

END-STAGE RENAL DISEASE IN SUB-SAHARAN AFRICA

Saraladevi Naicker, FRCP, PhD

Chronic kidney disease is at least 3–4 times more frequent in Africa than in developed countries. Hypertension affects \approx 25% of the adult population and is the cause of chronic kidney failure in 21% of patients on renal replacement therapy in the South African Registry. The prevalence of diabetic nephropathy is estimated to be 14%–16% in South Africa, 23.8% in Zambia, 12.4% in Egypt, 9% in Sudan, and 6.1% in Ethiopia. The current dialysis treatment rate ranges from 70 per million population (pmp) in South Africa to $<$ 20 pmp in the most of sub-Saharan Africa. The transplant rate in Africa averages 4 pmp and is 9.2 pmp in South Africa. The goal for sub-Saharan Africa should be to have a circumscribed chronic dialysis program, with as short a time on dialysis as possible, and to increase the availability of transplantation (both living related and cadaver) and promotion of prevention strategies at all levels of health care. Screening for kidney disease in high-risk populations, eg, patients with hypertension and diabetes mellitus and a family history of kidney disease, should be instituted as the first step in kidney disease prevention in developing countries. (*Ethn Dis.* 2009;19 [Suppl 1]:S1-13–S1-15)

Key Words: Chronic Kidney Disease, End-stage Renal Disease, Sub-Saharan Africa, Renal Replacement Therapy, Prevention Strategies

INTRODUCTION

Africa is the second-largest continent on Earth and has a population of \approx 850 million people living in 54 countries, with a population growth of 2.3%. Sub-Saharan Africa occupies $>$ 80% of the land mass of Africa and has a population of 741 million and an annual population growth rate of 2.1%. Millions of people live in poverty, with an external debt of 48.3% of gross national income.¹ In sub-Saharan Africa, $>$ 291 million people live on $<$ \$1 per day.

Life expectancy has declined in the past 10 years in sub-Saharan Africa and averages 46 years.¹ Wars, crime, and violence are a serious drain on the economy, and in South Africa crime costs an estimated 6% of gross domestic product. Increasingly, health is influenced by social and economic circumstances. Any improvements in health thus demand integrated, comprehensive action against all the determinants of poor health.

Per capita expenditure per year on health care ranges from \$9 (Nigeria) to \$29 (Senegal) to \$100 (North Africa) to \$158 (South Africa); per capita health-care expenditure in Europe is \$2000. Healthcare expenditure in 2002/2003 for the public sector in South Africa amounted to \$100 per capita per year, \approx 3% of gross domestic product.²

Infectious diseases are the world's leading cause of death, 43% in the developing world compared with 1.2% in the developed world.³ Diseases that seemed to be controlled, such as tuberculosis and malaria, have become a major health problem. HIV/AIDS has reached epidemic proportions, especially in sub-Saharan Africa; two-thirds of all adults and children with HIV worldwide live in sub-Saharan Africa (24.7 million), and the epicenter is in Mozambique, Swaziland, and South Africa.^{4,5} Of the known deaths world-

wide due to AIDS in 2006, 72% of those occurred in sub-Saharan Africa (2.1 of a total of 2.7 million). Botswana has an estimated 330,000 people infected with HIV/AIDS, including 39% of the population aged 15–49 years. Africa is thus facing the “double burden” of disease, with also a marked increase in noncommunicable diseases, such as cancer, diabetes, and hypertension.⁶

There is a continuing “brain drain” of healthcare workers from Africa to more affluent regions.⁷ There are large rural areas of Africa that have no health professionals to serve these populations. There are no nephrologists in many parts of Africa; the numbers vary from .4 per million population (pmp) in Nigeria to .5 pmp in Kenya and Sudan, 1 pmp in South Africa, 4 pmp in Morocco, and 10 pmp in Egypt according to a recent report.⁸ The Fellowship Program of the International Society of Nephrology has trained many African physicians to provide renal care for their communities.

CHRONIC KIDNEY DISEASE

The high incidence of chronic kidney disease among Black Americans has been demonstrated in several studies. Unfortunately, lack of functioning registries in most of sub-Saharan Africa has resulted in a lack of reliable statistics. However, there is a general impression that it is at least 3–4 times more frequent than in more developed countries; uremia was reported to account for 1.0%–1.5% of total annual deaths among Egyptians, both in the predialysis era and for 2 decades thereafter.⁹ These figures are comparable with those of other countries in the region with similar socioeconomic standards.

Chronic kidney disease affects mainly young adults aged 20–50 years in sub-Saharan Africa and is primarily due

From the Division of Nephrology, University of the Witwatersrand, Johannesburg, South Africa (SN).

Address correspondence and reprint requests to: Saraladevi Naicker, Division of Nephrology; Johannesburg Hospital–Area 551; University of the Witwatersrand; 7 York Rd, Parktown; Johannesburg, 2193 South Africa; 27-11-4884799; Saraladevi.Naicker@wits.ac.za

to hypertension and glomerular diseases, unlike developed countries where chronic kidney disease presents in middle-aged and elderly patients and is predominantly due to diabetes mellitus and hypertension.¹⁰ Hypertension is a cause of chronic kidney failure in Africa, especially in Black patients.

Hypertension affects $\approx 25\%$ of the adult population and is the cause of chronic kidney failure in 21% of patients on renal replacement therapy in the South African Registry;¹¹ hypertension was the most common cause of end-stage renal disease (ESRD) in Black South Africans and accounted for 34.6% of ESRD in that racial group. In contrast, hypertension was reported to be the cause of ESRD in 4.3% of Whites, 13.8% of Indians, and 20.9% of people of mixed ancestry. In a study to determine the pathologic basis of ESRD in Black South Africans, essential malignant hypertension was the single most common cause of ESRD, occurring in 49%.¹²

The estimated increase in diabetes mellitus in Africa is anticipated to be 12.7 million, an increase of 140% by 2025.¹³ Diabetes mellitus may present one of the most daunting challenges in the future and affects 9.4 million people in Africa. The increase in cases in the next 2 decades will exceed 40% in developed countries and is anticipated to be in the order of 170% in developing countries. The prevalence of diabetic nephropathy is estimated to be 14%–16% in South Africa,¹⁴ 23.8% in Zambia, 12.4% in Egypt, 9% in Sudan, and 6.1% in Ethiopia.¹⁵ Diabetes accounts for 11% of patients with ESRD in Nigeria¹⁶ and 9%–15% in Kenya.¹⁷ Few of these patients are offered renal replacement therapy because of associated co-morbid conditions, unless they are able to fund renal replacement therapy themselves or have health insurance.

Glomerular disease is more prevalent in Africa and seems to be of a more severe form than that found in Western countries; it is characterized by poor

response to treatment and progression to renal failure.

TREATMENT OF CHRONIC RENAL FAILURE IN SUB-SAHARAN AFRICA

The availability of renal replacement therapy is limited in much of sub-Saharan Africa because of high costs; lack of available therapy is responsible for the high rate of morbidity and mortality. Renal replacement therapy was accessed by approximately 1.8 million people worldwide in 2004; $<5\%$ of the dialysis population was from sub-Saharan Africa.¹⁸ The current dialysis treatment rate ranges from 70 pmp in South Africa to <20 pmp in most of sub-Saharan Africa. Dialysis rates are 45 pmp for hemodialysis and 25 pmp for continuous ambulatory peritoneal dialysis (CAPD) in South Africa, 46 pmp for hemodialysis and 85 pmp for CAPD in Sudan, 7.5 pmp for hemodialysis and 1.2 for CAPD in Kenya, 421 pmp for hemodialysis and 0.3 pmp for CAPD in Egypt, and 650 pmp for hemodialysis and 20 pmp for CAPD in Tunisia. Availability of CAPD is limited in sub-Saharan Africa because of high cost of dialysis fluids and a perception of a high rate of peritonitis. Transplantation is limited by cost, donor shortages, and lack of a brain-death law in most of sub-Saharan Africa. The transplant rate in Africa averages 4 pmp and is 9.2 pmp in South Africa.^{19,20}

Funding for renal replacement therapy is primarily private in much of Africa, with the governments of only a few countries providing therapy for small number of patients (eg, Mali, Mauritius, South Africa); indigent South Africans can access chronic dialysis at governmental cost only if they are eligible for transplantation. In many African countries, chronic dialysis is not sustainable, with patients unable to afford dialysis beyond the first 2–3 months.

The reality is that there is not enough money for health care in the developing world, and provision of renal replacement therapy is especially challenging in sub-Saharan Africa. The goal should be to have a circumscribed chronic dialysis program, with as short a time on dialysis as possible, and to increase the availability of transplantation (both living related and cadaver) and promotion of prevention strategies at all levels of health care in Africa. Patients with renal disease should be referred to a nephrologist at an early stage so as to institute measures to retard progression and plan timely transplantation or dialysis; this is particularly important where related donors may be available.

PREVENTION STRATEGIES

Screening programs are in their infancy in most of Africa, with a few programs in South Africa, Nigeria, Ghana, and Kenya. Screening for kidney disease in high-risk populations (eg, patients with hypertension and diabetes mellitus and a family history of kidney disease) should probably be instituted as the first step in kidney disease prevention in developing countries such as Africa.²¹ Education of patients and healthcare workers regarding hypertension, diabetes, obesity, and proteinuria and health promotion (eg, prudent diet and exercise) is essential. COMGAN programs and World Kidney Day have heightened awareness of kidney disease in medical professionals and the public.

Efforts should be made to optimize the therapy of hypertension, diabetes mellitus, and renal disease. Implementation of recommended targets for control of hypertension and diabetes is essential. In areas where there are insufficient numbers of physicians, nurses and other health workers could be trained to manage these conditions at a local level, with clearly defined criteria for referral of patients.

CONCLUSION

Provision of renal replacement therapy is especially challenging in sub-Saharan Africa. Nephrologists and physicians are faced with large numbers of ESRD patients, inadequate facilities, funding and support. Support from the International Society for Nephrology and its programs has gradually improved the capacity of physicians to provide renal care. While prevention strategies are recognized as optimal therapy in managing kidney disease, it is still in its infancy in much of Africa, mainly due to lack of healthcare workers and funding.

REFERENCES

1. World Bank Annual Report 2002: 84–113. 3.
2. Registrar of Medical Schemes Annual Report 2001. Pretoria: Council for Medical Schemes 2002.
3. World Health Organisation Report, 1997.
4. UNAIDS report 2005.
5. UNAIDS report 2006.
6. World Health Organisation. *Innovative Care for Chronic Conditions: Building Blocks for Action*. Geneva: WHO; 2002.
7. Eastwood JB, Conroy RE, Naicker S, West PA, Tutt RC, Plange-Rhule J. Loss of health professionals from sub-Saharan Africa: the pivotal role of the UK. *Lancet*. 2005;365: 1893–1900.
8. Bamgboye EL. End stage renal disease in sub-Saharan Africa. *Ethn Dis*. 2006;16:S2-5–S2-9.
9. Barsoum RS, Rihan ZE, Ibrahim AS, Lebstein A. Long term intermittent haemodialysis in Egypt. *Bull World Health Organ*. 1974;51:647–654.
10. Arogundade FA, Barsoum RS. CKD prevention in sub-Saharan Africa: a call for governmental, nongovernmental and community support. *Am J Kidney Dis*. 2008;51:515–523.
11. Veriava Y, Du Toit E, Lawley CG, et al. Hypertension as a cause of end stage renal failure in South Africa. *J Hypertens*. 1990;4: 379–383.
12. Gold CH, Isaacson C, Levin J. The pathological basis of end stage renal disease in Blacks. *S Afr Med J*. 1982;20:263–265.
13. World Health Organisation Report, 1998.
14. Kalk W, Jaunnou J, Ntsepo S, et al. Ethnic differences in the clinical and laboratory associations with retinopathy in adult onset diabetes. *J Int Med*. 1997;241:31–37.
15. Amos AF, McCarty DJ, Zimmet P. The rising global burden of diabetes and its complications: Estimates and projections to the year 2010. *Diabetic Medicine*. 1997;14:S7–S85.
16. Mabayoje MO, Bamgboye EL, Odutola TA, Mabadeje AF. Chronic renal failure at the Lagos University Teaching Hospital: a 10-year review. *Transplant Proc*. 1992;24(5):1851–1852.
17. McLigeyo SO, Kayima JK. Evolution of nephrology in East Africa in the last seventy years—studies and practice. *East Afr Med J*. 1993;70:362–368.
18. Grassman A, Gioberge S, Moeller S, Brown G. ESRD patients in 2004: global overview of patient numbers, treatment modalities and associated trends. *Nephrol Dial Transplant*. 2005;20:2587–2593.
19. Naicker S. End-stage renal disease in sub-Saharan and South Africa. *Kidney Int*. 2003; 63(Suppl 83):S119–S122.
20. El Matri A. ESRD in Africa. AFRAN congress, Khartoum, Feb 2007.
21. Katz I. Kidney and kidney related chronic diseases in South Africa and chronic disease intervention program experiences. *Adv Chronic Kidney Dis*. 2005;12:14–21.