PREAMBLE:

The Vice-Chancellor, Deputy Vice-Chancellors – Academic, Administration, and Research, Innovation and Development, the Registrar, the Librarian and the Bursar; Members of Governing Council; Provosts of College of Health Sciences and Postgraduate College; Deans, Directors, and Heads of Departments; members of Senate; my Colleagues; Friends; Family members; Invited Guests; Great Ife Students; The Press, Ladies and Gentlemen.

It is indeed an honour and uncommon privilege to present the 430th inaugural lecture of this great University today, Tuesday, 22nd September 2026. An inaugural lecture is one of the most cherished traditions of the university. I perceive it as an institutional obligation and not just a personal milestone. It is an opportunity to render my stewardship in academics, professional and educational administration having attained the rank of a Professor in Obafemi Awolowo University in October 2011, served as Vice-Dean, Faculty of Clinical Sciences, the Presidents of my professional Associations, Nigerian Association of Nephrology (NAN) and Transplant Association of Nigeria (TAN), Seventh Registrar of the National Postgraduate Medical College of Nigeria (NPMCN) and currently serving as the Pioneer Vice-Chancellor of Federal University of Medicine and Medical Sciences, Abeokuta (FUMMSA).

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Today, as I present this lecture, my charge is therefore threefold: to reflect on the journey so far, to share evidence from my contributions to nephrology and medical education in Nigeria, and to propose pathways for the future of kidney health and postgraduate medical training in our country.

It is my expectation that this will inspire students and junior colleagues, generate dialogue and collaboration amongst colleagues across disciplines, teachers and policy makers with a view to addressing national kidney health challenges from the clinic to the community, from the laboratory to policy decisions.

I therefore invite you to join me on this journey of reflection, discovery, and service.

My name Fatiu is rooted in the Arabic word 'Al-Fatih' that signifies one who opens and who conquers — a name that, in retrospect, proves prophetic for a life characterised by the opening of new frontiers in medicine, research, and institutional leadership.

EARLY LIFE AND FAMILY BACKGROUND

I was born into the family of Chief Semiu Baosaliu Arogundade, who was then the 'Aro of Iberekodo town' — the second in command to the 'Onibeju of Ibeju', the paramount ruler in Ibeju-Lekki Local Government Area. At that time, this region fell under the Epe Division in Lagos State, Nigeria. My mother was Mrs. Iyabode Emily Arogundade, from Aiyeteju Town, within the same Local Government Area. I was raised in the traditions of the Islamic faith. From an early age, this upbringing instilled in me the values of discipline, the pursuit of knowledge, and a dedication to the service of humanity — values that would come to define every stage of my career.

At about the age of seven, I faced a health challenge that necessitated a hospital visit. As common practice at that time, the family had first tried traditional herbs, '*Agbo*'. On the appointed date, I had to be woken up much earlier than usual to prepare for the journey. We arrived at the General Hospital, Lagos ('Odan'), before daybreak. Sitting at the medical records section, we were the very first to arrive, with a long queue forming behind us. After registration, I was moved to the consultation area, where we waited until around 9 o'clock when the doctor eventually arrived.

On his arrival, I observed a flurry of activity as patients were organized for consultation. The doctor was a young man, agile, neat, smart and corporately dressed.

Fascinated by his presence, I asked who he was and was told he was the doctor everyone had been waiting to see. It was the aura

that heralded his arrival that made me decide that I would also become a doctor (In'Sha'Allah). Alhamdulillah, this eventually came to fruition on the 10th day of October 1990, at the age of 24, when I graduated with a Bachelor of Medicine, Bachelor of Surgery (MBBS) from the University of Lagos.

EDUCATIONAL BACKGROUND

For the first stage of my education, I attended Fazl-Omar Ahmadiyyah primary school Okesuna, Lagos, between 1972 and 1978. I proceeded to Government College, Ketu, in the Epe Division of Lagos State, for my secondary education from 1978 to 1983. Subsequently, I attended Baptist Academy, Obanikoro, Lagos, from 1983 to 1985, for my Advanced Level examinations.
In 1985, I gained admission into the College of Medicine, University of Lagos, by direct entry, graduating in 1990 with a Bachelor of Medicine, Bachelor of Surgery (MBBS) degree. This medical training at one of Nigeria's foremost academic institutions provided the rigorous scientific foundation upon which my extraordinary lifelong career in medicine and nephrology would be built.

POSTGRADUATE TRAINING, ACADEMIC AND PROFESSIONAL QUALIFICATIONS

Following graduation, I proceeded to the General Hospital, Minna for my housemanship training. I thereafter completed my National Youth Service at the Government Hospital Koko, Delta State, where I was subsequently retained and worked from 1992 to 1995. Thereafter, I joined the Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, and commenced residency training in Internal Medicine in September, 1995, following a successful interview by Prof R.O.A. Makanjuola, the then Chief Medical Director and Prof. A.A. Ajayi, the Acting Head of Department of Medicine, amongst others.

I cut my teeth in postgraduate training under the guidance of distinguished academics and clinicians, including Emeritus Professor Adewale Akinsola, as well as Professors Balogun,

Erhabor, Ndububa, and Akintomide, among others. They collectively nurtured me from an uncommitted stem cell – a greenhorn without a primary examination – to maturity as an academic, clinician and educational administrator. Consequent on their diligence, commitment and selflessness, I passed the part 1 examination of both postgraduate colleges in 1998, winning the Sebanjo Prize for the best candidate in the Clinical examination at the National Postgraduate Medical College of Nigeria (NPMCN). For my post-part 1 training, I maintained a clear focus on nephrology – the medical subspecialty concerned with kidney disease and renal replacement therapies.

In May 2001, after successfully passing the part 2 examination, I was awarded the Fellowship of the National Postgraduate Medical College of Nigeria in Physic (FMCP), with a subspecialisation in Nephrology. I also won the Dr V.O. Uzodike Prize for the best student in the part 2 examination in the Faculty of Internal Medicine. Thereafter, I completed my fellowship training at the Cairo University under late Emeritus Professor Rashad Sammy Barsoum, another distinguished academic and international scholar, who was then the Secretary-General of the International Society of Nephrology (ISN). I returned to OAUTHC in February 2002 and was appointed Hospital Consultant in May 2002 and subsequently in OAU as Lecturer I in November 2002. I was promoted to Senior Lecturer in 2005 and believing that a 12-year waiting period would be too long to earn Fellowship of West African College of Physicians by election, having passed the part 1 examination in 1998, I chose to sit for the part 2 examination of the College, obtaining my Fellowship of the West African College of Physicians (FWACP) by examination in 2005.

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Between 2001 and 2002, I received advanced specialist training in Nephrology through the International Society of Nephrology (ISN) Fellowship Program at Cairo University, Egypt, under the erudite scholar late Emeritus Professor Rashad Sammy Barsoum. This globally competitive programme is reserved for physicians demonstrating exceptional promise in renal medicine. I was

nominated by my mentor and father, Emeritus Professor Adewale Akinsola, while Professor Michael Olabode Balogun and Professor Muheez Alani Durosinmi supported the application with excellent references. This fellowship broadened my exposure to global standards and practices in nephrology, equipping me with a solid foundation for the pioneering clinical and academic work that lay ahead.

During the fellowship, I won the Young Investigator Award from the International Society for Peritoneal Dialysis (ISPD) based on my part 2 dissertation. This honor required me to attend the ISPD conference in Montreal, Canada, to receive the award and present my paper. I was also privileged to receive several travel grants from the ISN to attend World Congresses of Nephrology in Berlin, Milan, Singapore, Hong Kong, South Africa, Thailand and India.
In 2017 and 2018, I was admitted to the Fellowship of the Royal College of Physicians of Edinburgh (FRCPEdin) and the Fellowship of the Royal College of Physicians of London (FRCP), respectively – two of the oldest and most prestigious medical institutions in the world, marking international recognition of my contributions to medicine. Furthermore, I served at various times as a visiting Professor to the University of Virginia, USA.

In 2020, I was conferred with the degree of Doctor of Medicine (MD) by publication by the National Postgraduate Medical College of Nigeria – an honour accorded to scholars whose body of published research constitutes a substantial and original contribution to medical science. That same year, I completed a leadership and management course at the University of Washington, USA, and was awarded a Certificate in Leadership and Management in Health.

I was subsequently admitted to the Fellowship of the Nigeria Academy of Medicine (FNAMed) and the Nigerian Association of Nephrology (FNAN), the highest honours bestowed by the Academy of Medicine and Nephrology Association upon their distinguished members. These were in addition to the Fellowship

of the International Society of Nephrology (ISN), awarded upon completing my ISN Fellowship training in 2002. Most recently, in 2025, I was admitted to the Distinguished Fellowship of National Postgraduate Medical College of Nigeria (DFMC), which represents the highest honour awarded by the College to her most eminent Fellows.

Professionally, I have served as Vice-chairman of Nigeria Medical Association (NMA) in Osun State, Chairman of Medical and Dental Consultants Association (MDCAN), OAUTHC Chapter, the Presidents of Nephrology Association of Nigeria (NAN) and Transplant Association of Nigeria (TAN), Chairman of African Regional Board of ISN, Council and Executive Committee Member of the ISN which is the highest global professional body for the subspecialty of nephrology. I was voted President-Elect of African association of Nephrology in 2025 and would (In Sha Allah) assume office in Tanzania in 2027. In all these positions, I made sterling contributions to the growth of the profession, medicine, nephrology, faculty of clinical sciences, college of health sciences (OAU) and the OAUTHC, majority of these are beyond the scope of this lecture but I will reflect on a few.

INTRODUCTION:

Nephrology is the study of the kidney in both health and disease states; it covers the structure and function of the kidneys as well as various pathological insults encountered in diseased states.

About the Kidney?

The kidneys are paired, bean-shaped organs, approximately fist-sized, located in the mid-back, just below the rib cage on either side of the vertebral column (backbone) (Fig 1). They are important excretory organs responsible for eliminating metabolic waste from the body, particularly nitrogenous substances filtered from the blood and excreted in urine. Beyond waste excretion, the kidneys play a critical role in homeostatic regulation. They are central to the production of red blood cells, the maintenance of

healthy strong bones, control of blood pressure, and the precise regulation of fluid, acid-base and electrolyte content of the body.

The medial, indented aspect of the kidney is known as the hilum, through which the renal artery enters and the renal vein and ureter leave the kidney. Anatomically, the anterior relations of the right kidney include the liver**,** duodenum, and ascending colon, while that of the left side are the spleen**,** stomach**,** pancreas, and descending colon. Posteriorly, both kidneys relate to the diaphragm superiorly, and to the psoas major**,** quadratus lumborum**,** and transversus abdominis muscles. The superior pole of each kidney is capped by the adrenal (suprarenal) gland.

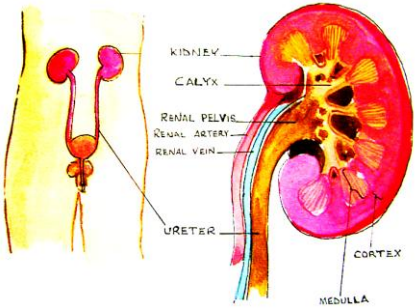

Figure 1: Showing Urinary tract anatomy and Blood vessels

Inside each kidney, there are approximately one million microscopic functional units called **nephrons**. Each nephron is composed of two primary structural components: the **glomerulus**, a high-pressure capillary network that filters the blood, and **Bowman's capsule,** a cup-like sac that encapsulates the glomerulus and channels the initial filtrate into the renal tubule.

Within the segments of the renal tubule, complex biochemical adjustments are continuously made to the filtrate based on the

body's precise homeostatic needs. For example, the tubules reabsorb most of the filtered water and essential electrolytes, drastically reducing the final volume of excreted fluid. Simultaneously, the tubular epithelium selectively reabsorbs or secretes organic solutes, hydrogen ions, and metabolic wastes to rigorously maintain systemic chemical and acid-base balances in the body.

Once this intricate process of filtration, reabsorption, and secretion is complete, the remaining fluid in the tubule emerges as urine. This urine is sent out of the kidney into the **ureter**, a muscular tube leading to the **urinary bladder**, which serves as a reservoir until excretion occurs via the **urethra**.

For this filtration process to function optimally, an adequate blood pressure is mandatory to propel the filtrate through the glomerular filter or sieve. If the arteries supplying the kidneys become diseased or narrowed, perfusion drops, and the filtration process is severely compromised. Ultimately, sustained renal health demands adequate pressure, intact nephrons – both glomeruli and tubules – and an entirely unobstructed outflow tract from the microscopic collecting ducts down to the urethra.

NORMAL KIDNEY FUNCTION:

The normal urine:

The kidneys are primarily responsible for regulating the water content of the body. Daily fluid intake via liquids and solid food averages up to 2 litres, supplemented by approximately 500mls of metabolic water generated internally through the breakdown of body fuels, carbohydrates. To maintain balance, the kidneys excrete between 1.2 -1.5 Litres of this fluid daily as urine.

Under normal physiological conditions, urine is straw-coloured, clear, and free of sediments. It is typically voided 3-4 times daily and usually not at night. The urinary stream is painless, effortless and continuous. The specific gravity is usually about 1.020 (ranging between 1.010 and 1.030 depending on the body's state of

hydration or concentration needs), a slightly acidic pH, and an absence of glucose or protein. Microscopic evaluation may show fewer than 5 white blood cells per high-power field, but red blood cells should be entirely absent.

The kidneys are also key player in the regulation of body electrolytes and maintenance of acid-base balance of the internal environment. When the kidneys are diseased, ingested salt accumulates, leading to volume expansion and hypertension. Similarly, the excretion of other electrolytes becomes impaired; potassium, hydrogen, and phosphates ions accumulate in the plasma, leading to severe clinical consequences, including lethal cardiac arrhythmias and sudden death.

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Systemic blood pressure is significantly regulated by the kidney. The kidney synthesizes and releases various substances in response to changes in intravascular volume and renal perfusion pressure. When the volume or pressure is low, the kidney release substances including renin that converts Angiotensinogen circulating in plasma to Angiotensin I which is further converted to Angiotensin II in the lungs by the Angiotensin Converting Enzyme (ACE), both being potent vasoconstrictors. Angiotensin II, alongside other vasoactive substances, acts to restore systemic blood pressure. However, a diseased kidney responds maladaptively, causing hypertension or severely exacerbating existing hypertension.

Beyond haemodynamics, the kidneys also regulate blood production through the secretion of the hormone 'erythropoietin' which drives erythropoiesis. In chronic kidney disease, erythropoietin production declines sharply, serving as the primary driver for the profound reduction in blood content (anaemia) that characteristically accompanies kidney failure.

Finally, the kidneys maintain skeletal integrity and strength of our bones. They produce the active form of vitamin D (1, 25 dihydroxycholecalciferol) via the 1α-hydroxylation of 25 hydroxycholecalciferol. This active hormone is essential for the

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gastrointestinal absorption of calcium. Without it, calcium homeostasis fails, rendering bones fragile, brittle, and highly susceptible to fracture – a spectrum of disease known as Chronic Kidney Disease-Mineral and Bone Disease (CKD – MBD) and renal osteodystrophy.

The kidney also releases a number of other hormones that are necessary for metabolic processes in the body (Fig 2).

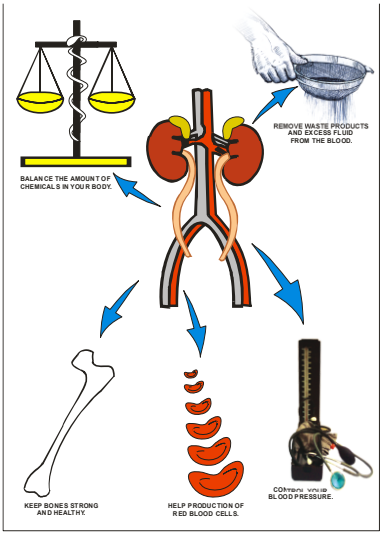

Figure 2: Functions of the kidneys

Pathophysiology of CKD and AKI.
Kidney diseases are broadly classified into two major categories: chronic kidney disease (CKD) and acute kidney injury (AKI). Both

conditions have become increasingly prevalent, with their global burdens assuming epidemic proportions.

What is CKD?

According to the Kidney Disease Improving Global Outcomes (KDIGO) Clinical Practice Guidelines, CKD is defined as the abnormalities of kidney structure and function, present for more than three months, with clear implications for health (KDIGO, 2023). This diagnostic threshold is met by an objective marker of kidney damage (such as persistent albuminuria or proteinuria) or a sustained reduction in the glomerular filtration rate (GFR) to less than 60 ml/min/1.73m^2.

In clinical practice, GFR serves as the primary index of overall of kidney function. Rather than relying solely on raw clearance, GFR is typically estimated from serum creatinine using validated, population-specific equations, as highlighted in our collaborative work (Sanusi, A.A., Arogundade, F.A. et al., 2009).

To guide therapeutic interventions and predict outcomes, CKD is staged systematically on a spectrum from stage 1 (the mildest form, with preserved GFR but evidence of structural damage) to stage 5 (the most severe form, representing kidney failure). Upon reaching Stage 5, also known as End Stage Kidney Disease (ESKD), the loss of metabolic filtration is profound such that patients require kidney replacement therapy (KRT) – via maintenance dialysis or kidney transplantation – to survive.

This stratification is visually represented in the composite KDIGO heat map shown in Figure 3. The framework utilizes a colour-coded risk grid based on both GFR and the degree of albuminuria. Green represents low risk (if no other markers of kidney disease, no CKD); Yellow: moderately increased risk of progression; Orange: high risk of clinical deterioration; Red: very high risk of progression to kidney failure and cardiovascular events.

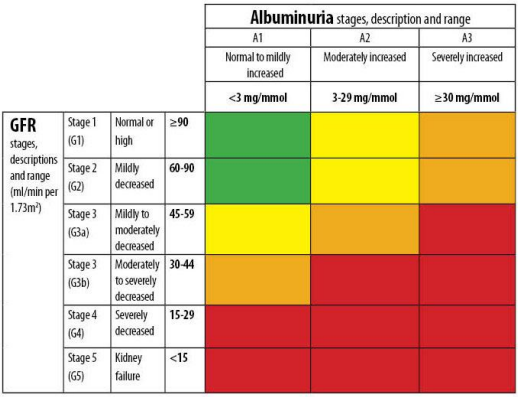

Fig 3: KDIGO: Prognosis of CKD by GFR and albuminuria categories

Green: low risk (if no other markers of kidney disease, no CKD); Yellow: moderately increased risk; Orange: high risk; Red: very high risk. GFR, glomerular filtration rate.

(Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int. 2024;105(4S): S117–S314. S13.)

The structural injury that initiates chronic kidney disease typically originates from systemic or primary kidney conditions. Globally, glomerulonephritis, hypertension and diabetes mellitus are the 3 most common aetiologies. Regardless of the primary insult – whether driven by immune-mediated inflammation, mechanical shear from hypertension, or chronic hyperglycaemia – these conditions converge on a common pathway of cellular and haemodynamic derangements, ultimately destroying the functional nephrons.

At the cellular level, podocytes, tubular epithelial cells, interstitial fibroblasts, and vascular cells respond to injury by proliferating and synthesizing excessive amounts of extracellular matrix

proteins. This pathological accumulation drives the thickening of the glomerular basement membrane and induces mesangial expansion, severely compromising the filtration barrier and process.

Concurrently, systemic hypertension imposes severe mechanical stress on the renal vasculature, causing wall thickening and narrowing of the vessels – a process termed arteriolosclerosis. This limits downstream perfusion, provoking chronic tissue ischaemia and inflammation cascades that culminate in the scarring and obsolescence of the glomerulus, known as glomerulosclerosis. This fibroproliferative process is tightly regulated by many factors that are released from the damaged cells, including inflammatory cytokines, complement cascade, pro-fibrotic growth factors, and adhesion molecules. As a critical mass of nephrons undergoes irreversible destruction, the surviving, healthy nephrons initiate a maladaptive compensatory mechanism to sustain overall kidney function. These remaining healthy nephrons undergo structural hypertrophy and increase their individual filtration capacity – a phenomenon known as single-nephron hyperfiltration or what we can call overwork. While initially adaptive, this functional overload accelerates further injury.

This sustained hyperfiltration and increased mechanical load damage the delicate podocytes, disrupting the integrity of the filtration barrier (slit diaphragms). Consequently, large macromolecules (such as proteins) escape into the urinary space, manifesting clinically as proteinuria. The filtered proteins are toxic to the tubular epithelium; their reabsorption activates the intracellular release of pro-inflammatory and pro-fibrotic cytokines, such as transforming growth factors. This triggers a destructive positive feedback loop that accelerates nephron drop-out and drives disease progression.

Furthermore, progressive scarring of glomeruli severely compromises blood supply to the tubules. This induces chronic tubulointerstitial hypoxia, which heightens tubular cell injury and

accelerates programmed cell death. This self-perpetuating cycle of hypoxia, inflammation, and fibrogenesis systematically replaces functional tissue with non-functional scar tissue, continuing inexorably until the kidney fails.

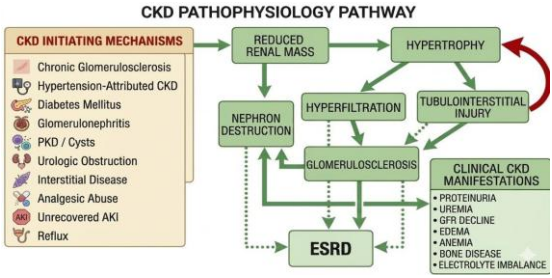

Fig 4: Pathophysiologic pathway for Chronic Kidney Disease

What about AKI?

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In contrast to the chronic presentation, AKI is defined as a rapid, sudden deterioration in kidney function occurring within 48 hours or seven days, resulting in elevation in levels of serum creatinine (a marker of kidney function) or reduction in urine output or both. Aetiologically, AKI is traditionally classified into three distinct categories based on the site of the primary insult: pre-renal, renal or post renal AKI. In this clinical scenario, the renal tubules suffer from profound hypoxic or nephrotoxic injury consequent on hypovolaemic or toxic insults. This triggers the immediate release of vasoactive chemicals, pro-inflammatory cytokines, and chemokines, ultimately culminating in tubular epithelial cell death and severe interstitial inflammation. As these necrotic tubular cells are desquamated, they cast off into the lumen, causing mechanical intratubular blockage. This obstruction drives a high-pressure back-leak of filtrate across the damaged basement membrane, while simultaneously worsening local inflammation and microcirculatory derangements. This destructive cycle perpetuates the injury, and its resolution depends heavily on the rapidity of

controlling the initiating events alongside aggressive supportive therapeutic interventions. While tubular cells ordinarily possess a remarkable capacity to regenerate, persistent or recurrent injury halts this repair process. This can drive progression toward irreversible cortical necrosis or maladaptive tubulointerstitial fibrosis, establishing a direct pathway toward irreversible CKD.

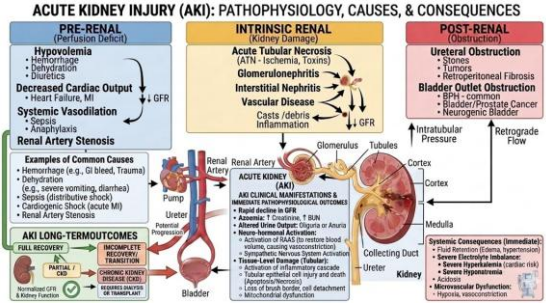

Fig 5: Pathophysiologic pathway for Acute Kidney Injury

BURDEN OF KIDNEY DISEASE:

Kidney disease is globally recognized as a multidimensional health burden that is now assuming epidemic proportions, particularly in Nigeria and across Sub-Saharan Africa (SSA). This regional crisis is uniquely characterised by an alarmingly high prevalence, distinct genetic susceptibilities, and profound socioeconomic barriers to life-saving care. Mr Vice-Chancellor, Sir, based on my primary research and clinical findings over the past 30 years, the true burden of kidney disease within our sub-continent can be systematically categorised into four primary areas: epidemiology, the risk factors (Multiple Burden), the economic impact of treatment, and the consequences on the quality of life.

1. The Epidemiological Burden:

The true national prevalence of CKD in Nigeria – a country whose population is rapidly expanding toward 250 million individuals –

remains officially undocumented via a single national registry. However, it is widely recognised to be alarmingly high. Across our multi-center epidemiological investigations spanning different geographical zones from the North to the South, and the East to the West, we have found prevalence figures ranging between 12% to 26% across various cohorts.

In one of our landmark community-based studies, 'A community study of the prevalence, risk factors and pattern of CKD in Osun State' (Oluyombo, R., …. Arogundade, F.A. et al. 2013), we evaluated 454 residents with a mean age of 45.8 (± 19.0) years. An estimated GFR < 60 ml/min/1.73m^2 was present in 12.3% of the cohort, while macroalbuminuria was present in 8.9%. The overall prevalence of CKD in this population was 18.8%, with CKD stages 1, 2, 3 and 4 accounting for 2.4%, 4.1%, 11.8% and 0.5% respectively.

In a subsequent rural screening in Aiyepe, Ogun State titled 'Prevalence and pattern of Chronic Kidney Disease and its associated risk factors in a rural community in Southwestern Nigeria, (Oyebisi O.O., …… Arogundade F.A., et al. 2018), we screened 464 individuals with a mean age of 48.09(±15.7) years. In this cohort, the crude prevalence of CKD was found to be notably higher at 27.6%.

To capture the distinct dynamics of the northern region, our prevalence study in Kombotso, Kano, titled "Prevalence of Chronic Kidney Disease Markers in Kumbotso, Rural Northern Nigeria" (Nalado A., ……Arogundade F.A., et al. 2016), screened 480 individuals. Here, an eGFR of less than 60 ml/min/1.73m^2 was identified in 26% while persistent proteinuria was detected in 23.6% and haematuria in 1.6%.

In the largest multi-center urban community study conducted in the country, evaluating 10 urban communities across10 state capitals distributed through all the six geopolitical zones, Awobusuyi et al.

identified a crude prevalence of 23.47% (1,896 out of 8077 participants).

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A comprehensive analysis of all the available peer-reviewed publications on CKD prevalence across every geopolitical zone in Nigeria reveals that 20.4% of 14,253 pooled, screened participants had either overt or covert CKD (Table 1; Arogundade et al, 2023). This aggregate data highlights an astronomical 300% increase in the documented prevalence of CKD in Nigeria over the last three decades. Advanced CKD and End Stage Kidney Disease (ESKD) have also become highly visible clinically, constituting between 8.0% and 23.0% of all medical admissions in hospital-based studies, while representing approximately 0.5% of the total community-dwelling CKD population.

Mr Vice-Chancellor, Sir, the demographic implications of these percentages are staggering. At the end of 2025, the population of Nigeria reached approximately 237,527,782, with adults over the age of 18 accounting for 124,707,102 (52.5%) of those individuals (Fig 6). Applying our pooled empirical prevalence rate of 20.4% to this adult cohort indicates that an estimated 25,440,249 Nigerian adults are currently living with covert or overt CKD. Furthermore, assuming that advanced end stage kidney failure accounts for 0.5% of this total CKD population, approximately 127,201 of our citizens are actively living with ESRD. The crushing socioeconomic and clinical implications of these figures on treatment are immense, as we will explore later.

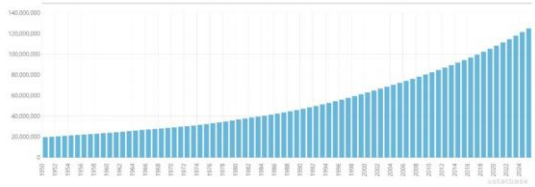

Fig 6: Population of Nigerians above 18 years from 1950-2025
Is there any peculiarity in Nigeria?

Our epidemiological data reveals that CKD in Nigeria primarily affects young and middle-aged adults between the ages of 20 and 50 years. This demographic pattern aligns closely with reports from other developing nations in Sub-Saharan Africa; however, it stands in sharp contrast to the developed world, where CKD is predominantly a disease of older age groups [Arogundade et al, 2008, Ulasi et al 2010, Arogundade et al , 2011]. Furthermore, a large proportion of these CKD patients are males, meaning the disease disproportionately strikes individuals during their most economically productive years, with devastating consequences for family structures and societal productivity [Arogundade et al, 2008, Ulasi et al 2010, Arogundade et al , 2011].

Across our multi-centre investigations, the primary predictors and risk factors for the development of CKD include increasing age, male gender, systemic hypertension, diabetes mellitus, cigarette smoking, obesity, and dyslipidaemia. Additionally, a strong family history of hypertension, diabetes, – alongside other genetic and environmental factors – remains significant predictors of kidney disease susceptibility.

What about the causes?

The underlying causes of CKD in Nigeria, though similar to what has been reported from different countries in sub-Saharan Africa, it differs remarkably from that in the developed world [Arije et al, 2000, Arogundade et al, 2008, Ulasi et al 2010, Arogundade et al , 2011]. In our environment, hypertension and glomerulonephritis remain the two most common causes of CKD, with diabetic nephropathy presenting as a distant third. However, given the rapidly rising prevalence of diabetes mellitus in our urban centers, the contribution of diabetes nephropathy is projected to increase significantly over the coming decade [King H et al, 1998, Ulasi et al 2010, Arogundade et al , 2011]. On the contrary, in the developed nations of the Americas, Europe and Asia, diabetes mellitus remains the commonest cause of CKD.

Furthermore, the traditional infectious causes of CKD continue to abound in our environment. Chief among these is HIV Associated Nephropathy (HIVAN), which remains a major contributor to the CKD burden [Arogundade et al, 2008, Arogundade et al , 2011, Naicker S, 2010]. Other important causes include obstructive uropathy, sickle cell nephropathy, polycystic kidney disease, chronic tubulo-interstitial nephritis and connective tissue diseases [Alebiosu et al, 2006, Ulasi et al 2010].

Table 1: An analysis of some population studies on prevalence of Chronic Kidney Disease (CKD) in Nigeria.

Author	Year	Town	Region of Nigeria	Number studied	Number with kidney damage or CKD (n)	Prevalence of kidney damage or CKD (%)
Afolabi et al.	2009	Ilesa, Osun state	South west	250	26	10.4
Oluyombo et al.	2009	Ilie, Osun State	South west	454	56	12.3
Okoye et al.	2009	Etsako, Edo state	South south	520	126	24.3
Ulasi et al.	2013	Enugu, Enugu state	South east	1941	221	11.4
Oluyombo et al.	2013	Ekiti North / Central, Ekiti State	South west	1084	154	14.2
Abene et al.	2013	Jos, Plateau State	North central	510	128	25
Okwuonu CG et al	2014	Umuahia, Abia State	South east	328	44	13.4
Egbi OG et al.	2014	State Secretariat, Bayelsa State	South south	179	14	7.8
Awobusuyi et al.	2015	10 major cities in 6 geopolitical zones.	All 6 regions	8077	1896	23.47
Nalado et al.	2016	Khumbotso , Kano	North west	454	117	26
Oyebisi et al.	2018	Aiyepe, Ogun State	South west	456	126	27.6
Total Prevalence			All 6 regions	14,253	2906	20.4

The clinical outcome of advanced CKD in Nigeria remains dismally poor. Because vast majority of affected patients cannot afford kidney replacement therapy (KRT), they are placed on conservative medical management, – a scenario that, in our environment, is akin to waiting for the final day (death sentence). Even the few individuals who manage to scrape together resources to commence KRT are unable to sustain it beyond the first few sessions. Furthermore, curative kidney transplantation remains entirely inaccessible to most Nigerians due to its exorbitant, out-of-pocket cost.

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In one of our studies, Arogundade et al. found that only 5% of ESRD patients are able to sustain dialysis for more than 3 months. Hence mortality is very high with majority dying within the first year of clinical presentation and diagnosis. To identify intervention points capable of altering this gloomy trajectory, we systematically analyzed the systemic and patient-level factors driving these poor outcomes. Our research identified major institutional and community-level barriers to care. Institutional challenges include late presentation to healthcare facilities, presence of co-morbidities, limited capacity for KRT, exorbitant cost of treatment, and a shortage of kidney disease prevention training among non-nephrologist healthcare workers. At the community level, the primary hurdles are poor awareness of kidney disease and poor health seeking behaviour. Consequently, public health strategies aggressively targeted at modifying these specific factors would likely reduce the morbidity and mortality associated with kidney failure in our sub-region.

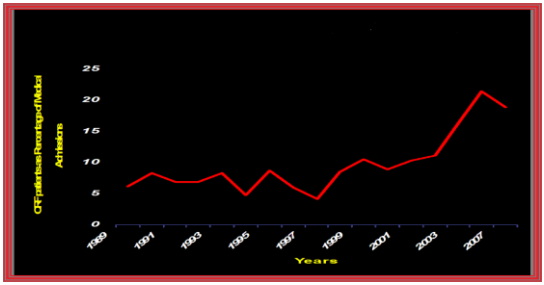

Fig 7: Incidence of CRF Admissions over an 18 year period in OAUTHC

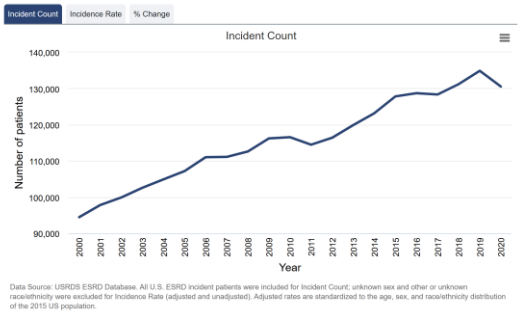

Fig 8: Incidence of ESKD Admissions over a 20-year period in USRDS

What about AKI?

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Arogundade and colleagues looked at AKI in different scenarios and documented important findings. Our previous study titled 'prevalence and pattern of AKI in the intensive care' (Okunola O.O., Arogundade F.A. et al., 2015) revealed AKI accounted for 19.6% of intensive care admissions in OAUTHC with significant male preponderance. The primary indications for ICU admission

included head injury (30%) and major burns (20%). Surgical sepsis accounted for 17.5% cases, followed by advanced metastatic carcinoma at 15%, and multiple fractures at 10%. Notably, mortality rate was significantly higher among patients with multiple organ failure, reaching 80% compared to 20% for those presenting with AKI alone.

In another study on AKI on the medical wards, (Arogundade et al, 2008) we critically appraise the factors that influence survival and determine the usefulness or otherwise of available kidney replacement therapies (Acute HD vs. Acute PD). A total of 46 patients with mean age of 38.2 years were recruited. The primary aetiologies identified were gastroenteritis and septicaemia in 36.9% and 30.5% of the patients, respectively. Unlike in the ICU, 56.5% of all the patients survived. Factors significantly associated with survival included age, sex, aetiology (Fig 9), duration of oliguria, presence of pulmonary oedema, and utilization of kidney replacement therapy. When comparing modalities, no significant differences were observed between the haemodialysis (HD) and peritoneal dialysis (PD) groups regarding age, duration of oliguria, length of hospitalisation, survival rates, or the impact of pulmonary oedema and AKI aetiology. However, the number of HD sessions and the overall duration of PD significantly influenced patient survival.

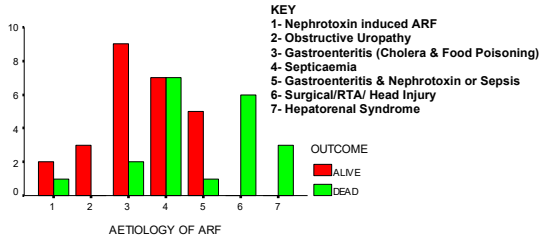

Fig 9: Bar chart showing the relationship between aetiology of Acute Kidney Injury and survival

In yet another study, in collaboration with University of Virginia health System, we assessed 9,673 survivors of AKI, 7,170 (74.12%) had complete renal recovery. Major advanced cardiovascular events MACE occurred in 27.28% of our study population over a median follow-up period of 399 days. A significantly higher proportion of patients who did not recover renal function completely developed MACE, when compared with those that recovered completely. In the same vein, 22% were majorly affected by depression; and this imposed an increased long-term risk for MACE and all-cause mortality by 24 and 18%, respectively.

In a systematic review on AKI in Sub Saharan Africa, we retrieved 3,881 publications, of which 41 met our defined inclusion criteria, including 1,403 adult patients and 1,937 paediatric patients. Acute kidney injury in sub-Saharan Africa was characteristically severe; among studies reporting a need for dialysis, 70% of affected adults required dialysis, yet only 33% actually received it. The overall adult mortality rate was 32%, but it rose to 86% among patients who required dialysis but did not receive it due to resource unavailability or prohibitive costs. Major barriers of access to care were out-of-pocket costs, inconsistent hospital resources, late presentation, and female sex.

In 2026, we conducted a meta-analysis of Acute Kidney Injury (AKI) in Nigeria to determine the overall incidence and outcomes (Adejumo A.O., …...Arogundade F.A., 2026). We identified relevant studies on AKI in both adult and paediatric populations between 1980 and 2024. A total of 384 publications from which 44 studies that fulfilled the inclusion criteria and involved 123,324 patients were selected. The median age of the study participants was 31.1 years, and the median proportion of females was 42.9%. The overall pooled incidence of AKI in this study was 15.0%. The pooled incidence of AKI in the adult and paediatric populations was 18.0% and 12.0%, respectively. The leading aetiologies of AKI were hypovolaemia (32.3%), sepsis (28.8%), malaria (12.8%), and acute glomerulonephritis (11.5%). About 46.0% of

the AKI population presented with stage 3 AKI, and haemodialysis served as the modality of choice for 76.2% of those who underwent dialysis. The overall pooled all-cause mortality rate in patients with AKI was 26.0%. Importantly, these studies only captured patients with financial resources to access care, suggesting that the true regional burden may be even higher. Consequently, high mortality rates and limited dialysis access remain major challenges across Nigeria and the broader African continent. This scarcity of medical resources highlights the urgent need for a holistic, health-system-wide approach to the prevention and management of acute kidney injury in Nigeria and the entire sub-Saharan Africa.

In another of our recent publications 'Predictors of Acute Kidney Injury and In-Hospital Mortality in Patients with RT-PCR Confirmed Lassa Fever in Southwest Nigeria' (Ojo O.E., Hassan M.O. ……. Arogundade F.A., et al., 2026), we studied 482 adults with RT-PCR-confirmed Lassa fever with the objective of identifying predictors of AKI and in-hospital mortality. We found that 21% (95% CI, 17.4%–24.9%) developed AKI and mortality was 10.1%. Out of those that died, 32.7% had AKI. Independent predictors of AKI found in the study included male sex ($p<0.001$), bleeding abnormalities ($p=0.044$), diabetes ($p=0.029$), elevated white blood cell count ($p=0.005$), increased neutrophil count ($p=0.003$), and elevated aspartate transaminase ($p=0.017$) while the predictors of in-hospital mortality were AKI ($p=0.033$), oliguria ($p=0.045$), mean arterial blood pressure ($p=0.001$), haematuria ($p=0.015$), and elevated monocyte count ($p=0.022$). Kaplan-Meier analysis demonstrated significantly poorer survival in patients with AKI versus those without (mean survival 19.0 vs. 29.7 days; $p\leq0.001$). We concluded that AKI complicates approximately 21% of Lassa fever hospitalizations and is associated with an 11-fold increase in mortality. Male sex, bleeding, diabetes, leukocytosis, and elevated aspartate transaminase independently predict AKI, while oliguria, haematuria, blood pressure, and monocyte count predict mortality.

2. The Multiplicity of Risk Factors – Another major burden.
In Nigeria and across the African continent, the epidemiology of kidney disease involves a multifaceted interplay of traditional, environmental, non-traditional or infectious and genetic risk factors:
Traditional risk factors: In several of our studies, we established that hypertension and diabetes mellitus (DM) are not just causes of CKD, they are also leading contributors to its progression.

In our case control study, 'Which factors actually influence the development and progression of overt nephropathy in Nigerian diabetics?' (A. Ibrahim, F.A. Arogundade, et al., 2009) we assessed the risk factors predisposing Nigerian diabetics to overt nephropathy with a view to developing strategies for its prevention. Thirty (30) patients with diabetic nephropathy (DN) who have been diabetic for a minimum of five years and had no other presumed cause of nephropathy were compared with 32 age- and sex-matched diabetic patients without nephropathy.

We demonstrated that the overall duration of diabetes, blood pressure and blood sugar levels were significantly higher in DN patients than in the controls ($p < 0.05$). A family history of kidney disease, socio-economic status, cigarette smoking, body mass index and total serum cholesterol did not distinguish between DN patients and controls ($p > 0.05$). However, systolic blood pressure positively correlated with serum creatinine ($r = 0.057$, $p < 0.001$) and duration of DM ($r = 0.284$, $p = 0.02$). Furthermore, our research uncovered a classic clinical triad – retinopathy, peripheral neuropathy and left ventricular hypertrophy – that was significantly associated with advanced DN ($p < 0.05$). We concluded that a prolonged duration of diabetes, hypertension, poor glycaemic control, and the presence of microvascular or macrovascular complications (retinopathy, peripheral neuropathy, and left ventricular hypertrophy) serve as the primary risk factors driving overt nephropathy among diabetic Nigerians. Consequently, target-driven preventive strategies must prioritise rigorous blood pressure optimization and strict glycaemic control.

To contrast these findings within general populations, our community-based epidemiological surveys revealed a high burden of cardiovascular and metabolic risk factors across rural and semi-urban Southwestern Nigeria:

In Ilie, Osun State: The crude prevalence of hypertension was 30%, diabetes mellitus was 3.7%, obesity stood at 14.6%, and asymptomatic haematuria was detected in 3.1% of the population.
In Aiyepe, Ogun State: A similar pattern emerged, where 28.9% of studied participants had hypertension, 4.2% had diabetes mellitus, and 30% were living with obesity.

To establish the intersection of systemic vascular disease and early renal impairment at the primary care level, we evaluated a family practice cohort in our study, 'Risk factors for Chronic Kidney Disease in newly diagnosed hypertensives' (Bello I.S., Arogundade F.A., et al. 2013). We determined the prevalence of hypertension amongst the family practice population and ascertained the anthropometric and clinical correlates of the studied population. Among 1,106 patients screened, 215 were found to be hypertensive, representing a crude prevalence of 19.6%. The cohort spanned age range of 17 to 82 years (Mean ± SD; 57.53 ± 13.02yrs), with a female predominance of 61.4%. Lifestyle screening revealed that 4.7% smoked cigarette, while 12.1% consumed alcohol. Alarmingly, 58.0% were either overweight or classified as obese, 5.8% had hyperglycaemia while 40% had glomerular filtration rate (GFR) less than 60 mls/min at the time of their initial diagnosis. Statistical correlation analyses within this cohort revealed that while age correlated positively with Systolic BP ($r=0.231$, $p<0.001$), it demonstrated a significant inverse correlation with Diastolic BP ($r=-0.304$, $p<0.001$). Furthermore, serum creatinine demonstrated a significant positive correlation with Systolic BP ($r=0.158$, $p=0.04$) and Diastolic BP ($r=.272$, $p<0.0001$). Serum triglyceride levels also correlated positively with BMI ($r=0.176$, $p=0.035$) and waist-hip ratio ($r=0.226$, $p=0.007$). We concluded that the prevalence of hypertension and associated CVD risk factors were high among the

study population. These findings indicate that a massive proportion of hypertensive patients in our environment already harbor established, asymptomatic CKD at clinical presentation, highlighting an urgent need for routine community-based screening and preventive programme at the primary and secondary care levels.

We expanded this risk profiling to urban cohorts in our comparative study, 'Renal risk profiling in newly diagnosed hypertensives in an urban population in Nigeria.' (Gbadegesin A, ……Arogundade F, et al, 2019), we analyzed 250 newly diagnosed, untreated hypertensive Nigerians alongside 250 apparently healthy, age- and sex-matched normotensive controls from the same community. Our analysis revealed that 28% of the newly diagnosed hypertensives had an estimated glomerular filtration rate of less than 60ml/min. Furthermore, persistent microalbuminuria was detected in 42.4% of the hypertensive subjects compared to just 18.8% of the normotensive controls. The hypertensive cohort also exhibited a significantly higher prevalence of modifiable behavioral and metabolic risks, including analgesic use (86.4% versus 41.6%, $p < 0.001$), alcohol consumption (20.8% versus 12%, $p = 0.008$), dietary sodium intake from consumption of canned/salted food (18.8% versus 8.4%, $p= 0.001$) and central obesity (36.1% versus 26.8%, $p= 0.025$) compared to controls. These clear, modifiable renal risk factors provide a powerful actionable blueprint for community-level preventive nephrology strategies.

To understand these dynamics on a continental scale, we participated in the Human Heredity for Health in Africa (H3Africa) Kidney Disease Research Network study, culminating in the publication, "Cardiovascular Risk Factor Burden and Association With CKD in Ghana and Nigeria" (Olanrewaju, T.O., ..., Arogundade, F.A., et al., 2021). This massive transregional study evaluated 8,396 participants, including 3,956 established CKD cases, across both Ghana and Nigeria. For this network cohort, CKD was defined as estimated glomerular filtration rate of

<60 ml/min per 1.73 m^2 and/or albuminuria as albumin-to-creatinine ratio <3.0 mg/mmol (<30 mg/g) for ≥3 months. We assessed self-reported (physician-diagnosis and/or use of medication) hypertension, diabetes, and elevated cholesterol; and self-reported smoking as cardiovascular risk factors. The overall mean age of the cohort was 45.5 ± 5.1 years. Major cardiovascular risk factors included hypertension (59%), diabetes (20%), and elevated cholesterol (9.9%). Notably, the overall cardiovascular risk burden was significantly higher in the Ghanaian cohort than in the Nigerian cohort (P < 0.001). Multivariate logistic regression identified that hypertension (adjusted odds ratio [aOR] = 1.69 [1.43-2.01, P < 0.001]), elevated cholesterol (aOR = 2.0 [1.39-2.86, P < 0.001]), age >50 years, and body mass index (BMI) <18.5 kg/m^2 were independently associated with the presence of CKD. We found that the impact of diabetes and smoking on CKD was subject to modification by other risk variables. This multi-country data demonstrates that middle-aged West African adults are facing an overlapping crisis of traditional cardiovascular risks alongside nutritional deficiencies, both driving the regional CKD epidemic.

Environmental factors: Beyond traditional metabolic and systemic factors, environmental exposures – specifically to hydrocarbons (HCs), heavy metals, and nephrotoxic (native herbs) remedies – play a major role in the evolution and progression of kidney disease in our environment. To evaluate the direct impact of industrial chemical exposure on primary renal pathology, we conducted a landmark case-control study, 'Association of hydrocarbon exposure with glomerulonephritis in Nigerians' (Ishola D.A. Jr, Arogundade A.F., Sanusi A.A., Akinsola A., 2006). We compared lifetime HC exposure levels between 50 Nigerian patients with glomerulonephritis (GN)-induced CKD and 45 healthy, age- and sex-matched control subjects. We found that the HC exposure score (HES) was significantly higher in the patient's cohort than in the controls, measuring 2307.5 (±698.8) vs. 53.4 (±16.5), respectively (p < 0.001). To evaluate relative risk, the HES was dichotomised by classifying all participants within the

upper third of scores as a high-exposure sub-group. A significantly greater proportion of patients fell into this high-exposure category ($p<0.002$). Using multivariate logistic regression analysis to control for potential confounding variables such as age and gender, we determined a greater than four-fold risk of developing GN-induced CKD among individuals with high HC exposure (OR 4.3; 95% CI -1.7 - 11). This critical environmental association was strongly reinforced by a related study by Okoye et al (2022), which evaluated 148 individuals. In their cohort, 70.3% of the documented kidney disease cases were categorized as heavily exposed to hydrocarbons, compared to only 28.4% of healthy controls ($p < 0.001$). Crucially, a significantly higher number of cases were born near petrochemical refineries or currently resided near petrochemical refineries and heavy industrial plants compared to controls. Taken together, the findings from these 2 studies indicate that chronic HC exposure represents a potent, modifiable environmental risk factor for glomerulonephritis and subsequent CKD in Nigeria. Implementing strict occupational safety measures and regional environmental exposure limitations could profoundly reduce this unique aspect of our regional renal disease burden.

Regional Specifics: Infectious diseases which could be viral, bacterial, fungal or parasitic (e.g. HIV, malaria, and schistosomiasis etc.) contribute to the "tropical spectrum" of kidney disease (Arogundade et al., 2016). In one of our studies titled, 'Renal disease in HIV-seropositive patients in Nigeria: an assessment of prevalence, clinical features and risk factors' (Emem-Chioma P, Arogundade FA, et al, 2008), we assessed the pattern of kidney disease and its risk factors in 400 HIV-infected Nigerians. The mean (±SD) age was 34.6 (± 9.4) years, and all other identifiable causes of CKD were excluded. We observed a high occurrence of kidney disease (proteinuria and/or elevated serum creatinine), in 38% of the patients. This cohort included 74 males and 78 females with a M:F ratio of 1 and the mean age (±SD) was 35.8 (±10.01) years. Systolic and/or diastolic hypertension was seen in 13.2% of these patients while the mean (±SD) body mass index (BMI) and packed cell volume (PCV)

were 18.5 (±3.1) kg/m^2 and 25.26 (±6.81) %, respectively. The mean (±SD) CD4+ count was 246.49 (±192.8) cells/microl, while the mean (±SD) serum creatinine and 24-hour urine protein excretion rates were 210.11 (±337.8) micromol/L and 2.57 (±2.42) g/day, respectively. We further compared subjects with and without nephropathy and found that higher age and low BMI, serum cholesterol, serum albumin and CD4+ counts, were significant risk factors for nephropathy. Kidney histology revealed mainly focal glomerulosclerosis (FGS) with glomerular collapse in 70% of the patients biopsied.

In another study, 'Comparative Evaluation of Prevalence, Risk Factors, and Pathologic Features of Kidney Disease in Highly Active Antiretroviral Therapy-Naive and Highly Active Antiretroviral Therapy-Experienced Patients at a Tertiary Health Facility in Maiduguri, Northeastern Nigeria' (Sulaiman MM, …. Arogundade FA, et al, 2022), we compared the clinical and histopathologic patterns of kidney disease between 200 patients receiving highly active antiretroviral therapy (HAART) and 200 HAART-naive patients in Maiduguri, Northeastern Nigeria. We found that 10.5% of the participants in the HAART-experienced group had kidney disease compared with 30.5% participants in the HAART-naïve group. The mean serum creatinine (SCr), $CD4^+$ cell counts, and viral load were 185.67 ± 221.80 µmol/L, 493.26 ± 241.97/mm^3, and 8,856.79 ± 19,747.11/mL in the HAART-experienced group, respectively. In the HAART-naïve group, the mean SCr, $CD4^+$ cell count, and viral load were 141.88 ± 130.56 µmol/L, 270.00 ± 154.65 cells/mm^3, and 139,217.70 ± 12,598.50/mL. For those participants who underwent renal biopsy, Focal segmental glomerulosclerosis (FSGS) was the most common histologic diagnosis, accounting for 64.7% of all biopsies. Ultimately, we established that kidney disease was prevalent among HIV-infected patients and risk factors for chronic kidney disease within this vulnerable population included increasing age, lower body weight and body mass index, high human immunodeficiency virus (HIV)-1 viral loads, low CD4+ cell counts, severe anaemia, and persistent proteinuria.

In another seminal global collaboration, 'kidney disease in the setting of HIV infection: conclusions from a kidney disease: Improving Global Outcomes (KDIGO) Controversies Conference' (Swanepoel CR, et al., 2017), we reported the consensus recommendation of an international panel of experts spanning nephrology, renal pathology, and infectious diseases to define the pathology of kidney disease in the setting of HIV infection. This landmark global initiative was driven by four core mandates: to define the precise pathology of kidney disease manifesting in the setting of active HIV infection; elucidate the expanding role of genetics in the natural history, diagnosis, and targeted treatment of renal disease in HIV-positive populations; rigorously characterize the renal risk-benefit profile of lifetime antiretroviral therapy (ART) configurations for both HIV management and pre-exposure prevention; and establish international best practices for the comprehensive prevention and long-term clinical management of chronic kidney disease among individuals living with HIV. From this global consensus, we strongly emphasized the mandate for routine mandatory screening for CKD in all HIV positive individuals at the exact time of initial diagnosis, followed immediately by formal disease staging and the rapid initiation of anti-retroviral therapy. To achieve this at the primary and secondary care tiers, a baseline urinalysis must be performed for all HIV-positive individuals to detect worsening or new onset proteinuria or haematuria. Where feasible, quantitative evaluation of proteinuria should be prioritised. This screening paradigm must be maintained annually for all stable patients. However, significantly more frequent monitoring is clinically indicated for individuals who are haemodynamically unstable, severely immunocompromised, or viraemic. Finally, we established clear, standardized criteria for immediate nephrology referral, which include unexplained AKI or CKD, rapid functional decline, new onset or worsening proteinuria and CKD stage 3b or Stage 4 for preparations for KRT.

Genetic susceptibility and Kidney Disease:
Genetic diseases are highly prevalent in contemporary nephrology practice, driving both disease initiation and progression. Modern genomic insights reveal that these genetic influences orchestrate renal decline through three distinct pathogenic mechanisms: first, direct monogenic inheritance, where a single mutation causes structural destruction, as classically demonstrated in autosomal dominant polycystic kidney disease (ADPKD); second, secondary systemic manifestation, where renal impairment develops as a consequence of systemic disease pathology, such as sickle cell nephropathy; and third, synergistic genetic susceptibility, where specific variants act in concert with concurrent disease promoters, typified by apolipoprotein L1 (APOL1)-mediated kidney disease.

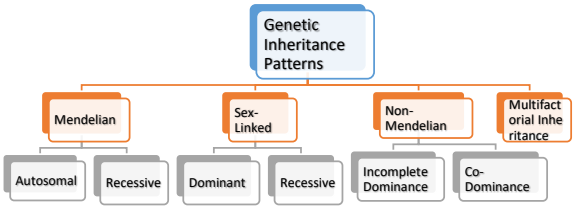

Fig 10: Schematic representation of genetic Inheritance Patterns

To assess the interplay between genetic predisposition and kidney disease, I shall start with Sickle cell disease (SCD), a genetically inherited disease in an autosomal recessive pattern but with significant racial and geographical predilection. In our environment, it stands as a major, highly visible contributor to the chronic kidney disease burden.

To evaluate the scope of this genetic complication, we established the baseline magnitude of renal impairment in this population in our study, 'An appraisal of kidney dysfunction and its risk factors in patients with sickle cell disease' (Arogundade F.A. et al., 2010.). We evaluated 374 SCD patients with a median cohort age

of 23 years (range 7-62 years), and a median age at sickle cell diagnosis of 4 years (range 0.25-31years). Our analysis revealed that while 68.2% of the patients exhibited preserved renal parameters, the remaining 31.8% presented with established markers of kidney disease, manifesting as persistent proteinuria, macroscopic or microscopic haematuria, or a significantly reduced glomerular filtration rate (eGFR < 60 mL/min/1.73 m²). The age of patients was a significant predictor of kidney disease ($p = 0.002$) and correlated with the level of serum creatinine ($r = 0.188$, $p < 0.001$), GFR ($r = 0.245$, $p < 0.0001$) and the degree of proteinuria ($r = 0.174$, $p = 0.006$). Patients with kidney disease had a significantly higher number of crises/hospitalizations ($p < 0.001$). Over the course of the evaluation window, seven patient mortalities were recorded; among these, four individuals (representing 1.07% of the total cohort) succumbed directly to advanced End-Stage Kidney Disease (ESKD). These findings highlight the need for early, routine microalbuminuria screening in all sickle cell patients to interrupt the progression to irreversible kidney failure.

To bridge the gap between clinical observation and definitive structural tissue mapping in Sickle Cell Nephropathy, we advanced our research from large-cohort clinical profiling to targeted renal biopsies. In our recent prospective study, 'Clinicopathologic Study of Sickle Cell-associated Kidney Disease: A Nigerian Experience' (Hassan M.O., Arogundade F.A. et al, 2024., Odeyemi A ….Arogundade FA et al, 2022), we assessed the prevalence, pattern and predictors of renal dysfunction in 105 SCD patients and investigated the associated renal histopathologic changes in 22 with indications for biopsy. We found that 35.2% had CKD, as defined by an eGFR of 60 ml/min/1.73 m^2 and/or proteinuria. The fractional excretion of potassium (FEK) was elevated in all patients, whereas the fractional excretion of sodium (FENa) was elevated in 98.1% suggesting significant tubular dysfunction. Glomerular filtration rate was negatively correlated with irreversible percentage sickle cell count ($r = -0.616$, $P = 0.0001$), FEK ($r = -0.448$, $P = 0.0001$) and FENa ($r = -0.336$, $P = 0.004$).

We established that increasing age, irreversible percentage sickle cell count, haemoglobin levels and FENa were the major predictors of CKD. The histological pattern revealed mesangioproliferative glomerulonephritis in 50%, minimal change disease in 27.3%, focal segmental glomerulosclerosis in 13.6% and interstitial nephritis in 9.1% (Fig 11). In conclusion, we found that CKD was prevalent in SCD patients, and it was characterised by tubular dysfunction and mesangioproliferative glomerulonephritis. The main predictors of CKD were increased age, frequency and/or severity of vaso-occlusive crisis, worsening anaemia and tubular dysfunction.

In yet another cross-sectional study of 200 age and sex matched SCD patients divided equally into 2 groups of sickle cell anemia (SCA) and SCT with 100 controls with HbAA (Odeyemi A…Arogundade FA et al, 2022, Odeyemi A…Arogundade FA, 2022). We found a prevalence of microalbuminuria was 61%, 12% and 8% ($p<0.0001$) in SCA, SCT and controls respectively. We concluded that kidney impairment was is more prevalent in the SCD and SCT population and thus there may be a need to adopt measures of early detection and institute aggressive lifestyle modification to prevent chronic kidney disease.

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Mr. Vice-Chancellor, Sir, these definitive 2024 tissue patterns explain the clinical realities we first identified fourteen years prior. Synthesizing these two decades of original research yields three undeniable clinical rules for the care of sickle cell patients in our sub-continent:

1. **The Age Effect:** Advancing patient age increases the risk of developing progressive, irreversible kidney disease.
2. **The Chronicity Effect:** A younger age at initial SCD clinical manifestation predicts a significantly higher lifetime probability of renal failure.
3. **The Crisis Effect:** A higher frequency and severity of vaso-occlusive crises directly accelerate downstream nephron drop-out and tissue scarring hastening progression of kidney injury.

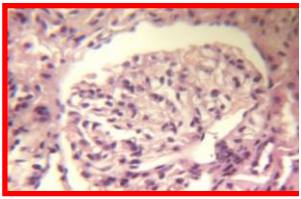

Fig 11A: Kidney histology showing minimal change disease. Magnification, X100 (H&E).

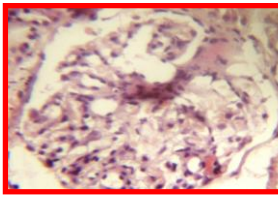

Fig 11B: Kidney histology showing mesangial proliferation. Magnification, X100 (H&E).

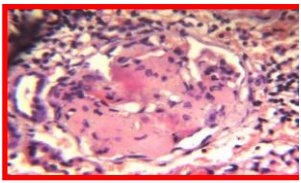

Fig 11C: Kidney histology showing global sclerosis. Magnification X100 (H&E).

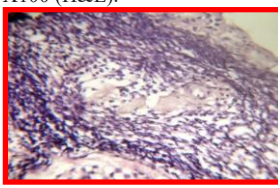

Fig 11D: Kidney histology showing interstitial nephritis. Magnification, X100 (H&E)

Based on the constellation of our findings in sickle cell disease and renal pathology, we propose a novel five-stage classification system for sickle cell nephropathy, paired with corresponding management modalities (Arogundade FA et al, 2010, Arogundade FA et al, 2016, Odeyemi A…Arogundade FA et al, 2022, Odeyemi A…Arogundade FA, 2022, Hassan MO, Arogundade FA et al, 2024) (Fig 12).

1 - Stage of Hyperfiltration
2 - Stage of Normal GFR
3 - Stage of Microalbuminuria
4 - Stage of overt proteinuria
5 - Progressive CKD / ESKD

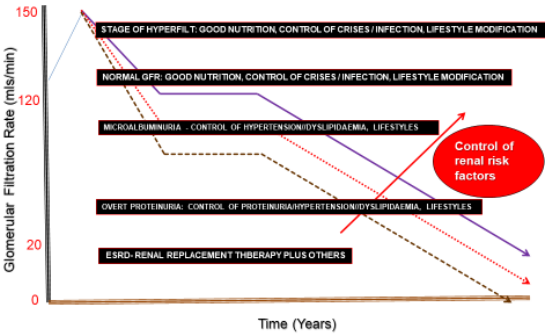

Fig 12: Staging of Kidney Disease in Sickle Cell Patients and management modalities.

Autosomal Dominant Polycystic Kidney Disease (ADPKD), another genetic disease inherited in a Mendelian autosomal dominant pattern, is presumably rare in Africa. Knowledge about the disease in Nigeria is limited as demonstrated by scanty publications on the subject. In our study 'Clinical presentation and outcome of autosomal dominant polycystic kidney disease in Nigeria' (Arogundade F.A. et al, 2018), we determined the pattern of clinical presentation and outcome of forty-one ADPKD patients. We found that the M:F=1.3:1 with mean age of 48.6(±4.6) years. Family history of ADPKD and hypertension were present in 56.1% and 82.9% respectively. Their mean systolic and diastolic blood pressures were 166.9 (±23.6) and 104 (±21.2) respectively. Nocturia (78.0%) and loin pain (68.3%) were the most common presenting symptoms. Liver cysts (31.7%) and aortic regurgitation (22.0%) were the predominant extra-renal manifestations. Twenty-three (56.1%) received haemodialysis; none received renal transplantation. Death rate was 51.2%, with the presence of uraemia and intra-cerebral aneurysm contributing significantly to mortality. We concluded that ADPKD may not be so rare in Nigeria and awareness campaigns to change attitude of family

members to screening and further studies using newer criteria for diagnosis of ADPKD should be conducted.

Apolipoprotein L1 gene (*APOL1*) and the Kidney:
The discovery of APOL1 risk variants has redefined the burden of kidney disease for West Africans, explaining why CKD often progresses more rapidly in this population than in other global cohorts (Gbadegesin RA, …. Arogundade F, et al. 2024; Pollack MJ et al, 2023, Olabisi OA et al, 2022, Osafo et al…. Arogundade FA et al, 2016, Friedman et al, 2011).

Role of Apol 1 Gene:
The APOL1 gene is one of the six APOL genes on human chromosome 22. It is found only in primates and encodes a protein (APOL1) that protects against Trypanosoma brucei. There are 3 distinct alleles of this gene; G0, G1, and G2. G0 refers to the alleles lacking the mutations associated with G1 or G2. It is considered the non-disease associated allele. G1, the first disease-associated allele, refers to a pair of coding polymorphisms (p.S342G and p.I384M) that are almost always inherited together. G2, the second disease-associated APOL1 allele, refers to a six-nucleotide deletion that leads to the in-frame loss of two amino acids. APOL1 is the trypanolytic factor in human blood that ensured survival of West, Central and East Africans to the ravaging effects of trypanosomiasis (sleeping sickness) which used to be uniformly fatal (Fig 13). Among African Americans, the allele frequency of the G1 variant is approximately 23%, while the G2 variant stands at roughly 15%. Because APOL1-associated nephropathy follows an autosomal recessive pattern of inheritance, an individual must inherit two risk alleles – one from each parent – to manifest the high-risk genotype. Consequently, due to genetic admixture dynamics, approximately 13% of the self-identified African American population empirically carries this high-risk genotype, predisposing them to accelerated chronic kidney disease.

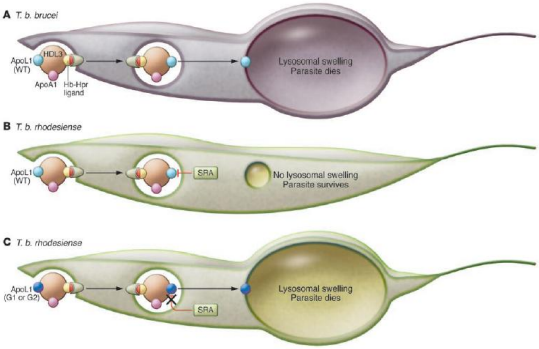

Fig 13: APOL1 Risk Variants Were Positively Selected Because They Protect Africans Against Trypanosome Infection

Friedman DJ, Pollack MR. Genetics of kidney failure and the evolving story of APOL1

In our study on '*APOL1* Bi- and Monoallelic Variants and Chronic Kidney Disease in West Africans' (Gbadegesin RA, …. Arogundade F, et al. 2024), we conducted a case-control study involving participants from Ghana and Nigeria who had CKD stages 2 through 5, biopsy-proven glomerular disease, or no kidney disease. We analyzed the association of CKD with *APOL1* variants among participants with high-risk genotypes (two *APOL1* risk alleles) and those with low-risk genotypes (fewer than two *APOL1* risk alleles) by fitting logistic-regression models that controlled for covariates, including clinical site, age, and sex. A total of 8,355 participants (4712 with CKD stages 2 through 5, 866 with glomerular diseases, and 2777 with no kidney disease), the prevalence of monoallelic *APOL1* variants was 43.0% and that of biallelic *APOL1* variants was 29.7%. Participants with two *APOL1* risk alleles had higher odds of having CKD than those with one risk allele or no risk alleles (adjusted odds ratio, 1.25;

95% confidence interval [CI], 1.11 to 1.40), as well as higher odds of focal segmental glomerulosclerosis (adjusted odds ratio, 1.84; 95% CI, 1.30 to 2.61). Participants with one *APOL1* risk allele had higher odds of having CKD than those with no risk alleles (adjusted odds ratio, 1.18; 95% CI, 1.04 to 1.33), as well as higher odds of focal segmental glomerulosclerosis (adjusted odds ratio, 1.61; 95% CI, 1.04 to 2.48). The inclusion of covariates did not modify the association of monoallelic and biallelic *APOL1* variants with CKD or focal segmental glomerulosclerosis.

We concluded that monoallelic *APOL1* variants were associated with 18% higher odds of CKD and 61% higher odds of focal segmental glomerulosclerosis; biallelic *APOL1* variants were associated with 25% higher odds of CKD and 84% higher odds of focal segmental glomerulosclerosis (Fig 14).

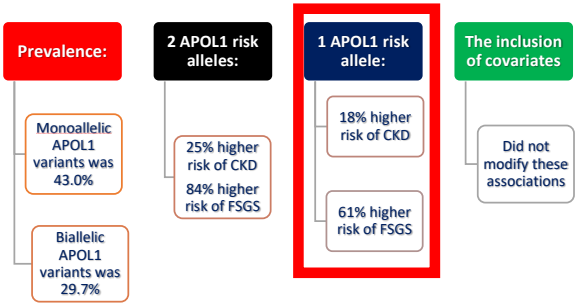

Fig 14: Summary of our findings (Gbadegesin RA, …. Arogundade F, et al. 2024)

Secondary Complications of CKD: A major contributor to the Burden.

The clinical burden of CKD is severely exacerbated by an array of systemic complications. Over the past three decades, our research team at the Renal unit of the Department of Medicine, Obafemi Awolowo University (OAU)/ Teaching Hospitals Complex

(OAUTHC) has systematically evaluated these syndromic relationships. Specifically, our clinical investigations have focused on three primary axes of secondary kidney disease morbidity: first, the pattern of haematologic indices and the response of anemia to treatment with parenteral iron and erythropoietin; second, the burden and biomarkers of CKD–mineral and bone disorder (CKD-MBD); and third, the interplay between malnutrition, infection, and inflammation.

Anaemia is one of the most common complications of CKD, exerting profound effects on patient morbidity and mortality; furthermore, it serves as a major cardiovascular risk factor. The treatment and correction of anaemia leads to improvement in cardiovascular status and quality of life of patients with CKD. The pathogenesis of anaemia in CKD include iron and erythropoietin deficiency. Arogundade et al, studied the haematologic indices and response to Erythropoietin therapy in patients with chronic renal failure. (Arogundade FA, Bappa A, et al. 2006), we characterised the anaemia in Nigerians with CKD and provided preliminary data on their response to r-HUEPO treatment through an open labelled clinico-pathologic study. Thirty consecutive, newly diagnosed patients with CKD (mean age: 40.17(±13.4) years) were recruited, alongside 25 age- and sex-matched healthy Nigerian controls. The mean creatinine clearance (CrCl) was 11.68(±9.16) mls/min in the patient group compared to 94.0(±16.67) mls/min in the control group. A comprehensive assessment of their renal status was done as well as full haematological profile, including bone marrow aspiration and staining, prothrombin time and bleeding time. Stool test for occult blood and microscopy was also performed. Urine microscopy, culture and sensitivity were carried out on all subjects. Subcutaneous recombinant erythropoietin was offered to those that were able to afford it at the dose of 50 units/kg body weight up to a maximum of 4,000 units thrice weekly and the response monitored over the study period. Anaemia was present in 100% of the patient cohort. The packed cell volume (PCV) in the patient group ranged from 10% to 35% (mean ± SD: 20.27 ± 5.6%), which contrasted sharply with the control group range of 37% to 48% (mean ± SD:

41.96 ± 16.67%). PCV correlated positively with creatinine clearance (r=0.97, P =0.0043) and negatively with bleeding time (r=0.49; P=0.043). The bleeding time was prolonged in 9 (36%) of the patients while it was normal in all controls (P<0.001). Ten Patients had malaria parasitaemia (40%) at presentation when compared with only 3(12%) of the controls (P=0.05). In addition, 88% of the patients had normal leucocyte count while all the control subjects had normal leucocyte counts. The platelet counts in the study group ranged between 86 and 246 x 10^9/L while for controls it ranged between 90 and 330 x 10^9/L. Bone marrow biopsy revealed hypocellular marrow in 80% of the patients and normocellular marrow in the remaining 20%. Regarding iron stores, marrow iron was normal in 40.0%, reduced in 36.7%, and absent in 23.3%. Furthermore, recombinant human erythropoietin (rHuEPO) therapy demonstrated clinical efficacy in 90% of the patients who received it. Over the study period, the mean PCV rose significantly from 20.6 (± 3.3) % to 33.6 (± 4.3) % (p=0.008) and retic index from 0.38 to 1.04 over the study period. We concluded that anaemia of increasing severity was common in CKD patients and worsens with disease progression. In the majority of patients, this anaemia was characteristically hypoproliferative with a normochromic, normocytic profile. Contributory factors included iron deficiency, inadequate dialysis dosing, increased bleeding tendencies and megaloblastic anaemia. Although erythropoietin therapy demonstrated high clinical efficacy, it remained financially prohibitive for the vast majority of the patients.

In a separate open-label randomized controlled trial titled 'Iron status and benefit of the use of parenteral iron therapy in pre-dialysis Chronic Kidney Disease patients' (Arogundade, F.A., Soyinka F.O., et al. 2013), Arogundade and colleagues evaluated the clinical utility of intravenous (IV) versus oral iron supplementation in correcting anemia and improving iron status among pre-dialysis chronic kidney disease (CKD) patients. Out of 60 consecutive pre-dialysis chronic kidney disease patients screened at our renal clinic over a 6-month period, 41 (68.3%) met the criteria for anaemia and were enrolled. The cohort had a mean

age of 39 years, a mean serum creatinine of 201.80 ± 70.25 µmol/L and, a mean creatinine clearance of 37.90 ± 12.17 ml/min. Baseline haematocrit concentration correlated inversely with serum creatinine levels, and 56.1% of the anaemic patients had concurrent iron deficiency. Following intervention, the IV iron group demonstrated a statistically significant mean packed cell volume (PCV) increase of 2.42 ± 1.98% (p=0.002) compared to a negligible mean PCV difference of 0.909 ± 0.94% in the oral iron group. Importantly, intravenous iron therapy alone achieved anaemia correction in about one-third of these patients without any life threatening adverse drug event.

In yet another prospective study, 'Anaemia and its Response to Treatment with Recombinant Human Erythropoietin in Chronic Kidney Disease Patients.' (Abdu A., Arogundade F., et al. 2009) the patterns of anaemia and clinical response to treatment with recombinant human erythropoietin(r-HuEpo) were evaluated in 20 CKD patients. Subcutaneous r-HuEpo was initiated at a weekly dose of 50 IU/kg and titrated according to haemoglobin (Hb) responses, which were monitored fortnightly to achieve a target Hb of 11g per dl. At baseline, all patients were anaemic presenting with a mean Hb of 7.36 ± 1.05 g/dl; the morphology was normocytic and normochromic in 85% of the patients. All patients responded to r-HuEpo therapy, with the mean Hb rising from 6.74 ± 0.70g per dl to 11.64 ± 0.37) g/dl in the maintenance haemodialysis group, and from 7.64 ± 1.19 to 11.98 ± 0.45) g/dl in pre-dialysis patients. The target Hb of 11g/dl was achieved within 8 weeks in pre-dialysis patients and within 10 weeks by those on maintenance haemodialysis. Collectively, these findings indicate that anaemia in our environment is predominantly normocytic and normochromic, and that intravenous iron supplementation and r-HuEpo therapy is highly effective for its correction.

Chronic kidney disease-mineral and bone disorder (CKD-MBD):

Chronic kidney disease-mineral and bone disorder (CKD-MBD) has been recognized as an important complication of CKD with

significant impact on morbidity and mortality. In a series of studies, Arogundade and colleagues assessed the prevalence, patterns, and clinical correlates of this condition, alongside the diagnostic utility of its associated biomarkers. In one of our publications on CKD-MBD, 'Prevalence and pattern of renal bone disease in end stage renal disease patients in Ile-Ife, Nigeria' (Sanusi A.A., Arogundade F.A., et al. 2010), we assessed its prevalence and magnitude in 30 patients with end stage renal disease (ESRD). The laboratory evaluation included serum calcium, phosphate, alkaline phosphatase, albumin and skeletal survey. The serum iPTH, osteocalcin, and 1,25 (OH2) D3 were also assessed. We found a mean age of 38.93 (± 15.7) years with a male:female ratio of 4:1. While uraemic symptoms were the major presenting complaints, none of the patients complained of bone pain or had fracture. The mean values for baseline laboratory parameters were as follows: serum creatinine, 1478.96 (± 771.12) µmol/L; urea, 22.33 (± 7.42) mmol/L; creatinine clearance (CrCl), 3.38 (± 2.22) mL/min; calcium, 1.8 (± 0.5) mmol/L; phosphate, 1.61 (± 0.65) mmol/L; albumin, 30.2 (± 6.1) g/L; and alkaline phosphatase (ALP), 124.33 (± 63.37) IU/L. Furthermore, the mean concentrations for bone biomarkers were 22.66 (± 24.72) pg/mL for intact parathyroid hormone (iPTH), 45.14 (± 43.8) ng/mL for osteocalcin, and 37.7 (± 22.3) pmol/L for 1,25-dihydroxyvitamin D3 [$1,25(OH)_2D_3$]. There were hypocalcaemia and hyper-phosphataemia in 80% and 60% of the patients respectively. Alkaline phosphatase was elevated in 44% of the patients while 11.8% had hyperparathyroidism. Level of 1,25 (OH)2 Vit D3 was low in 83.3% of the patients. There was a significant negative correlation between serum calcium and iPTH levels ($r = -0.915$, $p=0.029$). There was also significant negative correlation between alkaline phosphatase and 1,25 (OH)2 Vit D3 and serum albumin. Radiological evidence of renal bone disease (RBD) occurred in only 16.7% of the patients, hence its unreliability in diagnosing the condition. We concluded that CKD-MBD is common in our patients with ESRD. This presentation is predominantly characterized by low bone turnover, whereas the occurrence of hyperparathyroid bone disease appears to be notably low. In

another cross-sectional study titled 'Prevalence and pattern of chronic kidney disease-mineral bone disorders in 48 haemodialysis patients in Kano, northwest Nigeria' (Abdu A., Arogundade F.A., Aliyu A., 2015), the cohort presented with a mean age of 45.96 (±13.7) years. Hyperphosphatemia was found in 39.5% of the patients, hypocalcemia in 46%, an elevated calcium-phosphate product (>4.55 $mmol^2/L^2$) in 54.1%. Overall, 58% of the patients met the criteria for CKD-MBD, with 31% presenting with secondary hyperparathyroidism, and 27% exhibiting features of adynamic bone disease. Notably, serum 25(OH) Vitamin D_3 was low across the entire cohort (mean: 43.79 ± 21 ng/ml). In a subsequent 2025 investigation, 'The interplay between Fibroblast Growth Factor-23 (FGF-23) and traditional biomarkers of Chronic Kidney Disease - Mineral and Bone Disorder' (Ezeugonwa, R.S. … Arogundade, F.A., 2025) we evaluated serum FGF-23 levels in 103 patients across CKD stages 3a to 5 and compared them against 35 healthy controls. We found that the mean serum levels of FGF-23 were significantly higher in patients 241.05 (± 3.40pg/ml) compared to the controls 133.66 (± 2.35) pg/ml; p=0.009, and the same applied to the mean serum levels of iPTH for patients and controls (56.15 ± 43.48pg/ml vs 20.11 ± 5.57pg/ml, p = 0.009). Although FGF-23 levels rose progressively from stages 3 to 5, stage 5 patients on maintenance dialysis exhibited lower iPTH and FGF-23 concentrations than their pre-dialysis counterparts. Within the CKD cohort, the calcium-phosphate product had a positive correlation with both FGF-23 (r = 0.212; p = 0.01) and iPTH (r = 0.195; p = 0.022). Furthermore, the prevalence of CKD-MBD advanced alongside disease progression, rising from 72.0% in stage 3 to 90.0% in stage 4, and reaching 100% in stage 5. Taken together, findings from these three studies, we concluded that the prevalence of CKD-MBD was high in our patient population and increases progressively declining GFR. Notably, while FGF-23 demonstrates a weak correlation with the calcium-phosphate product, it does not significantly correlate with calcium, phosphate, or iPTH levels.

Malnutrition in CKD:

Malnutrition is a common complication in patients with CKD with significant impact on clinical outcomes in terms of morbidity, mortality and overall quality of life. In one of our studies titled 'The Prevalence and Pattern of Malnutrition in Pre-Dialytic Chronic Kidney Disease Patients at a Tertiary Care Facility in Nigeria' (Okunola O.O., Erohubie C., Arogundade F.A. et al, 2018), we assessed the prevalence and pattern of malnutrition in 102 pre-dialytic CKD patients in OAUTHC. We found that the prevalence of malnutrition in these patients varied significantly depending on the diagnostic criteria utilized. Prevalence rates were 8.8% by clinical assessment, 5.9% by Subjective Global Assessment (SGA), and 31.4% according to the International Society of Renal Nutrition and Metabolism (ISRNM) criteria. In using anthropometric and biochemical measures to assess malnutrition, it was detected in 31.4% of patients by Body Mass Index (BMI), 46.6% by triceps skinfold thickness, 30.4% by mid-upper arm circumference (MUAC), 46.1% by serum albumin, and 11.8% by serum cholesterol. The Prevalence of malnutrition increased significantly across CKD stages 2 to 5 with the use of clinical assessment (p=0.001), SGA (p value =0.001), serum albumin (p value =0.001) and BMI (p value =0.012). We concluded that malnutrition was common in pre-dialytic CKD patients in Nigeria and should be objectively assessed otherwise many patients may be missed.

In a comprehensive meta-analysis titled 'Global Prevalence of Protein-Energy Wasting in Kidney Disease: A Meta-analysis of Contemporary Observational Studies From the International Society of Renal Nutrition and Metabolism' (Carrero J.J., ------ Arogundade F., et al.), we evaluated the global burden of protein-energy wasting (PEW). The analysis included observational studies published between year 2000 and 2014 that recruited 50 or more patients and utilized either the Subjective Global Assessment or the Malnutrition-Inflammation Score. Among non-dialysis patients (stages 3–5 CKD across five studies; n = 1,776), PEW prevalence ranged from 11% to 54%. In the maintenance dialysis cohort (90

studies across 34 countries; n = 16,434), the interquartile range (25th–75th percentiles) for PEW prevalence was 28% to 54%. Significant variation in PEW prevalence persisted across cohorts even after adjusting for potential moderators; however, Mixed-effects meta-regression identified geographical region as the only significant moderator, accounting for 23% of the observed data heterogeneity. Furthermore, two studies involving 1,067 transplant recipients reported a PEW prevalence of 28% and 52%, while no eligible paediatric CKD trials were identified. Given the high global prevalence and well-documented adverse impact of PEW on clinical outcomes, these findings emphasize the critical need for early detection and targeted nutritional management.

Infection/ Inflammation:

In a two-part investigation examining the relationship between periodontal inflammation, systemic inflammation and chronic kidney disease (CKD) among 120 pre-dialysis patients (Onabanjo O.A., Nwhator S.O., Arogundade F.A. et al, 2025; Onabanjo O.A., Nwhator S.O., Arogundade F.A. et al, 2024), we evaluated the association of the periodontal inflamed surface area (PISA) with systemic inflammatory biomarkers and estimated glomerular filtration rate (eGFR). The cohort was divided into Group A (patients with periodontitis; n = 60) and Group B (patients without periodontitis; n = 60). Full periodontal examination was carried out in the participants for the estimation of PISA. Blood samples were also collected to determine levels of high sensitivity C-reactive protein (hsCRP), serum creatinine and interleukin-6 (IL-6) in all participants. We found that the mean value of hsCRP was significantly higher in patients with periodontitis compared to those without (3.41 mg/L vs. 2.18 mg/L). PISA moderately correlated with hsCRP ($r = 0.4$, $P < 0.01$) in both groups. hsCRP also moderately correlated with IL-6 ($r = 0.6$, $P < 0.001$) in both groups. Pearson correlation and linear regression analyses revealed a significant negative association between PISA and eGFR ($r = -0.5$, $P < 0.001$; $\beta = -0.017$, 95% CI: -0.026 to -0.009; $P < 0.001$). We concluded that a significant association exists between PISA and systemic inflammatory markers, with the elevated hsCRP

levels in Group A highlighting the systemic inflammatory burden imposed by periodontitis. In addition, the strong link between renal function and periodontal inflammation suggests that worsening periodontitis may contribute to progressive decline in eGFR.

3. Psychosocial Burden and Quality of Life

The true burden of kidney disease extends far beyond objective biochemical markers. It profoundly diminishes the health-related quality of life (HRQOL) and exerts a devastating psychosocial impact that radiates from the patients to family caregivers and the broader healthcare system. Frontline healthcare workers face a significant "care burden", while patients on maintenance haemodialysis report severely compromised HRQOL scores, a clinical reality that is frequently complicated by major depressive disorder.

Because of these profound impacts, the objective assessment of quality of life is vital in monitoring response to various treatment measures. Various instruments, which include both generic and disease-specific instruments, are used in the assessment of health-related quality of life (HRQOL). In an attempt at correlating Karnosfky Performance Status Scale and Short-Form Health Survey among patients on maintenance haemodialysis, Arogundade and co-investigators studied 55 subjects, 27 males and 28 females, mean age 40.76 (±11.05) years (Arogundade et al 2006). Although Karnofsky Performance Status (KPS) scores correlated significantly and positively with all eight SF-36 domains, multiple regression analysis revealed that only physical functioning, social functioning, and role limitations due to emotional problems maintained independent statistical significance. The serum creatinine and haemoglobin positively correlated with physical function, bodily pain, social functioning and overall Karnofsky performance scores. Age of the patients correlated negatively with two SF-36 dimensions (physical functioning and role limitation due to physical fitness) and Karnofsky scores. This study revealed a good correlation between Karnofsky performance status scale and the short-form (SF36)

health survey in this haemodialysis population. Our data proves that age, severe anaemia (haemoglobin), and metabolic clearance (serum creatinine) are the dominant drivers directly governing the daily quality of life in these patients.

In another study, 'Health-related quality of life in emotionally related kidney transplantation: deductions from a comparative study', Arogundade F.A. et al., 2005 compared HRQOL between 52 live related, emotionally related kidney transplantations and 68 HD patients using the Karnofsky performance status scale. The duration of end-stage renal disease was 7.14 (± 3.8) years and 5.30 (± 4.15) years for transplant and HD patients respectively. The HRQOL was similar in both living and emotionally related recipients, but both were significantly better than that of HD patients ($P < 0.001$). There was significant negative correlation between HRQOL and age ($r = -0.363$, $P < 0.001$), serum creatinine ($r = -0.502$, $P = 0.001$), serum urea ($r = -0.493$, $P < 0.001$), serum phosphate ($r = -0.363$, $P = 0.003$) and calcium-phosphate product ($r = -0.305$, $P < 0.001$). There was significant positive correlation between HRQOL and haemoglobin ($r = +0.495$, $P < 0.0001$) and serum calcium ($r = +0.247$, $P = 0.017$). Age of the patients appears to be the most important determinant of HRQOL in the studied population. HRQOL was similar in the related and unrelated donor transplantations, and both were better than in haemodialysis patients.

In yet another study by our team, 'The burden of caring for renal patients: The nurses perspective' (Mobolaji-Olajide O.M … Arogundade F.A. et al., 2013), we evaluated the burden experienced by 240 nurses caring for patients with CKD, identified the procedures causing the caregiving burden and factors associated with burden in two hospitals in Ondo State, Nigeria. To quantify the direct psychological and physical toll that renal care exerts on healthcare providers, we evaluated institutional care demands using the validated Zarith Burden of Life Instrument (ZBI). This psychometric scale yields an aggregate score ranging from 0 to 88, where a score between 21 and 40 signifies mild-to-

moderate burden, and a score greater than 40 indicates a high-to-severe burden. Within our evaluated cohort of specialized nursing personnel, the mean age of the respondents was 33.7 (±7.5) years. Regarding care difficulties, 40.0% reported no burden, 48.3% experienced a mild-to-moderate burden, 10.4% faced a severe burden, and 1.3% reported a very severe burden. Dialysis procedure (65.5%) was identified as posing the greatest caregiving burden. Factors identified as responsible for caregiving burden were shortage of staff (68%), lack of funds on the part of the patients (67.1%). Caregiving burden was not associated with age, gender, or years of experience of the personnel. We concluded that caregiving burden was highly prevalent among the nursing personnel, with dialysis service demand identified as the greatest contributory factor. These findings suggest that expanding government funding and optimization of staffing models within dialysis units could significantly mitigate the burden of care experienced by these healthcare providers.

Our team also investigated 'Major Depression and Long-Term Outcomes of Acute Kidney Injury' (Balogun R.A., Omotoso, B.A. ……. Arogundade F.A., Abdel-Rahman E.M., 2017) we studied the prognostic implication of a diagnosis of depression on renal recovery and major adverse cardiovascular events (MACE) in 2,519 adults with AKI managed at the University of Virginia Medical Centre. We found that young patients, females, African Americans, and those with more comorbid conditions, especially CHF, CVD, diabetes, peptic ulcer disease, chronic pulmonary disease and liver disease were found to be affected with depression. The crude hazard ratio for developing MACE was 1.245, while that for all-cause mortality was 1.186. This indicates that the cohort with major depression exhibited a 24 and 18% increase in long-term risk for MACE and all-cause mortality, respectively. Consequently, patients presenting with both AKI and major depression face a significant higher long-term risk of MACE and all-cause mortality.

4. Economic and Management Burden / Barriers to Care:
The most challenging aspect of the burden is the cost of Kidney Replacement Therapy (KRT). In a developing economy, the transition to terminal CKD or End-Stage Kidney Disease (ESKD) is often a death sentence due to the following reasons:

Cost of Kidney Replacement Therapy (Dialysis & Transplantation):
Globally, the financial burden of managing of ESKD is escalating exponentially; it is projected to increase from 153.72 billion US Dollars to 531.76 billion US Dollars by 2035, representing an approximate 346% increase over a ten-year period (Fig 15). In Nigeria, National health insurance covers only about 1% of the population and excludes kidney disease management from its benefit package. Consequently, vast majority of patients pay out-of-pocket. This financial model drives high rates of "catastrophic health expenditure", leading to alarming treatment dropout rates and, ultimately, premature mortality.

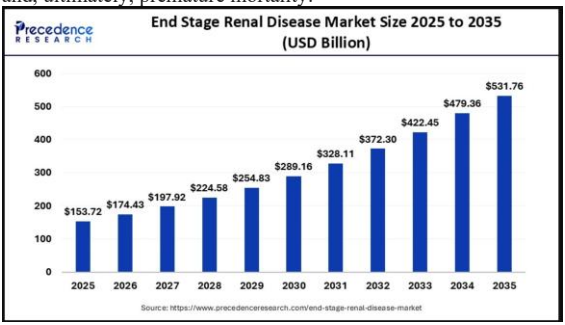

Fig 15: ESRD Market size 2025-2035 (Precedence Research End Stage Renal Disease Market Size, Share and Trends 2026 to 2035. Code 3263, https://www.precedenceresearch.com.end-stage-renal-disease-market)

To chart the historical and clinical evolution of advanced kidney failure at our center, we evaluated the long-term trends and therapeutic endpoints of a massive patient cohort over nearly two decades. In this landmark study, "The pattern, clinical characteristics and outcome of ESRD in Ile-Ife, Nigeria: Is there a change in trend?" (Arogundade, F.A., Sanusi, A.A., Hassan, M.O., Akinsola, A., 2011), Arogundade et al tracked the clinical characteristics and outcomes of 760 End-Stage Renal Disease (ESRD) patients managed at the Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC) over a 19-year window spanning 1989 to 2007. Our analysis revealed that the disease primarily struck young adults, with a mean age of 39.9 (±1.67) years and a profound male preponderance of 70.3%. Kidney replacement therapy offered included HD in 73.2%, Continuous Ambulatory Peritoneal Dialysis (CAPD) in only 1.2% patients and kidney transplantation in only 0.9%. Out of the patients commenced on HD which was the commonest KRT used, only 6.8% were able to sustain the treatment for longer than 3 months. On the contrary, 77.8% of CAPD patients and all transplanted patients survived for between six months and four years ($p<0.001$).
In yet another study, 'Risk factors and outcomes of acute decompensation in patients with chronic kidney disease' (Hassan M.O., ……. Arogundade F.A. 2023), we assessed the common causes of acute decompensation in 163 non-dialytic CKD patients necessitating emergency dialysis and assess the relationship between these risk factors and outcomes. We found a median age of 39 (28–52) years, with male preponderance of 76.7%. The common causes of acute decompensation identified were heart failure (41.7%), malignant hypertension (39.9%), sepsis (35.6%), nephrotoxins (20.9%) and hypovolaemia (16. 9.%). In-hospital mortality was recorded in 34.4% of the patients. Adjusted odds of in-hospital mortality were significantly increased in the presence of heart failure (odds ratio [OR], 2.93 [95%, 1.14–7.55]; P = 0.026) and malignant hypertension (OR, 3.69 [1.15–11.81]; P = 0.028). We concluded that heart failure and malignant hypertension are major precipitating factors for acute-on-chronic kidney failure. Remarkably, our analysis identified both conditions as powerful,

Commented [MH11]: (16. 9%).

independent predictors of in-hospital mortality. Given the exceptionally high mortality rates documented within our tertiary care centres, the early identification and target-driven, aggressive management of these specific cardiovascular precipitants represent a critical, life-saving window of opportunity across this vulnerable patient population.

To frame our local data within a broader continental context, we co-authored a definitive, multi-country meta-analysis published in The Lancet Global Health. In this comprehensive systematic review, 'Outcomes in adults and children with end-stage kidney disease requiring dialysis in sub-Saharan Africa: a systematic review' (Ashuntantang G, ……. Arogundade F, et al. 2017), we initially screened 4,339 records. Of these, 68 high-fidelity studies met our inclusion criteria, comprising a pooled continental dataset of 24,456 adults and 809 children living with End-Stage Kidney Disease (ESKD). In the pooled analysis, 96% adults and 95% children who could not access dialysis died or were presumed to have died. Among dialyzed patients, mortality affected 88.0% of adults in incident cohorts, 16.0% in prevalent cohorts, and 36.0% of children. Dialysis discontinuation was 84.0% (n=2,990) in incident versus 5.0% (n=1,364) in prevalent adult cohorts. Transplantation rates were 1.0% (n=4,483) for incident adults, 19.0% (n=12,125) for prevalent adults, and 19.0% (n=381) for paediatric cohorts. These data show that most patients initiating dialysis in sub-Saharan Africa default and face premature mortality, highlighting an urgent need for sustainable regional management strategies.

In one of our earlier cited publications, 'A community study of the prevalence, risk factors and pattern of CKD in Osun State' (Oluyombo, R, …. Arogundade, F.A. et al. 2013) where 454 residents with a mean age of 45.8 ± 19.0) years were studied. We established that only 33.7% had heard of kidney disease; the level of knowledge of CKD was adjudged good in only 25.5%, but fair and poor, in 42.2% and 30.6%, respectively and expectedly there was higher prevalence of CKD in those with poor knowledge

(p=0.023). Smoking habit, habitual analgesic intake, alcohol and herbal concoction use were found in 7%, 20%, 19% and 75% respectively. Consequently, we conclude that improvement in knowledge of kidney health along with reduction in high risk behavior like smoking, habitual analgesic intake, alcohol and use of herbal concoctions could assist in stemming the rising trend of this epidemic in our environment.

Infrastructural Gaps: Although the number of kidney care centres has grown in recent years from less than 5 in the 1980s to more than a hundred now, there is still a substantial infrastructural gap to be met. First, these centres are mostly located in urban areas, and secondly, they are very insufficient for an estimated population of 48 million (20% of 240m) individuals living with overt or covert CKD. A further confounder is the lack of sustainable peritoneal dialysis (PD) program, despite its potential affordability. According to 2025 population data, about 45% of Nigerians live in rural areas with limited access to all forms of KRT. Poor road networks and poor transportation systems further worsen the outlook, significantly limiting access of the rural population to the treatment modalities. Furthermore, limited access to subclavian and jugular catheterization, specialized equipment, and a profound scarcity of transplant personnel and dedicated kidney care centers create severe logistical bottlenecks (Arogundade F. et al., 2006; Barsoum R.S., Khalil S.S., Arogundade F.A., 2015; Ashuntantang G., …...Arogundade F., et al., 2017, Arogundade F.A. et al, 2023).

Kidney transplantation (KT) being the gold standard treatment modality for terminal CKD leads to improvement in both the quantity and quality of life. Unfortunately, it is not exploited to its full potential in most countries, and this is particularly the case in developing economies. Only a very small fraction of the ESRD population in emerging countries ever get transplanted because of the myriads of barriers and bottlenecks. In a review 'Kidney transplantation in a low-resource setting: Nigeria experience' (Arogundade F.A., 2013), I reviewed KT in Nigeria between 2000

and 2010 and assessed peculiar challenges that needed to be addressed for KT potential to be fully harnessed. A total of 143 KTs were performed in 5 transplant centres, with One-year graft and patient survival of 83.2% and 90.2%, respectively, and the 5-year graft and patient survival was 58.7% and 73.4%, respectively. Mortality was reported in 27% of recipients. The complications recorded included acute rejection episodes in 15-30%, chronic allograft nephropathy in 14.7% and malignancies, particularly Kaposi Sarcoma, which was reported in 5.6% of recipients. It was concluded that KT has led to an improved survival but was bedeviled with unaffordability, inaccessibility, shortage of donor organs and poor legislative support. I suggested that enactment of relevant organ transplant legislation, subsidization of renal care, and further development of local capacities would improve KT utilization and thus lead to better outcomes.

On global infrastructure for kidney care, the ISN through the Global Kidney Health Atlas (ISN-GKHA) spearheaded multinational effort to understand the status and capacity of countries to provide optimal care, particularly in low-resource settings. In an iteration, 'An update on the global disparities in kidney disease burden and care across world countries and regions' (Bello A.K., et al, 2024, Tannor E.K., …. Arogundade F.A. 2025), we assessed kidney care capacity across 167 countries (representing 97.4% of the global population) using data from 2016, 2018, and 2022. We found a global median prevalence of chronic kidney disease of 9·5% (IQR 5·9-11·7) with the highest prevalence in Eastern and Central Europe (12·8%, 11·9-14·1). For the survey analysis, responses received covered 87% of the countries. Chronic haemodialysis was available in 98%, chronic peritoneal dialysis in 79%, and kidney transplantation in 70%. However, only 74% of the countries were able to provide KRT to more than 50% of people with kidney failure. Children did not have access to haemodialysis in 19% of the countries, peritoneal dialysis in 6%, or kidney transplantation in 6%. Conservative kidney management (CKM) was available in 87 (53%) of 165 countries. The annual median costs of KRT were: US$19,380 per

person for haemodialysis, $18,959 for peritoneal dialysis, and $26,903 for the first year of kidney transplantation. Overall, only 45% of countries provided free haemodialysis and this increased with country income level. The median global prevalence of nephrologists was 11·8 per million population (IQR 1·8-24·8) with an 80-fold difference between low-income and high-income countries. Differing degrees of health workforce shortages were reported across regions and country income levels. Only a quarter of countries had a national chronic kidney disease-specific strategy and chronic kidney disease was recognised as a health priority in only 48% of countries. This study noted that countries in low-resource settings including ours have markedly diminished capacity for kidney care delivery.

The Bottlenecks: Systemic Constraints

Workforce Shortage: There is a severe shortage of nephrologists, renal nurses, and technicians.

Despite positive economic predictions and stable governments since the turn of the century, Africa continues to be afflicted by poverty, poor infrastructure, and a massive burden of communicable diseases such as HIV, malaria, tuberculosis, and diarrheal illnesses. With the rising prevalence of chronic kidney disease and kidney failure worldwide, these factors continue to hinder the ability to provide kidney care for millions of people on the continent. The ISN-GKHA project was established to assess the global burden of kidney disease and measure global capacity for kidney replacement therapy (dialysis and kidney transplantation). The aim of the second iteration was to evaluate the availability, accessibility, affordability, and quality of kidney care worldwide. We identified several gaps regarding kidney care in Africa, chief of which are (i) severe workforce limitations, especially in terms of the number of nephrologists; (ii) low government funding for kidney care; (iii) limited availability, accessibility, reporting, and quality of provided kidney replacement therapy; and (iv) weak national strategies and advocacy for kidney disease. We also identified that within Africa,

the availability and accessibility to kidney replacement therapy vary significantly, with North African countries faring far better than sub-Saharan African countries. The evidence suggests an urgent need to increase the workforce and government funding for kidney care, collect adequate information on the burden of kidney disease from African countries, and develop and implement strategies to enhance disease prevention and control across the continent.

Emigration of highly skilled professionals, "Brain Drain" (Japa syndrome):

The emigration of trained and skilled professionals to high-income countries significantly reduces the local capacity for care. In one of our publications, 'Nephrology in Nigeria' (Arogundade F.A. …. Bamgboye E.L., 2023) we reported that the reasons for emigration vary according to individuals involved, the time of graduation, local remuneration and other social and infrastructural amenities, what is now referred to as 'push and pull factors'. We reported three common time frames for emigration: immediately following completion of pre-registration year and national youth service, during or when seeking middle grade training or once established as a consultant. For earlier time points, movement seems to be a combination of training opportunities, family ties and socioeconomic opportunities. Movement of the established consultant seems more geared to socioeconomic opportunities. This may be reflected in the tendency of more mature practitioners to choose the Middle East as the emigration destination and the younger to seemingly prefer the United Kingdom (UK) or the United States of America (USA).

At the NPMCN, we observed an upsurge in the requests for transcripts by foreign institutions, which is a surrogate for assessing the rate at which employment is being sought outside Nigeria. It should however be noted that many other institutions may employ Nigerian graduates from known accredited institutions without requesting for transcripts. The total requests

for year 2021 was 166 while in the first half of 2022 alone it was 103 requests (Emina VA, ……Arogundade FA, 2022). (Fig 16)

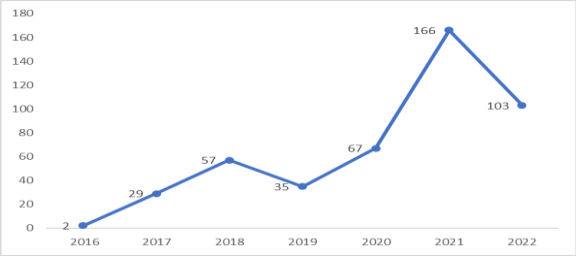

Fig 16: Graph showing transcript requests from NPMCN between 2016-2022

Summary of the Observations:

1. The primary driver of the Brain Drain is the economy
2. The issue of insecurity in the country
3. Inadequate appreciation of the intensity, duration and requirements of medical training and the burden of responsibility of practicing doctors which has resulted in inadequate rewards.
4. Embargo on recruitment or appointment of doctors for residency discouraged several of them and forced them to seek for opportunities abroad.
5. Lack of job satisfaction – inadequate or lack of equipment - Funding and Prioritisation
6. Socio-cultural problems limiting travel within the country
7. The teaching of professionalism, management and mentorship inclusion in the curriculum
8. Understaffing of medical personnel in the institutions/hospitals leading to heavy workload on the remaining staff thus leading to burnout.

Training Gaps: Limited formal training opportunities in specialized areas like interventional nephrology (e.g., vascular

access for dialysis including fistula creation, peritoneal dialysis catheter insertion, kidney biopsies in different circumstances). Peritoneal dialysis training is virtually lacking because of unavailability of consumables and consequently inadequate exposure of trainees to the practice.

Lack of standardized training pathways, technicians and other support groups and very few training centres for nephrology nurses.

Bureaucracy and Maintenance: The bureaucratic bottlenecks abound in government owned health institutions while this is rare in private establishments, this has contributed significantly to the poor pace of development of dialysis and transplantation in public institutions. Erratic power supply leads to reliance on generators and in recent times, use of renewable energy consequently leading to increase in the cost of dialysis with its attendant consequences. The inadequacy and lack of training of the technicians leads to poor equipment maintenance such that the shelf life of the machines becomes significantly compromised necessitating early replacement which is unaffordable. Bureaucratic hurdles also delay the procurement of consumables for kidney care and establishment of new centres particularly in the rural areas has not received the attention of local, regional and national authorities hence the neglect of 45% of the population that reside there.

The Breakthroughs: Resilience and Innovation:

The burden of kidney disease as we have seen is huge not only in Nigeria but across the globe with the west African natives and their descendants having a 200% increased risk. Despite several barriers and bottlenecks that have been highlighted, some giant strides have been achieved through local initiatives and international collaborations.

Kidney Replacement Therapy:

Transplantation: The planning for Kidney transplantation commenced in the nineties but the first successful one in Nigeria was performed in a private hospital (St. Nicholas) in Lagos in 2000 through assistance from Hammersmith, United Kingdom. OAU / OAUTHC engaged in capacity building for kidney transplantation for more than 10 years with some of the trainees seeking greener pastures as soon as they get trained. Our team received training from Cairo University, Cairo Kidney Centre, Manchester Royal Infirmary and University of Virginia, Charlottesville, USA. We performed wholly indigenous kidney transplantation in May 2002 which was the first in any teaching hospital in Nigeria and a month later we supported our colleagues that trained in OAUTHC, Ile-Ife, to attain the same feat in Kano which has been sustained till today. Our team also mentored 2 additional centres to commence the program (UITH, Ilorin and UMTH, Maiduguri). From just 3 centres in the country in 2002, we now have about 20 transplant centres. This unbridled proliferation though very desirable led to organ donation racket and trafficking particularly in Abuja and its environs with the investigative reporting of Daily Trust exposing the racket on 10th December 2023. This led government to mandate the National Tertiary Health Institution Standards Committee to produce guidelines for organ and tissue transplantation in Nigeria. I was appointed as the Chairman of this committee and along with several other colleagues across the country, we produced the first ever guidelines for organ and tissue transplantation in Nigeria, a document of the Federal Ministry of Health and Social Welfare. This document covered ethical basis of transplantation, procedure and guidelines for transplantation of kidney, cornea, bone marrow and liver as well as gamete transfer. When fully implemented this will reduce organ trafficking to the barest minimum or totally prevent it (FMOH, 2025).

In my narrative review of 'Kidney transplantation in a low-resource setting: Nigeria experience' (Arogundade F.A., 2013), earlier cited, a total of 143 KTs were performed in 5 transplant centers over a 12-year period with One-year graft and patient

survival of 83.2% and 90.2%, respectively, and the 5-year graft and patient survival was 58.7% and 73.4%, respectively and mortality was recorded in 27% of recipients with various complications managed. Today, we have about 20 centres (Fig 17) and have performed more than 2500 kidney transplants in Nigeria with improvements in the 1-year and 5-year, graft and patient survivals. Accessibility has improved with transplant centres now available in all geopolitical zones in our country though disproportionately concentrated in Federal capital territory, Abuja and Lagos. The shortage of donor organs is being addressed as there is an ongoing plan to start deceased donation. On legislation, the National Health Act of 2014 has now legalised organ transplantation including deceased donation, what remains is its operationalisation.

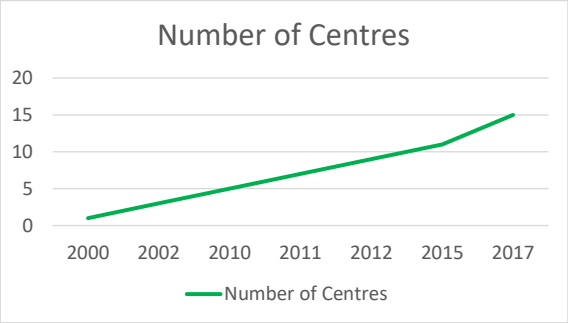

Fig 17: Kidney Transplant Centres in Nigeria

Capacity Building and Postgraduate Nephrology Training:
There are now several international collaborations, ISN Fellowship program, Sister Renal Centers (SRC), Sister Transplant Centres, Human Heredity and Health in Africa (H3A) that have not only assisted in developing nephrology and transplantation but has also supported and strengthened research in Nigeria. In OAU / OAUTHC we established SRC relationship with University of

Virginia, USA and this led to faculty exchange over a seven-year period with OAUTHC Renal Unit graduating from Level C to Level A during the period (Fig 18). The unit was able to further improve capacities of several of our staff across several specialties including 3 Nephrologists, 2 Transplant Surgeons, 1 Radiologist, 1 anaesthesiologist, 1 technician, 2 dialysis nurses, 3 trainee nephrologists and 1 paediatric nephrologist. This program is still running with at least 5 centres in Nigeria currently benefitting and OAUTHC is now also supporting Federal Medical Centre, Owo in a trio SRC relationship along with University of Virginia.

Fig 18: SRC Graduation Certificate from the International Society of Nephrology.

The H3A Kidney Research Study was established as a premier multinational, multicenter genomic initiative. At its inception, the consortium initially brought together five African nations. Through ongoing institutional evolution, two primary nations—Nigeria and Ghana—have maintained active longitudinal participation. This robust, international research network currently connects eleven specialized kidney care centers collaborating across both countries to map the genetic underpinnings of regional renal disease.

In another report designed to improve the capacity of nephrologists at utilizing an inexpensive tool, urine microscopy (UM), which is a basic, inexpensive and relatively simple diagnostic tool, that provides valuable information on nephrological diagnosis and sometimes prognosis.

We organized a theoretical and practical course during the 22nd annual meeting of the Nigerian Society of Nephrology. 'A theoretical and practical course on urine microscopy in Nigeria: a model for nephrological skill transfer' (Fogazzi G.B.…… Arogundade F.A., 2010). The presentations described were the methodology, the particles of the urine sediment and their clinical interpretation, the urine sediment in different clinical conditions, and 12 clinical cases, which demonstrated the value of UM in clinical practice including diagnosis and prognostication. Practical sessions showed the most important urine particles, and how they could be identified and combined into urine profiles. More than 97% of the participants found the course to be useful and practicable.

On training, I have mentored scores of medical students over three decades. I have supervised about 37 Part 2 Dissertations / MD Thesis (postgraduate) and 3 MSc Theses. List of supervised Doctors that successfully defended the Part 2 Dissertations / MD Thesis include:

1. Prof. Pedro Emem-Chioma FMCP
2. Prof. Aliyu Abdu FMCP
3. Prof. Okunola Oluyomi FMCP
4. Dr. Kwaifa Ibrahim Salihu FMCP
5. Dr. Isah Alhaji FWACP
6. Dr. Olalekan Ojo FMCP
7. Dr. Soyinka Folashade FMCP
8. Dr. Oluyombo Rotimi FMCP
9. Prof. Muhammed Afolabi FMCFM
10. Prof. Aisha Nalado FWACP
11. Dr. Aniema Udo FMCP
12. Dr. Hassan Muzamil O FMCP
13. Dr. Omotoso Bolanle FMCP
14. Dr. Oguntola Stephen FMCP
15. Dr. Gbadamosi Hakeem FWACP
16. Dr. Alhaji Abdu FMCP
17. Prof. Sakajiki Aminu Muhammed FMCP
18. Dr. Gbadegesin Aderoju FMCP
19. Prof. Akinbodewa AA FMCP
20. Dr. Ayoola Odeyemi FWACP
21. Dr. Aniede Francis Earnest FWACP, FMCP
22. Dr. Adelaja Aderemi FMCP
23. Dr. Erohubie Christain FMCP
24. Dr. Bamikefa Titilope FMCP
25. Dr. Omeiza Ismail FMCP
26. Dr. Fasaanu Nelson FWACP
27. Dr. Oyebisi Adeyanju FMCP
28. Dr. Segun Aremu FWACP
29. Dr. Sulaiman Maina Mohammed FMCP
30. Dr. Oripelaye M. FMCP
31. Dr. Onabanjo O.A FMCDS
32. Dr. Remigus Ezeugonwa FWACP
33. Dr. Amodu Bosede E. FMCP

Candidates that are yet to defend the Dissertation.

1. Dr. Oguntade Hameed
2. Dr. Adelakun Adegbola
3. Dr. Omosule Babaniji
4. Dr. Mohmoh Ayodeji

International Fellowships:
In addition to local training, I have facilitated international fellowships for 5 postgraduate doctors from the International Society of Nephrology Fellowship program as the host mentor. They are:

1. Dr. Stephen Osasan, FMCPath
2. Dr. Hassan Muzamil O., FMCP, PhD
3. Dr. Omotoso Bolanle A., FMCP
4. Dr. Oguntola Stephen O., FMCP, PhD
5. Dr Adeyemi Adefidipe, FMCPath

Two of these fellows completed the PhD during the program.

Governmental & Public Action:
Kidney Replacement Therapy (KRT) including Haemodialysis (HD), peritoneal dialysis (PD) and kidney transplantation remains the cornerstone of management of patients with end stage renal failure. In standard clinical practice, most patients are initially stabilized on maintenance hemodialysis or peritoneal dialysis before transitioning to a definitive allograft. The sole exception to this sequence occurs in cases of pre-emptive kidney transplantation, where a patient undergoes a successful renal transplant prior to the clinical necessity of commencing any regular maintenance dialysis. All these modalities are cost intensive but specific advantages and disadvantages have been identified with either of them and this influence patient's preferences. In one of our studies 'An analysis of the effectiveness and benefits of peritoneal dialysis and haemodialysis using Nigerian made PD fluids', (Arogundade F.A. et al, 2006), we compared the effectiveness, benefits and cost of HD and PD in the hope that it will provide a rational basis for preference of one or the other especially in third world countries where renal replacement therapy remains unaffordable and therefore relatively inaccessible to majority of patients. Two groups of twenty patients with renal failure matched for age and clinical diagnosis were managed with IPD and HD and the effectiveness, costs and complications of both modalities were compared. We found that both were comparably effective in the control of uraemia with

significant reductions in the serum urea, creatinine and potassium from 29.2 (± 7.2) mmol/L, 1693.7 (± 580.5) µmol/L and 4.8 (± 1.2) mmol/L to 13.2 (± 4.6) mmol/L, 796.0 (± 458.0) µmol/ L and 3.3 (± 0.6) mmol/L respectively for IPD (P<0.05) and 34.4 (± 9.0) mmol/L, 1536.0 (± 832.5) micromol/L and 4.8 (±1.3) mmol/L to 14.6 (± 7.5) mmol/L, 830.0 (± 570.7) µmol/L and 3.9 (± 0.8) mmol/L respectively for HD (P<0.05). In addition, there were significant improvements in serum bicarbonate in both groups. There was no significant difference in percentage reduction in serum urea, creatinine and serum potassium in both groups (P>0.05). However, HD managed patients required more blood transfusion (P<0.05). There were also comparably significant reductions in systolic, diastolic and mean arterial blood pressures in both groups (P<0.05). The costs of dialysis as well as the total cost of hospitalization were found to be significantly lower in patients managed with IPD (P<0.05). The commonest complication observed in patients managed with IPD was peritonitis while in patients managed with HD it was dialysis-induced hypotension. The clinical outcome was equally good in all the ARF patients as all of them recovered irrespective of the treatment modality; CRF patients did not fare as well with 37.5% mortality observed. We concluded that IPD and HD are effective renal replacement therapies with the former being significantly cheaper.

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There are 2 major reports on Continuous Ambulatory Peritoneal dialysis (CAPD) in Nigeria (Akinsola A., Adelekun A.A., Arogundade F.A., 2000, and Oguntade H.B., …. Arogundade F.A., …. 2023), the first was a preliminary report of the usefulness of CAPD in Nigeria using nine patients that consented and were initiated with fluids donated by Baxter, a dialysis consumable manufacturing company, thereafter patients procured the fluids which were imported. They were treated for periods ranging from 6-9 months with improvement in biochemical parameters and quality of life and survived while to procedure lasted. In the second report, we used fluids manufactured locally by Biomedical Company, Ilorin and managed 16 patients with mean age of 52

years. Eleven of them had the procedure for more than 3 months. There was improvement in biochemical parameters and HRQOL while the procedure lasted.

These observations constituted the rationale for the assertion that local manufacture of PD fluids could significantly reduce the cost of dialysis therapy and could then be taken up by government such that all patients would be offered PD as the first KRT. This could then become a national policy, as was previously practiced in some countries like Thailand and Mexico with excellent results.

Subsidization of HD commenced in 2024 with pilot implementation in 12 hospitals round the country while the National Health Insurance Scheme also supports acute dialysis up to maximum of six sessions. May I seize this opportunity to appreciate the Ministry of Health and Social Welfare under Prof Ali Pate, PhD, CON, and Dr Tunji Alausa, MD, CON, and my colleagues and all members of Nigerian Association of Nephrology and Transplant Association of Nigeria for their tireless advocacy efforts with different tiers of government. Subsidisation of KRT by government would not only improve access but also reduce morbidity and mortality, thus improving the life expectancy and HRQOL of affected Nigerians and enabling them to further contribute to the socio-economic development of our country. There are State governments that also subsidises dialysis or kidney transplantation eg Bornu and Yobe States. I encourage more states to join the league while encouraging the local governments to support preventive nephrology care which is at the primary health care level.

Research & Advocacy: The Nigerian Association of Nephrology (NAN) and local researchers are increasingly publishing studies (Fig 19) that inform policy and highlight local solutions, such as adapting equipment for PD particularly in paediatric population, HD vascular access, kidney biopsy and kidney transplantation. However, research funding is still very poor.

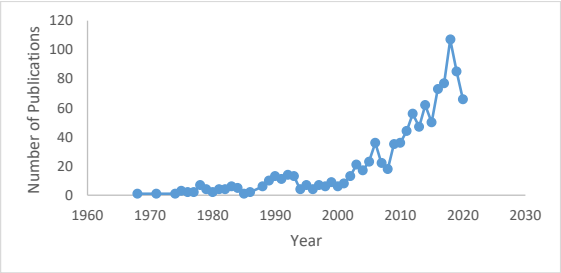

Fig 19: PubMed Search on Kidney Disease and Nigeria (n=1002)

Guidelines for CKD, Hypertension and Transplantation:
At the level of NAN, we have developed guidelines for detection and management of CKD, first published in 2010 when I served as a member and secretary to the guidelines committee. The revision was initiated in 2021 when I served as the President of the Association though completed in 2022.

Hypertension is also recognized globally as one of the commonest causes of CKD though in Nigeria, it seems to be the major cause. To stem the trend, we know hypertension must not only be controlled but the kidneys must also be protected. To achieve this Nigerian Hypertension Society also released guidelines for the management of hypertension, where I also serve as a member and secretary to the committee. This is currently being reviewed.

On organ and tissue transplantation, I chaired the expert panel that produced the guidelines for organ and tissue transplantation in the country, a publication of the National Tertiary Health Institution Standards Committee under the Federal Ministry of Health. (Fig 20A-C)

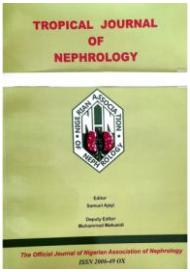

Fig 20A: Guidelines for Detection and Management of Chronic Kidney Disease in Nigeria

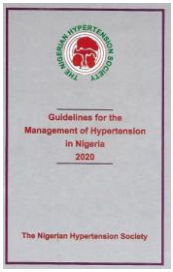

Fig 20B: Guidelines for Detection and Management of Hypertension in Nigeria

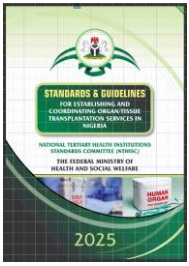

Fig 20C: Standards & Guidelines for establishing and coordinating organ / Tissue Transplantation Services in Nigeria

Apolipoprotein 1 Research:

This is another major landmark in kidney disease research in Africa. The H3Africa Kidney Disease Research Network was established to study the genetics and genomics of prevalent forms of kidney disease in sub-Saharan Africa and to build genuine capacity for its research. It involved researchers across several clinical centres in Six African countries: Ghana, Nigeria, Ethiopia, Cameroon, Kenya and South Africa though because of logistic challenges only Nigeria and Ghana were able to fully participate. I am proud to report that the Nephrology unit of the Departments of Medicine and Paediatrics, OAU/OAUTHC were part of the collaboration, with Prof. FA Arogundade as the site primary investigator and Professors Sanusi AA, Olowu WA, Okunola OO, Drs Omotoso BA and Hassan MO as co -investigators.

Key Findings

The consortium published one of the most significant findings in the history of APOL1 research, '*APOL1* Bi- and Monoallelic

Variants and Chronic Kidney Disease in West Africans' (Gbadegesin RA, ….. Arogundade F, et al. 2024), which has been reported earlier under genetic predisposition and kidney disease. For emphasis, the findings are as follows:

1. **Prevalence of APOL1 variants:**
    a. The prevalence of monoallelic APOL1 variants was 43.0%
    b. That of biallelic APOL1 variants was 29.7%.

2. **Risk of CKD in individuals with APOL1 gene variants**
    a. Participants with two APOL1 risk alleles had higher odds of having CKD than those with one risk allele or no risk alleles (adjusted odds ratio, 1.25), as well as higher odds of focal segmental glomerulosclerosis (adjusted odds ratio, 1.84).
    b. Participants with one APOL1 risk allele had higher odds of having CKD than those with no risk alleles (adjusted odds ratio, 1.18), as well as higher odds of focal segmental glomerulosclerosis (adjusted odds ratio, 1.61).
3. The paper also found that the association of biallelic APOL1 variants with CKD was stronger at more advanced CKD stages, specifically, the odds ratio for biallelic variants vs. fewer than two risk alleles was 1.25 for CKD stages 2–5 overall, but strengthened to 1.44 for CKD stages 4–5.

These study findings have addressed the gap in knowledge and confirmed that a single copy of APOL1 allele does confer increased risk for developing kidney disease.

Training in Medicine and Nephrology:

In June 2021, I was appointed as the Registrar of the NPMCN, a position that saddled me with the coordination of postgraduate medical education in Nigeria. The Registrar is the Chief administrative officer and responsible for the day to day running of the College but reports to the College President, Senate and

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I suggest that this should be a new standalone section titled "POSTGRADUATE TRAINING REFORMS & MEDICAL EDUCATION"

Governing Council. Consequently, my duties as the registrar of the College includes supervising, coordinating and ensuring quality training of postgraduate medical doctors throughout Nigeria, superintending over all College departments and by virtue of that coordinates accreditation of training institutions and programs as well as postgraduate examinations including the Doctor of Medicine program.

As the common adage goes 'assessment drives candidates' learning' and focuses on the main goals and objectives of the course. In the NPMCN and many other educational institutions, determination of pass scores used to be determined using norm referencing or an arbitrary 50% score. The College resolved in year 2020 to determine pass scores in our examinations using internationally recognized criterion referencing methods. As the Registrar, I had to supervise its implementation which involved training of examiners and candidates over an 18-month period and a phased out plan of implementation taking one stage of the examination at a time. Despite the challenges, standard setting was introduced to all phases of College examinations within the 4 years albeit to different degrees by different faculties. I must thank the current management of the College for sustaining and improving on the tradition.

In one publication 'Assessment of Candidates' Performance Pre- and Post-Adoption of Standard Setting in College Examinations between 2016 and 2023' (Charles-Eromosele TO,…… Arogundade F.A., 2024), we compared candidates' performance pre- and post-adoption of standard setting in the college in a cross-sectional study with a time trend. The results of all candidates who registered and sat for examinations in the years 2016-2023 were included in the study. We found that there was a statistically significant difference in the mean pass rates pre- and post-adoption of standard setting in the primary examinations ($P < 0.001$), Part I examinations ($P = 0.002$) and Part II examinations ($P < 0.001$) with a higher mean pass rate post-adoption of standard setting. We concluded that the increased pass rates in the primary,

Part I and Part II examinations post-adoption of standard setting may suggest improved examination performance, however, there is a need to assess the acquired competencies and skills of the candidates post-certification. The significantly higher mean pass rates post-adoption of standard setting are consequent on improvement in the quality and robustness of items/questions and of the examination processes, brought about by the training and retraining of faculty examiners which preceded the implementation.

Yet in another study in the Faculty of Internal Medicine, 'Assessment reform: Moving from fixed passing scores to standard setting based passing scores' (Isezuo S., Kadiri S., Arogundade F., Ogunbiyi A., Bello B., Kolawole W., et al. 2025) we assessed the performance of modified Angoff's method of standard setting and compared with fixed threshold based pass scores using the faculty of Internal Medicine, NPMCN results over a 5-year period. About 12 panelists performed ratings for MCQ involving an average of 90 candidates per examination twice a year. The procedures were consistent with guidelines for Angoff's method of standard setting. Panelists ratings clustered around 40%-60%. Compared to fixed 50% pass score, the Angoff's method was associated with higher pass scores and lower pass rates. Though, a narrow range of pass scores was observed, the pass rates varied significantly over time. Internal validity metrics were within acceptable limits. Angoff's method predicted candidates' performances in objective structured clinical examination (OSCE) and essay examination.

Based on these studies, we confirm the utility of the shift from traditional arbitrarily fixed pass score to content-based approach. Angoff's method provides a more rigorous assessment of candidates' competence and predicted performances in other examinations that applied different assessment methods.

One of the innovations introduced in the NPMCN is the online courses. We deployed college based courses namely, Medical

Education and Assessment methods, research methodology in Medicine and Health Resources Management virtually to our trainees and in one of our studies 'Evaluating the Effectiveness of Moodle-based Online Learning for Resident Doctors in Nigeria: A Mixed-methods Study', (Sule S…Arogundade F…,2026), we explored the perceptions of 198 trainee doctors about online courses and their experiences with Moodle learning management systems in Nigeria using a mixed-methods research design (i.e. quantitative and qualitative approaches). A self-administered questionnaire embedded in the online courses was used to collect data and there were three focus group discussion sessions. We found that the majority of respondents (88.4%) showed a significant improvement in their knowledge of the online course content after completing the courses; they found the courses to be user-friendly (90.0%) and felt motivated and committed to completing the courses (75.0%). On the learning programs they found useful, powerpoint (PPT) presentations (100%), quiz tests (97.5%) and videos of PPT presentations (79.3%) were the preferred online learning activities, with two-thirds preferring to study alone. Setting targets and managing time (75%) was the most frequently reported self-directed learning skill. Qualitative data analysis revealed four themes: adequate learning resources and activities, high motivation and commitment, a convenient, flexible and satisfying online course learning experience and a user-friendly learning environment. We concluded that Resident doctors viewed the NPMCN online courses as highly student-centred. Furthermore, participants reported improvements in levels of motivation, professional commitment, and overall satisfaction with the Moodle online learning Platform. These robust data points indicate that this digital framework can be successfully deployed as a primary learning tool across both our undergraduate and postgraduate medical curricula. Moving forward, this virtual infrastructure should be systematically complemented by target-driven, physical workshops and specialized courses to facilitate hands-on practical sessions

Commented [MH14]: i.e., quantitative and qualitative approaches

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University Administration:
I was appointed Vice-Chancellor of Federal University of Medicine and Medical Sciences Abeokuta (FUMMSA) by the President and Commander in Chief of Armed Forces of Nigeria, President Bola Ahmed Tinubu GCFR on the 10th March 2025 along with 3 other Principal officers, Dr Obayomi Olukayode Gregory (Registrar), Mrs Adedokun Olufunso Omolola FCA (Bursar) and Dr Agboola Idayat Odunola (Librarian). We were inaugurated on the 19th March 2025 and that heralded the commencement of activities to set up the new University. The Council had earlier been inaugurated under the chairmanship of the Pro-Chancellor, Dr. Muhammed Usman Shanawa, FWACS, a consultant Obstetrician and Gynaecologist. Other members of the council include;

• Professor Chinonye Love-Moses	Member
• Hon. Joshua Oludare Adewale	Member
• Hon. Uyi Ekhosuehi	Member
• Dr. Mrs. Laraba Yawo Mohammed	Member
• Hon. Kabiru Yahaya	Member
• Professor Adebola Ogunbiyi	DVC Academic
• Professor Tajudeen Badmus	DVC Administration
• Professor Fatai A. Fehintola	Senate Representative
• Professor Adenike Olaogun	Senate Representative
• Professor Mobolaji Dada	Senate Representative
• Professor Olugbenga Ayannuga	Senate Representative
• Dr Sunday A. Adetowubo-King	Congregation Representative
• Mr Olufunlola K. Aderinboye	Congregation Representative
• Dr. Obayomi Olukayode Gregory	Registrar/ Secretary to Council

We commenced the process of drafting the University Masterplan, submission of academic briefs I and II, geophysical survey and

environmental impact assessment which was completed against all odds and we had resource verification in July 2025. FUMMSA commenced admission of first set of students in August 2025 and admitted 1,099 students though only 964 accepted the offer and resumed. The University commenced academic activities in September 2025 albeit in our temporary site at Federal University of Agriculture Abeokuta (FUNAAB). I must thank the Paramount ruler of Egbaland, HRM Oba Gbadebo Aremu Adedotun Okekenu IV, CFR, Kabiyesi Prof. Saka Matemilola, Oluyalo Otileta VII, Olowu of Owu, OON, the Chairman of the Project Implementation Committee Prof. Oluwafemi Balogun, the Vice-Chancellor of FUNAAB, Prof Olusola Kehinde, Management and staff of Federal Medical Centre, Abeokuta, and several other sons and daughters of Egbaland that encouraged and supported our take off. We appreciate with gratitude the support of Honourable Minister of Education Dr. Maruf Tunji Alausa, MD, CON., Honourable Minister of State for Education, Prof. Suwaiba Said Ahmad, Permanent Secretary, Ministry of Education, Mr Abel Olumuyiwa Enitan (now Head of Service of the Federation), Executive Secretary of NUC, Registrar JAMB and the Executive Secretary of TETFUND for supporting our initiatives. As of today, we have concluded the first session and have concluded the admission of the second set. More importantly, we will be starting the 2026/2027 session on our 2 campuses.

IMPLICATION AND FUTURE OUTLOOK:

Recommendations

Chronic kidney disease has now assumed epidemic proportion and is a major public health issue globally. There is a need for a national kidney care policy to provide a coordinated kidney care and set standards for every Nigerian.

Preventive Nephrology:

Prevention we say is better and cheaper than treatment. Prevention of CKD will prevent catastrophic health expenditure and early morbidity and mortality. To prevent the disease, we must embark on massive health education which is undertaken every year on the

second Thursday in the month of March tagged 'World Kidney Day'. Aside this, there is a need for continuous education on appropriate health seeking attitudes. Early kidney disease would be detected with appropriate screening for kidney disease at different levels

- All children at pre-admission medical evaluation for Nursery, Primary, secondary and post-secondary schools.
- Patients of all age groups at first contact with hospital.
- All patients with chronic diseases whether communicable or not like hypertension, diabetes etc.
- Patients with family history of kidney disease, hypertension or diabetes.
- High-risk occupations, including outdoor workers and environmental exposures e.g. mechanics, bricklayers, long distance drivers, manual labourers, farmers using herbicides etc.
- Patients with Sickle Cell Disease and trait, SLE, HIV, Hepatitis B, Hepatitis C, obesity, or even preterm or low birth weight babies.

Subsidize Kidney Replacement Therapy including Transplantation:

Subsidisation of KRT will certainly improve accessibility and availability with consequent improvement in outcomes as has been observed across North African countries where there is state funding for KRT.

Recommendations to retain workforce:

Government:

1. Improved working climate: this will include improvement in remuneration and other social amenities like housing, accessibility of loans etc.
2. Improved Security which is being tackled by the three tiers of government.
3. Lifting of embargo on employment / reduction of bureaucracy in employment

Training Institutions:

1. Improved curriculum in terms of training and development through introduction of ethics, management and mentorship by the NUC, NPMCN, MDCN and the Universities.
2. Improved living conditions including provision of affordable accommodation within hospitals.
3. Provision of employment opportunities with properly defined job description.
4. Introduction of entrepreneurship into training curriculum.
5. The role of the NPMCN and sister colleges and the Ministry of Health to ensure young Doctors are motivated to continue to practice in the country.

Professional Associations:

1. Improved commitment to service
2. Improved sense of patriotism
3. Improved collaboration with Government
4. Improved collaboration within the unions and agencies e.g. Nigeria Medical Association (NMA), Medical and Dental Consultants' Association of Nigeria (MDCAN), Nigerian Association of Resident Doctors (NARD), etc.

Others are as follows:

1. Investment of the Private sector in Health as part of their corporate social responsibilities.
2. Continuous professional development for all practicing healthcare personnel.
3. Restoration of International exposure to trainees to further improve their capacity.
4. Infrastructures need to be upgraded to 21st century standards.
5. Memorandum of understanding between Nigeria and the countries that our medical personnel are migrating to, this will lead to establishment of a mutually beneficial working relationship.

Improved security:
There is no gainsaying the fact that the security situation of the country is contributing to the Japa syndrome amongst others. It also limits accessibility to existing care centres. Hence improved security could lead to better retention of workforce and improve accessibility.

Support for research fund:
Access to research funding is significantly limited locally and if we must contribute meaningfully to global nephrology practice and address gaps in training, practice and research, we MUST set aside research fund as a country. We have been able to achieve some headway with foreign collaboration but this will only be available for issues that are relevant to the environment of the sponsors. If we must address our peculiar health challenges, then funding MUST be made available possibly through a National Research Foundation or more specifically National Kidney Foundation.

CONCLUSION: Summary and Reflections
Mr Vice-Chancellor, Sir, I have presented my academic life story, having been birthed in Lagos, nurtured to maturity at the 'Great Ife' and yielding fruits (harvest) in Lagos and Abeokuta. I have taken us through the 4Bs (The Burden, Barriers, Bottlenecks and Breakthroughs) in the management of kidney disease, tracing kidney disease management from its epidemiology (the grassroots) to the most sophisticated research (genomics) and modern treatment modalities – dialysis and transplantation (the frontiers). I have also highlighted my humble beginning (grassroots) in Lagos Island to the ivory tower (frontiers) emphasising my fascinating childhood experience in 'Odan' (grassroots) to becoming a medical officer, consultant physician, lecturer, Professor, Registrar and Vice-Chancellor (frontiers).

Kidney diseases particularly CKD still constitute a significant burden affecting a fifth of our population, though only 1 out of every 40 manifest symptoms at any point in time.

It affects Nigerians in their economically productive years hence constituting a major drain on our National resources. The effort to confront the problem of CKD should therefore commence with improving the knowledge of kidney health of the general population.

Kidney care should therefore be incorporated into primary health care program and it should include early detection of kidney disease in childhood necessitating screening at pre-admission levels for nursery, primary, secondary and tertiary institutions.

Improved awareness education, screening and treatment for hypertension, diabetes mellitus and proteinuria, prompt treatment of infections including HAART treatment for HIV to reduce the burden and progression of its associated kidney disease.

Education on the need for avoidance of the recognised risk factors such as smoking, unrestricted consumption of analgesics, use of bleaching creams, unguarded use of local concoctions and exposure to environmental toxins like hydrocarbons.

Chronic kidney disease has assumed epidemic proportion and is a major public health issue globally. There is a need for a national kidney care policy to provide a coordinated kidney care and set standards for every Nigerian.

Access to life saving procedures such as dialysis or transplantation must be made available to all Nigerians whether rich or poor, male or female, young or old, the city or rural dwellers, public servants, the farmer, student, government officials, or politician, this is the task that must be undertaken by all of us.

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I thank the President of the National Postgraduate Medical College of Nigeria (NPMCN) Prof. Anthony Ikefuna FMCPaed, PNMC and other Principal Officers, Prof. Innocent Ikem, Dr Abdullahi Ibrahim and Prof Temitope Ayodeji Esan the current College Registrar. I thank all Senate Members, Governing Board and all academic and non-academic staff of NPMCN for your cooperation

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I thank all the members of my inaugural lecture committee under the leadership of Prof. O.O. Okunola, including the FUMMSA and NPMCN representatives, I am grateful, May God bless you all.

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Mr Vice-Chancellor, esteemed colleagues, respected families, friends and students, I thank you for attending this lecture and more importantly for honouring me with your presence.

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