Utilization, costs and outcomes for patients on publicly funded hemodialysis in India

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Abstract

Every year about 150,000 people develop end stage kidney disease (ESKD) in India, most of whom die without receiving treatment. In 2008, the state of Andhra Pradesh started public funding for hemodialysis (HD). We evaluated the coverage pattern, cost of care and outcomes of patients treated under this scheme. Unique identifiers and billing codes for HD, vascular access and hospitalisation were identified from claims database to construct utilisation, cost and outcome for subjects from 2008 to 2012. Outcomes were classified as death, dialysis discontinuation and kidney transplantation. Costs of HD, vascular access, and hospitalizations were calculated. A total of 13,118 beneficiaries (1.36% of all claimants, mean age 44 years, 73% males) received HD during the study period. The number of people who received HD increased from 29.5 pmp in 2008-09 to 122.2 pmp in 2012-13. Of all patients, 10% died and 37% dropped out in first 6 months. Median time on HD was 170 and 198 days for females and males respectively ($p=0.0059$). Mortality increased with age and was higher in women and in public hospitals. The average per patient annual expenditure on HD was US\$ 4,820. Costs of HD as a proportion of the total healthcare spend increased from 0.78% in 2008-09 to 5.15% in 2011-12. Progressive increase in uptake confirms a high unmet need for renal replacement therapy. High mortality and dropouts suggest the contribution of factors beyond user fees to outcomes. Insurance coverage does not address all inequities in access and the barriers to maintaining long term dialysis care.

Keywords : Hemodialysis, healthcare costs, India, Outcomes, Survival

Background

Lifestyle transitions are making chronic conditions such as chronic kidney disease (CKD) increasingly common in low and middle-income countries, including India. According to the 2016 Global Burden of Disease Study, CKD was the 9th leading cause of death in India, having risen from 15th rank in 2005 (<http://www.healthdata.org/india>). In a recent analysis of deaths in 1.1 million Indian households, renal failure was responsible for 2.9% of all deaths amongst 15-69 year olds in 2010-13, an increase of 50% from 2001-03.¹ Currently, most patients with end-stage kidney disease (ESKD) in India die without receiving appropriate treatment.²

As countries such as India move towards universal health coverage (UHC), the health and economic burden imposed by CKD – in particular how to take care of patients with ESKD – creates challenges for health systems. Although classified by WHO as a low priority service on the basis of cost-effectiveness,³ funding of dialysis has generated debates around societal willingness to pay for expensive medical care⁴.

The Rajiv Aarogyasri Community Health Insurance Scheme (RACHIS) was introduced in 2007 by the state government of undivided Andhra Pradesh (AP), India to provide free hospital care to poor households.⁵ The poor were defined as those with annual income below 60,000 Indian Rupees (INR, approximately US\$ 3,550) in rural areas and below INR 75,000 (US\$ 4,438) in urban areas. Under the program, a private insurer provided health insurance and was paid in full by the state government. Beneficiaries were able to utilize hospital services through a network of public and private hospitals. Each household received coverage for up to INR 150,000 (US\$ 8,876) per year, plus an extension of INR 50,000 (US\$ 2,958) for those needing long-term care. By 2012, RACHIS was claimed to be providing free care for 18.81 million households, constituting 81% of population of AP.⁵

We studied the use of maintenance HD between mid-2008 and mid-2012 across all 23 districts of undivided AP using RACHIS claims data. In this report, we describe

patterns of utilization of dialysis and outcomes for a large population of patients with ESKD.

Results

A total of 13,118 beneficiaries (1.4% of all claimants) received HD for ESKD during the study period, with 63.6% seeking care predominantly at private centres. Table 1 summarises the key findings on patient attributes and utilization patterns. The majority (73.4%) of patients were men, and the gender gap increased with age (Table 2). Approximately half of the patients were between the ages of 40 and 60 years. The mean age at start of HD was slightly lower for females (42.9 vs 44.4 years; $p < 0.001$).

The number of centres providing HD increased from 50 in 2008-09 to 89 in 2011-12 (Supplementary Table 1). This was paralleled by an increase in the uptake, as shown by the incidence of new patients accessing HD, from 29.5 per million of the population (pmp) in 2008 to 69.8 pmp in 2012 (Fig 1). Overall, the number of patients who received HD for ESKD increased from 29.5 pmp in 2008-09 to 122.2 pmp in 2011-12.

The number of dialysis units for every 100 recipients of ESKD receiving treatment ranged from 0 to 1.89 across districts of AP, with only 6 out of 23 districts having more than 1 dialysis unit for 100 residents (Supplementary Table 2).

A total of 5,595 (42.6%) patients underwent a vascular access procedure – 3,928 (29.9%) patients before, and 2,203 (16.8%) after initiating HD. A total of 488 (8.7%) patients underwent multiple procedures.

A total of 15,064 hospitalizations were recorded in this population, 11,991 (79.6%) before starting on HD. The majority (56%) of pre-HD hospitalizations were for medical management of chronic renal failure, either for starting dialysis or confirmation of diagnosis. After starting HD, hospitalizations were for the management of HD-related complications, or for kidney transplantation.

Outcomes

Of all the subjects who started HD, 2.3% received a kidney transplantation, 17.1% were reported as dead, and 63.5% had ceased treatment of their ESKD, i.e., stopped reporting to dialysis centres. After 6 months of HD, 10.2% had died and 36.2% ceased treatment (Table 3). The median duration the incident population stayed on HD was 170 days for females and 198 days for males. For patients who did not drop out, the median survival was 1,320 and 1,372 days for females and males respectively. (Figure 2). The hazard ratio (95% confidence interval) for the risk of death or discontinuation was 0.95 (0.92-0.99) for males compared to females, 1.005 (1.003-1.006) for each year increase in age and 1.07 (1.03 – 1.12) for those using services at public versus private dialysis centres.

Cost of care

The total cost of HD-related care was US\$ 63.2 million, accounting for 3.1% of all claim expenses during the study period. US\$59.9 million was spent on HD and US\$ 4.26 million on vascular access procedures. An additional US\$ 3.26 million was spent on hospitalizations for other indications in these patients. The mean annual expenditure per patient on HD-related care was US\$ 4,821 (Supplementary Table 3). In aggregate, HD-related expenditure as a proportion of all RACHIS claims increased sevenfold from 0.75% in 2008 to 5.2% in 2012 (Fig 3). Supplementary Tables 4 and 5 show details of indications for hospitalization and associated costs.

Discussion

This is the first large-scale study to present population-based data on utilization of HD and outcomes of care for ESKD in India. Our data came from over 68 million people who were eligible to receive free care, constituting over 80% of the population in the undivided AP.

The year-on-year increase in uptake in treatment suggests that programs such as this are making inroads in addressing the high unmet need for dialysis, albeit at the cost of a significant economic burden on the health system.

A notable finding is the poor survival and high drop-out rate, with only 53% patients continuing dialysis for >6 months. Even the dropout and transplant-censored survival was below the global standards. According to the United States Renal Data System Report, the expected remaining lifespan on dialysis is about 10.5 years for dialysis patients 40-44 years of age and about 5.5 years for those aged 60-64 years.⁶

A recent systematic review from Africa⁷ suggested high mortality and dropouts amongst patients who received dialysis for ESKD. Overall, only about 10% of African adults with incident ESKD remained on dialysis for over 3 months, with patients stopping dialysis after a mean of 6.5 sessions only. Only a minority of patients received financial support for their dialysis, unlike in the present report.

The high dropout rates, most of them early in the course of treatment deserve closer examination. Since we were able to track all unique patients across different dialysis facilities, the likelihood that any patient would be continuing dialysis elsewhere or received a transplant using their own funds either within or outside the jurisdiction of RACHIS is extremely low. Therefore, such dropouts can be safely assumed to have culminated in death. These data are consistent with previous single-centre reports from India.⁸ Finally, it is possible that some patients with acute kidney injury (AKI) were miscoded as ESKD but recovered kidney function sufficiently to come off dialysis.

Given that treatment through this program was provided without charge, factors other than the cost of dialysis itself likely contributed to early discontinuation, especially in the rural populations. They could include out-of-pocket expenses for travel to dialysis units; management of associated conditions (anaemia, abnormalities of bone and mineral metabolism, blood pressure and nutrition) and comorbidities, the costs of which were not covered by the scheme; loss of income

and carer burden. RACHIS covered only one set of labs per month. Previous studies have shown that the catastrophic cost burden associated with long term dialysis treatment is a major contributor to cessation of treatment and inequity in access to care.⁹

The low annual spend per patient is low in comparison to that reported from other countries (US\$ 89,900 in USA, AU\$65,000 in Australia, US\$12,100 in Thailand and US\$9,112 in Brazil). One consequence of the low spend may be the poor patient survival observed in this study. The reimbursement rates were decided by the government without any formal costing analysis to determine a model that will provide an essential level of quality. Given limited resources available, maintaining a low-cost model of care, whilst meeting a minimum acceptable level of service quality is critical for enabling a basic level of access. Our analysis suggests that the current model of insurance coverage does not adequately address the barriers to long term care that lead to optimum survival. Overcoming these barriers is likely to increase the cost of care, hence understanding the gains from such investment in terms of enhanced patient survival and productivity is important.

The data also suggest residual inequities in the care of females with ESKD. Although men outnumber women amongst the dialysis population in almost all geographic regions, the over-representation of men (3:1) in this study was striking, suggesting that social determinants are influencing the disparities. It is possible that a larger proportion of women in this population either are not diagnosed, or do not present for treatment. Even those women that entered the HD program were more likely to cease treatment than males perhaps because, in these cases, households are less willing to bear the out of pocket costs of ongoing medications.

State-funded dialysis programs for patients with ESKD are being increasingly adopted as part of universal healthcare provision in low and middle-income countries.⁴ The findings presented here are of significance, since the recently announced National Dialysis Program in India envisages provision of free dialysis to the poor using a public-private partnership model akin to the one evaluated in this study. However,

the suboptimal outcomes suggest the need to make dialysis more accessible through participative approaches. Community-focussed models of dialysis delivery such as peritoneal dialysis and satellite dialysis units need to be developed. The financing model, especially around the ancillary costs, and oversight around overall quality of care need evaluation to ensure that dialysis programs can deliver acceptable outcomes. Other urgent needs include development of a program of care that includes early detection and prevention of kidney disease, better care of those with pre-dialysis CKD and expansion of the transplant program. Finally, success of ongoing efforts to develop low-cost but robust and sustainable dialysis delivery systems (<https://www.ellenmedical.com/>) could be particularly relevant for emerging economies.

Our study has several strengths – it covered a large beneficiary population who are unlikely to have gone outside of the network for expensive treatment, such as dialysis. For the same reason, we were able to establish the outcomes with a high degree of confidence. We were able to perform a comprehensive cost-calculation that included not only the cost of dialysis treatment, but also ancillary services. The weaknesses were related to the nature of the data. The source of information was claims data, without any link to medical records. Hence, we were unable to get information on comorbidities, causes of death, medication use, dialysis quality and complications. We were also unable to determine the characteristics of patients who discontinued dialysis – whether these people had been referred late, had to travel long distances, belonged to very poor rural communities, or had inadequate family support. As participants were recruited in hospitals, we were unable to account for patients who might have developed ESKD but did not access HD at all.

In conclusion, removal of out of pocket of cost leads to increase in uptake of HD, confirming a previously high unmet need. The high mortality and dropouts suggest that insurance coverage does not address all inequities in access and the barriers to maintaining long term care. Prospective studies are needed to identify reasons for dialysis discontinuation and death; and to identify factors that will promote patients to stay on dialysis, improve quality of life and rehabilitation status. Such factors may

need to be specifically tailored for women. In projecting the future financing needs for dialysis treatment within the context of UHC, the study illustrates that meeting the previously high levels of unmet need will be a significant driver of cost, and the imperative will be on expanding coverage and promoting survival whilst maintaining a low-cost model of dialysis care.

Methods

Data Sources

We obtained data on all enrollees in RACHIS between 2008 and 2012. Unique identifiers for patients and households were used to reconstruct patient-level records of hospitalizations, procedures and costs. Data on the number of beneficiaries were collated from RACHIS annual reports. Patient age, sex, social class and place of residence were obtained from the claim records.

Inclusion criteria and study period

This study included all patients having at least one claim for the billing code of *Maintenance HD for chronic renal failure* during the study period (coded as M6.5 under the RACHIS billing system). This billing code entitled the dialysis centre to receive a reimbursement of INR 10,000 (US \$590) for a package of 10 HD sessions and a single renal biochemistry panel. Since many hospitals submit claims late, claims submitted until March 2013 were obtained and cut-off dates for follow-up were backdated to the end of the study period in 2012.

We identified unique individuals from these claims to build a database of patients on HD. Claims received from all centres were examined to account for any inter-facility transfers. The number of days on HD was computed as the difference between the dates of the first and the last claims, both days included. Patients utilizing more than 60% of the services at private facilities were assigned to the private group; otherwise they were classified as public patients. We also identified claims received for dialysis vascular access related procedures (billing codes: S7.11.13, S7.11.14, and S9.1.2), and other hospitalization events. Hospitalizations with a discharge date prior to start of HD were identified as pre-HD and others as concurrent hospitalizations.

Outcome Measures

The key parameters were clinical outcome (defined below) and costs of care. Patients were considered to be still on HD if the end date of the last claim received was beyond the study cut-off and the patient had not received a renal transplant, nor was reported to be dead. Death on HD was recorded if the last claim mentioned a date of death. Patients were classified as having stopped HD if the last claim received was before the study cut-off date and the patient neither received a renal transplant nor was reported dead. Finally, we scrutinised all claims for renal transplant surgery to identify whether the patient on HD had received a renal transplant.

For calculating costs, claims submitted for each patient were collated separately into those for HD, vascular access related, and other hospitalizations. Claims for HD and vascular access related hospitalizations were combined to calculate costs. Currency exchange from INR to US\$ was done on the basis of purchasing power parities in given years (<https://data.oecd.org/conversion/purchasing-power-parities-ppp.htm>).

Statistical analysis:

Data are presented as mean (standard deviation) or median (interquartile interval). The annual incidence and prevalence were expressed per million of the population, with population estimates derived from census data. Between group comparisons were done by chi-square tests for categorical variables and Student's t-tests for continuous variables. Two types of survival analyses were done using adjusted Cox model; one in which patients who ceased dialysis or received a transplant were censored, and the other for a composite of death and dialysis cessation.

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Figure Legends

Fig 1: Change in the number of new patients, and total number of patients who received hemodialysis (2008-12)

Fig 2: Kaplan Meier curve showing survival of A. all patients on HD and B. censored for transplants and dropouts

Fig 3: Proportion of claimants for HD and expenditure on HD as a percent of total expenditure from 2008 to 2012