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Global Dialysis Perspective: Sri Lanka

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Introduction

Sri Lanka is an island situated in the Indian Ocean just to the south of the Indian peninsula. It has a land area of 65,610 sq. km and a population of approximately 22 million. The population is distributed among 9 provinces with an average population density is 347.1 persons per sq. km. Western province, which is the country’s economic and administrative hub, has the highest population density of 1705.8 persons per sq.km. Sri Lanka has an ageing population, with persons over the age of 65 years has increased from 3.7% in 1970 to 10.8% in 2019. It has a multi-ethnic society comprising Sinhalese (75%), Sri Lankan Tamils (15%) and Sri Lankan Moors (9%)\(^1\). Sri Lanka has a high adult literacy rate, which was 92.9% for males and 90.9% for females in 2017.

Sri Lanka is categorized as a lower-middle-income country, according to the World Bank country classification by income level. The economy has shown a declining trend over the last few years compounded by the negative impact of the COVID-19 pandemic in 2020 and 2021. The subsequent economic recovery has been hampered by the raging inflation, foreign exchange devaluation and foreign currency deficit, resulting in the estimated year-on-year Gross Domestic Product (GDP) growth rate for the first quarter of 2022 turning negative at 1.6%.

Burden of CKD in Sri Lanka

Diseases of the urinary system, under which CKD is classified, have been the fourth leading cause of hospitalization (1,830 per 100,000 population) and the eighth leading cause of hospital deaths (14.4 per 100,000 population) in Sri Lanka in 2019 according to the Annual Health Statistics Report \(^2\). However, the exact prevalence of CKD and end-stage kidney disease is not
known due to the absence of an updated CKD registry in the country. A recent cross-sectional epidemiological study conducted in the Western province revealed a CKD prevalence of 14.8% among adults\textsuperscript{3}. The prevalence of CKD was higher in individuals with diabetes (28%) and hypertension (21%). In another study conducted in a rural population in Sri Lanka, the CKD prevalence was found to be 58.3% among the individuals with hypertension, which was 1.6 and 3.4 times that of Bangladesh and Pakistan respectively\textsuperscript{4}.

The CKD burden of the country has risen further during the last two decades with the detection of an increasing number of individuals with CKD from the north-central region of Sri Lanka, who do not have the traditional risk factors such as diabetes or hypertension or any other known causes of kidney disease. This disease, now termed CKD of unknown aetiology (CKDu), was first reported in the districts of Anuradhapura and Polonnaruwa in the Northcentral province but was subsequently identified from certain other hot spots in adjacent Kurunegala, Matale and Badulla districts. The prevalence of CKD in these endemic areas ranges from 5 to 15% with more than 75% of them not having traditional risk factors for CKD\textsuperscript{5,6}. The disease predominantly affects young and middle-aged farmers living in these areas. The characteristic histopathological lesion is chronic tubulointerstitial nephritis\textsuperscript{7}. Environmental nephrotoxic agents such as agrochemicals, heavy metals (such as cadmium, arsenic and lead), excess fluoride and hardness in water, and exposure to heat stress and dehydration are some of the postulated causative factors for the disease, but none have been proven yet\textsuperscript{8,9}. Many steps have been taken by the Sri Lankan government to mitigate the disease including the provision of demineralized water, banning the importation of certain agrochemicals, and provision of health advice on food and food preparation.
Dialysis services in Sri Lanka

Sri Lanka has a universal healthcare system that extends free healthcare to all citizens. The Ministry of Health provides government-funded free healthcare services via a tiered network of urban tertiary care hospitals coupled with smaller provincial and district hospitals and peripheral clinics. Haemodialysis is the main modality of renal replacement therapy (RRT) for patients with end-stage renal disease (ESRD) and is available mainly in tertiary care hospitals based in larger cities (Figure 1). Almost all the state-funded dialysis units are hospital-based with very few stand-alone dialysis units. Most of these units are overwhelmed by the excessive number of patients requiring chronic RRT resulting in many prioritizing dialysis to individuals with kidney transplant plans, and younger patients with fewer comorbidities. Most patients are dialyzed only two times per week with a considerable number getting only once per week or even lesser frequency of dialysis. Only a few hospitals in the private sector provide dialysis. Most of them are based in the Western province (Figure 1) and access is limited to patients who can afford the out-of-pocket expenditure.

Initiation of dialysis for most is via temporary vascular catheters with only a minority having mature arteriovenous fistulae (AVF) at the start of maintenance dialysis. Many factors including delayed referral to nephrology services, poor patient uptake, and delays in creating AVF due to lack of trained staff and non-availability of surgical theatre facilities contribute to this. Peritoneal dialysis (PD) is grossly underutilized in Sri Lanka as a modality of chronic RRT. Most patients are unwilling to accept PD as a mode of RRT due to their reluctance to accept the
responsibility of performing the treatment by themselves. In addition, lack of trained staff, 
interruptions in the supply of dialysis solutions and catheters, increased cost, and lack of 
reimbursement to nephrologists have contributed to its underutilization. However, PD has 
attracted renewed interest with the recent emergence of the CKDu epidemic in the country, 
which mostly affects patients living in rural areas who have poor access to haemodialysis 
services based in cities. Nephrologists from National Hospital Kandy in collaboration with 
Stanford University, USA have successfully started a continuous ambulatory peritoneal dialysis 
(CAPD) program in the CKDu-affected region in Girandurukotte\textsuperscript{10}. Patients’ ability to continue 
with employment while on treatment, availability of good family support, non-reliance on 
complex technology and electricity and less requirement for travel were contributory to the 
increased uptake of CAPD by the patients during this program. PD is performed via double-
cuffed flexible PD catheters inserted by open surgical method or percutaneously. The standard 
1.5\%, 2.5\% and 4.25\% dextrose solutions are used. Periodic educational and quality 
improvement programs have helped to reduce the PD peritonitis rate to 0.38 per patient-
year\textsuperscript{11}.

**Dialysis funding**

Both haemodialysis and CAPD are provided free of charge in public hospitals. A haemodialysis 
session in the state sector approximately costs USD 38, while it costs between USD 39-43 in the 
private sector. Considering that most patients undergo twice-weekly dialysis the approximate 
cost per month for a patient on haemodialysis is USD 300 – 350. In comparison, the monthly 
cost for CAPD is approximately USD 552 and automated peritoneal dialysis (APD) is USD 522\textsuperscript{12}. 

These suggest that the provision of HD is cheaper compared to PD, but the HD costs would be considerably higher if provided three times per week. Despite the haemodialysis and the medications provided free of charge in the state sector, indirect expenses including transport and loss of work due to treatment have resulted in many patients not attending dialysis sessions regularly.

Patients have to bear the cost of dialysis out-of-pocket in the private sector. Patients in low-income groups are supported by the government through the President’s Fund, where Rs. 400,000 (USD 1000) per patient is paid directly to the private dialysis unit. This amount will cover the cost of dialysis for approximately three months and no more funding is available for patients who exhaust this amount. Charity organizations such as the All-Ceylon Kidney Patients Association, bear a proportion of the cost of each dialysis for patients having a very low income.

The APD program is conducted as a public-private partnership, where the private agent provides the APD machine (the cost reimbursed by the government), the training and the continuation of care for the patients whereas the government provides the PD catheter and the dialysis solutions.

**Workforce**

The lack of trained staff is a major constraint to the expansion of dialysis services in the country. There are only 35 nephrologists, 1.6 per million population, which is slightly above the average of 1.2 per million population for the South Asian region\(^1\). The nephrology training program is conducted by the Postgraduate Institute of Medicine, with an intake of 5-10 trainees every
year, who go through a 4-year training course. The program includes a mandatory training period in an overseas centre of excellence, which is fully funded by the government.

Dialysis care is solely provided by nurses and there is no dialysis technician category. A formal training program does not exist for dialysis nurses and most of the training is limited to workshops and educational sessions conducted by individual institutions and the Sri Lanka Society of Nephrology.

AVFs are performed by vascular surgeons who are available only in a few larger hospitals based in major cities. There are considerable delays in AVF creation due to excessive numbers and the lack of availability of surgical theatre space.

**Challenges and future directions**

Sri Lanka has made considerable progress in the provision of dialysis to patients with ESRD. However, due to the ever-increasing numbers of patients with CKD more needs to be done to improve the capacity and quality of dialysis provided. Both the number of haemodialysis units and the number dialysis sessions provided by each unit need to be increased to enhance the dialysis capacity of the country. This requires more dialysis workforce. The creation of a new staff category of ‘dialysis assistants’ is in the pipeline, which could overcome some of the current staff shortages. Timely referrals, pre-dialysis counselling and creation of AVFs could also improve the quality of care provided. Efforts should be made to bring down the cost of haemodialysis in order to develop a sustainable haemodialysis program in the country.
Sri Lanka should also aim to strengthen the PD program. Since the treatment is expensive at present, low-cost treatment approaches should be explored including the production of PD solutions locally.

Finally, the health system should give priority to the prevention and early detection of CKD, by specifically focusing on high-risk populations (diabetes mellitus, hypertension and people living in CKDu endemic areas), in order to reduce the burden of ESRD and the need for RRT in the country.

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Author contributions:
Eranga Wijewickrama: Conceptualization; Data curation; Writing - original draft. Nalaka Herath: Data curation; Writing - review and editing.
References


Table 1. Demography and dialysis services in Sri Lanka

<table>
<thead>
<tr>
<th>Item</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population of the country, n</td>
<td>21,900,000</td>
</tr>
<tr>
<td>Number of nephrologists, n (pmp)</td>
<td>35 (1.6)</td>
</tr>
<tr>
<td>Total dialysis population, n</td>
<td>4,331</td>
</tr>
<tr>
<td>Prevalence, pmp</td>
<td>198</td>
</tr>
<tr>
<td>Dialysis modality distribution, n (%)</td>
<td></td>
</tr>
<tr>
<td>Incenter HD</td>
<td>3,517 (81)</td>
</tr>
<tr>
<td>Home HD</td>
<td>0</td>
</tr>
<tr>
<td>PD</td>
<td>814 (19)</td>
</tr>
<tr>
<td>Number of HD centers, pmp</td>
<td>4.6</td>
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<tr>
<td>Number of HD machines, pmp</td>
<td>26.5</td>
</tr>
<tr>
<td>Number of PD centers, pmp</td>
<td>0.8</td>
</tr>
<tr>
<td>Payment</td>
<td></td>
</tr>
<tr>
<td>Dialysis services</td>
<td>Dialysis is free of charge in public hospitals but limited. Patients have to pay out-of-pocket for private sector dialysis.</td>
</tr>
<tr>
<td>Reimbursement</td>
<td>Nephrologists are reimbursed for private sector dialysis</td>
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<tr>
<td>Staffing</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Who delivers dialysis?</td>
<td>Dialysis Nurses</td>
</tr>
<tr>
<td>Nurse to patient ratio</td>
<td>1:2-3</td>
</tr>
<tr>
<td>Frequency seen by nephrologist</td>
<td>3 monthly</td>
</tr>
<tr>
<td>HD session frequency, %</td>
<td></td>
</tr>
<tr>
<td>3 sessions per week</td>
<td>&lt;10</td>
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<tr>
<td>2 sessions per week</td>
<td>50</td>
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<td>1 or &lt;1 session per week</td>
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<tr>
<td>HD session length</td>
<td>4 hours per session</td>
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<td>HD vascular access, %</td>
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<tr>
<td>AVF</td>
<td>56</td>
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<td>AVG</td>
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<tr>
<td>Permanent vascular catheter</td>
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<tr>
<td>Temporary vascular catheter</td>
<td>34</td>
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<tr>
<td>PD modality, n (%)</td>
<td></td>
</tr>
<tr>
<td>CAPD</td>
<td>751 (92)</td>
</tr>
<tr>
<td>APD</td>
<td>53 (8)</td>
</tr>
</tbody>
</table>
Figure 1. Distribution of dialysis centers in Sri Lanka

- **Haemodialysis Centers in government hospitals**
- **Haemodialysis Centers in the private sector**
- **Peritoneal dialysis Centers**