End-Stage Renal Disease in India and Pakistan: Incidence, Causes, and Management

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Chronic renal failure is a devastating medical, social, and economic problem for patients and their families in India and Pakistan. Reliable data on the true incidence and prevalence of end-stage renal disease (ESRD) in India and Pakistan are lacking because no national registries exist. Among reported cases, chronic glomerulonephritis is the most common cause, accounting for more than one third of patients, while diabetic nephropathy accounts for ≈20% of all patients in India. Delayed diagnosis and failure to institute measures to slow the progression of renal failure have resulted in a predominantly young ESRD population, with a median age of 44 years. Because of financial constraints, less than one third of all patients referred to a tertiary care center receive any kind of renal replacement therapy. Most hemodialysis patients who stop treatment and die do so because of cost constraints within the first three months, and ≈5% of patients are started on ambulatory peritoneal dialysis. Renal transplantation is the cheapest option, but <10% of all patients with ESRD have a transplant. Cyclosporine, azathioprine, and prednisolone continue to be the backbone of post-transplant immunosuppression, but cyclosporine is stopped in a significant proportion of patients at one year post-transplant to cut down costs. Living related donor transplants constitute 70% of all transplants; two thirds of the donors are females, while more than three fourths of all recipients are males. Spouses account for 20% of donors from within families. Almost 30% of transplanted kidneys are donated by living unrelated donors, while cadaver donors account for only 2%. More resources must be mobilized to care for these patients; early detection of renal disease must be facilitated, and measures to delay ESRD must be implemented. (*Ethn Dis*. 2006;16[suppl 2]:S2-20–S2-23)

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India and Pakistan are together home to more than one sixth of the world's population. According to the World Bank, both countries fall in the low-income group and are classified as developing countries.[1] Less than 2% of the Indian population earns US ≥$1000 in a year, and >35% survive on an annual income US <$90. India and Pakistan have an annual gross national product (GNP) of US $450 and $470 billion, respectively, which is <1.5% of that of the United States. The annual expenditure on healthcare is 0.6% and 1.5% of total GNP in Pakistan and India, respectively. Most of this amount goes toward meeting the cost of national health priorities like control of infectious diseases, family planning, providing clean drinking water and sanitation, and maintaining basic hospital infrastructure. These economic constraints affect the care provided to patients with end-stage renal disease (ESRD).

Both countries have a dual healthcare delivery system; economically less advantaged patients are cared for by state-run hospitals, and the more affluent population generally receive hospital care in the private sector.[2–4] The state-run healthcare system has a pyramidal structure, with primary healthcare centers at the bottom followed by block or district hospitals and university hospitals. The top is formed by few tertiary care referral centers, which are the only places where facilities for complete ESRD care are available. State-run hospitals, where consultations are generally free and dialysis and transplant costs are subsidized, are overloaded with patients with long waiting lists for dialysis as well as transplantation. They do not provide maintenance hemodialysis for ESRD, as most dialysis centers are overwhelmed by patients with potentially reversible acute renal failure. As opposed to this situation, privately run centers readily accept patients on maintenance dialysis programs and have a shorter waiting list for transplantation. Furthermore, all state-run hospitals undertake kidney transplants only from genetically related or spousal kidney donors, as opposed to in the private sector where unrelated (and paid) donors may also be accepted.

Incidence and Causes

The precise number of ESRD patients in these two countries is not known because no regional or national registries exist. Patients have to travel far from their homes to hospitals where specialized care is available. The estimates are at best approximations based on the experience of individual nephrologists and may not reflect the true situation. Conservative estimates put the annual incidence of ESRD in India and Pakistan at ≈100 per million population, which appears to be lower than the 98–198 per million reported from ESRD registries of developed countries.[2,6,7] The incidence of ESRD in India and Pakistan would be expected to be higher since poor socioeconomic status predisposes the population to a number of infection-related glomerulonephritides and the incidence of nephrolithiasis is higher in both countries as they fall in a "stone belt."[7] A higher incidence of ESRD has also been noted in Asians of Indian origin in the United Kingdom.[8] If the incidence of ESRD is indeed 100 patients per million population per year, this would mean ≈100,000 new patients every year for a population of 1 billion in India

Table 1. Causes of ESRD in India and Pakistan

	India% *		
	(all age groups)	(>40 years)	Pakistan %†
Chronic glomerulonephritis	34.5	18.3	37
Diabetic nephropathy	20.5	33.9	10
Chronic interstitial nephritis	16.5	24.7	19
Hypertensive nephrosclerosis	4.5	5.5	12
ADPKD	5	8.2	3
Miscellaneous/unknown	19	9.1	19

* Data from ref. 9
† Data from ref. 3
ADPKD: autosomal dominant polycystic kidney disease

and 15,000 patients for a population of 150 million in Pakistan. The prevalence of ESRD (ie, the number of patients maintained on dialysis) is likely to be <50 patients per million population since few patients can afford this form of therapy.

The causes of ESRD in India and Pakistan are shown in Table 1. Chronic glomerulonephritis is the most common cause of ESRD.[2,3,9] The high prevalence of glomerular diseases may be linked to the infections prevalent in these countries. Geographic differences in the spectrum of disease are related to the age and socioeconomic status of the population studied. Diabetic nephropathy is more common in high-income patients, those from urban areas, and in persons >40 years of age.[9–11] Chronic interstitial nephritis accounts for 16.5% of ESRD patients in India. Since one third of these have underlying calculus disease, ≈5% of all ESRD in India is due to nephrolithiasis. The spectrum of glomerular disease as reported from two referral centers in India is shown in Table 2.

ESRD patients in the subcontinent are younger as compared to their Western counterparts. The median age of patients entering ESRD programs is 44 years in India, as compared to 52–63 years in developed countries.[3] Thus, ESRD affects most patients in the prime of their lives. These patients are often the sole breadwinners of their families. Delay in detection and failure to institute strategies that delay progression of renal failure contribute to ESRD at a younger age.[14]

Patients generally present late in the course of their disease; 73% of patients first see a nephrologist when they require dialysis or less than four months before they develop ESRD. Furthermore, unlike Western nations, the concept of health insurance is in a primitive stage. Most patients on renal replacement therapy (RRT) in these countries are funded by their employers or by charity organizations. In a study from a private-sector hospital in south India, 63% of patients belonged to this group, 30% arranged finances by selling property, 20% raised loans, and 4% were able to take care of their treatment costs by pooling family resources.[5]

Thus the fate of ESRD patients is dismal; most (65.7%) do not receive any form of RRT or stop treatment because of lack of resources. Of those referred to a center known for its prolific transplant activity, only 12.8% underwent renal transplantation, 16.3% received maintenance hemodialysis (HD) for varying periods of time, and 5% received continuous ambulatory peritoneal dialysis (CAPD); therefore, the overall percentage of ESRD patients undergoing transplantation is likely <10%.[9]

DIALYSIS

India has ≈600 practicing nephrologists and 400 dialysis centers (0.4 per million population). Approximately one third of these centers are state run, whereas the remaining are under private management. A large number of dialysis units are small, minimal care facilities with <5 dialysis stations. A rough correlation has been shown between the number of dialysis facilities and the per capita income of different states. The more industrialized western and southern states of the country have more RRT centers, whereas the least developed states in the eastern part of India have the fewest centers per million population.[15] Pakistan has 72 public and private HD centers (0.5 per million population).[2] The annual cost of HD ranges from US $2300 per year for twice weekly HD to US $3500 per year for three times weekly HD. The annual cost of 6000 IU of erythropoietin given every week is US $1700.

Of those on maintenance dialysis, 85% are on HD and only 15% on CAPD. Most patients are given HD twice a week. Only 20% of patients are dialyzed three times a week. All dialysis units reuse dialyzers after manual cleaning, and >50% of units still use acetate buffer in HD. The dialysis prescription is empirical, with Kt/V <1 in the majority.[16] Erythropoietin is used in adequate dosage by only 30%–40% of patients.

In the last 8 years, the number of CAPD patients in India has grown substantially compared to the number in Pakistan, where CAPD use is relatively new. India has an estimated 4000 patients on CAPD; more than two thirds of these patients are on three 2-L exchanges per day with twin bags. Peritonitis rates are within acceptable limits. Financial constraints prevent wider acceptability of CAPD; the annual cost is US $4500 per year for three exchanges per day. Thus, the cost of CAPD is approximately two times higher than HD on the subcontinent.

RENAL TRANSPLANTATION

In the absence of adequate dialysis facilities, renal transplantation remains

Table 2. Spectrum of glomerular diseases in India

	Chandigarh*	Vellore†
MCD	24.5%	19.6%
MPGN	10.7%	8.5%
MGN	9.8%	7.6%
FSGS	9.6%	10.3%
DPGN	8.2%	10.6%
Cres.GN	7.8%	6.0%
Mes.PGN	5.3%	7.4%
Scl. GN	4.5%	9.2%
SLE	6.0%	8.4%
Amyloidosis	3.6%	1.4%

* Data from ref. 13.

† Data from ref. 12.

MCD: minimal change disease, MPGN: Membranoproliferative glomerulonephritis, MGN: membranous glomerulonephritis, FSGS: focal segmental glomerulosclerosis, DPGN: diffuse proliferative glomerulonephritis, Cres.GN: crescentic glomerulonephritis, Mes.PGN: mesangioproliferative glomerulonephritis, Scl. GN: sclerosing glomerulonephritis, SLE: systemic lupus erythematosus.

the best hope for ESRD patients in India and Pakistan. It is not only the best form of RRT in terms of quality of life but is also the least expensive option if cyclosporine, azathioprine, and prednisolone are used.[17] Approximately 45 major centers (0.05 per million population) perform transplants in India and 12 (0.08 per million population) in Pakistan; these centers do an estimated 3000 and 400 transplants every year, respectively.[2–4] The cost of renal transplant surgery at a public hospital is US ≈$1000, which covers the surgical fees, medications, consumables, and inpatient hospital charges, but the same surgery is likely to cost three to four times more at a private center. The annual cost of cyclosporine and azathioprine immunosuppression is US ≈$3000. Financial constraints are an obstacle to long-term immunosuppression, and in most instances, cyclosporine is tapered and stopped at one year electively. A significant number of patients stop cyclosporine abruptly and run a higher risk of acute rejection and graft loss compared to those who taper slowly.[18] Cost of immunosuppression one year after transplantation is US <$500 if only azathioprine and prednisolone are used. At one large center in Pakistan, a successful transplant program is run largely based on donations from nongovernmental charity organizations and individuals, where immunosuppressive drugs are also provided free of charge. This successful experiment needs to be copied at more places in the subcontinent.[5]

Living related donors constitute ≈70% of all kidney donors in India. In Pakistan, related donors account for 50% of transplants. Data on the type of kidney donors in the state-funded living-related kidney transplant program provides data on the gender bias in Indian society. In one such program, 37% of all donors were mothers, and the kidneys went mostly to their sons (76%); 29% of donors were sisters, and 88% of the beneficiaries of these kidneys were brothers. In all, 66.4% of the donors were female, and 83.2% of all recipients were males.[19] Spousal donors (largely wives) account for >20% of all donors from within families. Living unrelated donor transplants constitute ≈30% of all transplants in India.

Although the Human Organ Transplant Act has been in place in India since 1994 to regulate transplant activity and to promote cadaveric transplants, no such legislation exists in Pakistan. However, despite this legislation, cadaveric donor transplantation has not picked up and accounts for <2% of all transplants. In India ≈600 cadaveric transplants have been done as of 2004, while in Pakistan only a handful of cadaveric kidney transplants have been performed by transplanting organs donated from overseas organ-sharing networks.[6] Lack of awareness of brainstem death, apathy of doctors treating brain-dead patients, lack of intensive care units, social beliefs and superstitions, and the need for consent from relatives after brain death are the major obstacles to cadaveric transplantation.

CONCLUSIONS

The true extent of the problem of ESRD in these two countries is not known. Facilities for the provision of RRT are grossly inadequate and not accessible to a large part of the population. Renal replacement therapy (RRT) is expensive, and no organized reimbursement system exists. Renal transplantation remains the best option among different RRT modalities. Both government and nongovernmental resources must be mobilized for the care of ESRD patients. Lastly, increased awareness of renal disease among the population is needed, as are strategies to facilitate early detection and prevention to delay the onset of ESRD.

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