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Pediatric Nephrology in South Africa

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South Africa is a very beautiful country with very diverse populations, financial resources and cultures. In 2018, the World Bank upgraded South Africa to status of an Upper Middle Income country, third only to Thailand and China. This is deceptive as living conditions are improving but still leave a lot to be desired. Basic amenities such as water and electricity are a major problem in rural areas, with load shedding of electricity (planned electricity outages to prevent unplanned blackouts) happening in the cities affecting dialysis facilities. This is complicated by the legacy of apartheid which kept races apart with unequal different health, education and social facilities. Slowly there has been integration, but should be evolving at a pace that is faster. In certain areas like the Western Cape, integration has been better.

There are eight medical schools in the country producing approximately 1500 new doctors every year. There are presently 1385 registered paediatricians in the country. Paediatric nephrology is only offered in 7 centres located in 4 cities. Two of these centres are the main transplant centres, located in Cape Town and Johannesburg. Presently there are approximately 30 registered paediatric nephrologists in the country, suggesting a shortage of this specialised skill.

In the 2011 census, the population of South Africa was 51.7 million, of which 20.1 million (38.8%) were less than 19 years of age. There is only 1 Adult Nephrologist per *1 million people* in South Africa (Clin Kidney J. 2016 Feb; 9(1): 11–22). The paediatric nephrology coverage is probably only a 1 Pediatric Nephrologist per *4 million people*. Unlike the adult services where many nephrologists are in private practise, most of the paediatric nephrologists (90%) are in the public sector, caring for 80% of the population.

Despite the shortage, due to better living conditions and primary health care, the prevalence of acute post streptococcal nephritis has dropped markedly (Figure 2). In areas where there are a lot of suboptimal housing (e.g. Cape Town and all the periurban areas) the condition is still seen, but with decreasing prevalence.

The prevalence of CAKUT is reasonably high. The most common lesions in the Black African child is obstructive uropathy due to posterior urethral valves (PUV), pelvi-ureteric junction

(PUJ) obstruction, vesico–ureteric junction (VUJ) obstruction. These lesions are often diagnosed postnatally as sonar for foetal abnormalities are not done antenatally in majority of pregnancies in the public sector. Vesico-ureteric reflux (VUR) is uncommon in the Black African Children, but is common in the White and Asian populations. Mixed race populations may present with a combination of all the pathologies. Therefore, in some areas after a urinary tract infection (UTI), only sonar of the kidney and bladder is performed. A voiding cysto-urethrogram (VCUG) or nuclear imaging is only done after two properly documented UTI or if obstructive lesions of the lower tract are suspected. The trend is towards a MAG 3 scan after an ultrasound, but if there are no radionuclear imaging facilities available then a VCUG is done.

The prevalence of nephrotic syndrome is high in the Black African child, with a high prevalence of steroid resistance. The incidence of both minimal change and focal glomerulosclerosis is almost equal to at 30%. In a recent genetic study done in Durban, Kwazulu-Natal, published in 2018, the Nephrin 2 gene was the most common genetic cause in Black Africans, compared to the Black Americans, where the APOL 1 gene has been more prevalent. Hepatitis B related nephropathy, which causes mainly secondary membranous nephropathy, formed almost 20% of nephrotic syndrome in Southern African countries before being virtually eliminated with the introduction of Hepatitis B immunization in 1994. HIV associated nephropathy was making an impact, but with the introduction of highly active antiretroviral therapy, has remained with a prevalence of 5-7% of nephrosis. AKI due to sepsis and gastroenteritis remains a prevalent clinical problem (Figure 1).

Hypertension due to Takayasu's Aortitis with or without renal artery involvement is relatively common and often associated with a Grade 4 Mantoux response to Tuberculosis. Areas such as Cape Town, where TB is endemic, still has 1-2 new cases per year. They are treated with anti-tuberculosis drugs and steroids, cyclophosphamide and maintained on methotrexate and low dose steroids and anti-hypertensive agents. Often stenting of renal arteries and aorta are undertaken by our cardiology colleagues with a fair degree of success.

Renal replacement therapy in the form of peritoneal and haemodialysis has been freely available but is generally confined to the major academic centres. Both modalities are used, although a "PD first approach" is preferred. Presently, automated peritoneal dialysis is done unless there is no electricity available in the area. Acute dialysis is started whenever possible, until the cause of the renal failure is determined and suitability for chronic dialysis and transplant is determined via a multi-disciplinary team consisting of social workers, nursing staff, psychologist, palliative care team and the medical team. An approach for an affected child is outlined with the multi-disciplinary team for further escalation or withdrawal of therapy. We are trying to change the circumstances where we have influence. The problem is that we do not have sufficient social workers follow-up on missed appointments and compliance of therapy. Almost one third of patients are lost to follow up. This is due to a very mobile population, lack of funds for travel to health facilities, inadequate housing, and inadequate nutrition.

Renal transplantation is available to children in the four major centres, but due to social customs and rituals, the pool for cadaver organs are very limited. There is a bigger push

for living related donors. The first paediatric renal transplant was done in 1967 by Prof. Chris Barnaard in Cape Town followed by paediatric renal transplants in Johannesburg and Cape Town both in 1968. A total of 249 paediatric transplants have been done in Cape Town, 418 in Johannesburg and approximately 10 in Durban. Pretoria is sending their transplants to Johannesburg. Renal replacement therapy including transplantation is available in private practise in Johannesburg.

The capacity for dialysis and transplantation training has increased with the opening of the Nelson Mandela Children's Hospital in Johannesburg, which has state of the art infrastructure and equipment.

With the assistance of both IPNA and ISN fellowships, there has been a tremendous amount of training done for fellows from Africa in Cape Town (almost 25 fellows) and to a lesser extent in Johannesburg, Pretoria and Durban. These fellows have virtually all returned home after completion of training, and have built paediatric renal units and programmes doing renal replacement therapy, including transplants in Kenya, Ghana, Nigeria, Zambia, Uganda and Tanzania.

In conclusion, renal replacement therapy is available to children of South Africa. However, due to poor living standards, distance to travel to and from health facilities, and poor compliance and follow up it becomes a more difficult task to insure these services are delivered to children in need. The present financial constraints have affected the functioning of the health sector. However, prevention initiatives, including monitoring blood pressure and urine dipsticks in schools, can make a huge impact in detecting and diagnosing renal disease early, instituting appropriate management, and decreasing renal related diseases requiring renal replacement in the country.

I thank all of the paediatric nephrology and nursing colleagues for taking great care of these precious children under difficult circumstances and inadequate resources, as well as assisting me with data for this report.

Diagram 1

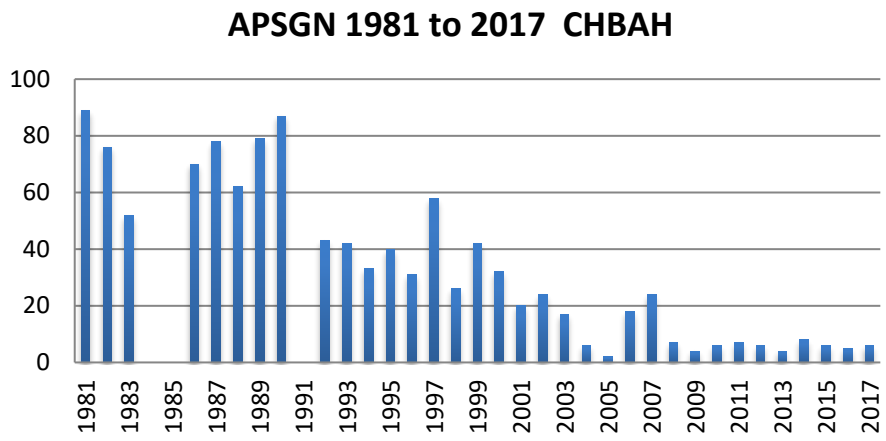

Figure 1: Number of cases of acute post streptococcal nephritis (APSGN) at the Chris Hani Baragwaneth Academic Hospital (CHBAH) over the last three decades

Figure 2: Causes of Nephrotic Syndrome in biopsied Black African Children at CHBAH 1982 -2017