

## How to tackle the avalanche of chronic kidney disease in sub-Saharan Africa: the situation in the Democratic Republic of Congo as an example

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### Introduction

In developing countries chronic kidney disease (CKD) is a growing problem. In most of sub-Saharan Africa, the vast majority of patients with CKD die because of lack of treatment. Renal replacement therapy is expensive, which makes it unaffordable to the residents of low-income regions. A solution to this problem may lie in preventive interventions. This editorial will focus on the reasons and some ways to reach such objectives.

### Overview of the situation

Developing countries now face a double challenge. Besides acute infectious illnesses, they are experiencing the growing problem of chronic diseases, including CKD. In sub-Saharan Africa, the vast majority of patients hospitalized with CKD quickly die because of lack of means for treatment. Moreover, CKD in Africa affects younger adults than in developed countries with a very high risk for disabilities and deaths [1]. This terrifying situation urgently calls for the awareness and aid of the international nephrology community.

Attention to CKD is increasing worldwide, because of a rapid increase in its incidence—due to aging, hypertension and diabetes—coupled with the huge cost of treatment of end stage renal disease (ESRD). These factors render CKD an important focus of health care planning in the developed world, but 85% of the world's population live in low-income regions,

where population growth is higher and the effect of CKD is likely to be greater [2].

### Use of renal replacement therapy

More than 80% of patients on renal replacement therapy (RRT) live in North America, Japan and Europe, which combine 15% of the world's population. Despite its high costs, these regions can afford RRT, but even in Europe, lower national wealth is associated with reduced prevalence of RRT. In Belgium, the prevalence of patients on RRT is almost 1000 per million, whereas in central and eastern European countries, it is 160 patients/million population. In less developed countries, there is also a wide variation in prevalence rate, which is linked to per capita income [2]. One can project that in countries with a per capita gross national product (GNP) <1000 USD, it is very unlikely available. This would be the case for most of sub-Saharan Africa. This simple fact makes it difficult to accept the idea that continuous ambulatory peritoneal dialysis in conjunction with an active transplant programme would be a viable therapeutic option for CKD in sub-Saharan Africa [3]. Indeed, a recent report on the economic and financial situation in the Democratic Republic of the Congo (DRC) in 2002 showed that 80% of the urban population was poor with a per capita GNP barely above 100 USD [4]. Considering that a single dialysis session costs at least 100 USD and that patients or families must pay all of this cost, it becomes clear that long-term dialysis will not be an option for most Africans with renal failure [1].

### Costs and survival

The prevalence of ESRD, continually increasing in most countries, is highly variable in developing countries, despite incidences that are probably not dissimilar to those of developed countries. The fact

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is that prevalence figures and their differences from one country to another largely reflect survival. A sizeable proportion of people who live in the poorest countries and have CKD die of uraemia because RRT is not available. Approximately 100 000 ESRD patients die per year in the USA, which is about 4% of total deaths in that country's general population. Data from African nations show substantially higher percentages of deaths from renal diseases—as high as 22% of all deaths in Madagascar [5]. Additional, and more recent, data point in the same direction. Of 400 patients admitted for kidney disease to the academic hospital of Kinshasa, the capital of the DRC, 78% were already at stage 5 of CKD [6]; and only 11% of them could afford peritoneal dialysis (the sole dialysis treatment available in that country)—the others rapidly died. In low-income countries, limitations to regular maintenance dialysis include paucity of dialysis units, restriction of these units to urban centres, and absence of government funding or health insurance to cover the high costs of such treatment. It is clear that RRT is so costly that in practice there is only a minimal probability that a large segment of the world's population would benefit from it. It is also not possible for all patients with CKD in underdeveloped countries to move to developed countries for RRT [7]. In sub-Saharan Africa, and especially in DRC, economic factors necessitate an alternative approach for the treatment of CKD.

### Causes of the increase in ESRD

It is already a challenge to address the existing causes of renal disease in Africa, such as nephrotic syndrome associated with infectious disease (for instance post-streptococcal glomerulonephritis or malaria) or glomerular diseases associated with hepatitis B. To these is now added the problem of HIV and AIDS. The most common renal complication of HIV/AIDS is HIV-associated nephropathy (HIVAN), which is itself not rare [8]. In DRC, the proportion of HIVAN among 210 HIV-seropositive patients was 11% [9]. Further added to these are the cases emerging because of the effects of 'westernization'. Between 30 to 50% of all cases of ESRD in developed countries result from obesity, diabetes and hypertension. Indeed, the variation between countries in the incidence of ESRD mirrors that of the prevalence of those diseases. Now, these 'western' problems undoubtedly will affect developing countries, because their prevalence is increasing. By 2020, the burden of diabetes and cardiovascular diseases would have increased by 130% in Africa, with concomitant increases in the incidence of CKD and ESRD. In the DRC, there is already evidence of such a trend. While glomerulonephritis (35%) remains the primary cause of ESRD in DRC, hypertension (30%) and diabetes mellitus (25%) currently are important additional causes of renal diseases, just as they are in the developed world.

### Prevention must be first

Governmental and medical sectors in sub-Saharan Africa that deal with uraemic patients face an untenable dilemma: there is a growing number of people with ESRD and parallel with that a lack of resources for dialysis or kidney transplantation. A reasonable response to this ethical and economic dilemma would be the identification of high risk people and early prevention of CKD. At present, most CKD patients are diagnosed late, at a stage when there is no possibility of reversing the disease.

Alarmed by this situation, the International Society of Nephrology convened a multidisciplinary group of physicians to develop strategies to avert this bleak outcome. Their Bellagio 2004 declaration for the global advancement of nephrology proposed to do so through the prevention of CKD, using an approach based on awareness, early detection and effective treatment [10]. Educating the population on how to prevent renal disease, identifying those at risk of developing CKD, raising the awareness of the general public, policy makers and health care workers, modifying the lifestyle of susceptible individuals, detecting early stages of CKD, arresting or hindering the progression of disease, and creating facilities for global assistance; all are likely to be very useful tactics. Early detection of modifiable factors, such as hypertension, obesity, smoking and proteinuria (detected by urine dipstick analysis) would be useful and cost-effective. To those classic precipitating factors one must add, especially for Africa, detection and elimination of the use of harmful herbal remedies.

### How to organize prevention? A global approach or an individualized choice?

A global approach should propose the health education of the general population and the prevention of not only infectious but also metabolic and hypertensive diseases. With regard to CKD, it is urgent and within the scope of prevention to screen patients with risk factors, which include having a family member with kidney disease [11]. The programmes to detect and prevent CKD should be adapted to the local environment, taking into consideration health awareness, availability of human and material resources, and cultural influences on the understanding of disease processes and on the acceptance of preventive measures. Some preventive programmes have already shown interesting results in some parts of the world [12–14]. For instance, in Bolivia, Plata *et al.* [12] showed that it was possible to screen a large population of patients at a relatively low cost, identifying urinary abnormalities in apparently healthy subjects, which serves as the essential first step in treatment. This was confirmed in India by Mani [13] who, examining the Indian population in their homes, achieved promising results after applying therapy

for the treatment of newly identified patients with diabetes and hypertension, and this at a very low cost. Katz *et al.* [14] also advocated regular integrated checks for CKD and its risk factors in Australian Aborigines, using programmes run by primary health workers.

Implementation of a prevention programme requires equipment, drugs and institutions to manage transmission of practical information both to health workers and lay populations. It is likely that the usual models of care, involving specialists, may need to be changed to ones that use existing primary care infrastructure. One protocol for a prevention programme would start with trained non-physician health workers who will use a simple set of questions—such as about swelling of the feet, difficulty in breathing or passing urine—followed by examinations of morning samples of urine for sugar and protein, and accurate measurements of the blood pressure (BP). Next, medical doctors could check those persons who answered positively to any of the questions, those with high BP ( $> \text{or } = 140/90$ ) and those who had abnormal urine test(s). When a urinary abnormality is confirmed, a blood sample would be obtained for glucose and creatinine determinations. Diabetes and hypertension could be treated by low-cost drugs and persons who had protein or blood, or both, in their urines or had elevated serum creatinine could be sent to hospital for further medical examination. Developing such prevention programmes will also be expensive, but probably much less expensive than RRT and could, one hopes, prevent the avalanche of new ESRD patients.

### Pitfalls of prevention: numbers, politics and goals

Screening and intervention programmes require considerable resources both in terms of funds and trained manpower. Quantification of what is needed depends on knowing the size of the problem. In DRC, a screening programme in young adults showed signs of CKD in 3.3% of them (unpublished data). This high prevalence emphasizes the potential magnitude of the problem, but additional studies need to be done to determine the prevalence of CKD.

Political considerations must not hinder these efforts. Developed countries should be ready to assist with technical support, to promote exchange of personnel from developing countries, to authorize free internet access to new publications in the nephrological field, to set up prevention programmes, and to secure the cooperation of pharmaceutical companies. If the goal of better medical care is to be realized, such assistance will need to be sustained for many years, regardless of political pressures.

Another problem with prevention is how to manage risk factors in different racial populations. For instance, one can reasonably ask whether more intensive antihypertensive treatment decreases the risk of CKD in black Africans. According to the African American Study of kidney disease and hypertension trial in the USA, there was no benefit to strict control

of BP compared with conventional control of BP. That is, the rate of decline of GFR was the same, whether the treatment achieved a BP of 130/80 or 140/85 mmHg [15]. This finding raises questions about the BP that one must maintain in a hypertensive black African to prevent the development of renal failure.

### Manpower problems

Generalist physicians and non-physician health care workers will need to be engaged in this preventive effort, but such trained manpower is often lacking in Africa.

In all of the DRC, there are barely more than 2000 physicians, for a population of 60 million [16]. By way of comparison, in the USA there are almost one million physicians in a country of 300 million people. The DRC, and her African neighbours, need increased training of generalist physicians and paraprofessionals. A recent estimate indicates that a tripling of the current numbers of African health workers is required to address overall current needs [17]. Leaving aside the time needed to amass that manpower, the cost of the requisite training will impede or prevent the achievement of such a large expansion of the health care work force.

Considering specifically kidney diseases, DRC is a vast country of over 2 million km<sup>2</sup>, but it has only one renal unit and seven nephrologists (0.11/million inhabitants). That number is much less than the ratio of nephrologists to population in most other countries, which is 20/million in Belgium, 17/million in the USA, 10/million in Egypt, 1/million in South Africa or even 0.6/million in Nigeria (there are no nephrologists in Chad or Tanzania). With such limited manpower, it will be difficult to implement programmes to detect, prevent or treat CKD. Moreover, it is difficult in Africa, and especially in DRC to convince medical doctors to specialize in nephrology, given that the fate of the vast majority of their uremic patients is an early death.

One part of the solution will be to slow down the brain drain, the exodus of medical professionals from Africa and other tropical regions to developed countries. For example, three quarters of the doctors recently trained in Ghana have left that country to go to England or the United States [17], and in Cameroon, the exodus of medical professionals has reached crisis levels [18]. Substantial infusions of funds for good compensation of these professionals in their home countries is essential, as is money to properly equip the local medical facilities to make their practices efficient and satisfying. Training nephrologists and allied professionals who will serve their home countries is a vital goal. Western countries of course can assist in this effort directly by providing training, but they can also support it indirectly—by expanding training programmes for their own nationals, so that they do not continue to rely on immigration from

developing countries to fill national shortages of health workers.

## Conclusions

To address the CKD problem of sub-Saharan Africa will need sustained efforts from governmental agencies, international societies, the pharmaceutical industry and philanthropic bodies. The health needs of people should be placed above politics. Local manpower must be developed to meet present and projected demands. Developing prevention programmes and training an additional one million African health workers will cost money (perhaps more than 10 billion USD), but the resulting benefits will likely vindicate this investment.

Prevention of ESRD is a desirable goal, but without international help to bolster both prevention and therapy, its terrifying prevalence will persist and continue to escalate.

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