providers providing PPP services, with the largest one (NephroPlus) managing 16,000 patients in over 210 centers.

**Workforce**

India has one of the lowest density of nephrology workforce worldwide. There are only about 2,600 nephrologists (1.9 per million population), and there is a chronic shortage of dialysis nurses and technicians. There are about 72 nephrology training programs with an intake of approximately 150 trainees every year who go through a 3-year course. Similar statistics for other personnel are not available. Nurses are required to receive 6 months practical training in dialysis unit in addition to basic nursing training, and dialysis technicians undergo a certificate course in dialysis technology. Some stand-alone dialysis centers are run by dialysis technicians and not regularly supervised by nephrologists. Other multipurpose workers provide sanitation, machine cleaning and dialyzer reprocessing services. Very few centers have access to renal dieticians.

**Funding**

Health expenditure is 3.5% of the gross domestic product in India, as opposed to an average of 9.9% worldwide. Public health spending is just about one-fourth of the overall health expenditure, or about 22 US$ per capita, one of the lowest in the world. Universal health insurance is meagre, with only 37% of the population having access to some health insurance in 2017-2018.
The Indian dialysis market is estimated to be growing at a rate of 31% per annum, compared to 8% in the rest of the world. Payment for dialysis is a mixture of state-funding, employment-based insurance, charity and self-funding (Table 1). Most patients pay for dialysis from their own resources as they are not eligible for state-funding and not covered under insurance. This includes most of rural population engaged in farming and those working in the unorganised sectors. The high rate of catastrophic healthcare spending, supported by distress financing that pushes families into poverty is well-documented.22

The annual reimbursement for HD in India ranges from approximately 1,400 US$ to 10,800 US$ depending on the nature of the facility. However, this reimbursement is not based on any health technology assessment, and largely reflects only the cost of dialysis consumables and overhead costs in private centres (Figure 1). Many of the cost components are hidden as they are part of the overall hospital budgets and not included in calculation of reimbursement for HD. In the only comprehensive study of costing of HD, the total cost incurred on one session of HD in a public hospital was estimated at INR 4,148 (US$64).23 The cost of creating an arteriovenous fistula creation varies between 6000 INR (78.7 US$) to 20,000 INR (262.2 US$).

In addition to the aforementioned National Dialysis Scheme operating through designated district-level centers, eligible patients can receive dialysis in other hospitals that are reimbursed under the National Health Protection Scheme launched in 2018, later renamed the Ayushman Bharat Pradhan Mantri Jan Arogya Yojana.24 Both these schemes do not cover non-dialysis direct (e.g. medication, management of complications) and indirect (e.g. travel) expenses. In a study that examined the outcomes of patients dialysed through publicly funded insurance scheme (Aarogyasri) in the state of Andhra Pradesh, only about 53% patients continued HD after 6 months.15 In 2019, the government added reimbursement for PD to the National Dialysis Scheme. There are a number of other government-run employee health schemes, which offer a reimbursement of INR 2,900–3,335 (US$ 45–51) per dialysis session, and also reimburse other direct medical costs.25 Private sector employees can get reimbursed through private insurance schemes.

**Looking ahead**

Dialysis is growing rapidly in India, but there is room to improve access and quality of service. With commitment from the union and state governments and entry of new service providers, scaling up of service delivery seems a realistic goal. While HD is the dominant modality, wider
adoption of PD might allow more rapid and equitable expansion, including to remote rural areas. Training of a cadre of professionals that provide all-round care and address common issues related to dialysis delivery including expertise in vascular access care is a priority. Development of a registry would allow ongoing monitoring of quality of service delivery, provide iterative feedback for service improvement and allow international comparisons. For maximum impact, dialysis services should develop as a component of integrated kidney replacement therapy program that includes kidney transplantation for suitable subjects and conservative care for those deemed to be unsuitable for dialysis. Finally, the health systems should be reoriented to increase focus on primary care that prioritises early detection and prevention of progression of kidney disease.

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**Author Contributions**

J Bharati: Data curation; Writing - original draft

V Jha: Conceptualization; Supervision; Writing – review and editing
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Table 1: An overview of dialysis services in India

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>Number of dialysis patients in your country (total number and per 1,000 people in the general population)</td>
<td>174,478 (as of 2018)³</td>
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<tr>
<td>Number of patients on home dialysis in your country</td>
<td>8,500</td>
</tr>
<tr>
<td>Are all dialysis sessions covered by insurance, or do some patients have out-of-pocket expenses?</td>
<td>About 35% dialysis patients have some insurance coverage. Most patients incur out-of-pocket expenses to varying degrees. New reimbursement schemes are expected to increase insurance coverage.</td>
</tr>
<tr>
<td>Are the dialysis units hospital-based or freestanding?</td>
<td>Both hospital-based and free-standing dialysis units exist, with predominant free-standing units.</td>
</tr>
<tr>
<td>Are the dialysis units for-profit or non-profit?</td>
<td>For-profit in corporate and free-standing units. Public hospital units and those run by charities are non-profit</td>
</tr>
<tr>
<td>What is the reimbursement per dialysis session in $US?</td>
<td>Approximately 15 US$ to 63 US$</td>
</tr>
<tr>
<td>Are all the staff who deliver dialysis nurses, or do you also use patient care technicians?</td>
<td>Nurses and technicians work interchangeably to deliver dialysis</td>
</tr>
<tr>
<td>What is the typical patient to RN ratio in the dialysis units?</td>
<td>3-5:1</td>
</tr>
<tr>
<td>What is the average length of a dialysis session?</td>
<td>3-4 hours</td>
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<tr>
<td>How many times per month are patients seen by a nephrologist during dialysis sessions?</td>
<td>Variable: Smaller cities and towns: once in 2-3 months Larger cities: 4-6 times per month</td>
</tr>
<tr>
<td>What is the proportion of HD patients in your country using an AVF, AVG and CVC?</td>
<td>Prevalent patients AVF-56-87% CVC-13-44% AVG- &lt;1% Incident patients CVC: &gt;75% AVF: &lt;25%</td>
</tr>
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³ This figure is based on data from the National Dialysis Database for the year 2018.
Figure 1: Dialysis practice and funding in India

- **210,000** new patients develop kidney failure each year
- **174,478** patients were on maintenance dialysis in 2018

**Dialysis modality**
- Recurring cost for one HD session: ₹1,100-4,500 ($15-60)

**Dialysis funding**
- Total cost (capital + recurring) to the health system for one HD session in a public sector hospital: ₹4,148 ($64)