

# Prevention of chronic renal failure at the community level

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Renal transplantation in India costs about US\$5000 (\$1 = Rupees 48.25), azathioprine costs \$200 a year and cyclosporine costs \$2000. Against this the average per capita income is \$279 (Rs. 12989) per year; 36% of the population earn less than \$105, and only 2.2% earn more than \$1000. The country cannot afford to treat end-stage renal disease. Thirty percent of chronic renal failure is due to diabetic nephropathy, and 10% each to hypertensive nephropathy and chronic pyelonephritis. Social and preventive health workers of the Kidney Help Trust administered a questionnaire at the homes of a study population of 25,000, examined the urine of every individual for albumin and reducing substances, and checked the blood pressure of every person aged over 5; 90% of the population cooperated. Six percent were hypertensive and four percent had diabetes. Eight percent of them subsequently took regular treatment. Using only reserpine, hydralazine and hydrochlorothiazide for hypertension, and glibenclamide and metformin for diabetes (as these are the cheapest agents available), we were able to control the blood pressure to 140/90 or less in 96% of cases, and to reduce HbA1C by 10% or more of the original reading in 77%. An HbA1C of 7% was achieved in 50% of the diabetic subjects. The total cost amounts to 27 US cents for one year per capita of the study population. The Indian Government now spends \$7.67 per capita on health each year, but expects patients to attend its Primary Health Centers. The patients do not attend because in doing so they lose a day's wages. We believe that domiciliary treatment is the solution for these diseases, and expect to see a fall in the incidence of chronic renal failure if this is instituted in the future.

India has a small but active community of nephrologists and urologists who have been diligent in establishing effective treatment for chronic renal failure. Renal transplantation from related donors is the most commonly employed option for end-stage renal disease (ESRD), but transplantation from unrelated live donors has always been widely practiced, and the use of cadaver donors has recently become possible. Hemodialysis is available both in hospitals and in the home, and continuous ambulatory peritoneal dialysis (CAPD) has been established in a few centers. However, all this comes at a price. Renal transplantation costs about US\$5000, azathioprine cost \$200 a year, and cyclosporine costs \$2000. The costs of dialysis amount to around \$5000 each year.

**Key words:** prevention, chronic renal failure, community economic therapy.

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## THE HARD ECONOMIC FACTS

India is a nation of one billion people, expanding apace. It threatens to overtake China as the most populous country and it ranks as number 150 among the countries of the world, both in terms of per capita gross domestic product, and in the human development index [1]. The per capita income in 1999 to 2000 was \$279 a year. The income above which an individual is liable to pay income tax is \$1000 per year, and only 2.2% of the population pay tax. The Government has declared the poverty line to be the amount of money that could buy food to the energy value of 2400 calories per day in villages, and 2200 calories per day in towns. While the figure varies from region to region, the cost of achieving this average is \$105 a year, and no less than 36% of the population were below this level. Only a tiny minority of Indians can afford to pay for renal replacement therapy.

The vast majority of the population depends on the government for medical relief. The average expenses of the various state governments and the central government on health costs amount to \$7.67 per capita per year. The cost of the cheapest immunosuppressive agent, azathioprine, is \$200 per year. The more successful our program, and the more patients we sustain with a functioning graft, the higher the annual recurring expenditure.

Despite these gloomy figures renal transplantation is being performed in India. How do the patients pay for it? Four per cent pay from pooled family resources, 26% take loans, 30% sell property or jewelry, and 63% have help from their employers or accept charity [2]. These numbers exceed 100% because many in the last three categories raise funds in more than one way. Since the earnings of the average Indian amount to only \$279 a year, it is unlikely that the vast majority of patients would ever earn enough to restore the family wealth; thus, a transplant, however successful, invariably leaves the family poorer.

## PREVENTION OF CHRONIC RENAL FAILURE: A FORGOTTEN APPROACH

It seems clear that the treatment of established ESRD is beyond the reach of the average Indian or of the

**Table 1.** Causes of chronic renal failure in Apollo Hospital

Disease	Percentage
<u>Diabetic nephropathy</u>	29.60
Chronic interstitial nephritis	20.39
Chronic glomerulonephritis	17.44
<u>Arteriolar nephrosclerosis</u>	11.00
<u>Chronic pyelonephritis</u>	9.70
Focal and segmental glomerulosclerosis	3.73
<u>Autosomal dominant polycystic disease</u>	2.32
<u>Obstructive nephropathy</u>	1.86
<u>Percentage of total</u>	96.04

A total of 6420 patients seen in 17 years. It is possible to do something to prevent those which are underlined, 54% of the total.

country as a whole. On the other hand, the physician cannot just tell a patient to go home and die, and an effort should be made to preserve patients from this fate. I looked at the causes of chronic renal failure as seen at my unit (Table 1). The principle causes of ESRD were diabetic nephropathy, hypertensive nephropathy, chronic pyelonephritis, autosomal polycystic kidney disease and obstructive uropathy. Over 50% of these diseases possibly could be prevented if an effort was made; millions of Indians suffer from diabetes and hypertension and are unaware of their illness. Even if they know they have one of these diseases, there are often few symptoms, and they therefore do not take treatment.

### GOVERNMENT POLICY ON RURAL HEALTH

Seventy per cent of Indians live in villages, so it makes sense to start any mass program there. Primary Health Centers cater to a population of 35,000. Each has two doctors and a number of paramedical workers. All medical care is free, and, theoretically, there should be drugs available for all common ailments. However, the patient must go the center for attention, and this might mean traveling 10 or 15 kilometers across fields or rough tracks. Where roads and buses are available, the patient is unlikely to have the funds to pay for transport. Unless he or she happens to live in the village where the center is located, it is likely to take half a day just to get there and back, and he is likely to receive a week's supply of drugs at the most, for which he loses a day's wages. Most people simply cannot afford this effort, and therefore will seek medical attention only if there is some illness that prevents them from working. As a result of this, only acute illness characterized by obvious symptoms such as high fever or severe pain get treated. Diabetes and hypertension are totally neglected.

The Government has some domiciliary programs but these are mainly for tuberculosis and leprosy. While infective diseases are clearly a high priority, we have forgotten the increasing incidence of diabetes and hypertension. World Health Organization (WHO) mortality

statistics indicate that deaths from disease of the circulatory system in developing countries have risen from 16% in 1985 to 24% in 1997. The major causes are diabetes and hypertension. We have large numbers of patients suffering from these two diseases, but no national action plan for containing the problem.

### RURAL PROGRAM OF THE KIDNEY HELP TRUST OF CHENNAI

The Trust, working in association with the Tulsi Rural Development Trust, has centered upon a population of 25,000 in a group of villages and hamlets about 50 km from Chennai. A card is developed for each household, and each member of the family is listed on it. The demographics of the entire area are mapped. Girls who completed their schooling and are waiting at home to get married are selected and trained as Preventive and Social Health Workers. They receive a stipend of \$20 per month, and because they live in their own homes this is virtually pocket money for them. After a few years they get married and leave us, and we then train someone else to replace them. Doctors visit from the city and are paid \$10 on each occasion. A nephrologist goes monthly to see the special problems and receives \$20 a visit. The expenses of travel to and from the city are borne by the Trust.

The Preventive and Social Health Workers (PSHWs) who travel by bicycle, go from house to house and apply a brief questionnaire to every member of each family, asking simple questions relating to frequency of micturition, dysuria, hematuria, renal angle pain, swelling of legs and breathlessness. These questions have been translated into the local Tamil language, printed on a card and laminated, and the PSHW carries the card with her. The urine of every individual is collected and examined for albumin with sulphosalicylic acid, and for reducing substances with Benedict's reagent. While it is obviously more convenient to use a test strip, we have found a number of false positives with the strips, and in any case it is much cheaper to use the older tests. Blood pressure is recorded for everyone over the age of five years. All those who have given positive answers to the questionnaire, or have urinary or blood pressure abnormalities are seen by the doctor on his or her next visit. The doctor usually sets up a temporary center at a convenient location such as the veranda of a school or a local government office, or even in the shade of an old tree. All the subjects are asked to come to this makeshift center, but even if they do not come, the doctor will go to their house to see them, in an attempt to ensure the maximum possible compliance. The findings are checked, a complete medical examination is done and blood is collected for the following tests: blood urea, serum creatinine, and glycosylated hemoglobin (HbA1C). All investigations are car-

ried out free of charge by the Apollo Hospital Laboratory. Where necessary, the patient is taken to the hospital for further tests such as ultrasound or renal biopsy, but the majority of patients undergo only those tests mentioned earlier. Our aim is to repeat this cycle of case finding for the entire population every year, but so far we have been able to complete the survey only once every 18 months. Our initial survey found hypertension in 5.3% of the population, diabetes in 3.6%, evidence for renal disease (short of chronic renal failure) in 0.7%, urological disease in 0.25% and chronic renal failure in 0.16%. Overall, 7.5% of the subjects surveyed needed our help. In successive surveys, new onset diabetes was discovered in 0.32% of the population each year, and hypertension in 0.55%.

We treat all hypertensive subjects with hydrallazine, reserpine and hydrochlorothiazide, and all diabetic patients with glibenclamide or metformin, since these are the cheapest available drugs. All medication is provided free by the Trust. What benefit can be derived from such treatment? 1999 WHO-International Society of Hypertension Guidelines indicate that a prolonged 5 mm fall from the usual diastolic BP reduces the risk of stroke by 35 to 40%, of major coronary heart disease by a lesser amount, and of chronic renal failure by one quarter [3]. The DCCT trial showed that for every 10% reduction in HbA1C there is a 40% reduction in vascular complications, including nephropathy [4]. Even if we cannot reach all of these goals in our patients, we can at least hope to achieve some degree of control.

Is reserpine adequate as a hypertensive agent? This is an Indian drug, and physicians of my age or older have extensive experience with it, though it has fallen into disuse. I am not alone in believing that this is an effective agent. Kronig et al found it more effective than some of the newer more widely used agents [5]. Besides preventing hypertensive nephropathy, control of hypertension should slow the decline of renal function that accompanies many other renal diseases. Much of the recently published work in this area has been carried out with the use of angiotensin converting enzyme (ACE)-inhibitors that India cannot afford. Will other agents have similar effects? I am encouraged by the suggestion, especially when renal function is near normal, that metoprolol also is effective [6].

The PSHW monitors blood pressure once a week, and is allowed to modify the dose of the drugs within limits. The doctor sees the patients once a month, and is responsible for major changes and dietary advice. Diabetic patients are treated only by the doctors who modify treatment with the aid of HbA1C readings taken once every three months. The PSHW is taught to recognize hypoglycemia and how to correct it, and she will then stop the drug and call on the doctor to modify treatment on his next visit. Using oral agents and a plan for gradual incre-

mental dosing, we have not yet seen cases of severe hypoglycemia.

### WHAT HAS BEEN ACHIEVED?

There was a co-operation rate of 89.6% for the survey. Of those in whom we found disease, there were only 30.3% who had prior knowledge of it. Of the disease cohort, 24.6% preferred to be treated by their own practitioners and were encouraged to consult with them, as we do not wish to compete with the established services. Of the remainder 79% cooperated with treatment. Among this core group we were able to control hypertension to less than 140/90 in 96%, excellent results by any standards. Glycated hemoglobin was brought down to 7% or less, a number that we would regard as tight control, in only 50% of the population, a much less satisfactory result. There was, however, a reduction of 10% in HbA1C in 77% of the patients, and in achieving this we hope to modify the vascular complications of diabetes, including renal failure, to some extent.

### COST OF THE PROGRAM

A total of \$2,067 per year is spent on materials and transport, \$2,124 on salaries, and \$2,158 on medicines. The annual cost of treatment is 27 cents per capita of the population. Our goal is to provide a working model that can be taken up by the Indian Government in its health program, and thus we need to fit into its current expenditure of \$7.67 per capita per year. It is clear that this goal has been achieved. Whether we will be able to make inroads into the prevention of renal failure has yet to be seen. We have no proper control group. If we diagnosed diabetes and hypertension and treated only half the patients and kept the other half as a control group, we would certainly not obtain the degree of cooperation that we currently enjoy. There are plans to extend the project to an adjacent area in the next few years, at which point we will be in a position to compare the findings in the new group with those in the current plan who by then will have had several years of surveillance and treatment.

### DISCUSSION

When is a preventive program worth implementing more widely? Some questions have to be answered. (1) Is the disease prevalent in the community? There is no doubt that large numbers of Indians suffer from diabetes and hypertension and the consequences of these conditions. (2) Are the effects serious enough to warrant the necessary effort? Renal failure, strokes, coronary artery disease and peripheral vascular disease are all major contributors to morbidity and mortality. (3) Is the dis-

ease easy to detect? A simple urine test and a recording of blood pressure are easily achieved as long as the population can be persuaded to submit themselves to testing. In our survey some subjects might be missed, since we only carry out a single reading and visit each village for a formal survey on only one occasion each year, but the PSHWs are in and out of the villages every day, and anyone with a symptom can approach them or one of our doctors at any time. Patients who have been missed can be picked up at subsequent surveys. (4) Can it be easily prevented? Primary prevention of diabetes and hypertension is the object here, but we have shown that we can establish good control of hypertension and reasonable control of diabetes in our community, and thus we hope to keep some patients, if not the majority, from suffering serious vascular complications. (5) Is the cost of screening and prevention affordable, and cheaper than treating the established disease? We have demonstrated that we can run this project within the Government's health budget. If it proves to be effective, it will be infinitely cheaper than treating established coronary and cerebrovascular disease, and chronic renal failure.

The goal of every young nephrologist in India is to establish a transplant program, and I have not found much enthusiasm for my views among my young colleagues. Let me make it plain that I am not against dialysis or transplantation. We should certainly provide the service for those who can afford it. The main point is that India cannot afford to pay for the treatment of end-stage renal disease in most instances. Our resources are minuscule and our problems are colossal. With what little we have, we need to provide the greatest good for the greatest number at the least cost.

We have demonstrated that with very little effort and expense, we are able to achieve reasonable results. Doing some good for 25,000 people is a drop in the ocean, but

it should be feasible for any doctor to take this up on a small scale. A doctor in the city could cover the families on his own street as a free public service. One residing in a block of flats could cover the entire block. If each one of us did just a bit, the whole country could be served, and the benefits from the ounce of prevention would outweigh the pound of cure.

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