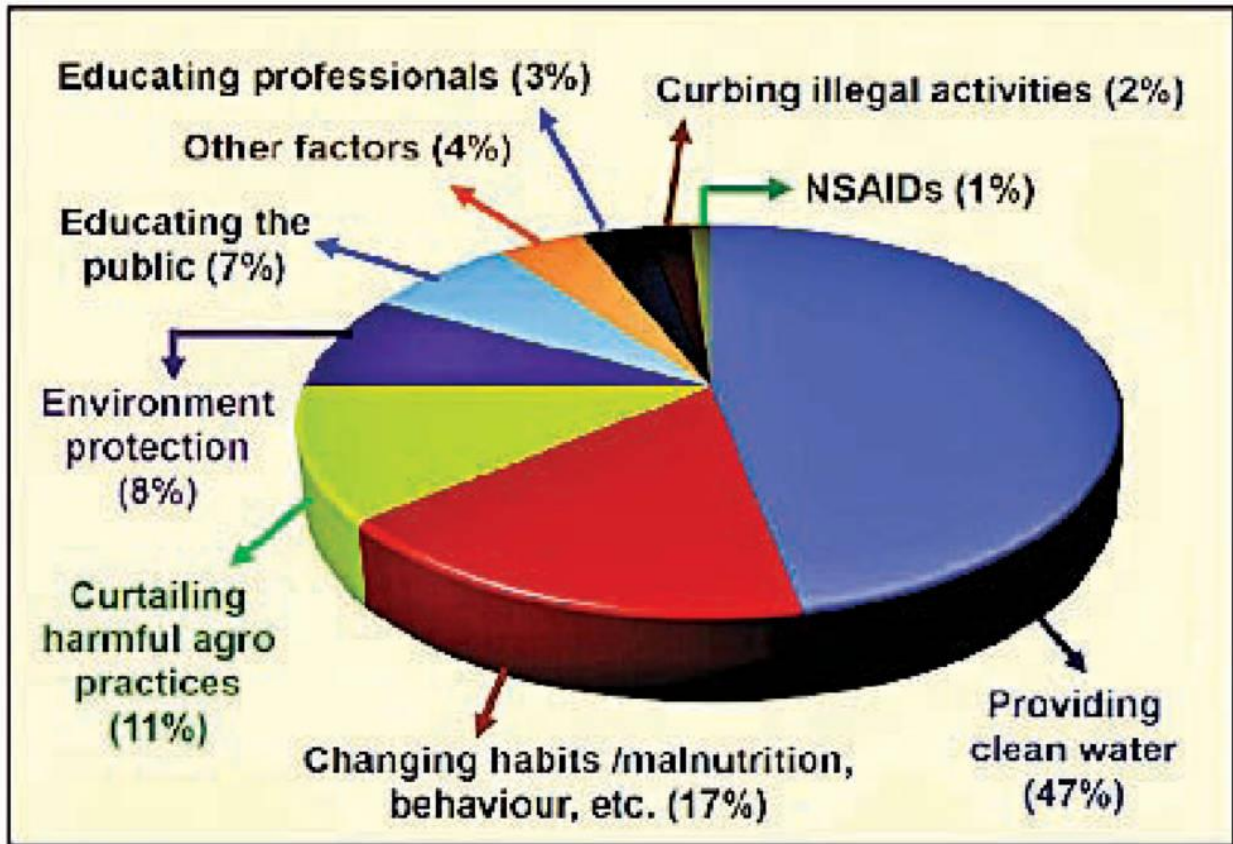
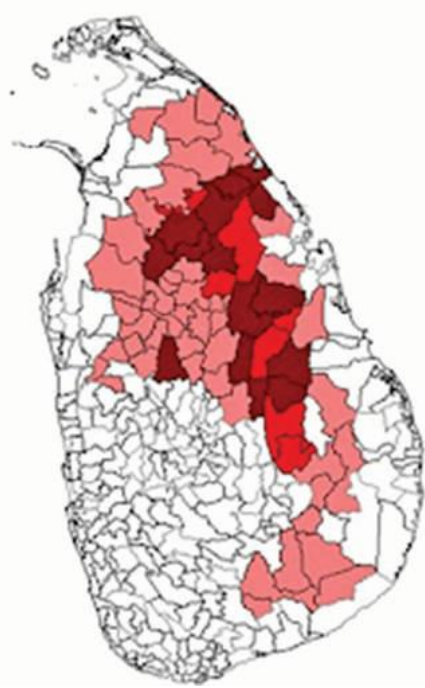
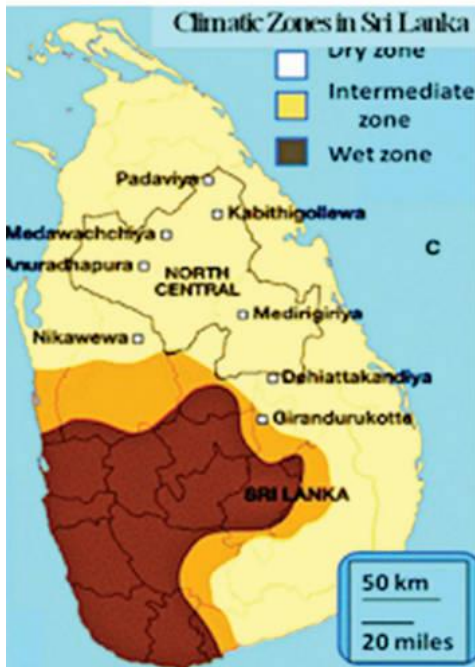


Economic cost of Chronic Kidney Disease (CKD): Is it bearable?







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**Figure 1: Climate zone area and high prevalence of CKD area.**

Chronic kidney disease of multifactorial origin (CKDmfo), also known as CKD of unknown origin (CKDu, CKDuo), is a serious public health problem predominantly affecting tropical countries.

This fatal, non-communicable disease predominantly affects middle-age male farmers. No convincing evidence exists that the disease is caused by heavy metals, arsenic, agrochemicals, or microbes; spread from person to person (i.e., contagious), or have predominant genetic factors or heritability.

Current investigations in Sri Lanka are continuing on the effects of geochemical and occupation exposure, such as agrochemicals; climate change-associated issues, such as chronic dehydration and frequent exhaustion; and the combined effects of fluoride- and magnesium-rich hardwater.

This study was undertaken to fill the existing gap in knowledge regarding the implicit and explicit cost on CKD issue in the country.

In Sri Lanka, the disease is exclusively affecting the people living in the dry zonal regions; over 80% of which are farming communities. This fatal disease is not restricted among agricultural workers.

These regions have little access to safe drinking water, education, modern medical facilities and effective preventive healthcare. In Sri Lanka, currently three Provinces covering approximately 30,000 kms are affected, with 3.0 million people at risk of developing the disease.

Although there are differences in types of crops and agrochemicals used in affected countries, many similarities exist, including year-around hot and dry weather, poor soil drainage and intermittent floods, high prevalence of poverty and malnutrition, inadequate access to healthcare and sanitation, lower education and socioeconomic levels and little access to clean water. Although CKD has been present in Sri Lanka for over two decades, few or no effective preventative actions have been introduced.

### **Economic Losses**

This prospective study was conducted at Hemodialysis units of two public (government) hospitals in Anuradhapura and Polonnaruwa Districts in Sri Lanka for a period of two months in September-October 2019.

Permission to conduct the study was obtained from the medical directors of the respective hospitals. Primary data collection was carried out with structured questionnaire among 1,200 affected households comprised 600 patients from each of four sampling districts; Polonnaruwa, Anurhadapura.

These districts were selected considering the incidents and the geographical spread of the disease. Our mapping clearly showing that the effected households were mainly clustered in the Dry-Zone.

The mean age of the CKD/CKDu patients was 58.1 years with  $SD \pm 11.4$  years (Anuradhapura district 57.9 years with  $SD \pm 12.1$  years, Polonnaruwa district mean age was 57.4 years with  $SD \pm 14.1$  years). In both districts more than 70, 40 and 33% of patients were over 50, 60 and 70 years of age respectively. Only a small percentage of patients (6.8 - 8.6%) were in the 31 to 40 year age group.

Farmers were the most commonly affected occupation group; 72.6% from Anuradhapura district and 67.1% from Polonnaruwa district. Of this most CKD/CKDu patients were in stage I (69.6%). Stages II, III, IV and V had (30.4%) with 547 (7.7%) patients in Stage V respectively.

The total number of dialysis sessions at the two hospitals for the months of June and July 2019 were 2421 and 2541 respectively, while the total hours of dialysis were 9441 and 10,113.

The indication for a majority of the dialysis were Chronic Renal Failure (June - 82.1%, July - 81.2%). The percentage surface area of the dialysis units at Anuradhapura Teaching Hospital (ATH) and Polonnaruwa General Hospital (PGH) were 0.3%, 0.5%, while the percentage patient

turnover was 0.1.5%, 1.2% respectively. Drugs and consumables costs accounted for 70.4% to 84.9% of the total costs followed by the wages of the nursing staff at each unit (7.8% to 19.7%).

Both renal and non-renal nurses were attached to the respective dialysis units, however, there was no difference in salary between the two groups. The percentage contribution to the total costs by each of the other cost items was less than 4.0%

The total cost per month for hemodialysis at the two hospitals combined was LKR 12.8 millions (US\$ 44,982), hence the annual hemodialysis cost at two hospitals alone is nearly LKR 153.6 million. The cost of hemodialysis per hour at ATH and PGH were LKR 2,820 and LKR 2,927 respectively.

Patients with ESRD in Sri Lanka usually undergo 2 to 3 hemodialysis sessions of four hours per week. The mean cost of a four-hour dialysis session in Sri Lanka per patient was LKR 7,321 (US\$ 36).

The annual cost of hemodialysis for a patient with chronic renal failure undergoing 2-3 dialysis session of four hours duration per week was LKR 763,500 - 924,320 (US\$ 3,817 – 4,622). However, since the aim of the present study was to calculate the operational costs of a hemodialysis unit thus capital expenses, such as expenditure for buildings and furniture were not included.

In a country where the annual per capita income is US\$ 3,679, comparatively the annual cost of dialysis of US\$ 4,221 - 7,202 is significantly high. This and the increasing prevalence of ESRD place a significant burden economically on the health care sector in Sri Lanka.

This study covered 600 affected households in each district for analysis micro level household impact. The average annual gross income per household is Rs. 562,000.00 and net income is Rs. 222,452.

Since more than 70% of effected households were dealing with farming activities mainly paddy-based society, their net income mainly depends on price of paddy and cost of cultivation. Per patient cost per year vary from stage one to five.

Total cost per patient included, treatment cost, transport cost, meals and accommodation, the value of production and business losses, employment loss and any additional cost caused due to patient. According to our comprehensive analysis, the per patient annual cost is Rs. 321,234 and it is from Rs. 138,456 – Rs. 138,620. It is a very sad situation since more than 50% of annual net income of sample households were sacrificed for a patient.

Both government and household level annual expenditure per CKD patient is around Rs. 1million and it is the social cost per patient. In Sri Lanka, the governmental costs for caring for patients with CKDmfo plus (lost) opportunity costs are approximately \$18.2 million/ year (Rs. 3,640 million per year)

## **Reduction Approach**

Source: Public health interventions for chronic diseases: cost-benefit modelisations for eradicating chronic kidney disease of multifactorial origin (CKDmfo/ CKDu) from tropical countries. Sunil J. Wimalawansa Professor of Medicine, Endocrinology and Nutrition, Cardio-Metabolic and Endocrine Institute, New Jersey, U.S.A.

According to Professor Sunil Wimalawansa's research paper, it is possible to control CKD cases 47% by providing clean water, 17% by changing habits - malnutrition behaviour, 11% by curtailing harmful agro practices, 8% by environmental protection and 7% by educating the public.

His research paper concluded as "Providing clean water to the entire affected region would be a one-time investment of \$9.5 million that would reduce the overall disease incidence by 45%.

Thus, investing less than 20% of one year's governmental expenses in addressing this disease, is sufficient to provide potable water to all affected regions in the country, and reducing the CKDmfo incidence by 45%"

Our analysis shows that 6% of total CKD/CKDu patients died within the first year of diagnosis whilst 17.5% died within three years. This represents 67.7% of total deaths in CKD/CKDu.

This emphasizes the immediate need for hospitals with facilities for dialysis and ideally renal transplants and possible actions to reduce the patients are most important. By reducing one patient per year, the country can save around one million SLR to the country.

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