Pathways to Progress: Paediatric Care, Child Health, and Medical Education in Nigeria

BAYERO UNIVERSITY KANO
PROFESSORIAL INAUGURAL LECTURE

Professor Mu'utassin Ibrahim *MBBS, FMCpaed, FWACP, PGDipMed Ed*

Professor of Paediatrics
Bayero University Kano

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Protocol

The Vice Chancellor,

The Deputy Vice Chancellor Academics,

The Deputy Vice Chancellor Administration,

The Deputy Vice Chancellor Management Services,

The Registrar and Secretary to the Governing Council,

The Bursar,

The University Librarian,

The Provost, College of Health Sciences,

The Dean, Faulty of Clinical Sciences,

The Dean, Faculty of Allied Health Sciences,

The Dean, Faculty of Basic Medical Sciences,

Deans of Other Faculties here present,

Members of the Senate of Bayero University Kano,

Head, of Departments

Academic and Professional colleagues,

The Non-Teaching Staff,

Family and friends,

Students,

All invited guests,

Gentlemen of the Press,

Ladies and Gentlemen,

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Summary of the Inaugural Lecturers' Biodata

Professor Mu'utassim Ibrahim is one of the early fully trained paediatrician from the Northern parts of this country. He has been a medical practitioner, resident trainee and consultant paediatrician with special interest in Haematology and oncology and Medical education. He was promoted Professor of Paediatrics by Bayero University Council on 1 October, 2001. Born on 14 March, 1955, Professor Mu'utassim Ibrahim was enrolled at Gidado Primary School, Katsina from 1961 to 1967. From there he gained admission to Government Secondary School Katsina, from 1968 to 1972. On passing out with the West African School Certificate Division 1, he was admitted to the school of Basic Studies Ahmadu Bello University, Zaria from January 1973 to June 1974. On completion of the course, he was admitted to read the MBBS from 1974 to 1979, passing out with Distinction in pharmacology in June 1979. He was a House officer at General Hospital, Katsina and Ahmadu Bello University Teaching Hospital, Kaduna from June 1979 to June 1980. He was posted to Ogun State for the NYSC and subsequently got redeployed to Sokoto State for the primary assignment.

Graduate and Professional Training

Professor Mu'utassim Ibrahim joined the University of Sokoto as Demonstrator in Paediatrics on completion of the NYSC on 1 October, 1981. He enrolled for the Residency Training in paediatrics at Ahmadu Bello University Teaching Hospital, Zaria in January 1984. On passing the Part 1 Examination in 1986, he proceeded to spend one year in the UK on attachment at the Derbyshire Children's Hospital, Derby, the City Hospital Nottingham and the Groby Road Hospital, Leicester for higher training in general paediatrics, neonatology and paediatric cardiology respectively. He returned to Nigeria in June, 1988 and submitted his dissertation with the title "**Cord blood Alphafoetoprotein level as an Index of Maturity in the Newborn: A comparative study of methods of estimating Gestational Age**" for the Final Fellowship of the National Postgraduate Medical College of Nigeria. The thesis was accepted and the Fellowship awarded in November 1988. On returning to the University of Sokoto, he was already a Lecturer 1 and was appointed Consultant paediatrician by the Teaching Hospital. He was saddled with leading the department and establishing most of its programs, clinical and academic. At that stage there were very few Nigerian academics in the College of Health Sciences, thence a lot of responsibilities rested on his shoulders. He was a Member of the University Governing Council elected from Senate and a Member of the Board of Management of the Teaching Hospital first representing the Provost of the College and latterly representing the Senate. In 2002, Professor Ibrahim was at the University of Dundee, Scotland to undertake the course on Medical

Education. Eight month later he was awarded the Postgraduate Diploma in Medical Education of the University of Dundee.

Appointments and Honours

Dr. Ibrahim was appointed Consultant paediatrician and moved rapidly to consolidate the department in the new teaching hospital in Sokoto. He rolled out the academic and clinical programs for the students and the larger public. He participated in the National Micronutrients Survey in 1992 covering the North west states. He initiated and completed several basic research in child health in and around Sokoto area. He was appointed Senior lecturer in 1989. His professional interests span through paediatric Haematology and oncology, neonatology and cardiology. As qualified specialists become available, he relinquished the latter sub-specialties, concentrating on Haematology and Oncology. He had a distinguished career in Medical Education, where his flag ship paper "**Medical Education in Nigeria**" 'was a source of reference on the subject in the last 15 years. He was a distinguished External Examiner to several universities and an examiner of the National Postgraduate Medical College of Nigeria since 2000. He was an Examiner for the Masters' degree in Medical Education of the University of Port Harcourt since 2020 and have now examined and passed 8 candidates to date.

Professor Muutassim Ibrahim was the Chief Medical Director of Usmanu Danfodiyo Teaching Hospital Sokoto 1994 to 2002. He was also the Vice Chancellor, Umaru Musa Yaradua University Katsina 2010 to 2015. He was the recipient of First Bank Chair in Paediatrics endowed to Bayero University in 2005. He was appointed to the Board of Directors of Sickle Cell Foundation of Nigeria, one of the top most professional bodies dealing with all aspects of Sickle Cell Disease in the country. He was also a Trustee on the Board of SCORE Foundation who also deal with aspects of Sickle Cell Disease Especially Newborn screening in Kaduna, Plateau, Nassarawa, FCT, Niger and Katsina States.

Professor Ibrahim is a Member of the Health Committee of Gidauniyar Jihar Katsina (Katsina State Foundation) since its inception in 1996. He was bestowed with the Traditional Title of **Durbin Yawuri** by his Royal Highness, the Emir of Yawuri Dr. Muhammad Zayyanu Abdullahi CON in 2000.

Academic and Literary Works

Professor Mu'utasim Ibrahim has published over 50 peer reviewed articles in National and International journals. He had contributed a Chapter on Bleeding Disorders in the flagship paediatric textbook for Nigerian doctors: Paediatrics and Child Health in a Tropical Region. He has also authored a manual on

Paediatric Oncology Chemotherapy protocols, A guide for Practicing doctors. He has delivered several papers on medical Education in Nigeria at many academic forums in Nigeria on invitation. Dr. Ibrahim has trained over 40 fellows of the National and West African Colleges and also supervised two Master's degree recipients at Bayero University.

Family Life:

Our distinguished lecturer is married with six children, four of whom are Medical doctors, the others an Engineer and an Architect. He is a scion of the Hambali Clan of Unguwar Alkali Katsina, who were until recently the family of all judges in the defunct Katsina province and also the Chief imam of the Katsina Central Mosque.

Leisure and extracurricular activities:

Professor Ibrahim has always been a sportsman. In his younger days he plays squash racket and brisk walking. Currently, he is an amateur golfer and plays regularly at Kano golf club. He enjoys reading, especially history and travelogues.

Preamble

I stand before you to deliver what should have been delivered 2 decades ago. I'm grateful and full of thanks to the Almighty Allah for sparing my life to witness this occasion. Mr. Vice Chancellor Sir, I thank you immensely for this opportunity to deliver this inaugural lecture. I have had a unique experience of joining the academic ladder very early in life, even before acquiring any specialization. On top of that, my path took a turn when at the early age of 39, I was appointed the Chief Medical Director and Chief Executive of Usmanu Danfodiyo University Teaching Hospital, Sokoto. That inevitably altered my academic course and put me in a position to steer the development of a new teaching hospital at a period when there were very few qualified Nigerians on the ground, and hardly any private University. We pushed on and here we are today, after such a long journey.

The title of this lecture may not give a hint of what is to come but the circumstances informed the choice. I was appointed Professor of Paediatrics of this great university on 1st October, 2001 a few months to my joining Bayero University from Usmanu Danfodiyo University where I cut my academic teeth. The period was challenging as there were only two of us as permanent full time academic staff of the University. The priority at the time was to gain accreditation to train Medical undergraduates at Bayero University. Medical education has always been challenging in this part of the country due to unavailability of manpower and the very strict nature of the accreditation process of both the Medical and Dental Council of Nigeria and the National Universities Commission (NUC) particularly the former. Thus, at the time of my joining this great University, BUK had experienced several failed accreditation exercises and had continued to fan out its students to other accredited Nigerian Universities. This lecture is thus a tribute to the University and to spell out my life experiences in paediatrics, medical education and human resource management as past chief executive officer of Usmanu Danfodiyo University Teaching Hospital, Sokoto and a former Vice Chancellor of Umaru Musa Yar'adua University, Katsina and the quest for excellence. It would be an opportunity to highlight the highs and lows as well as the victories and failures over a prolonged period in academics and clinical practice.

I cannot recall the exact time I took the decision to study Medicine, but I can recall selecting to read Medicine in my application form as we were

writing the West African School Certificate examinations in 1972 and at the same time applying for admission to the School of Basic Studies, Ahmadu Bello University Zaria, that had just commenced two years earlier. At that point, we were required to indicate the course of study we propose to study if successful. As destiny took us to our ultimate destination, I was admitted to read for the MBBS of Ahmadu Bello University, Zaria the only University in the northern states at the time. I was the only one from my Secondary school and one of only two of us admitted from Katsina province which was part of North Central State at the time.

My journey to paediatrics and medical education began in the most unlikely places. This happened during my year as a National Youth Corp member in Sokoto State and the Specialist Hospital Sokoto. My love has always been for internal medicine, having worked with and admired top physicians at work, Professors E.H.O. Parry, P.A.J. Ball, Greenwood and Whittle as a medical student at ABUTH Zaria and during holidays at the General Hospital, Katsina, where late Dr. M.T. Abdullahi of blessed memory and Dr. D. S. Tafida the former Chief Physician to late President Shehu Shagari was the Chief Consultant Physician and in Charge of the Hospital. All of these giants of Internal Medicine shaped our young mind into loving the science and logic of differential diagnosis in Medicine. This was to change at the commencement of my primary assignment at the Specialist Hospital Sokoto where I was posted to the Children's ward. The experience of managing such a huge number of children with various diseases and illnesses from the lower rung of society as is found in paediatric practice in most parts of Nigeria changed my mind to pursue postgraduate training in paediatrics and child health.

The paediatric residency training at Ahmadu Bello University Teaching Hospital was rigorous but excellent with dedicated faculty. Most residents were able to complete the training in the prescribed period of 5 years. I was one of the residents that completed the residency in 5 years including the one year spent in the United Kingdom. I received a letter of commendation from the Director of the Institute of Health at the time late Professor B D Musa for the record of completing the program in exactly 5 years. (Appendix) The year spent in the UK was at three hospitals in the Midlands. First in general paediatrics with Dr. Richard Morton, who was a Senior Registrar at the Department of Paediatrics ABUTH in 1976 – 78, and now Consultant Paediatric Neurologist at Derbyshire Children's' Hospital, then a further three months with Dr. David Curnock, a Consultant Neonatologist at Nottingham City Hospital and finally the last

three months with Dr. Ranjit Leenage, a Consultant Paediatric Cardiologist at Groby Road Hospital Leicester. You may wonder as to the spread of time in as many as three major specialties. That was the trend at that period when the aim was to produce competent general paediatricians who can handle most childhood illnesses because there weren't that many specialists around at that time.

I was back at Usmanu Danfodiyo University, Sokoto at the end of 1988 with my new Fellowship in Paediatrics having gone for this training on 1 January 1984. I was appointed Honorary Consultant by the Management Board of the Teaching Hospital and joined the Department of Paediatrics. The task before the College of Health Sciences and the University at the time was to prepare for the forthcoming accreditation of the Medical School by the Nigeria Medical Council as it was then known. University of Sokoto was among the seven sisters and one of the first to commence the MBBS program in 1979/80. However, it had faced serious challenges attracting and retaining sufficient number of qualified faculty staff to pass the accreditation exercise. All students up to that time had been sent to accredited medical schools to complete their training. No sooner had I reported that I was thrust with the responsibility of taking over as Head of Department from late Professor Ahmed Taqi who was at the time also the Provost of the College of Health Sciences. Our task was to prepare the College for the Medical and Dental Council Accreditation of the MBBS programme of the College.

Failed Accreditation:

Having prepared well in terms of equipment and student facilities as well as improved human resources, the College invited the Medical Council to Sokoto with the high hopes of getting the accreditation even if it be provisional. Unfortunately, the Council found the college to be grossly deficient in academic staff in the MBBS program. A decision was taken to direct the College to firm out all its clinical students to accredited Medical schools in the country. As the youngest academic staff in the college I was directed to head a team to various Medical schools to share our predicament and ask for assistance with absorbing our three sets of clinical medical students to complete their studies. The University of Maiduguri under the leadership of the then Vice Chancellor, late Professor Nuru Alkali of blessed memory, accepted to absorb the three sets of students under some conditions. All of them were required to matriculate afresh at University of Maiduguri and would receive the University of Maiduguri degrees. The University of Sokoto was also required to pay the teaching staff of the University of Maiduguri for the extra job of training its

students. The University of Sokoto also had to provide hostel and transport facilities for the transferred students. That was how the problem was solved. Among those transferred students are some of the finest professors sitting in this audience.

Academic sojourn

The journey to academics has been long but enduring. Our generation has had the great fortune of attending medical school in the early 70's at Ahmadu Bello University, the only University in the Nineteen Northern States curved out of the old Northern Region of Nigeria. The core academic staff were British with a few from the United States, Europe and other commonwealth countries. Every Department from Basic Sciences to the Hospital was headed by a British National except the Department of Obstetrics and Gynaecology, headed by the great Professor K. A. Harrison, an Ijaw from present day Rivers State. At the end of the second clinical posting in the Department of Medicine, every student was required to conduct a basic research and present the findings to the Department. I was encouraged by the Senior Registrar of our team, Dr. JT Macfarlane to investigate whether sputum output by patients with pulmonary tuberculosis is a measure of the severity of their disease. I duly developed the protocol which also involved carrying out chest x-ray and serum analysis of proteins and other parameters. Hospital care including drugs, laboratory investigations, surgery and catering services was absolutely free for all patients at the time. I would set out every morning to the Tuberculosis annex at Tukur-Tukur, Zaria to collect the jars of sputum I had earlier distributed to the TB patients and measure their sputum output. At the end of the study period of about 2 months, I presented my findings to the Department chaired by the Head of Department of Medicine and a well-known great author and physician Professor Sir Eldryd H. O. Parry (author of the book ***"Principles of Medicine in Africa").*** Finger clubbing was observed in 21% of 70 adult Nigerian patients presenting with pulmonary tuberculosis. These patients had significantly higher incidence of haemoptysis and they also showed a significantly lower body weight and serum albumin than those without clubbing. Their chest x-ray revealed larger cavities and at 2 months the mortality of the patients with finger clubbing (40%) was very much higher than those without (5.5%). It was suggested that finger clubbing is of value in assessing patients with pulmonary tuberculosis because it helps to identify those with severe destructive disease. Professor Parry directed my supervisor, who was the Senior Registrar of the team, Dr. J.T Macfarlane to publish the report. The research was published in the International Journal "**TUBERCLE"** with the title "**The importance of finger clubbing in pulmonary**

tuberculosis". {Tubercle 1979.60:45-48}. The paper was published before I graduated and thus made me an author in an International Journal as an undergraduate.

Table 1. Presenting features of 70 patients with pulmonary tuberculosis.

	Definite finger clubbing	Absent finger clubbing	Statistical significance
No. of patients	15	55	
Mean age in years (Range)	30.3 (25 – 40)	34.7 (18 – 70)	NS
Length of history in weeks (SD of mean)	87.4 (106)	44.2 (53)	NS
No. with haemoptysis	12 (80%)	23 (42%)	P<0.01
No. with history of cigarette smoking	9 (60%)	9 (16%)	P<0.01

Table 2. Results of investigations in 70 patients expressed as mean values + 1 SD

	Definite finger clubbing	Absent finger clubbing	Statistical significance
Weight (Kg)	41+ 6.5	46.2+8.5	P<0.05
24 –hour sputum volume (ml)	122+82	96+103	NS
Serum albumin	30.7+5.8	37.1+6.1	P<0,01

Table 3. Chest x-ray findings in 70 patients

	Definite finger clubbing	Absent finger clubbing	Statistical significance
X-ray classification*			
Mild	1 (7%)	8 (14%)	NS
Moderately advanced	3 (20%)	20 (36%)	NS
Far Advanced	11 (73%)	27 (50%)	NS
Mean diameter of largest cavity (mm) (SD of mean)	54.0 (27)	34.7 (18.4)	P<0.01

*National TB Association of USA classification.

The study showed high incidence of finger clubbing in African patients presenting with pulmonary tuberculosis. Initial x-ray findings showed those with clubbing had significantly larger cavities than those without. After two months of treatment, 6 (40%) of the patients with clubbing had died compared with only 3 (.5%) of those without; a significant difference. (P<0.01).

As a resident trainee in the Department of Paediatrics, Ahmadu Bello University Teaching Hospital Zaria from 1984 to 1988 I was able to write and publish some

case reports that received International acclaim. The second publication was another research I carried out as an undergraduate to satisfy the requirement of the Department of Community Medicine for the MBBS degree. This was on the Birthweight in Katsina. The research was carried out at the maternity hospital Katsina. We established the mean Birthweight in children born in that year 1978 as 3.07 kg for males and 2.98 kg for females. For the first time we conclusively showed that the presumed birthweight of 3.0 kg was not universally applicable across the country. This paper was published in the Journal of Tropical Pediatrics with the title **"Birthweights in Katsina". (J. Trop Ped 1986; 32:200-202)**.

Table 4. Foetal sex and mean birthweights of 182 singleton Katsina babies

			Birthweight (Kg)	
Foetal sex	**No**	**Percentage**	**Mean**	**Range**
Male	99	54.4	3.070	1.228 – 4.500
Female	83	45.6	2.980	1.900 – 4.480
Total	182	100	3.029	1.22 - 4.500

*P<0.001

What is interesting is that a recent repeat of the same study in Katsina (2019) which was 41 years after our initial study, found even lower birthweights in the same community. That showed people were better fed in 1978 than they are presently! It may have gotten worse in the last 5 years.

A difficult to diagnose case came before our team sometimes in 1986. This was a 5-year-old child with multiple bony deformities and several pathological fractures, fresh and healing. As the team registrar, I was challenged by my consultant, Dr. WBR Werblinska, a Polish doctor to investigate and establish the diagnosis. This, I did and eventually published the case as my very first fully written paper as a Registrar with the title **"Familial hyperphosphatasaemia in a Nigerian child". (Ann. Trop. Paed. 1987:7:222-226).** This was a rare hereditary disorder of bone metabolism, which diagnosis is based on clinical, pathological, biochemical and radiological changes. It is an autosomal recessive disorder and up to that time was the first to be reported from West Africa. The disorder is that of failure of maturation of primitive fibrous bone into compact lamellar bone as a result of over-production and over-destruction of bone and bone collagen by osteocytes. Clinically, symptoms of familial hyperphosphatasaemia manifest early in childhood because of the abnormal bone modelling which results in gross skeletal deformities with or without bone fractures, proportionate dwarfing, chest deformities and macro cranium. Radiographs are characterized by symmetrical involvement of all bones, generalized lack of discrete cortex and poor modelling. Elevated levels of serum alkaline phosphatase of bone origin and a serum and urinary hydroxyproline are found. The acid phosphatase is also elevated.

Table 5. Serum biochemistry in a child with familial hyperphosphatasaemia

Test	Number of determinations and values 1st	2nd	3rd	Units	Normal range
Alkaline phosphatase	253.0	235.0	243.4	KA	3 – 13
Acid phosphatase	12.0	12.04	12.4	KA	0 – 4
Calcium	2.60	2.13	2.42	mmol/L	2.25-2.75
Phosphorous (Inorganic)	1.42	1.0	1.20	mmol/L	0.8 – 1.4

The paper attracted many requests for reprints across the world.

Figure 1. Picture of child showing grotesque skeletal deformities and muscle atrophy

Figure 2. X-ray of thighs showing multiple healed and healing fractures, thin cortices and poor mineralization of bone.

I have not encountered another one to date. The challenges of being a Registrar in those days was enormous. Our team encountered a young male child aged 10 years who presented with onset of total blindness following 5 days of persistent frontal headache. While being investigated, he developed an abdominal mass and a jaw swelling. He was fairly nourished. He was completely blind. There was ptosis of both eyes with bilateral internal and external ophthalmoplegia. Both pupils were dilated and fixed. The discs were pink with normal vessels. There was no papilledema. He had a fleshy left mandibular tumour with dental anarchy. A fine needle aspiration biopsy of the tumour showed cells diagnostic of Burkitt's lymphoma. The child was treated with combination chemotherapy and the tumour resolved, but he never regained his sight**." Burkitt's lymphoma presenting with blindness: a case report". (Annals of Trop Paediatrics. 1990:10; 31-323.)**

Working in an African environment where the English language is a second language brings to the fore the limitations of the understanding of the language and its nuances and metaphors by medical students and health workers. We encountered many health workers and students unable to understand some of the terms used in standard medical text books from European authors. Some of the culinary metaphors used were noted to be incomprehensible to the students. That

inspired us and colleagues to conduct a research on this dilemma of the African Medical students in understanding those terms. The result was an interesting paper we published in the medical education journal with the title **"culinary metaphors in Western Medicine: a dilemma of the Medical students in Africa." (Medical Education;1992;26;423-424).**

The results showed that, the vast majority of medical students and young resident doctors are not familiar with many of the European foods, fruits and beverages that are commonly used in medical textbooks to describe disease conditions. We thus concluded that, in describing disease conditions, medical educators and authors in Europe should endeavour to use terms that are simple and universal. They should not assume universal knowledge of fruits and dishes available in their environment. Medical educators in Africa should also simplify the description by using appropriate terms. Working in general paediatrics in an environment with few specialists like Sokoto State was in the late 80's and early 90's always generates interesting and useful papers. This will always cut across multiple specialities as the few on ground would have to provide specialist services within the limits of what was available in the hospital. There has always been dissenting opinions on the fate of a vital organ, the spleen in children with Sickle Cell Disease. Is it true that it always auto-ablate? Does it shrink in size but remain functional? In a major multicentre research across the country, with Professor Adekunle Adekile as the principal investigator, we looked at the fate of the spleen in SCD in children in all zones of the country and in patients from the United States of America. This was published as **"The Spleen in Sickle Cell Anaemia. Comparative Studies of Nigerian and U.S. patients. (Am J Hem.1993;42: 316 – 321").** The summary of findings across various centers in Nigeria, an endemic malaria zone and Georgia USA, a non-malaria area where age and sex matched children with SS were compared. Splenomegaly was found in 22.3% of Nigerian patients (n=310) while it was found in only 8% of US patients (n=100) from Georgia. There was significant linear correlation between spleen size and Hb levels and (C3 and C4) were not affected by the spleen size. In both groups, patients with splenomegaly had fewer circulating pitted red cells than their counterparts without splenomegaly. This study provides additional evidence that malaria plays a significant role in the persistence of splenomegaly in African patients.

Table 6. Mean Haematological Data According to Spleen Size

Spleen (cm)	n	RBC (10-12/L)	Hb (g/dl)	MCH (pg)	Hb F (%)
Nigerian SS patients					
All	302*	2.81	7.6	27.1	9.3
0	238	2.92	7.8	27.3	9.0
1 – 5	30	2.82	7.5	26.4	11.3
6 – 10	25	2.15	6.3	30.4	11.8
>10	9	1.74	5.4	30.6	11.2
U.S. SS patients					
All	100	2.77	8.0	29.4	13.7
0	92	2.75	7.9	29.6	8.5
1 - 5	8	3.09	8.6	27.7	14.3
Nigerian AS controls					
All	81	4.34	11.7	26.9	1.5
Nigerian AA controls					
All	26	4.23	11.7	27.6	0.6

**Data for some patients were unsatisfactory; values for PCV, MCV, and MCHC are omitted because the effect of storage of the samples made these measurements unreliable.*

In furtherance of basic research and documentation of the clinical picture of the health and welfare of children, we looked at the spectrum of diseases resulting in Infant mortality in the teaching hospital in Sokoto. This was published as **"Infant mortality at Usmanu Danfodiyo University Teaching Hospital, Sokoto" (Nig. J Paediatr 1993.20;17 – 20.)**

Table 7. Main causes of neonatal deaths in three centers

	Cause of Neonatal death in 3 centers		
	Sokoto	**Ibadan**	**Ilorin**
Prematurity	24.6	36.4	40.8
Septicaemia	14.3	7.6	5.8
Birth asphyxia	13.0	N.A	23.7
Respiratory distress/pneumonia	10.8	4.7	8.6
Congenital malformations	6.1	10.1	1.2
Meningitis	4.3	4.1	N.A
Neonatal jaundice	3.4	14.9	7.8
Neonatal tetanus	1.9	16.8	11.3

Significantly at the time, combined neonatal jaundice and neonatal tetanus which accounted for 31.7 percent of neonatal deaths in Ibadan and 19.1 percent of deaths in Ilorin, were responsible for only 5.3 percent of deaths in Sokoto. Among 263 children dying after the first month of life, the causes established are given in the table below.

Table 8. Causes of post neonatal deaths as recorded in 263 children in Sokoto.

Disease condition	No of deaths	Percent of total
Gastroenteritis	92	35
Lower respiratory infections	60	22.8
Septicaemia	36	13.7
Anaemia	27	10.3
Measles	13	4.9
Convulsions	11	4.2
Meningitis	9	3.4
Others	15	5.7
Total	**263**	**100**

Another paper we published was extracted from the dissertation submitted for the fellowship in 1988. The research was on a well-known tumour marker ***"alphafoetoprotein***" produced in the yolk sac in early pregnancy and declines towards parturition. We envisaged that it could serve as a marker of maturity of the newborn infant and set out a research to follow the pattern of alphafoetoprotein in newborn infants at various gestational ages in the neonatal unit of the ABU Teaching Hospital Zaria. Using the technique of radioimmunoassay with the appropriate kits we were able to determine and confirm the relationship between alphafoetoprotein and gestational age. Our findings were published in the flagship journal of paediatrics in Nigeria edited by the renowned paediatrician late Professor Asuquo Antia of blessed memory. **"Cord blood alphafoetoprotein in gestational age assessment" (Nig. J Paediatr;1994.21:8 – 11).**

Table 9. Mean levels and ranges of Alphafoetoprotein (AFP) at various gestational ages.

Gestational age (Weeks)	Mid-range point (weeks)	No.	Mean AFP (IU/L)	Range
27 – 28.9	28	3	331,200	302,000 – 357,300
29 – 30.9	30	4	306,400	291,000 – 312,000
31 – 32.9	32	9	258,100	240,000 – 275,000
33 – 34.9	34	8	242,400	225,000 - 240,000
35 – 36.9	36	12	221,267	200,000 – 240,000
37 – 38.9	38	10	189,700	148,000 – 205,000
39 – 40.9	40	47	175,738	125,000 – 225,000
41 - 42.0	41.5	18	149,810	115,000 – 200,000
>42	--	2	106,500	88,000 – 125,000

The range of cord blood AFP was 88,000 IU/L to 357,000 IU/L with wide individual variations in AFP at all levels of gestational age. The mean AFP at birth irrespective of gestational age was 201,152.2 IU/L with a standard deviation of 57,32.6 IU/L. there is a steady decline in AFP with increasing gestational age.

We correlated the AFP and gestational age to arrive at a regression equation from a scatter gram. The coefficient of correlation (r) for AFP versus gestational age was -0.88 for females and -0.63 for males and -0.77 for all infants. The correlations were all highly significant (P = 0.001). The formula for the regression line was ***y = 50.507 – 5.93 x 10 – 5x.*** from a given AFP level, the 95% percent confidence interval for determining the gestational age was 4.2 weeks.

Sequel to this paper we also published a review article on alphafoetoprotein. **"Alphafoetoprotein. The ubiquitous protein". (Sahel Med J. 1998: 1 (1); 1 – 5).** A further publication linking gestational age with anthropometric measurements of newborn babies was made**.**

In furtherance of the research on gestational age estimation, another paper was extracted to show how anthropometry can be used to estimate gestational age. This was published as "**Gestational age estimation in Nigerian Newborns" (Sahel Med J. 1998:1. (1) 10 – 14**).

As expected in a virgin place for academic paediatrics our next few publications were of a general nature. We encountered an interesting case of a neonate with meningitis in whom the offending bacteria was a gram negative cocci said by the microbiologist to be resistant to penicillin at the time. That was in 1990 when there was almost a 100% susceptibility of most gram negative organisms to penicillin. However, the child didn't respond to the standard regime of penicillin and gentamycin. We requested for another microscopy and culture of the CSF. The culture grew the same gram negative organism but this time it was resistant to penicillin, gentamycin, chloramphenicol, co-trimoxazole, ampicillin and streptomycin. The antibiotics was changed to cefuroxime but this time we noticed the onset of hydrocephalus. This compounded our dilemma as there was no reported resistance to these antibiotics in the literature. I showed the results to a visiting professor of Microbiology from ABU Zaria late Professor L J Eglar. He explained this was impossible. He asked that a fresh CSF preparation be taken and spread on a culture dish for him to take to his laboratory in Zaria. Two days later, he called on land line (there was no mobile phones or internet at the time) to confirm that the organism was ***Acinatobacter species*** (mima polymorpha) which morphologically resembles the Gram negative bacteria ***H. Influenzae and N. Meningitides*** known to cause meningitis in neonates. It was sensitive to rifampicin to which the child responded but ended up with a communicating hydrocephalus**." Hydrocephalus and Cerebral palsy due to Acinatobacter Meningitis in a Neonate." (West African J. Med. 1995: 14: 59 – 60).** Respiratory infections were only second to diarrhoeal diseases in causing child morbidity and mortality in the 90's. We studied retrospectively the pattern of Childhood pneumonia and its outcome in children in Sokoto and published our findings in the Nigerian Journal of Paediatrics. **"Childhood Pneumonia in Sokoto". (Nig. J Paediatr 1996: 24: 91 – 5).** This threw more light into this common illness. There were 415 cases received in the 12 months' period of the study. Seasonal variation was observed with 50.6% occurring during the four

rainy months (June to September). The case fatality was rate was 10.4 percent. Infants comprised 54.7% of all cases and 38.3% were aged 1 – 5 years. The most common complication was febrile convulsion which occurred in 7.3 percent of cases. Pleural effusion and heart failure was also encountered in 5 and 2 cases respectively. Sickle cell disease is a major health problem throughout the country with a prevalence of the **S gene** carriage of well over 25% of the population. It was therefore no surprise that as paediatricians we encounter Sickle Cell Disease and its complications in routine daily practice. It was observed that a number of children were seen with stroke, a phenomenon mainly associated with adults from high blood pressure and atherosclerosis. This lead to us compiling and closely studying the number of children coming with stroke. This was before the days of transcranial Doppler or even the widespread availability of CT Scan and MRI. All that was available to paediatricians was sharp clinical methods and in-depth neurological examination of the child. Seven cases of stroke were recorded in a 2-year period. This was published as **"Cerebrovascular accidents (strokes) as seen in children at Usmanu Danfodiyo University Teaching Hospital, Sokoto". (Nig J Med. 1996: 6 (4); 112 – 115**.). Five of the seven cases had Haemoglobin SS. The mean age of onset was 6.8 years. There was preponderance of females (5 out of 7). For the first time, we documented HBSS as a major risk factor for stroke in children in the absence of transcranial Doppler or CT and MRI facilities. The outcome at that time was poor. Two of the children died during the first admission. Two died on readmission within 7 months of the first admission. Two were discharged to follow up with major neurological sequelae. (hemiplegia and aphasia). Only one child recovered completely.

Childhood cancer is always a daunting task for a paediatrician isolated in a distant hospital without the benefit of a pathology and morbid anatomy laboratory. Even Fine Needle Aspiration Biopsy was not available unless a visiting pathologist comes from other parts of the country. Despite the short coming we set out to document the prevalence of the commonest childhood tumour of that period Burkitt's lymphoma. A two-year prospective study was carried out and the results were a fascinating revelation of the epidemiology of Burkitt's lymphoma and its relationship to environmental factors and poverty**. "Burkitt's lymphoma in children at Sokoto" (Nig J Med. 1998;7(3): 115 – 119).**

Still from our days in Sokoto we documented many childhood diseases which were duly published. Among these was the prevalence of poisonous snake bite which was seen in children. "**Poisonous snake bites in children in Sokoto, North West Nigeria" (Sahel Med J. 1998 (1) 23 – 26).** Another published report charting the clinical picture of paediatrics in Sokoto was a glance into neonatal septicaemia, **"Antioxidant in Neonatal Septicaemia" (Sahel Med J. 1999.2;(2):66-72).** We also documented the clinical picture of measles as seen in Sokoto. **"Clinical presentation and outcome of measles in Sokoto Nigeria" (Sahel Med J.1999. (2) 2: 104 – 107)**. And another paper on neonates **"Assessment of the febrile neonate. (Sahel Med J. 2000. (3) 1: 9 – 15)** was

published about the same time as to complete the picture of paediatrics in Sokoto. At a point we noticed the prevalence of intestinal helminthiasis among school children to be on the rise and planned a field research to establish the picture among primary school children in Sokoto. This was published subsequently. **"Intestinal helminthic infections among primary school children in Sokoto. (Sahel Med J. 2000; (3) 2:65-68).** The study was carried out in twenty primary schools across 10 Local governments randomly selected among children 5 - 14 years. A total of 2432 children had their stools examined. Of these, 1736 (71.4%) had intestinal helminth infection. Out of these infected children, 1411 (81%) had two or more parasites in their stools.

Table 10. Faecal microscopic analysis for ova, cysts and parasites in 2432 stool samples in primary school children in Sokoto.

Types of parasite	Number of subjects
F + B	344
D + C + A	294
A + H	268
G + H + E	249
B + I	147
B	140
C+ B + G	109
H	74
F	73
D	3
Nil	696

Key:

A = Ova of Ascaris lumbricoides
B Ova of Hymenolepsis nana
C Ova of Hookworm
D Ova of Giardia lamblia
E Ova of Enterovirus vermicularis
F Ova of Taenia saginata
G Ova of Trichurus trichuri
H Cysts of Entamoeba histolytica
I Cysts of Entamoeba coli

We found a strong correlation between worm infestation and parents' education. 91.4% of infected children came from families with no formal education and only 9.4 of those whose parents had tertiary education were infested.

My movement to Bayero University Kano came through mid-2002 having been accepted for a one-year sabbatical leave at the end of my tenure as Chief Medical Director of Usmanu Danfodiyo University Teaching Hospital, Sokoto. My academic contributions began with a case report on carbon monoxide poisoning as seen in children. This is a common problem because of use of petroleum

generators in homes and offices. The general population is largely ignorant of the toxic nature of carbon monoxide which is odourless and colourless and can kill silently. **"Carbon monoxide poisoning in a child: A case report". (Nig J Paediatr 2004. 31: (2). 56 – 58).** The paper was a wakeup call to the populace and the authorities to improve the power supply situation in the country. While settling down in Kano we looked at the prevalence and outcome of obvious congenital malformation among babies born in the Teaching Hospital. This was a revealing outcome as for the first time congenital malformations were documented and the short term outcome listed**. "The Prevalence and Perinatal outcome of obvious Congenital Malformations among Inborn Babies at Aminu Kano Teaching Hospital Kano". (Nig J Paediatr 2005; 32: (2).47 – 51).** The spectrum of what a clinician encounters in a big city surprises most of the time. Our team encountered a rare condition referred from another hospital for severe respiratory distress which was inappropriately diagnosed as asthma. However, there was the absence of a fundamental physical sign of asthma which was 'wheezing' caused by spasm and narrowing of the bronchioles despite the severe and noticeable respiratory distress. That cast doubt on the presumed condition. We also noticed that the distress was relieved with change of position of the child. A foreign body obstructing the airway was suspected. The ENT team was invited to do a direct laryngoscopy on the child. This lead to the discovery of laryngeal papilloma in the child. The appropriate surgery was carried out to remove it and the child made an uneventful recovery**." Laryngeal papillomatosis presenting with acute airway obstruction in a 6-year-old male child." (Indian Journal of Pediatrics: 2000;76; 1 – 3).** Another published communication about that time came from a study of the Human Immunodeficiency virus in children. One of the clinical manifestations worthy of close study was diarrhoea which remains a common problem among children. **"Clinical indicators of HIV infection in under five children with diarrhoea in a resource limited setting. (Nig J Paedtr 2009; 12(1) 13 – 18).** Further research on paediatric documentation in Kano and its surrounding states was carried out over the next few years as research by residents was focused on that. Our group looked at 3869 consecutive admissions to the children's ward to determine the pattern of morbidity and mortality. The outcome was a landmark paper **"Mortality and Morbidity pattern among 3869 consecutive admissions at Aminu Kano Teaching Hospital Kano. (Nig J Paedtr; 2008: 35; 67-74).** We then had an in-depth look at a hitherto unsearched topic on childhood cancer. We carried out a prospective study of all cancer admissions at Aminu Kano Teaching Hospital Paediatric ward over a 5-year period. **Epidemiology of childhood malignancies in Kano. A five-year prospective study. (Nig J Paedtr: 2009. 36. (3&4): 104 -106.**

Table 10. Types of malignancies observed at Aminu Kano Teaching Hospital by gender in a 5-year period.

Diagnosis	Male frequency	Females frequency	Total	Percentage
Burkitt's lymphoma	27	22	49	30.8
Retinoblastoma	14	11	25	15.7
Nephroblastoma	9	10	19	12.0
Acute lymphoblastic leukaemia	17	0	17	10.7
Non-Hodgkin's lymphoma	6	9	15	9.7
Neuroblastoma	8	3	11	6.9
Acute myeloid leukaemia	3	5	8	5.0
Hodgkin's lymphoma	7	0	7	4.4
Rhabdomyosarcoma	2	1	3	1.9
Ovarian tumours	0	3	3	1.9
CNS tumours	1	1	2	1.2
Total	**95**	**64**	**159**	**100**

Furthermore, additional details were published as **"Pattern of Childhood malignant tumours at a Teaching Hospital in Kano Northern Nigeria. A prospective study. (Indian J Cancer; 2014; 55: (3): 259 – 261.).** A follow up to this research was a comparative study and data sharing with researchers from Obafemi Awolowo University Teaching Hospital, Ile-Ife. **"Pattern of Childhood malignant tumours in two tertiary Hospitals in Nigeria. A comparative study. (Nig J Paedtr 2013: 40: 175 – 178.).** Another work on an aspect of sickle cell disease done by our team which followed a number of sickle cell anaemia to determine the fate of the spleen in children over the years. This was achieved by use of ultrasound examination and was published as: **Ultra sonographic spleen size and Haematological parameters in children with sickle cell anaemia in Kano Nigeria. (Nig Post Grad Med J 2014. 21: (2): 165 – 170).** We also had a study on childhood asthma as seen in Kano, establishing the socio-demographic and clinical characteristics of asthmatic children at Aminu Kano Teaching Hospital Kano. Nigeria. **(Nig J Paedtr. 2014; 41. (4):360 – 364.** Another aspect of this study was to link asthma as seen in the study with the C-reactive protein, a marker of allergy. **Plasma high sensitivity C-reactive protein in children with asthma seen at Aminu Kano Teaching Hospital, Kano. (Sub-Saharan African J Med. 2014. 1; (3):40 – 44**). Our group also had a cursory look at paediatric HIV infection in Kano resulting in the mapping of the clinical picture. Paediatric HIV in Kano, Nigeria. (**Nig J Clin Pract. 2013. Oct – Dec: 16. (4): 521 – 525.)**

Sojourn into Sickle Cell Disease and Cancer research

Every practicing paediatrician in this country must encounter sickle cell disease in all its ramifications. Sickle cell disorder (SCD) is the commonest inherited disorder in tropical Africa. Nigeria, being the most populous country in Africa contributes about half of the estimated 300,000 newborn babies with SCD annually. Sickle cell disease occurs when an individual inherits the variant sickle haemoglobin (Hb S) from one parent and another variant Hb from the other parents. The inheritance of Hb S from both parents i.e. Hb SS is referred to as sickle cell anaemia and is the commonest and most severe form of SCD. Thus, SCD includes HbSS Hb SC, Hb Sβ thalassaemia. Hb CC also occurs and although it is without Hb S, it is also an inherited Hb disorder which we should learn to recognize and attend to.

Haemoglobin and Variant Haemoglobin

Haemoglobin is the bright red iron containing protein within the red blood cells. It is responsible for carrying oxygen from the lungs to all body tissues and for carrying carbon dioxide back from all parts of the body to the lungs. The two major human haemoglobins (Hb) are:

1. Adult haemoglobin (Hb A) in grown-ups.
2. Foetal haemoglobin (Hb F) in unborn and new-born children.

Foetal haemoglobin (Hb F) which is present at birth is replaced within the first year of life. Normal humans have very low level of Hb F and of Haemoglobin A2 (Hb A2). There are over 1000 variant haemoglobins, most of which don't make any significant clinical impact.

Sickle Cell Haemoglobin (Hb S)

Sickle cell haemoglobin is very common in sub-Saharan Africa. It is also known to exist in the Mediterranean region and the Arabian Peninsula. Sickle cell haemoglobin exists where malaria infection is prevalent now or in the past. The hypothesis was that healthy carriers of sickle cell gene (Hb AS) are protected from death due to malaria and thus survive to pass the gene to their offspring. People with normal haemoglobin Hb AA easily succumb to malaria especially in childhood.

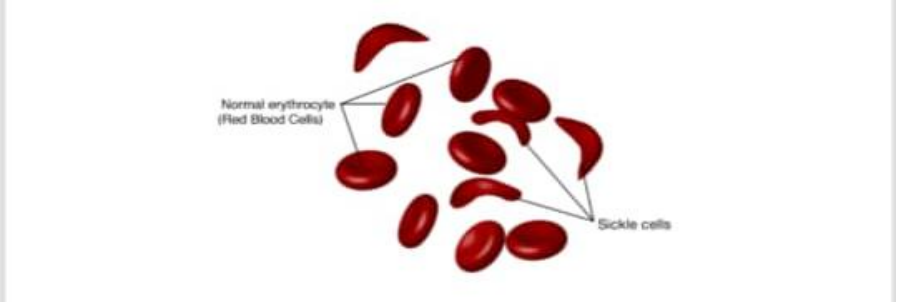


Figure 3: Normal red cell & Sickle Cells in the Circulation

Sickle cell disorder (SCD) occurs when Hb S gene is inherited from one parent and either another Hb S gene or another variant gene such as Hb C or beta thalassaemia (β-thal) gene is inherited from either parent. The commonest form of SCD in Nigeria is Hb SS, followed by Hb SC and the Hb βthal. Much has been written about sickle cell disease and its epidemiology in Nigeria. It is known that as much as 20 to 30% of Nigerians carry the Sickle Cell gene. The impact of sickle cell disease can be found in every family in Nigeria. This can be glanced from the names given to sickle cell disease in the prevalent Nigerian languages, Hausa refer to it as "Amosanin kashi" in Yoruba it is "Ibinu ala or Ibinu alaifo "and "Akwukwo uda" in Igbo language. The impact is profound with individuals suffering from severe pains, profound anaemia, chronic infections, malaria and major complications like stroke and Acute chest syndrome. This high prevalence of sickle cell disease has significant social and economic costs, not just from the fortunes families spend to take care of their frequently sick members with sickle cell disease, but also from lost economic opportunities due to frequent hospitalization, work absences due to recurrent ill health and inability to be optimally productive. We have referred above to some of the primary research done on this condition in the various centers we worked. Newer efforts to prevent sickle cell disease in Nigeria of recent include premarital testing for genotype between prospective couples and newborn screening. The program of premarital testing is already yielding fruits, with many religious and even secular authorities insisting on seeing the laboratory results of the genotype of the couple before formally tying the knot of marriage. Newborn screening has been launched in selected states of the federation by mostly international haemoglobin research groups working in Nigeria. The SCORE foundation was one such group carrying out newborn screening in Kaduna, Plateau, Niger and Katsina States. This screening requires the use of High Performance Liquid Chromatography (HPLC) machine with its attendant costly reagents. At this time this is too expensive for the average Nigerian. Apart from these interventions, public health initiatives through genetic counselling and education campaigns on radio and social media and face- to – face communication are continuing and yielding positive results. Overall, sickle cell disease remains a major health challenge in the country. Continued efforts to improve diagnosis, treatment and management of the condition especially at primary health care and secondary centers are continuing. The Sickle Cell Foundation Idi- Araba, Lagos was the pioneer Non-governmental organisation to initiate systematic campaign on the epidemiology, management and genetic counselling for Sickle Cell Disease across Nigeria. These pioneering efforts were done by the vision and focus of a single individual, Professor Olu Akinyanju a now retired professor of Medicine, Haemato-Oncology at the University of Lagos. The Sickle cell foundation is on the verge of starting a Bone Marrow Transplant at their facilities in the Lagos University Teaching Hospital within this year 2024. (successful bone marrow transplant was carried out).

Goals in the Management of Sickle Cell Disease

The goals of management of Sickle Cell Disease is to improve the quality of life, improve survival and life expectancy of sufferers. This is achieved by the team work of doctors, nurses, social workers and administrators in the formal setting of hospitals, clinics and health centers.

Objectives of Clinical Management of Sickle Cell Disease

- Maintain a steady state of health
- Prevent or greatly reduce the frequency of crises and complications
- Treat crises and complications promptly and effectively
- Promote a healthy lifestyle and a positive self-image

Maintaining steady health entails preventive measures of administering vaccines and drugs as scheduled in the first year of life as well as specific vaccine that were demonstrably effective in preventing infections. The drug oral penicillin V was in early 80's in a clinical trial shown to prevent the most common infections affecting children with sickle cell anaemia. The trial was abandoned as oral penicillin V was shown to have significantly reduced morbidity and mortality among recipients of oral penicillin compared to the cohort that were given placebo. Oral penicillin is now recommended for children initially up to the age of nine years, but subsequently based on evidence recommended for life. **(Gaston MH, et al 1986; Falletta JM et al 1995)**. Sequel to the success of daily oral penicillin v administration routinely in SCA patients further work was done to identify the top most bacteria causing infections in the patients. Haemophilus influenzae type B, Streptococcus pneumoniae and staphylococcus aureus were identified. A vaccine against H. Influenzae and S. pneumoniae was developed. Both have proven very effective in preventing infection in sickle cell patients and are now administered routinely to all patients. Maintaining good health also entails paying attention to good food and regular exercises within the tolerance limits of the patient.

Prevention and reducing frequency of crises and complication are achieved through counselling, information sharing and advise on healthy living. These are largely attained through regular contacts in the clinic and sharing information brochures. Sickle Cell Anaemia patients are taught to recognize early signs of impending crises and to do what is necessary to avert a full scale crisis.

Treatment of acute crisis and prevention of complications remains the focus of frontline doctors at most health institutions. This is achieved through development of evidence – based treatment guidelines and protocols that all health workers adhere to. To this end, our team at Aminu Kano Teaching hospital, Kano had protocols for management of SCD and prevention of complications. Further research into the genesis of severe complications like Acute cerebral syndrome were carried out by research teams from the United States and Aminu Kano Teaching Hospital, where the application of Transcranial Doppler to detect blood flow into the middle cerebral artery and its velocity was linked to

predicting who would get a stroke in the coming few months. Furthermore, the researchers looked into the use of hydroxyurea, a key antimetabolite drug at various doses to prevent stroke in those identified with increased velocity by the Transcranial Doppler studies. The results delivered in the last few years have become a powerful tool in the prevention of stroke in children with SCD.

Promote a healthy lifestyle and a positive self-image. Much has been achieved in this respect with counselling of families and patients over the years. The production of information brochure and use of the mass and social media has ensured good education available to all sickle cell sufferers. Dietary advice and sticking to advise to avoid extreme weather have all helped in that regard. Most of what was made available to families and patients was based on pain staking research and evidence. The new social media however is a double edged sword. There is little control of what is posted on social media. this has the effect of spreading false and misleading information as well as fake claims of cure by opportunists.

The joint research by Vanderbilt University and our team at Aminu Kano Teaching Hospital with Professor Shehu Umar Abdullahi as co-principal investigator with Professor Michael. R. DeBaun addressed the key issue of one of the dreaded complications of sickle cell anaemia, namely stroke. For so long, the only known remedy was a monthly or more frequent blood transfusion to keep the amount of circulating HbSS to below 30%. This was easily attainable in western countries with highly organized healthcare delivery systems. It was however nearly impossible in our country where blood donation is the exception and often families have to donate blood for their relations at the point of transfusion. Other challenges of monthly blood transfusion include inadequate blood supply, costly reagents and blood bags, unsafe transfusion practice and a high probability of blood-borne infections. Stroke prevention is a key issue in the management of sickle cell anaemia. This is because of the very high incidence of stroke among children with SCA. The Spring trial of Hydroxyurea for primary stroke prevention in children with Sickle cell anaemia in Nigeria came up with some actionable conclusions. Transcranial Doppler Velocity (TCD velocity) is a surrogate marker of stroke prevention. Hydroxyurea was associated with reductions in TCD velocities over time. It was established that low dose (10mg/kg) and moderate dose (15 to 20mg/kg) Hydroxyurea therapy had similar primary stroke incidence rates. The conclusion from the SPRING trial was that for children with abnormal TCD velocities, no difference in the incidence rate of ischaemic strokes between low dose and moderate dose Hydroxyurea. Low dose Hydroxyurea has a neuroprotective effect, but higher doses of Hydroxyurea 25 – 30 g/kg decreases thus: -

- All causes of hospitalization
- Pain associated with a physician visit
- Home pain management

The trial has brought tremendous results that are now implemented across three states of Kano, Kaduna and Katsina where Hydroxyurea therapy has been instituted with State government funding assistance. The outcome of the research goes beyond simple application of a new drug to modify the consequences of SCD in a positive way, but went on to identify other vulnerabilities of SCD patients, their poor economic state and the fact of the existence of moderate to severe malnutrition among them due to those economic constraints.

Contributions in Paediatric Oncology

As pioneers in paediatrics in this part of the country, we had to do basic research and documentation of the state of child health in our locality. My first publication was an encounter with an amazing case of sudden loss of vision in a 10-year-old child, with no history of trauma or consumption of any drug or poison or herbal medications. This intrigued our consultant and as junior Registrars, we were challenged to determine what caused that loss of vision. The challenge was taken and the problem solved. This was published in the Annals of Tropical Paediatrics [**Burkitt's Lymphoma presenting as blindness: Ann. Trop. Paed. 1990,10; 319-322].** At the Teaching Hospital in Sokoto, there wasn't any systemic study of childhood illnesses in the late 80's and thus nothing to fall back on. Our earlier contributions in that respect was to profile the common morbidities and the outcome of their management. Next was to determine the contribution of various aspects of childhood illnesses to morbidity and mortality. The Burkitt's' lymphoma as seen in children in Sokoto was published in the Nigerian Journal of Medicine. [***Nig. J Med. 1998;7. (3) 115 – 119].*** This was the first published report of this childhood malignancy from Sokoto. It detailed the clinical picture of BL as seen in this new academic and clinical territory. Furthermore, we looked at some aspects of childhood illnesses that were new to the environment but related to the haematopoietic system. We detailed the incidence of stroke in childhood and the aetiology. Up to that time, stroke was perceived as an adult disease largely from atherosclerosis and high blood pressure, two pathologic conditions not seen commonly in children. What we found was that, stroke was not uncommon in children in Sokoto. But, the aetiology was largely from sickle cell disease. Survival was fair though with some residual disabilities. The early years in Sokoto University Teaching Hospital were hampered by the very severe shortage of academic staff and complete absence of a resident pathologist and haematologist. Almost every biopsy taken and every tissue removed had to be transported to neighbouring Ahmadu Bello University Teaching Zaria for histopathological examination. At that time also, there was no radiologists on ground and the Hospital had to do with a visiting Radiologist from the University of Ilorin Teaching Hospital and a Haematologist from the University of Nigeria Teaching Hospital, Enugu. Those were the days of safe travel across the country. We have earlier in this lecture covered the aspects of paediatric oncology we were able to study and document at Aminu Kano Teaching Hospital over the course of the last decade. What is cancer and how common was it among children?

Cancer is poorly understood by people in our community. Because of its ubiquitous manifestations, it is often associated with evil spirits and supernatural forces. This is largely a function of the level of literacy in society. What then is cancer and how does it manifest in the child?

Cancer is a group of diseases characterized by uncontrolled growth and spread of abnormal cells. These abnormal cells can invade and destroy healthy tissues. They can also spread to other parts of the body to cause serious malfunction or destruction of the invaded tissue or organ, a process known as metastasis.

How does cancer develop?

To understand how cancer develops, it is necessary to learn about cell biology.

The cell is the basic building block that makes up all living things. The human body is composed of cells.

All cells in a human body have their own carefully controlled life cycle.

Cancer occurs when the control of this cycle goes wrong leading to unregulated growth of a group of cells which can spread and damage other structures in the body.

The cell nucleus holds the DNA that contain the genetic code.

Cancer is caused fundamentally by damage to the DNA leading to abnormal unregulated growth of cells.

All cells in the human body share the same DNA code.

The DNA is clustered into long strands called chromosomes. There are 23 pairs of chromosomes in each human cell.

Within each chromosome, the DNA is arranged in genes, each coding for a single protein.

We can think about genes and chromosomes as being like a library of books, with each of the 23 chromosomes an individual volume and each of the 21,000 genes as a page of instructions in that volume.

It is easy now to see conceptually how damage to a page of instructions can lead to alterations in the properties of a cell.

In 2000, two leading cell biologists, Douglas Hanahan and Robert Weinberg, published a seminal paper entitled "The Hallmarks of Cancer" summarizing the changes that are both necessary and sufficient to produce a cancer. These are: -

1. Self-sufficiency in positive growth signals
2. Lack of response to inhibitory signals
3. Failure to undergo 'programmed cell death' to eliminate faulty cells
4. Evasion of destruction by the immune system
5. The ability to grow in and destructively invade other tissues
6. Ability to sustain growth by generating new blood vessels

Cancer results from damage to the DNA, leading to the changes described in the previously.

All agents that damage DNA are therefore potential carcinogens.

Mutations in different set of genes would be necessary to cause the hallmark changes described by Hanahan and Weinberg

Studies by Dr. Vogelstein's group (pre-malignant condition to outright cancer) showed it is possible to identify candidate genes that need to be damaged for each step in the cascade to occur.

What is inherited in such cases is a greatly increased risk of developing a disease early, often in a florid and aggressive manner.

Study of these "cancer families" helped identify key cancer related genes such as that of adenomatous polyposis coli APC or gene for, RB (linked to retinoblastoma, a childhood eye tumor).

The non-inherited cancers worldwide are responsible for most cancer deaths arising from the lungs, stomach, liver, colon, breast and prostate.

Of these cancers, lung cancer is strongly linked to cigarette smoking and liver cancer to hepatitis B virus infection, with a significant role for alcohol consumption. Cancers of the digestive tract are presumed to be linked to diet. Likewise breast cancer and prostate cancer are clearly linked to diet and hormonal factors.

At the beginning of the last century, cancer was thought to be uncommon in children in Nigeria.

With the establishment of the University College Hospital Ibadan in 1948 and the presence of pathologists, cases of cancer in children began to be encountered.

By the mid-70s reports of childhood malignancies abound from the first teaching hospital in Northern Nigeria, the Ahmadu Bello University Teaching Hospital, Zaria.

A prospective study of childhood malignancies over a 5-year period at Aminu Kano Teaching Hospital revealed a high incidence of cancer in children as shown in the following Table:

The worldwide incidence of cancer varies by region and age groups. Globally, there were estimated 20 million new cases of cancer in 2022 with 9.7 million deaths. The estimated number of people who were alive within 5 years following a cancer diagnosis was 53.5 million. About 1 in 5 people develop cancer in their lifetime, approximately 1 in 9 men and 1 in 12 women die from the disease. The global cancer burden according to WHO indicated that lungs, breasts and colorectal cancers are the three major cancer types in adults. Lung cancer was the most commonly occurring cancer worldwide with 2.5 million new cases (12.4%). Female breast cancer ranked second with 2.3 million cases (11.6%) followed by colorectal cancer 1.9 million new cases (7.3%), prostate cancer 1.5 million cases (7.3%) and stomach cancer 970,000 cases (4.9%).

Cancer in Children

Worldwide, an estimated 400,000 children and adolescents (aged 0 – 19 years) are diagnosed with cancer annually. There are obvious under reporting especially from developing countries because of manpower and infrastructural inadequacies. Leukaemia, lymphomas and brain cancers are the most common types, however, this varies with the region. In Kano, lymphomas, leukaemia and retinoblastoma are the most commonly encountered childhood malignancies. Diagnosing cancer in children is often straightforward because of late presentation in this environment due to various factors, such as poverty, illiteracy, ignorance, presence of highly active traditional medicine practitioners and quacks as well as poor diagnostic facilities in our health institutions. Causes of childhood cancer varies; from inheritance, to genetics to arthropod borne viruses, to exposure to hazardous agents in the environment and even poor diet. The International Agency for Cancer Research (IARC) have examined the effects that both antenatal and postnatal nutrition may have on a child's risk of developing acute leukaemia by examining the diets of mothers before the birth of their child and the diets of children during the first few years of life. They noted that regular consumption of fruits and supplementation with folic acid during pregnancy are two factor that may offer protection against the development of acute leukaemia in children. In this systemic review, this group of researchers also noted a possible association of maternal consumption of coffee and or caffeinated beverages with an increased risk of childhood acute leukaemia. The World Health Organization currently recommend that pregnant women with a high daily caffeine intake (more than 300 mg per day) should lower their daily caffeine intake during pregnancy. This is to reduce a known risk of pregnancy loss and low-birthweight neonates. What was apparent in our study of cancer in children in Nigeria, particularly in Sokoto and Kano, was that childhood cancer was highly prevalent and responsible for the death of a significant number of children. The pattern of childhood cancer observed over a period of five years and the comparative figures for OAUTH Ile-Ife are shown in the Tables:

Cancer Incidence at Aminu Kano TeachingHospital:

CANCER INCIDENCE IN CHILDREN IN AKTH JULY 2003 TO JULY 2008

Diagnosis	Frequency		Total	percentage
	Males	Females		
Burkitt's lymphoma	27	22	49	30.8
Retinoblastoma	14	11	25	15.7
Nephroblastoma	9	10	19	12.0
Acute lymphoblastic leukaemia	17	nil	17	10.7
Non Hodgkin's lymphoma	6	9	15	9.4
Neuroblastoma	8	3	11	6.9
Acute myeloid leukaemia	3	5	8	5.0
Hodgkin's lymphoma	7	nil	7	4.4
Rhabdomyosarcoma	2	1	3	1.9
Others (CNS, Ovarian)	2	3	5	3.2
Total	95	64	159	100

PATTERN OF CHILDHOOD CANCERS IN KANO AND ILE-IFE OVER A 10 YEAR PERIOD(2001 – 2010)

Type of cancer	AKTH Kano	OAUTH Ile-Ife
Lymphoma	194	339
Burkitt's lymphoma	122	301
Non-Hodgkin's lymphoma	46	13
Hodgkin's lymphoma	26	25
Retinoblastoma	61	45
Acute leukaemia	60	72
Nephroblastoma	44	38
Neuroblastoma	21	18
Rhabdomyosarcoma	11	17
Nasopharyngeal cancer	3	4
CNS tumour	5	3
Teratoma	1	3
Bone tumour	Nil	24
Others (CML, Hepatic tumor)	10	5

The figures for childhood cancers observed in Kano were compared to the cancer incidence reported from Obafemi Awolowo University Teaching Hospital, Ile-Ife.

What was obvious was the high incidence of lymphomas in both institutions followed by retinoblastoma and leukaemia.

The team also discovered that, cancer in children was strongly linked to parental income, education and social class. This did not come as a surprise as healthy living and health seeking behaviour is determined by education and income. The

family diet which may influence some forms of cancer as well is a function of the family income.

PARENTAL SOCIAL CLASS IN RELATION TO CANCER IN THEIR CHILDREN

Social class	AKTH Kano	%	OAUTH Ile-Ife	%
I	18	4.3	49	8.6
II	22	5.5	60	10.5
III	38	10.9	127	22.4
IV	94	22.9	185	32.6
V	23	56.4	147	25.9
Total	410	100	568	100

The Oyedipe classification for social class was applied to these families.

Cancer appears to afflict children from families with low socio-economic status both in Kano and Ile-Ife, with majority of cancer victims in Kano (79.3%) from very poor socioeconomic background with only (9.8%) from families that were educated and in the middle to top income range.

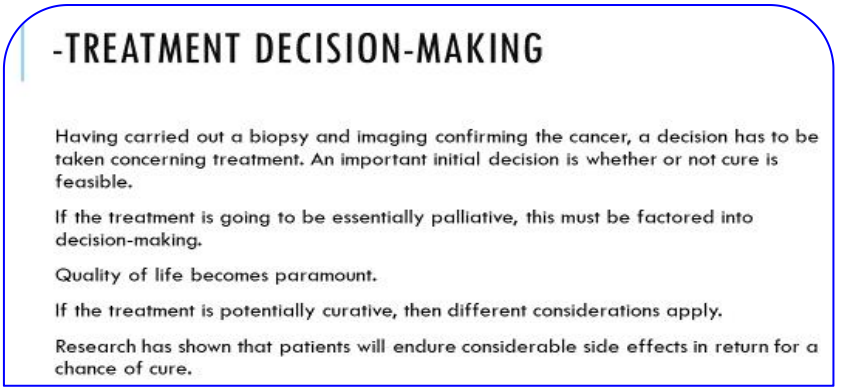
In Ile-Ife, 58.5% of the children were in the lower social class and 19.1% from educated families in the middle to top income range.

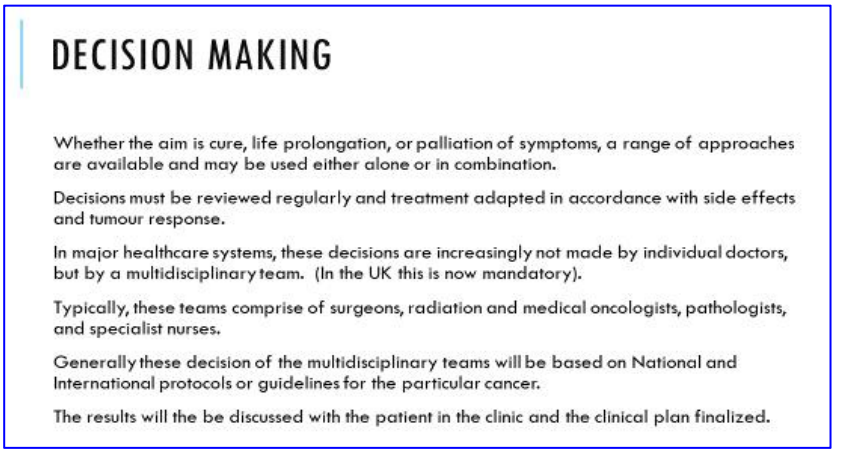
These findings were statistically significant and confirmed earlier observations by researchers, that childhood malignancies targets children from the lower rung of society.

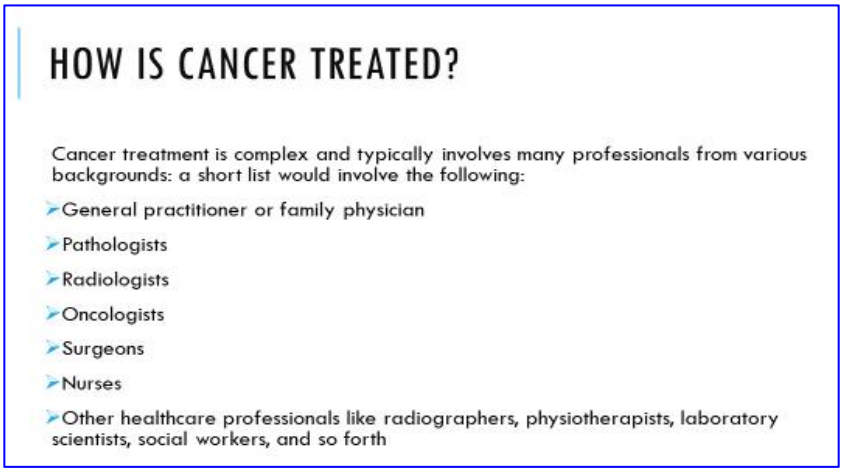
BURKITT'S LYMPHOMA BEFORE CHEMOTHERAPY

Treatment of Cancer

So much progress has taken place since the last century to the present date. 100 years ago, cancer is considered incurable and more or less a death sentence. That is no longer the case with the advances of the sciences, cancer can be detected very early and measures taken to treat it. Cancer treatment is complex and involves several specialists, from establishing the diagnosis to actual administration of treatment. This would include pathologists, radiologists, nurse practitioners, pharmacists, occupational therapists, social workers, physiotherapists and many more. Diagnosis of cancer is based largely on symptoms at presentation and confirmation by obtaining a small piece of tissue of the affected organ, which is called biopsy. Imaging by radiologists and additional laboratory tests are carried out to establish among other variables the STAGE of the cancer. The latter would guide the attending doctor of the choice of treatment and weather it would be for a total cure or just palliative treatment to prolong life by a few years. The primary question for the pathologist is to decide "Is it cancer?" if the answer is yes, he now decides the specific type and in what organ of the body did it start and at what stage it is. Molecular markers are also used in the modern classification of cancers. Molecular markers are characteristic features based on excessive level of a particular markers either in the tumour itself or circulating in blood. Or sometimes in urine. These are not generally available in our hospitals as yet.







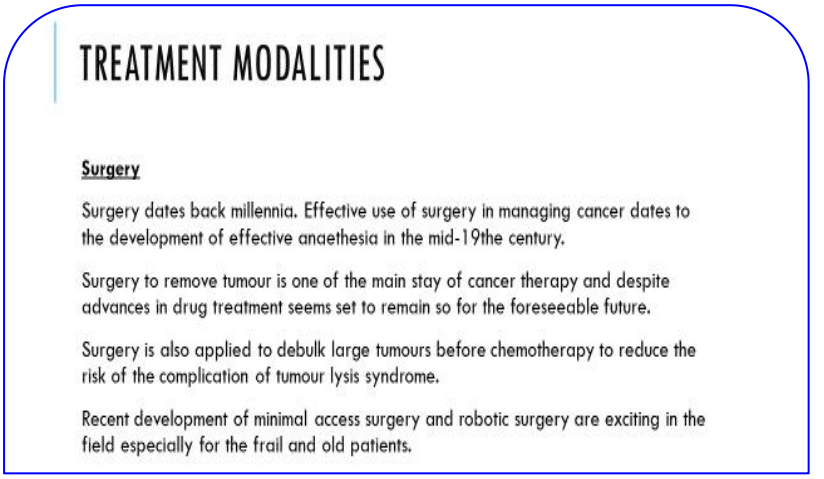
Treatment decision making is generally based on four approaches or a combination of them.

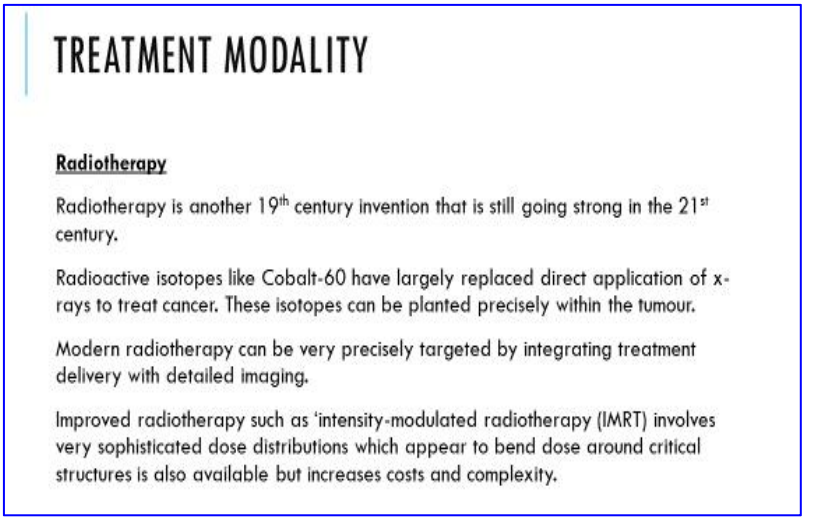
- Surgery
- Radiotherapy

- Chemotherapy
- Hormone therapy

An important initial decision is whether or not cure is feasible if treatment is meant to be essentially palliative, this must be factored in the initial decision making. At that point, quality of life going forward become the paramount consideration. In our practice in Kano, only two primary treatment options are routinely available in childhood cancer therapy. These are surgery and chemotherapy. The results have been a mixed bag because of the reality of poverty among families of childhood victims of cancer and late presentations. I have alluded to the poor outcome in most cases, with a five-year survival below 30% in our environment.

Surgery:





TREATMENT MODALITY

Hormone therapy

Hormone therapy for cancer dates back to 1940's following observations made by Charles Huggins an American urologist on patients with prostate cancer.

The parent tissue from which prostate cancer or breast cancer developed needed normal hormone to thrive. Removal or blocking this hormone by castration or administration of female sex hormone dramatically results in rapid response and shrinkage of the tumour and the associated symptoms. However these endocrine effects would last only 1 or 2 years with the disease recurring.

This has lead to development of a whole range of hormone-based medications for both prostate cancer and breast cancer in particular.

One of these drugs the oestrogen blocker tamoxifen is probably responsible for saving more lives than any other anti-cancer drug.

TREATMENT MODALITY

Chemotherapy

Chemotherapy covers a wide range of different agents with diverse origins from plant extracts to antibiotics to synthetic chemicals based on DNA.

All chemotherapeutic agents interfere with the mechanics of cell division. As many tissues have dividing cells, this leads to the typical side effects of nausea and vomiting and hair loss(damage to hair follicles) and risk of infection (damage to production of white cells needed to defend against infections).

TREATMENT MODALITY

Chemotherapy drugs came from a variety of sources. Plant extracts (vincristine, docetaxel, paclitaxel), complexed heavy metals (cisplatinum, carboplatin), and antibiotics (doxorubicin, mitomycin). Others are compounds derived from DNA components like 5-fluoro-uracil derived from uracil.

Although most tumour types will respond to chemotherapy to a degree, sadly most major cancers have proved to be more resistant to chemotherapy, with cures elusive.

Chemotherapy has also been used as adjuvant therapy after surgery and radiotherapy to handle undetectable micro-metastasis.

More recently, greater emphasis has been placed on the role of chemotherapy in palliation of symptoms.

TREATMENT MODALITY

Monoclonal antibodies

In the 1970s, technology was developed to exploit the ability of the immune system by manufacturing antibodies against 'artificial targets' such as cancer cells. These engineered targeted antibodies are called monoclonal antibodies- antibodies made by a single clone of cells and can be made to stick to pretty much any chosen target.

By picking targets on cancer cells, these natural molecules can be used both as an aid to imaging by linkage to radioactive chemicals, or simply as treatment in their own right.

Initially it was thought monoclonal antibodies would be the magic bullet that would eradicate advanced cancer by being custom made for each tumour.

The reality proved to be less dramatic. But, they are making a come back in increasing numbers. The best known monoclonal antibody is trastuzamab ((Harceptin).

TREATMENT MODALITY

Targeted molecular therapy

With the sequencing of the entire human genome, the possibility of using this development to benefit humanity became clear.

As more genes were cloned, it became possible to map the genes that are abnormal in cancer cells. Once a key gene is identified, it became possible to design drugs that target the abnormal gene.

A successful drug that targets an abnormal gene is the anti leukaemic drug imatinib Glivec) in childhood CLL characterized by the presence of the Philadelphia chromosome. It brought about prolonged remission, though unfortunately this was not permanent.

TREATMENT MODALITY

Drugs used for symptom control

These drugs though not targeting the cancer cells, have contributed greatly in the success of cancer treatment.

1. anti 'sickness" drugs

2. granulocyte colony stimulating factors (G-CSF) boasts white blood cell counts, reducing risks of infection. A second related product called GM-CSF (granulocyte-macrophage colony stimulating factor) initially developed for the same purpose has turned out to have a valuable role in releasing blood cell precursors called stem cells into circulation.

THE ECONOMICS OF CANCER CARE

There are extensive investments in new treatments by both drug and equipment manufacturers. New treatments must be paid for and in general will cost more than the older technologies they replace.

Economics impinges on cancer care at a more macroeconomic level than the cost of individual drugs.

In general, the developed economies of the world have a comprehensive healthcare systems that broadly cover health issues from cradle to the grave.

In developing countries even basic infrastructure is lacking. Whether or not to buy an expensive new drug is not even part of the discussion and is not relevant to most of the population.

What then can we do to cancer patients that are mostly poor?

ALTERNATIVE AND COMPLIMENTARY APPROACHES TO CANCER CARE

Steve Jobs, the famous co-inventer of APPLE died of pancreatic cancer. He was said to have moved from a conventional hospital to alternative care and complimentary medicines.

Research shows that at least half of cancer patients in developed countries use complementary or alternative medicines in addition to conventional medicine.

We do not have the figures for our patients in Nigeria, but one would suspect that most of them have used alternative medicines before showing up in our hospitals.

Complimentary medicines are those used along with conventional therapies as a form of support.

ALTERNATIVE AND COMPLIMENTARY APPROACHES TO CANCER CARE

Alternative medicines are aimed at replacing the mainstream treatment with one that modern conventional medicine would regard as unproven at best or harmful at worst.

There are a large number of different alternative and complementary medicines, including homeopathy, acupuncture, dietary therapies, herbal therapies, aromatherapy as well as several African traditional medicines from different ethnic nationalities.

These medicines are untested and unregulated. No regulation applies to them. No test of efficacy.

The practitioners of these therapies are not subjected to basic rules. The purveyors of these medicines appear to believe that they work and their patients likewise.

Alternative and complimentary medicines are therefore in reality more akin to religion than science. This goes a long way to explaining their apparent immunity to the law, as religion itself enjoys the same degree of legal privileges.

The tragedy of Childhood cancer in Nigeria and particularly in the far North is that it affects the least educated and the most impoverished among the citizens. There is strong evidence that literacy leads to better health seeking behaviour and thus leading to early diagnosis of the cancer. Education also enhances the family income and spending habits. This invariably leads to better nutrition for the family, better immunity and less likelihood to contract infections that may lead to malignant transformation. Unfortunately, poverty has spread among our citizens like wildfire since the advent of democracy. Feeding one's family is now becoming a challenge to the vast majority of the citizens of the country. Childhood malnutrition is evident. The percentage of stunted children in our North –West region has now reached a staggering 56% as against the National average of 34% according to data released by the National Bureau of Statistics (NBS) arising from the 2022 National survey.

The First Bank Chair Endowed to the Department of Paediatrics

The First Bank of Nigeria endowed a Chair in Paediatrics, which was competitively won by our team at Bayero University in 2006 and I was inaugurated as the Chair occupant of First Bank Professorial Chair in Paediatrics. I submitted a research proposal to look into "***The prevalence of Bacteraemia among febrile children admitted to Aminu Kano Teaching Hospital, Kano".*** The Board of Trustees of the Chair however asked that we conduct collaborative studies with a University Teaching Hospital in the Southern part of the country to enable us have a complete picture of bacteraemia in febrile children in Nigeria. The background to this research was that Nigeria has one of the highest child mortality rates in the world. The under –five mortalities for 2006 was 191 per 1000. Nigeria is also among the top ten countries contributing to child mortality and the highest risk of child death in the world. Nigeria also has the highest number of newborn deaths, with over 250,000 deaths annually. Infectious diseases directly contribute to 32% of child death and 25% of neonatal deaths. A research to determine the bacterial agents of these infections and their antibiotic sensitivity will contribute greatly towards attaining the Millennium Development Goal 4, (MDG 4), whose main outcome is reducing under-five mortality by two-thirds by 2015. The findings from the study would facilitate the evolution of effective treatment regimens for infective disorders in the newborn and child. For the component of the study in the South, I collaborated with Professor O. T Adedoyin of the Department of Paediatrics, University of Ilorin. Though Ilorin is politically in the North, it is geographically in the south of the country.

The research findings at Aminu Kano Teaching Hospital from 355 children aged 0 – 12 years whose blood culture was obtained. 17 were excluded due to incomplete data or contamination of the samples. Bacterial isolates were obtained in 114 and no isolates in 201 specimens. The prevalence of septicaemia among febrile children was 35.8%. The commonest isolates were E. coli 40/114 (35.1%) followed by Staphylococcus aureus 31/114, Salmonella 9/114, Klebsiella specie 8/114, coliforms 7/114. Others were Streptococcus pneumoniae 5/114, Proteus vulgaris 4/114 and Proteus mirabilis 4/114. The pattern of bacteraemia by age

group revealed that in the first month of life, 42.1% of all infections was caused by Staphylococcus aureus. Gram negative organisms notably E. coli and non-typhoidal salmonella are each responsible for 15.8% of neonatal infections. In the post neonatal period, Staph aureus 26.7% and Streptococcus Pneumoniae 20% take first position with E. coli 33.5%, Proteus vulgaris 13.3% and Coliforms 6.7% make up the rest. For the age group 1 – 5 years, Gram positive organisms (S. aureus and S. pneumoniae) together are responsible for 25.9% of infections while Gram Negative E. coli, Salmonella and Klebsiella are largely responsible.

Antibiotic sensitivity showed that the Gram Positive S. aureus was largely sensitive to oflaxacin (99,5%) ciprofloxacin (96.2%) cefuroxime (75,5%) cloxacillin (59.2%) and augmentin (51.8%). Sensitivity to gentamycin was 67.9%. s. aureus was resistant to cotrimoxazole, erythromycin and penicillin at 75%, 54.9% and 75.7% respectively. S. pneumoniae was sensitive to ceftazidime (97%), cephalexin (88.9%) cefotaxime (88.5%) and augmentin (68%). It was resistant to cotrimoxazole, gentamicin and penicillin at 65%, 45% and 67% respectively. Gram negative isolates showed sensitivity to oflaxacin, nitrofurantoin, gentamicin and ceftazidime at 95.5%, 90.7%, 86.7% and 91% respectively. The resistance to penicillin was 83%, augmentin 76.2%, cotrimoxazole 83.9%, tetracycline 65% and amoxicillin 45.7%.

On the basis of this research, we recommended the use of antibiotics in this region as follows.

Table: Recommended antibiotic usage for common bacterial infections in Kano and surrounding States

Age Group	Commonest Isolates	1st Choice antibiotic	2nd choice antibiotic	3rd choice antibiotic
0 - 28 Days	S. aureus E. coli Salmonella spp	Ceftazidime Ceftriaxone + Gentamicin Amikacin	Ciprofloxacin Augmentin Ampiclox + Gentamicin	Cloxacillin Penicillin Chloramphenicol + Gentamicin
1 - 12 months	S. aureus E. coli S. Pneumoniae	Ceftazidime Ceftriaxone Ampiclox/Augmentin + Gentamicin Amikacin	Amoxicillin Oflaxacin Penicillin G + Gentamicin	Chloramphenicol Ampicillin Cotrimoxazole + Gentamicin
1 – 5 years	S. aureus E. coli Salmonella spp	Ceftriaxone Augmentin Ampicillin Ciprofloxacin	Cefotaxime Chloramphenicol Oflaxacin	Penicillin Cotrimoxazole Cefixime +

	S. pneumoniae	+ Gentamicin	+ Gentamicin	Gentamicin
> 5 – 10 years	S. aureus E. coli	Ceftazidime Ampiclox Augmentin + Gentamicin	Cefotaxime Chloramphenicol Oflaxacin + Gentamicin	Cotrimoxazole Ampicillin Ciprofloxacin + Gentamicin

From the Ilorin study centre, 288 blood cultures specimen were successfully analysed with 115 positive cultures and 173 with no growth. The prevalence of septicaemia among febrile patients was 38.2%. the most common bacterial isolates were Staphylococcus aureus 63/110 (57.3%) followed by Salmonella typhi 14/110 (12.7) Staphylococcus epidermidis 9/110 (8.2%) Staphylococcus saprophyticus 7/110 (6.4%) and enterobacter 7/110 (6.4%). Out of the 110 bacterial isolates, 82 (74.5%) were gram positive, while 28 (25.5%) were Gram negative.

The sensitivity of Staph aureus to the antibiotics oflaxacin, ciprofloxacin, gentamicin and cefuroxime was 100%, 94%, 77.4% and 62.5% respectively. Its resistance to augmentin and cloxacillin was 55.9% and 68.8% respectively. The sensitivity of Salmonella typhi to Ciprofloxacin, oflaxacin, ceftazidime and augmentin was 100%, 81.8%, 75% and 71.4% respectively. The Gram positive organisms were more sensitive to oflaxacin (100%), ceftazidime (92%) and Oflaxacin (88%). The two antibiotics that cover both gram positive and negative organisms satisfactorily are ciprofloxacin and oflaxacin.

Table: Antibiotic sensitivity pattern of bacterial isolates from the Ilorin Study centre

Org	No	Aug (%)	Amo	Tetr	Gent	Oflox	Cipr	Cef	Cefta	Nitr	Clox
Staph-A	63	28 (44)	2(33)	19(29)	51(80)	63(100)	59(94)	53(84)	53(84)	-	20(31.2)
Salmon	14	12(85)	7(50)	4(28)	12(84)	11(81)	14(10)	13(90)	14(100)	8(58)	8(58)
Staph-E	9	9(100)	6(67)	6(67)	9(100)	9(100)	9(100)	9(100)	6(66)	-	6(66)
Staph-S	7	-	-	-	7(100)	-	7(100)	-	-	-	7(100)
Enter	7	2(33)	1(11)	4(50)	5(66)	7(100)	7(100)	2(28)	6(87)	5(73)	-
Pseud	3	2(67)	1(33)(	-	2(67)	3(100)	3(100)	1(33)	3(100)	5(73)	-
Citro	3	2(67)	1(33)	-	1(33)	3(100)	3(100)	1(33)	-	1(67)	-
E.coli	1	-	-	-	1(100)	1(100)	1(100)	1(100)	-	-	-

Key: Aug- Augmentin, Amo-amoxycillin, Tet-tetracycline, Gent – gentamicin, Oflox- oflaxacin, Cipro – Ciprofloxacin, Cef –cefuroxime, Ceft-ceftazidime, Nitr-nitrofurantoin, Clox-cloxacillin, Stap A- staphylococcus aureus, Staph E-staphylococcus epididemis, Staph S-staphylococcus saprophyticus, Enter-enterobacter, Pseudomonas aeruginosa, Citro-citrobacter, E. Coli-Escherichia coli.

Bacterial infections are a significant cause of morbidity and mortality in the developing countries. Monitoring of the susceptibility pattern of the pathogens on a regular basis and surveillance of sensitivity and resistance pattern to antimicrobials is imperative. This is because the problem of bacterial resistance to antibiotics is a worldwide phenomenon. In our country, we face the double jeopardy of widespread distribution of fake and sub-standard drugs, which makes the job of a physician even more difficult to handle.

Fever which remains a common symptom of many childhood illnesses in Nigeria and across the world may be an early presentation of a bacterial infection as this study from Ilorin and Kano indicated. About a third of all febrile illnesses are caused by a bacterial infection. The leading causes of septicaemia among febrile children in Ilorin was Staphylococcus aureus and Salmonella typhi. A combination of quinolones and gentamicin is advised for empiric treatment is suspected S. aureus septicaemia while ciprofloxacin or ceftazidime would be most suitable for Salmonella typhi. There should be a high index of suspicion of septicaemia for all children with a febrile illness.

My Sojourn in the Field of Medical Education.

Mr. Vice Chancellor Sir, I have always taken interest in Educational methods and how teaching or pedagogy is conducted. In 1981 at the beginning of my journey in academics, the then Provost of the College of Health Sciences, University of Sokoto, Professor Frank Howarth, A British National sent me as a young staff of the College of Health Sciences, University of Sokoto to the University of Lagos to undertake a course run by the College of Medicine University of Lagos, named "**Educational Methods in Health Sciences**". The essence of the course was to teach lecturers in the Colleges of Health Sciences and Faculties of Medicine how to teach. The course opened my eyes to educational methods and the various approaches to teaching in lectures, small groups and bedside formats. It is unfortunate that the course has since been discontinued by the University of Lagos. At the end of my tenure as Chief Medical Director of Usmanu Danfodiyo University Teaching Hospital Sokoto in 2002, I applied for a sabbatical leave to attend the Postgraduate Diploma in Medical Education course at the University of Dundee, in Scotland. This was granted by the Board of Management of the Teaching Hospital, with late Jarman Kano Professor Isa Hashim as Chairman. I arrived the UK in January, 2003 and proceeded to the University of Dundee in Scotland to join the face to face course for the Postgraduate Diploma and Masters in Medical Education which share the same course contents. The Centre for Medical Education of the University of Dundee was a World Class Centre for Medical Education led by the renowned Medical Educationist, Professor Sir Ronald Harden. I met a class of postgraduate students from practically all continents of the world. The core of Medical Education is to train Medical personnel the art and science of teaching or pedagogy. The aim is to improve teaching and learning in medicine with the evident change in that wide area.

At the core of Medical Education are these topics:

- Teaching and learning
- Curriculum development
- Small group teaching
- Large group teaching
- Principles of assessment
- Assessment Instruments
- Quality assurance in Medical Education

Quality Assurance requires painful changes to what is observed to lead to poor outcomes. Change doesn't take place easily in higher education. Most teachers and professors have their methods engraved in stone and are exceptionally hard to change. In the United Kingdom, higher education changed in the 1990's due to the requirement of quality Assurance. The changes in Medical Education were also the outcome of the publication by the General Medical Council titled "**Tomorrow's Doctors"**. In the publication, the General Medical Council of Great Britain set out the expected qualities of a doctor and how that can be achieved by training institutions. The challenges facing medicine and medical education were emerging as follows:

1. Patients as consumers
2. Society in general
3. Practising doctors
4. Medical students

These challenges occurred as a result of changes in: -

1. Patients expectations
2. Healthcare delivery
3. Medical knowledge
4. Doctors availability and workload
5. Students' requirements

Patients' expectations have changed as a result of modern communications, availability of the internet and a more open society. Patients are no longer passive recipients of the doctors advise. They expect to be consulted and carried along in the management of their illness. The era of the all-knowing, paternalistic doctor of yore, is long gone. Medical educators must thus embrace the changes and impact them on their students. Society also expects accountability from those attending to its health matters and positions of privilege and responsibility as are medical doctors. The efficiency of a treatment must be known and the cost-effectiveness proven.

Healthcare delivery: In the past, individual doctors are responsible for the delivery of healthcare to a large group of people assisted by nurses and other ancillary health staff. This has changed with improvement in the number of

doctors especially in secondary and tertiary hospitals. Junior doctors as part of a team are constantly available in tertiary hospitals. To be noted also is the fact that professional boundaries are less rigid now than in the past. Nurses and other healthcare professionals have upped their knowledge and skills and are able to perform several functions reserved in the past for medical practitioners.

Change in Medical Knowledge: that medical knowledge has expanded by leap and bounds is evident in all aspects. Not only are doctors better informed, but the age of digital media and the internet have made medical knowledge available to practically anyone with an android phone or iPhone. The exponential growth of medical knowledge has made it imperative to redesign the curricula, remove old topics and introduce new ones in the curriculum. Appropriate contents and the integration of basic and clinical sciences is now an important aspect of the new curriculum. There has been changes too in the pattern of diseases seen in practice with an ageing population and change in the basic diet or food of the community, leading to the emergence of new diseases and degenerative diseases.

Changes in doctors' availability and workload: contemporary attitudes to work have changed and in many cases have resulted in less fulfilment of society's expectation of the doctor. In the past, individual doctors are more approachable to their patients but are now less inclined to give that personal service, especially in public hospitals. The pressure to deliver clinical services, engage in research and provide accountable training opportunities for trainees and medical students have made it more difficult for senior faculty members to focus on teaching. Junior doctors now engage is faster training modules and often emerge as certified specialists with limited knowledge and clinical experience and knowledge of clinical procedures.

Changes in students' requirements: it has been said that medical courses contribute to the disillusionment and demoralization of students by deadening their initial enthusiasm for medicine and failing to prepare them adequately for the diversity of problems which they will encounter as professionals (Godfrey 1991). Students' expectation of the quality and administration of undergraduate teaching are higher today than in the past. Unfortunately, the teacher attitude falls short of these expectations. Todays' students come from a wider range of social, ethnic, and economic backgrounds than previously, with greater variety in personal and academic achievements. All students study in the English language, which is unfortunately poorly taught in especially the public schools. This gives rise to challenges and difficulties in comprehending communication skills and in practising aspects of physical examination of the patient.

The response to these challenges by Medical schools was slow but steady with the results that:

- Development of new curricula incorporating new curriculum themes and different educational strategies

- The introduction of new learning situations and the use of new tools and aids to learning
- The introduction of new methods of assessment
- A realization of the importance of staff development structures

New curricula with new themes were developed in some of the older medical schools in Nigeria but not the newer ones. Many of these new medical schools simply copy and adopt the curricula of the old schools regardless of the timeliness. On my return from Dundee, I made an attempt to introduce what I have learnt and drive the process of developing a new curriculum for the Bayero University Faculty of Medicine in the College of Health Sciences by writing to the then Dean of the Faculty outlining my vision for a new curriculum in tandem with modern themes and with particular emphasis on communication skills. Examples of different curricula models include:

- Outcome based learning
- Problem based learning
- Task-based learning
- Core and student-selected components
- An integrated system based approach
- A spiral curriculum

Unfortunately, this didn't come to fruition.

The new learning situations and learning strategies: while lectures and bedside teaching retain a place, as a result of the societal changes and the changes in the circumstances of health personnel new learning situations have been introduced. Traditional clinical skills can be learned in contemporary healthcare situations and purposely set up clinical skills centres, ambulatory care and day surgery units. This provides an increase in opportunities for learning outside the traditional teaching hospital setting and increase opportunities for independent learning and in small group teaching events.

Information technology was available as a tool for accessing information and lifelong learning. Videos and self-videoing have been used to teach clinical skills, consultation techniques and to explore issues of attitude and behaviour. The use of study guides, and the use of computer assisted learning programmes and the internet have increased. The role of simulators and simulations is well recognized for training in aspects of physical examination and practical procedures at both undergraduate and postgraduate levels.

Assessment is at the heart of any training, be it professional or otherwise. Newer assessment methods that aim to remove subjectivity associated with past assessment methods were evolved. The Objective structured Clinical Examination (OSCE) which can test performance and competence in a wide variety of settings has largely replaced the highly subjective LONG Case and SHORT Case format of the clinical examination. The Viva Voce or Oral

examination has also been standardised or modified to eliminate observer/examiner bias.

Self-development of faculty staff is paramount if changes in the curriculum are to have any long lasting impact. Unfortunately, this is mostly misunderstood and is not by any means easy to implement. An amateur role for a medical teacher is no longer sustainable. Competence in teaching should be and must be a requirement for elevation to higher academic roles. This can only happen when the employer demands evidence of proficiency in teaching and observed a clear outcome from the students. Institutions are judged by the quality of their products and their ability to practice and project what they have learnt and take it further. Unfortunately, we haven't reached there yet. Teaching is yet to be given the priority it deserves in assessing faculty staff for higher academic positions. This, it is hoped would be given its deserved attention.

The obvious variability and concern in the Nigerian Medical Education scene led me to study and produce a seminal paper published in the journal "Medical Teacher" with the apt title "**Medical Education in Nigeria*".(Medical Teacher; 207,29: 901 – 905).*** This paper has been quoted in academic papers more than 1500 times as of July, 2024 according to the publisher **"Academia'**. In that paper, we traced the history of Medical education from its beginning at the University College Ibadan in 1948 as a College of the University of London to the position in 2007 when there were a total of 34 medical schools in the country. The paper identified stagnant curriculum and poor training in teaching and assessment methods as the bane of Medical education in Nigeria. It proposed the regulators, namely Medical and Dental Council of Nigeria and the National Universities Commission to conduct a "Needs Assessment" of Medical teachers to identify their training needs and facilitate their training as teachers in medicine. The paper also urged for appropriation of resources to establish modern teaching facilities like simulation centers or clinical skills laboratory to compensate for the changes in the teaching and learning environment, where patients are less likely to be available or even if available to consent to be used to teach students and also where medical teachers have less time for their students, being engaged in so many other activities unlike the situation in the past, where teachers dedicated 100 percent of their times to students' training and patient care. We also urged for the review of the Medical curriculum, as it was noticed that most medical schools at the time copy what existed in the older medical schools and continue to use it to teach students, despite the changes that have taken place in the society and the teaching and learning environment. Finally, it called on close collaboration with International Medical Education organizations like Association for Medical Education Europe, (AMEE), Foundation for the Advancement of International Medical Education and Research, (FAIMER) and Association for Medical Education Africa, (AMEA).

The objectives of Medical Education in Nigeria as in the MDCN and NUC documents are:

- To provide a sound scientific and professional basis for the training of doctors capable of working anywhere in the country
- To provide training to equip these health personnel to render primary health care (PHC)
- Teaching of PHC should be multidisciplinary, involving all clinical and some pre-clinical departments
- The training of doctors should be more community-based in keeping with the concept of social responsibility, all health training institutions should make a definite commitment to provide community bias to their training
- To produce doctors who would satisfy internationally recognized standards, and who would undertake further training towards specialisation anywhere in the world
- To produce doctors with sufficient management ability to play a leadership role in health care delivery

Our research found out that all Nigerian Medical schools operate a traditional curriculum. Course delivery is mostly didactic lectures, tutorials, bedside demonstration and teaching. Learning is opportunistic. There is a sharp division between pre-clinical and clinical departments, with minimum if any integration. We concluded that, medical academics from Europe who wrote these curricula some 40 or more years ago can still recognize their input. Little effort was made to modify or revise the curricula in most medical schools across the country. The regulatory bodies, MDCN and NUC had proposed changes in medical education to provide for the perceived needs of the populace. these changes were that:

- The curriculum should give prominent attention to Primary Health Care
- Teaching of Primary Health Care should be multidisciplinary, and all clinical departments and some pre-clinical departments should take part
- The training of doctors should be more community based
- In keeping with the concept of social justice, all health training institutions should make a definite commitment to provide a community bias to their programmes.

In the 2006 document, the Medical and Dental Council of Nigeria refined and expanded the Objectives of Medical Education in Nigeria based on its assessment of Nigeria's large population; mostly young and illiterate, rural and poor. The MDCN believed that, the only realistic process of addressing the health care needs of the country is through primary health care. Hence their formulation of minimum standards for medical training programmes that balances the two major categories of:

- Preparation of course participants for practical, professional postgraduate training

- Use of the scientific foundation programmes to understand the principles of medical practice as well as the acquisition of new knowledge through meaningful postgraduate studies and research

The Course Credit System and Medical Education in Nigeria

There was a conflict between the two regulatory bodies for Medical Education namely the National Universities Commission (NUC) and the Medical and Dental Council of Nigeria (MDCN) related to the objectives of curriculum delivery. The NUC in its 1989 document recommended that Medical Faculties should operate a course credit system which is understood to mean a quantitative system of organization of the curriculum in which subject areas are broken down into course units which are examinable and for which students earn credit(s) if passed. Furthermore, it said the courses were to be assigned weights called credit units. Credit units consist of specified number of student teacher contact hours per week per semester. The Medical Council on the other hand objected to this proposal and stated that: Examination by course unit system is not considered feasible under present condition and so should not be made compulsory and the guideline does not encourage credit unit system. (MDCN 2006). Eventually, the latter view was the position adopted in all medical schools and a credit system was not introduced.

In July 1989, the WHO and the World Federation for Medical Education convened a meeting of African Ministerial Consideration on Medical Education in Abuja, Nigeria. Delegates were Ministers of Health from the African region and Deans and Provosts of Medical Schools from the region. The theme of the conference was Medical Education in Africa an agenda for change. In the final communique, the conference agreed that changes were necessary to move Medical Education forward in Africa. Specifically, there should be changes in Medical Education to:

- Increase total coverage to serve more people through community-based medical education
- Recognize and make reparation to the poor linkage of the present medical curriculum with other sectors that influence health – agriculture and the economy;
- Recognize that there needs to be a major increase in educational resources even to maintain the present system of medical education.

It further resolved that political will and major resources are required to attain the set goals and that National Health Councils and Committees of Deans and Provosts of Medical Schools should put forward well-articulated programmes to attain the set goals of a new approach to Medical Education in Africa. (African MCME 1989). Unfortunately, not much was achieved in practical terms, perhaps because of poor or lack of leadership. This was the bane of Medical Education in the last three decades because emphasis on formal training in Medical Education was never prioritized, until very recently. A handful of Nigerian Universities

have now mounted training in Medical Education, awarding Postgraduate Diploma and Master's degree in Medical Education.

Potential and Actual Problems of Medical Education in Nigeria

The bulk majority of Medical schools in Nigeria are facing myriad of problems in discharging their mandate to the students and the country. Some of these are:

- Curriculum overload
- Curriculum atrophy, with no iterative process built upon evaluation
- Absence of staff training programs in medical education
- No Departments of Medical Education and lack of leadership
- Lack of awareness of global change in medical education with little or no opportunity to travel and learn
- Inertia and reluctance to accept changes by those who find themselves in leadership position in Nigerian Medical Schools
- Finance not allocated to the acquisition and development of modern medical teaching resources, like clinical skills centres
- No National quality control body. Once a medical school is accredited, it produces graduates based on its internal standards, and the minimum academic standard set by the NUC.
- The quality of graduates is not the same across the country
- A poor national social infrastructure. Electricity has remained extremely poor and unreliable despite billions of dollars spent to improve it. Power supply to hospitals and universities is becoming increasingly unaffordable.

Some of these absences and obstacles are taken for granted and dealt with in Western and even some African and Asian medical schools. Their resolution is considered essential for any meaningful progress and smooth running and development of medical schools and the development of quality healthcare workers for the Nigerian population, who are subjected to the ravages of poor nutrition, infectious diseases, social deprivation and now additionally pervasive insecurity.

The biggest challenge facing medical educators in Nigeria is lack of exposure and awareness of the current trend in medical education. Modern and common methods of instructions like ambulatory teaching, problem based learning, case based discussions, outcome based learning and task based learning were unheard of. Use of simulated patients or clinical skills centre were unheard of. Mercifully in recent postgraduate examinations, simulated patients were introduced.

Needs Assessment

A National needs assessment of medical educationists would produce a long list of basic requirements. If this were to be aligned to a National Working Party on Medical Education, plus a governmental desire to develop the healthcare professionals of the future by providing adequate resources, Nigeria may move

forward in the field of Medical Education. Through the needs assessment, educational strategies could evolve and would be a vehicle to:

- Develop new curricula which incorporated new themes and different educational strategies (Harden et al 1999)
- Introduce new learning situations and the use of new educational tools and aids to learning
- Introduce and give value to communication skills
- Introduce new methods of assessment
- A realization of the importance of staff development structures (Dent & Harden 2005)

As previously mentioned, the regulatory body, Medical and Dental Council of Nigeria (MDCN) has made it abundantly clear to all medical schools that, while it is interested in the product of the outcome of their training efforts, each school is independently responsible for achieving the minimum standard. It is our contention that, without the leadership role of the MDCN, the Medical schools will continue as they were in the last century and still are in the present century! The time has come to terminate the trend in traditional curricula with its opportunistic learning methods, factual overload and variable outcomes and quality of the product.

The new curriculum finding acceptance and favour worldwide is one which is responsive to our changing society and to the needs of the trainee. The curriculum is student centred rather than teacher centred. It helps the student to track their way through a maze of new information and learn New educational strategies appropriate for adult learning that are adapted in place of didactic teaching. (Dent & Harden 2005) The new curriculum has as its major themes communication skills, attitudinal and ethical issues, preparation for practice and team work and evidence based practice. (Harden 2000). The new curriculum needs to be patient centred facilitating the future doctor to adopt to a changing environment and to the stiff competition they face from new professionals in the health sector, from the Nurse clinician, to the physiotherapist and optometrists, who have all come of age as professionals. Decision making in the 21st Century should be a joint one between doctor and his patient (Towle, 1988).

Medical Education in Nigeria requires urgent assistance from International bodies like FAIMER and AMEE and the World Federation of Medical Education. These International bodies can run short courses for medical educators to introduce them to modern thoughts and methods in medical education. Selected faculty staff in each of the medical schools should be given the opportunity to attend courses in medical education and get certified. They would form the nucleus of the staff of medical education departments in their respective universities. Resources must be appropriated by government to establish modern learning centres like clinical skills centre in each medical school. It is also imperative to establish quality control and quality assurance in medical education with nationwide application. Medicine is now viewed as an international

commodity traded across frontiers. Most developed economies of western Europe are short of medical manpower. As much as 50% of medical graduates leave their country of origin to work and settle in the western world and the middle east. Nigerian Medical graduates working in the UK alone are nearing 10,000 as at today, forming the 3rd largest group of expatriate doctors in the UK. Many more are in the USA, Canada, Australia and New Zealand. They can also be found in Saudi Arabia and the Gulf countries. Thus, the imperative of evolving to modern curricula cannot be overemphasized.

Evaluating the role of Nigerian Medical Schools in the training of Medical graduates was the subject of another paper in the Nigerian Postgraduate Medical Journal: ***Ibrahim M, Evaluating the current role of Nigerian Medical schools in the training of Medical graduates. Niger, Postgrad Med J. 2008; Sept 15 Suppl:1; 22 – 30.*** This seminal paper examined what the role of the institutions charged by law with the responsibility of training and graduating medical doctors was. The paper examined the various stages medical education has evolved in Nigeria and highlighted the problems and prospects going forwards and to challenge medical educators to chart a way forward for the sector. Unfortunately, more than one and half decade after, what is easily discernible is the continued fall in the standards of medical graduates and the imperative to train and retrain medical teachers to do more in the delivery of the medical curriculum. The medical graduate of today is an international commodity who must be prepared to practice anywhere in the world. Disease conditions that were hitherto confined to the affluent western world are now prevalent in our country. Medical graduates must be trained to recognize and treat such conditions. Here we are referring mainly to cardiovascular diseases and their consequences. Myocardial infarction which in my days as a medical student were only encountered in textbooks, but are now common. Sudden death from massive heart attacks and cardiac rhythm disorders are common, yet they are largely not recognized as fatal conditions by lower order non specialist medical graduates, leading to delay in referrals and fatal outcomes. In essence, the time has come to embark on a radical approach and changes to the medical education curriculum to ensure that all graduates have attained a minimum standard of understanding of prevalent conditions and what to do about them. The outcome based medical curriculum.

It is not enough nor acceptable to put the blame on shortcomings on the medical graduate, but the teacher must accept his portion of the blame if there is failure in outcomes.

A story frequently told by educators concerns a young lad and his dog Fido. "***I taught Fido how to whistle***" the boy proudly tells his father. When asked to demonstrate this remarkable achievement, the boy commands '***Fido, whistle***!' Fido wags his tail vigorously but does not whistle. "I didn't hear him whistle the father says to his son who replies "***I taught him how to whistle, but he didn't learn!"***

All too often we, as teachers, focus too much on what we teach rather than on what our students learn. Outcome based education emphasises what we expect students will have achieved when they complete their course. These learning achievements go beyond just knowing; rather they describe what learners can actually do with what they know. Outcome based education defines what we expect of our graduates and holds us accountable to provide an education that achieves those endpoints. Medical schools around the world are increasingly embracing the concepts of outcome based education (Simpson et al 2002, Smith et al 2003).

Planning for the doctor of the future.

The traditional model of education begins with the delineation of the knowledge fundamental to medicine, teaching that knowledge, then testing whether students have learned that information typically by some form of closed book examination. The hope is that acquisition of this knowledge base will lead to students becoming good doctors.

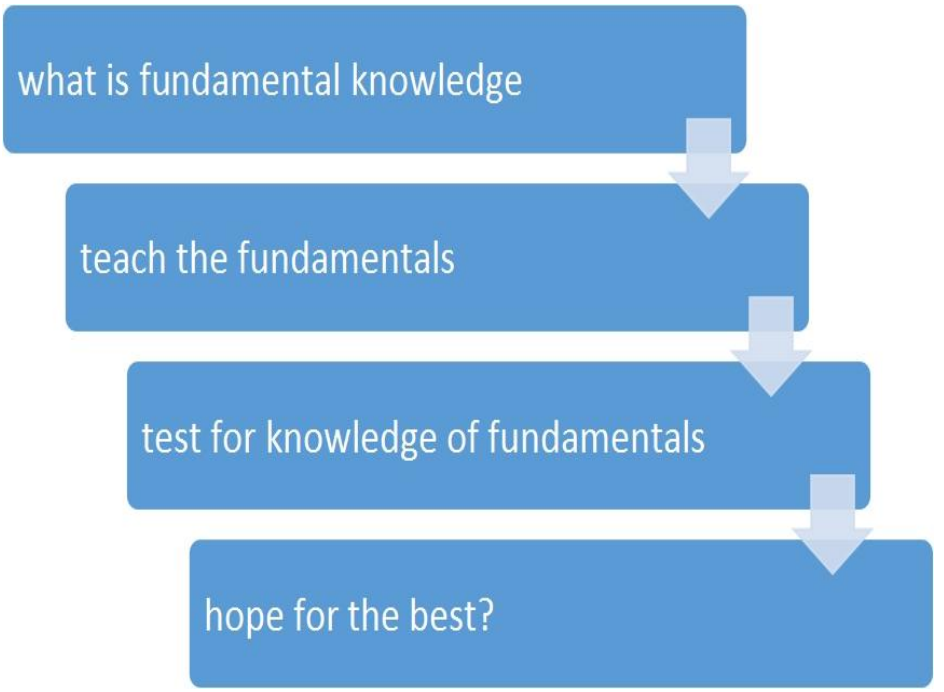


Fig. The Flexnerian model

The outcome based model goes in the opposite direction to the Flexnerian or traditional model, starting with the good doctor and working backwards. It begins by defining the attributes of the successful graduate, then they figure out how they would know whether students had attained those outcomes, then they create learning opportunities that would enable the student to achieve them.

Choosing outcomes

A medical school can create its own outcome based curriculum based on its peculiar circumstances. But, it can also adopt more universal outcomes already defined and adopted by older medical schools. Brown Medical School defined these outcomes in 9 (nine) areas (Smith et al 2000).

1. Effective communication
2. Basic clinical skills
3. Using basic science in the practice of science
4. Diagnosis, management and prevention
5. Lifelong learning
6. Professional development and personal growth
7. The social and community contexts of healthcare
8. Moral reasoning and clinical ethics
9. Problem solving

The 'Scottish doctor' model has twelve outcomes, categorized into three elements (Simpson et al 2000)

- ***What the doctor is able to do***
  - Clinical skills
  - Practical procedures
  - Patient investigations
  - Patient management
  - Health promotion and disease prevention
  - Communication
  - Medical informatics
- ***How the doctor approaches his or her practice:***
  - Basic social and clinical sciences
  - Attitudes, ethical understanding and legal responsibilities
  - Decision making skills and clinical reasoning
- **The doctor as a professional**
  - The role of the doctor within the health services
  - Personal development

The US Accreditation Council on Graduate Medical Education (ACGME) lumps the outcomes into a smaller set of six general competencies:

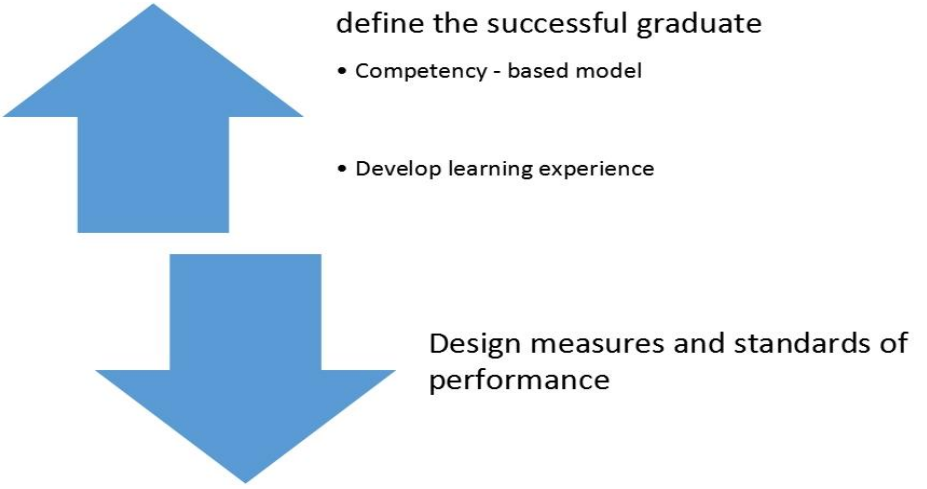
- Patient care
- Medical knowledge
- Practice based learning and improvement
- Interpersonal and communication skills
- Professionalism
- Systems-based practice

A school can adopt any of the outcomes or modify them to suit its environment. If a school chooses to create its own list of outcomes, it ought to maximise the

amount of participation in the process to increase the buy-in from students and staff. A nominal group process technique can be used to determine what each participant perceives as desirable attribute of a good doctor. Having assembled the attributes, participants are asked to place them in order of priority or tick the three most important attribute. They then tick the next three and so forth. The votes are tallied and the attributes with the highest votes are selected as the outcomes.

Having chosen the outcomes, the curriculum planners must define each more fully and this is best accomplished by a small group writing committee comprised of individuals with a particular interest in that outcome. The definition should be relatively short, but detailed enough to be clear (Harden 2002).

Outcomes should be few in number, self-evident, and easily understood. Once outcome is decided, the next step is to delineate criteria. The criteria describe specific tasks that a student will be expected to undertake to demonstrate mastery. For example, procedures such as measuring the blood pressure or examining the pupils with a light source or looking into the middle ear of a child with an auroscope could be delineated under medical procedures outcome.



Looking to the future, outcome based education is the way to go. It assures quality of the graduate guaranteed by the specified outcomes and the assurances of the teachers who are held accountable for what the student learns and can demonstrate competence in.

The Medical and Dental Council of Nigeria as a regulator for medical practitioners also has its set of criteria in terms of infrastructure, laboratories and hospital beds that every medical school must have to have its degrees recognized and registered with the Council. The curriculum from older medical schools is routinely copied and adopted by new ones. The broad National objectives of Medical Education in Nigeria as enunciated by the two bodies (NUC & MDCN) were: -

1. To provide a sound scientific and professional basis for the training of doctors capable of working anywhere in the country
2. To provide such training as would equip these health personnel to render Primary Health Care (PHC)
3. Teaching of PHC should be multidisciplinary
4. The training of doctors should be more community based
5. To produce doctors who would satisfy internationally recognized standards and who could undertake further training towards specialization anywhere in the world
6. To produce doctors with sufficient management ability to play leadership role in health care delivery.

With these broad objectives, the two regulators allow each university to set its own curriculum to attain the objectives. What we discovered was that, the universities were all using old curriculum based on traditional curriculum. Thus, it was found there was curriculum overload, curriculum atrophy with no iterative process built upon evaluation. Staff training program in pedagogy were universally absent. There was no Medical Education Department nor was there any leadership in that regards. Inertia and reluctance to accept changes by those in leadership position in Nigerian Medical schools was pervasive. The challenges facing Medical Education were enormous. There was no National Quality Control body, with the MDCN registering ALL graduates of approved medical colleges. Poor national infrastructure in Electricity being a top most challenge for both Universities and the Teaching Hospitals.

Abrahamson highlighted some of the recognized diseases of the curriculum that medical educators had to contend with. (Abrahamson J. 1978)

- Curriculum malaise [not OK, something wrong, depressing]
- Curriculosclerosis [crippled- no change whatsoever]
- Curriculoarthritis [bad articulation between segments=lack on integration]
- Curriculum ossification [the way WE have taught-if not broken why fix it]
- Carcinoma of the curriculum [uncontrollable growth of one part-influence of power]
- Iatrogenic curriculitis [continuous change –confusion]
- Curriculum hypertrophy [-additions + inability to take off any material]
- Materialistic curriculitis [nicely designed, not applicable – successful operation but the patient died]

The New Curriculum for Medical Undergraduates: Paradigm shift

The new curriculum finding acceptance and favour worldwide is one which is responsive to our changing society and to the needs of the trainee. It must identify what is ‘core’ and ‘non-core skill’ in each community setting. As enunciated earlier, the outcome must be clear, concise and verifiable. The assessment method to ensure that all core outcomes of each skill is tested must be

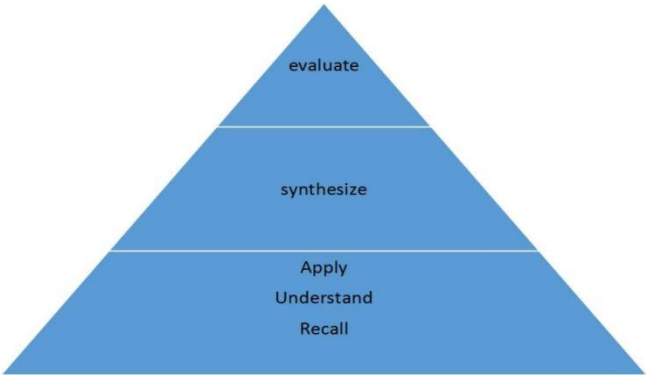
put in place. The new curriculum has its major themes communication skills, attitudinal and ethical issues, preparation for team work and evidence based practice. The new curriculum should help medical graduates to adopt to changing environment and to stiff competition they face from new professionals in the health sector, who have all come of age as professionals. Decision making in the 21st century should be a joint one between doctor and his patient. (Towle 1988).

The New curriculum: Paradigm Shift:

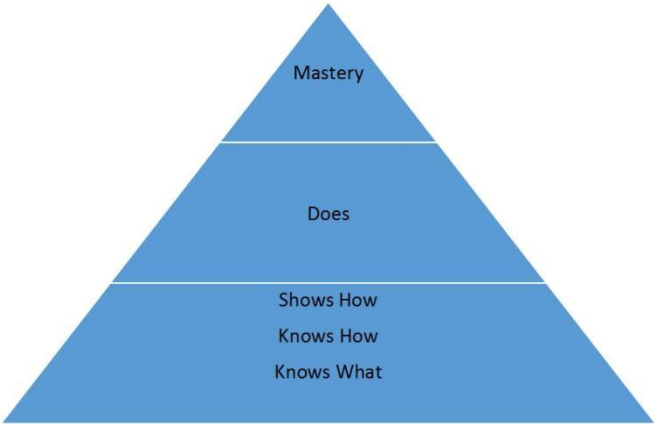
- Outcome based education
- Problem based learning
- Task based learning
- Core and student selected components
- An integrated system-based approach
- A spiral curriculum

The way to proceed are as witnessed in most parts of the world are:

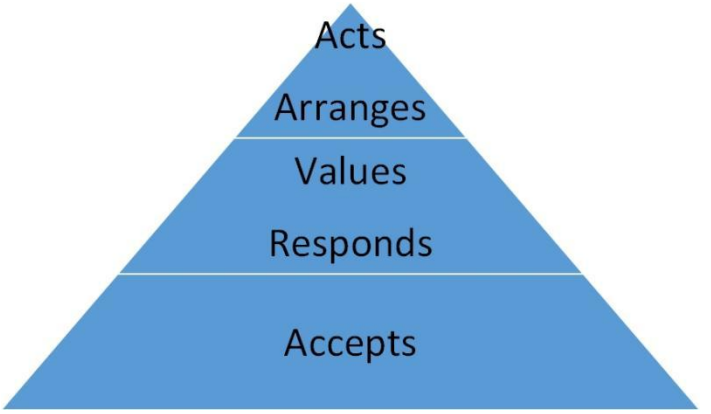
Knowledge Pyramid



Skills Pyramid



Attitude Pyramid



Futuristically, an amateur role for medical teacher is no longer tenable or sustainable. Competence in teaching must be a requirement for all medical teachers. Medical schools must make the provision to train their young faculty academics in teaching methods so that they become effective. Teaching by trial and error should never be condoned. The assumption that a qualified specialist can automatically turn into a good teacher is not based on reality or outcomes.

Other Academic and Administrative Engagements

Vice Chancellor, Sir, like most academics, I was engaged in University administrative processes very early in my career in the university. No sooner had I returned to the College of Health Science, Usmanu Danfodiyo University Sokoto, with my full fellowship in paediatrics in December 1988, the then Head of Department of Paediatrics, the late Professor Ahmed Taqi, a Sierra Leonean gentleman insisted I take over from him as the Head of Department of Paediatrics, while he continued as Provost of the College of Health Sciences. From that point, I was elected Deputy Provost of the College of Health Sciences. From the Senate of the University, I was again elected to serve on the Council of the University of Sokoto. All that happened within a short span of just about 6 months.

Board of Management of Usmanu Danfodiyo University Teaching Hospital Sokoto

I found myself representing the Provost of the College of Health Sciences at the Board of Management of University of Sokoto Teaching Hospital very early in my position as Lecturer/Consultant. The Chief Medical Director, was Dr. Idowu Koledade, a Dental surgeon from Kogi State was one of the best systematic and competent administrator I have ever met. He was meticulous in record keeping and can quote establishment circulars seamlessly. I learnt so much from him about Hospital administration and management of Human resources. The Board Chairman was Dr E. B. Mama, a pioneer private medical practitioner in Kaduna and a fine golfer and gentleman. I do not recall any management mishaps or disputes during his tenure. It was during his time that the then President General

Ibrahim B. Babangida, commissioned the New Usmanu Danfodiyo University Teaching Hospital, Sokoto. All the Clinical and service Departments moved from the State Specialist Hospital to the new Teaching Hospital in a grand ceremony witnessed by the low and high of Sokoto society. We contributed our mite to the smooth running of the young hospital.

Membership of the Governing Council of University of Sokoto

I was elected from the floor of the Senate of University of Sokoto to represent the Senate on the Governing Council of the University in 1989 for a term of 2 years. The Chairman of the Council was the late Alhaji Abdullahi Danburam Jada, a former Minister in the Northern Region government of the legendary Sir Ahmadu Bello, Sardaunan Sokoto in the first republic. This was a great learning period of administrative duties at high level for me personally. I learnt a lot from the Chairman on consensus building and carrying everyone along. The Council moved the University forward and ensured peace among academics, students and the University management. The Council Chairman was succeeded by another astute administrator in the person of the late Ambassador Tanimu Saulawa as Chairman in 1992. The University also had a change of name during this period to Usmanu Danfodiyo University. The rancour free management and very cordial relationship between the University Management of Vice Chancellor Professor Abubakar A. Gwandu and his team and Council continued. The major incidence that I recalled was the University College of Health Sciences losing its accreditation to train Medical Doctors granted by the Medical and Dental Council of Nigeria. The main reason for withdrawal of the accreditation was inadequate academic staff in various clinical departments of the Teaching Hospital. The University was directed to firm out all its clinical medical students to other accredited training institutions in the country. This was a hard and bitter blow to the university and to many of the young academic staff that had hoped for a smooth career in the university. I was dispatched by the Vice Chancellor to the University of Maiduguri to negotiate terms for the transfer of the students. The Vice Chancellor of the University of Maiduguri at the time was Professor Nuru Alkali. We presented a formal letter of request to him to transfer three sets of clinical students to that University of Maiduguri. The request was duly considered and discussed by the University and its College of Health Sciences management team. The request was accepted with conditions attached in respect of all the transferred students matriculating afresh with the university of Maiduguri and for Usmanu Danfodiyo University to rent accommodation for all of them as University of Maiduguri had no hostels for them. The University was also to pay additional allowances to the staff of each department of the University of Maiduguri who would be teaching them. I received the conditions and returned back to Sokoto to hand it over to the Vice Chancellor. Subsequently, the University transported all the students affected to Maiduguri and hand them over. The whole process was smooth and rancour free. Among those Sokoto students who graduated from Maiduguri are some in this audience who are now Professors in their respective disciplines in Bayero University. One of such

graduates is also currently serving as a Minister in the government of president Bola Ahmed Tinubu. May the soul of the two former Vice Chancellors of the University of Sokoto, Professor AA Gwandu and University of Maiduguri, Professor Nuru Alkali rest in peace. Amin.

Tenure as Chief Medical Director of Usmanu Danfodiyo University Sokoto

Mr. Vice Chancellor Sir, this inaugural lecture would not be complete without a mention of my tenure as Chief Medical Director of Usmanu Danfodiyo University Teaching Hospital Sokoto. On 14 February, 1994 barely five years after completion my Fellowship in paediatrics and still under the age of 40 years, I received a letter of Appointment as the new Chief Medical Director of UDUTH to take over from the outgoing CMD, Dr, Idowu Koledade. It was a momentous occasion not least because of my short experience in top level administration and my intimate knowledge of the problems of the Hospital. This was more acute in terms of staffing, especially at the level of consultants. The University had by then lost its accreditation to train medical doctors from the Medical and Dental Council of Nigeria. It was under that spectre that I took over. We charted a course of aggressive training of young medical graduates in older Teaching Hospitals to become Fellows and Consultants. We also embarked on expanding the infrastructure of the Hospital, particularly staff housing. We introduced a highly effective scheme of visiting consultants from as far away as Enugu and Benin to Sokoto. This worked very well in the interim to fill the gaps in specialist services. Together with the management of Usmanu Danfodiyo University, we embarked on a scheme of incentives to attract consultants and senior academic staff to join the University and the Teaching Hospital. Within a space of three years, the University was able to obtain re-accreditation for the training of doctors from the MDCN. The rest is history. The Sokoto Medical School has since then maintained its accreditation and has churned out a large number of high quality graduates who have maintained its flag flying across the world. Many are Professors in their chosen speciality in Europe, North American and the Middle East not to talk of those currently at the helm of affairs in the College of Health Sciences in Sokoto who are largely graduates of that college trained under our aegis. I must pay tribute to two gentlemen who were Chairmen of the Board of Management during my tenure, and who guided me through the turbulent early years of managing a huge establishment at a young age. These were Dr. E B. Mama, a pioneer private medical practitioner in Kaduna who told us at the Board meeting that he opened the first private clinic in Kaduna, The Lafiya Clinic in 1961 during the first republic. The second Chairman I worked with was the late Jarman Kano, Professor Isa Hashim. A professor of Public Administration in this great university and a perfect gentleman and seasoned administrator, who guided me in many difficult situations in the early days of democratic rule after 1999 until the completion of my tenure in 2002. To this day, what we put in place nearly 30 years ago is well appreciated in the University Teaching Hospital and beyond.

I moved to Bayero University Kano on sabbatical leave in June 2002, at the end of my tenure as Chief Medical Director of the Usmanu Danfodiyo University Teaching Hospital, Sokoto. This move though seemed natural, wasn't easy at all. Two gentlemen encouraged me and facilitated the movement. The late Professor Abdulhamid Isa Dutse, who was the Dean of the Faculty of Medicine at the time and my senior colleague Professor Sadiq S. Wali who was the then Chief Medical Director of Aminu Kano Teaching Hospital. The Bayero University Faculty of Medicine had only one Lecturer 1 in paediatrics and was struggling to gain accreditation for its MBBS program. I applied to come as a Professor of Paediatrics, at a time my papers for elevation to the Chair of Paediatrics were ready but not yet assessed as at the time I left Sokoto. Bayero University granted me a conditional offer subject to External Assessment, which I accepted. Halfway through the sabbatical year, in December 2002, I travelled to Dundee in Scotland to pursue a Postgraduate Diploma in Medical Education at the University of Dundee in Scotland. I returned to Bayero University 8 months later in August 2003, where I was now a full time staff, having transferred my services from the Usmanu Danfodiyo University, Sokoto to BUK. This was facilitated by the duo of late Professor Dutse and the Vice Chancellor, late Professor Musa Abdullahi, who kept in touch with me throughout my stay in Scotland, encouraging me and urging me to remain with Bayero University, Kano. I settled down on my return from Scotland and moved my family to Kano. The MBBS program was accredited and with my colleagues, we commenced residency training in paediatrics in the teaching hospital. Some of the early residents we had are now Professors of Paediatrics in Bayero University and also in other Universities. I was the Head of Department of Paediatrics for 6 years, from 2009 to 2014.

Brief stint at Abubakar Tafawa Balewa University Bauchi

The former Vice chancellor of Abubakar Tafawa Balewa University Bauchi, Professor Garba S. Babaji a friend and SBS/ ABU Zaria classmate whom we had worked with at the Usmanu Danfodiyo University Sokoto, invited me to come over and start the Faculty of Medicine of the University. ATBU Bauchi had just obtained the approval of the NUC to commence the MBBS program. I duly applied for a sabbatical leave form BUK and on approval, travelled to Bauchi to assume duty. There was nothing on ground even though they had admitted 100L students but placed them under the tutelage of the Faculty of Science for the 100 Level courses. I had no office and had to share that of the Deputy Vice Chancellor. Under that situation, we drew up a plan of action and developed an academic brief to be submitted to the National Universities Commission and the Medical and Dental Council of Nigeria. However, four months down the road, a search team from Umaru Musa Yar'adua University came to Bauchi and invited me to apply for the vacant post of Vice Chancellor. I did and was successful at the interview and was duly appointed Vice Chancellor. I bid farewell to the Vice Chancellor and my colleagues in Bauchi.

The new Challenge at Umaru Musa Yar'adua University, Katsina.

I assumed duty as Vice Chancellor in Katsina in February 2015. The challenges of running a State owned University, where all eyes are on the new institution with the visitor in the same town were enormous. I had gained experience running a Teaching Hospital a decade earlier and that experience came in handy. Nevertheless, the challenges of having to deal with ASUU lead by largely very young graduate assistants and Assistant lecturers was enormous. This was more so as they were being inspired and guided by a National ASUUs' zonal structure. It was difficult convincing these young aspiring academics to focus on their postgraduate studies rather than the fight between a behemoth national ASUU body and the local state university branch. They always feel emboldened and protected by the National leadership of ASUU. They were quick to join any National strike even where the issues involved had no relevance or bearing to our state University. The other challenge was with the Governing Council, composed with mostly local individuals, with political leaning towards the ruling party. They had an insatiable appetite that the University find hard to satisfy. It was not an easy journey by any means. My predecessor, the pioneer Vice Chancellor started the University with three Faculties, namely Faculty of Science, Faculty of Arts and Faculty of Education within the three years he was there. I consolidated these faculties and commenced the second phase of the university's academic brief. We established the Faculty of Social and Management Sciences with 8 disciplines. We also established the Faculty of Law with Full accreditation by the Legal Council of Nigeria. Towards the end of my 4th year as Vice Chancellor, I got the Tertiary Education Fund (TETFUND) to approve for the University to consolidate its unspent & un-accessed funds with it to establish a Faculty of Medicine. This proposal surprisingly met with a considerable degree of opposition from within and outside the university as narrated by the then Executive Secretary of the funds to me. Nonetheless, he saw our good intentions and approved the plan. The University engaged a firm of Architects to design the structure for the Basic Sciences buildings to house the Departments of Human Anatomy, Human Physiology and Community Medicine. On ground already was the Departments of Biochemistry and Microbiology standing alone in the Faculty of Natural and Applied Sciences. Equipment and teaching aids were ordered for each of the departments. We undertook a tour of Egypt and recruited Teaching Staff for Anatomy and Physiology and also signed agreements with the University of Cairo and Ain Shams University for exchange of teachers. We had also recruited Nigerian graduates and sent them for postgraduate training in various fields. It was at this point that my tenure ended. There was a setback to establish Faculty of Medicine as my successor was less interested and didn't do much throughout his 5 years' tenure. It was only after his departure that the plans were resuscitated, a Provost appointed and the College of Health Sciences commenced in earnest. Happily, the pioneer students are on the verge of moving to 300 Level to commence their Clinical training.

Sabbatical at Kaduna State University

I was at Kaduna State University, Department of Paediatrics for a one-year sabbatical after my tenure as Vice Chancellor. This was a year of reflection and guidance of the young University seeking accreditation for its MBBS program. The accreditation was successful, and we contributed our quota in the undergraduate and resident's postgraduate training. I returned to Bayero University mid July 2016.

Contributions to Career Counselling and Mentoring

Over the long years of Medical practice and Medical teaching, one has tutored and mentored many students on their career choices and specialization. This aspect of the medical teacher must be emphasized especially as over the years, one comes across students whose choice of the study of medicine was solely to satisfy their parents. If it becomes clear such students don't really have the aptitude for medical practice, it was well worth advising them to branch out to other aspects of life or careers. I have of recent encountered some very senior doctors who had served under me as House Officers or Registrars in my younger days and they recalled my interactions with them and how my intervention has remained with them for life and as they grow as professionals. A particular individual from the South East who until recently was the National President of the Nigerian Medical Association, told me of an incidence when he was my House officer and one late evening as I was driving out of the Teaching Hospital in Sokoto, I saw him chewing sugarcane in public. I parked my car and summoned him and reprimanded him that he is now a Medical Doctor and must behave accordingly and NEVER to be seen eating anything in public!

Contribution to Postgraduate Training of Residents Doctors

Since establishing the Residency program in paediatrics at Aminu Kano Teaching Hospital, we have graduated several Residents, who are now Fellows of the Postgraduate Colleges and have themselves progressed on the academic ladder, with some having already reached the pinnacle as professors of paediatrics in this very university and at the Usmanu Danfodiyo University, Sokoto. There are others that had come from outside, trained here with us and returned to their respective states. The list extends to over 40 trained Fellows:

Name of Candidate	Postgraduate College	Year Completed
1. Dr Fatima Hassan-Hanga	National	2004
2. Dr D.S. Gwarzo	National	2005
3. Dr Zubaida F Ladan	WACP	2006
4. Dr Yashua Alkali Hamza	WACP	2009
5. Dr Ibrahim Aliyu	National	2009
6. Dr Umar Shehu Abdullahi	WACP	2010

7. Dr Patience Ngozi Emegbolu	WACP	2011
8. Dr Bilkisu Garba Ilah	WACP	2011
9. Dr Taslim O. Lawal	WACP	2011
10. Dr Umar I. Umar	National	2012
10. Dr Basheer M. Zubair	WACP	2012
11. Dr Hafsat Ibrahim Umar	WACP	2013
12. Dr Umma Abdulsalam Ibrahim	National	2013
13. Dr Habibu Bala	National	2013
14. Dr Ibrahim Lawal Magaji	National	2013
15. Dr Umar Also	National	2013
16. Dr Halima Kabir	National	2013
17. Dr Umar Abba Sabo	National	2014
18. Dr Helen O. Akhiwu	National	2014
19. Dr Yunusa Yusuf	National	2014
20. Dr Binta Jibir Wudil	National	2015
21. Dr Jamila Sani Ibrahim	National	2016
22. Dr Fatima Usman	WACP	2016
23. Dr Samaila Musa Kallamu	National	2016
24. Dr Yunusa Sanusi	National	2017
25. Dr Kudirat Ahmed	National	2018
26. Dr Hadiza Ashiru	WACP	2018
27. Dr Abiodun Yekini	National	2018
28. Dr Amina Oiza Ibrahim	National	2018
29. Dr Aishatu Habib Sadauki	WACP	2019
30. Dr Nurudden Lawal	National	2020
31. Dr Nuruddeen Ibrahim	National	2020
32. Dr Lugga S. Abubakar	WACP	2020
33. Dr Aisha M. Zeidu	National	2020

34. Dr Ajide Aladesue	WACP	2021
35. Dr. Fatima Nasiru Faskari	National	2022
36. Dr Bashirudeen Lawal	WACP	2022
37. Dr Nuraat O Lawal	National	2021
38. Dr Fatime Othman Kyari	National	2021
39. Dr Aliyu O Suleiman	WACP	2023
40. Dr. Muhammad Tahir Otaru	WACP	2023
41. Habiba Muhammad Yahaya	Masters in Med Lab Sc Bayero University Kano	2018

The last years

On graduation in June 1979, Myself and a colleague Dr. Hassan S. Labo were immediately given employment as House Officers by the Kaduna State Government and posted to the Katsina General Hospital to serve as House Officers. (Appendix 2). That one year was a fascinating experience as we were the first doctors to take up posts as House officers in a fairly good general hospital that had full specialties with Consultants including pathology and Radiology. We had extensive experience and practical exposure to medicine in all its facets. I recalled we were on call every other day and had to carry out a lot of procedures on our own. This was also a period when "*Call Duty Allowances and Hazard Allowances*" were not yet introduced. One has to do with just that one salary which was on GL 08 step 4 translated into Three hundred and thirty-four Naira per month (N334 per month). This was a huge amount of money for any young person to earn at the time. The United States Dollar was at that time valued as $1 = 75kobo! As House officers, our monthly salary was $334. According to the Inflation calculator, $1 in 1979 is equivalent to $4.33 today in Purchasing Power Parity (PPP). Thus, as House Officers, the equivalent of our salary of 1979 in todays' dollars would be $1928.2 per month. Which at today exchange rate would be NGN3,085,038.4! This is more than triple the salary of a professor in todays' Nigerian public universities. How sad for the country!

At the passing out of the NYSC I was very keen to commence postgraduate training and had no difficulty taking a decision to join the newly opened College of Health Sciences, University of Sokoto. I was the first Nigerian trained medical doctor to be employed as a Demonstrator in Paediatrics in the College of Health Sciences University of Sokoto as it was then known. I was interviewed by the then Vice Chancellor, Professor S.A.S Galadanchi, who gave me an appointment on the spot, and directed me to look for a postgraduate course of my choice for sponsorship in any institution in the world. (Appendix 3). The Annual salary was NGN5,316.00 on GL 09 step 2. That was how this journey began. After 22 years in Sokoto, I moved to Bayero University Kano to continue the academic journey.

Our students from Usmanu Danfodiyo University Sokoto and from Bayero University and Aminu Kano Teaching Hospital have in many instances reached the peak of their academic career being professors in various fields and in various universities across the world. Some have been Vice Chancellors, some Chief Medical Directors of both Federal and State Tertiary Hospitals. We have established residency Training in paediatrics at Federal Teaching Hospital, Katsina graduating more than half a dozen Fellows of both the National Postgraduate Medical College of Nigeria and the West African College of Physicians as detailed above.

Acknowledgement

No human is an island. I have lived a long and fulfilling life as a young man, an undergraduate, a medical doctor, a paediatrician and an academic and a leader and mentor as Chief Medical Director of a University Teaching Hospital and Vice Chancellor of a University. I have in the course of this life been indebted to so many that space may not allow me to mention all, but shall attempt nonetheless.

All praise and gratitude are due to Almighty Allah (SWT) for granting me everything that I had achieved in life. My parents, Alkali Muhammadu Tukur Na'iya (d:1975) and my mother Hajia Murjanatu Waziri Zayyana (d:2023) brought us up in a most modest and Islamic way. My fathers' elder brother, late Alkalin Lardin Katsina, Mallam Ibrahim Maude (d: 1988) took over the responsibility of the education and upbringing of the whole children of our late father who died tragically in a road traffic accident at the age of 49 years, leaving behind 33 children all of whom successfully completed their education to University and Polytechnic level under his watch. Never resting until everyone of the orphans got whatever his own children got. May Allah reward him and join us all with them in Aljannah firdous, Amin. My immediate family, my wife Binta and the children Dr Jamila, a gynaecologist, Dr Aisha, an ophthalmologist, Dr Habiba, a paediatrician, Engr. Abbas, a mechanical and automobile engineer, Arch Fatima and Dr, Muhammad Zayyan an intern at AKTH are greatly appreciated for their patience and endurance while 'Baba" was away on numerous occasions through their growing up years. I appreciate you for towing the line of medicine and studying hard to become medical doctors, Engineer and Architect.

The foundation of modern schooling begins with the primary school. Here I recalled and have a keen memory of our late Headmaster at Gidado Primary School Katsina, Mallam Mamman Kankiya and the Arabic teacher Alhaji Mallam Na'aliya. The duo shaped our character early in life and made us to appreciate hard work at all stages of life. Passing the National Common Entrance Examination was a big deal in the 60's, when there were less than 30 Government owned Secondary Schools in the whole Northern Region, now 19 Northern States. In our own Katsina province in 1967, there was only two secondary schools at Katsina and Funtua. I was among the successful pupils and was admitted to Government Secondary School Katsina. At this school, the Principal was the late Mr. E.P.T. Crampton, a no nonsense English man, with a reputation for strict discipline and academics. He successfully guided us through secondary education, with my set producing several students who earned Division 1 with Distinction. The vice principal was Mallam Yusuf Aboki, who was also our mathematics teacher. We were easily admitted to the School of Basic Studies, ABU Zaria and Higher School Certificate (HSC) classes. I was among those that were admitted to the School of Basic Studies ABU Zaria in January 1973. Among our secondary school teachers, I must mention our Physics teacher, Mr. S.P. Cuganesam a Sri Lankan Tamil gentleman, who mentored us

and made everyone believe attaining distinction in the West African Examination Council Ordinary level examinations was possible and a done deal! Such was his confidence in our set. Other teachers of note were Mr. Jose, the biology teacher from India, Mr Phillips the chemistry teacher and Mr Cheriyan, the mathematics teacher and Mr Mathew the English language teacher. All were Indians. I also recalled the Egyptian Islamic studies teacher Mr Abdullah as well as Mallam Balarabe Abdullahi Lere and their contribution to our development in Islamic studies. At the school of Basic Studies ABU Zaria, the Principal who received us was Mr J.B. Maigida. The late Professor Ishaya Audu was the Vice Chancellor. Our gratitude is to the numerous Polish Nationals who formed the bulk of the teaching staff in the science section of the school of Basic Studies. I recalled Dr. JJ Galla, Dr. Frankowski and Dr. Werblinska who taught physics, mathematics and chemistry respectively. The biology teacher was Mr Olatunde. At the Faculty of Medicine, ABU Zaria, the Dean was the late Professor Harold Scarborough, a Scottish gentleman. We had Professor PSC Bunning, a Welsh gentleman as Professor of Human Anatomy ably assisted by Professor AA Tadros, and Professor Shatby, both Egyptians. In the Department of Physiology, we had Professor J. Murphy, an Irish gentleman assisted by Professor Kelvin Etta from present day Akwa Ibom state and two Professors Singh' both Indians and active teachers. In Biochemistry we had Professor Mary Holloway, an English lady. In the Department of Community Medicine, we had Professor Montoya Perez, from Brazil, Martha from India and PC Osuhor from the old Bendel State. These were the key facilitators for Basic Medical Sciences at ABU Zaria.

The Clinical years were fascinating as they were exciting. All the Departments Were Headed by British academics except the Department of Obstetrics and Gynaecology which was headed by the distinguished obstetrician Professor K.A. Harrison, from Abonnema in Rivers State. Other Professors Were Professor Una Lister, CC Ekwempu and the then young Dr. Nidi Briggs, still a lecturer 1, fresh from the UK at the time. (He subsequently became a Professor and Vice Chancellor of the University of Port Harcourt) The Head of Medicine was Professor E.H.O Parry, a distinguished cardiologist who left Zaria to start the University of Ilorin College of Medicine in 1976/77 and was succeeded by Professor P.A.J. Ball. Professor F Fakunle, Professor Greenwood and Professor Whittle. The Head of surgery was Professor James H. Lawrie, with Professors Mabogunje, Khwaja, Garg, Mbamali, John Momoh and Steven Kitchener in the Department. The Department of Paediatrics was headed by Professor Maureen Duggan, a highly energetic, no nonsense English lady. She fought we all recalled, to have a children's Out-patient department separated from the adult out-patient department because of the high mortality among children waiting to be attended to, when their mothers got pushed back by adults coming for medical attention. Other distinguished paediatric lecturers were Professor M.B. Abdurrahman, Dr. Hargreaves, Dr Anne Nesbit, late Dr. Isyaku Aliyu, (*brother to late Maradin Katsina and District Head of Kurfi, Alhaji Ahmadu Kurfi, a distinguished first generation civil servant and first Executive Secretary of FEDECO, the Electoral*

commission that conducted the 1979 elections). The Head of Department of Pathology was Professor G.M Edington, a pioneer pathologist who began his career in Africa from Gold Coast (now Ghana) in 1957 to Ibadan and then to ABU Zaria and finally University of Maiduguri. He co-authored the famous book, Pathology in the Tropics with Professor Gilles. Professor Ed. B. Attah a distinguished pathologist from present day Akwa Ibom joined the department from the University of Ibadan while we were there. In haematology, there was Professor Alan Fleming and Professor HHM Knox Macaulay from Sierra Leone, a distinguished Cambridge trained haematologist and Professor George Discombe in Chemical Pathology and the giant of microbiology, Professor L.J. Eglar and Professor R. Lawande. One of the fascinating clinical postings for medical students in those days was the one-month training in leprosy at Garkida, in present day Adamawa state and latterly at Sayi village in Zaria. The one-month training offers an unmatched experience of practical leprosy handling in all its ramifications. The Orthopaedic posting for one month was conducted at the National Orthopaedic Hospital, Dala, Kano under late Dr. Osad Osamwonyi, an ardent golfer. The Ophthalmology and psychiatry course all of one-month duration each were conducted at the Guinness eye Hospital, with Professor Abiose and at the Psychiatric Hospital, Kaduna under the late Professor M.H. Ahmed.

I undertook postgraduate residency training in paediatrics at ABUTH Zaria and Derbyshire Children's Hospital Derby. United Kingdom. I acknowledge the guidance of late Professors Kunle Ijaiya, Ahmed Taqi, Werblinska, Alhassan Yakubu and Geoffrey Onyemelukwe, the latter who though an Internist, has a strong bias towards immunology and contributed immensely to my part II fellowship dissertation. In the United Kingdom I was mentored by Dr Richard Morton, John Axton, David Curnock and Ranjit Leenage. I must also mention Dr, John Macfarlane, an internist and Consultant respiratory physician in Nottingham who was in ABUTH Zaria as Senior Registrar and guided me through my first published paper in 1978. He facilitated my linkage to the Derbyshire children's hospital.

Along the line, one comes across mentors of different categories that one is obliged to acknowledge. At University of Sokoto, I have already mentioned how Professor SAS Galadanchi pulled me into academic pursuit after completing the National Service Year in Sokoto. The Registrar of the University of Sokoto at the time, Mr. Henry Afolabi was of tremendous help and so was the Bursar, Alhaji Tijjani Yakubu. The late Mallam Lawal Kontagora, the Deputy Registrar remained a friend and a guide in all administrative issues. In subsequent years, many members of the University of Sokoto community assisted in many ways and are greatly appreciated. The Chairman of Council I had worked with mentored me in no small measure in administrative procedures and nuances. I would mention late Alhaji Abdullahi Danburam Jada and Ambassador Tanimu Saulawa in particular. Among the Vice Chancellors, late Professors Mahadi Adamu and the late Professor Abubakar Aliyu Gwandu were exceptional

gentlemen. Professor Gwandu was perhaps the most honest and God fearing person I have ever encountered. His Royal Highness, the Emir of Yawuri Dr. M. Z. Abdullahi deserved special mention. He was Vice Chancellor of Usmanu Danfodiyo University at the time I was Chief Medical Director of UDUTH. We worked in harmony to restore accreditation of the College of Health Science. When he ascended to the throne of Yawuri, he honoured me with the title of **Durbin Yawuri** in the year 2000.

At the Usmanu Danfodiyo University Teaching Hospital, I worked with as astute Hospital administrator, who was meticulous with details in the person of Dr Idowu Koledade. He was the Chief Medical Director when I resumed and was appointed Consultant paediatrician in 1988. I learnt a lot from him. The Chairmen of the Board I worked with were Dr E.B. Mama and latterly the late Jarman Kano, Professor Isa Hashim. I deeply appreciate Jarman Kano for his support at all times when I was the CMD and his constant advice and counsel in handling administrative matters during my tenure as Chief Medical Director and afterwards. The late Director of Administration, Alhaji Dalhatu Sule Kaura, a very patient gentleman was of tremendous assistance to me in my early days as Chief Medical Director of UDUTH, Sokoto.

In the department of Paediatrics at Sokoto Specialist Hospital, I met the late Dr (Mrs) Amina Jummai Suka, a 1975 graduate of ABU Zaria. She was central to my decision to specialize in paediatrics as against my first love, Internal Medicine. No regrets though. She died tragically in the 1991 Hajj plane crash at Jeddah, where we both served that year in the Hajj Medical team. Dr A.K. De an elderly Indian paediatrician with a lot of wisdom and knowledge of the ways of the world was unforgettable. When the Teaching Hospital moved to its permanent site, we had the late Professor Hamidu Ahmed joined me as associate lecturer. He was at the time a staff of the State General Hospital. The late Professor Ahmed Taqi was the Head of paediatrics.

The Department of Paediatrics Bayero University Kano had only one single permanent academic staff when I arrived Kano from Sokoto in 2002, and that was Dr. Raymond Belonwu, now a professor of Paediatrics. He worked very hard to teach and administer the department in those difficult days. The Department had since grown to a remarkable size, that many of the residents who trained under us are now full pledged professors of paediatrics in Bayero University and elsewhere. Colleagues that we grew together included classmates, Professor Abdullahi A. Abba, Professor of Medicine at ABU Zaria, Dr. Umar F. Ibrahim, Dr. Zakari Wambai Lapai, Dr. Abdulqadir Umar, Dr. Hassan S. Labo, the late Lafiya Nupe, Dr, Ibrahim Babamini Sule, Dr. Gladys H. George, Dr. Robert I Ati, Dr. Edwin Bako, Dr. Funmi Hassan, Dr. Bello W. Fatai, Dr. Adamu Panti, Dr. TJ Gana and Dr, Bisi Ogunsola. Other professional colleagues who influenced my career include Professor Ibrahim Abdu Aguye, Dr. Humphrey Menokpo, a Ghanaian, Professor William N. Ogala and the late Professor S. Ola Daniel, one-time provost of the College of Health Sciences, University of Sokoto.

Inspiring Undergraduate Students and Residents

It is appropriate to acknowledge some of the inspiring students I met during the course of my professional life as a doctor, consultant and academician. Some may not remember the impression they made and some I may also have forgotten. Dr Aminu Kasarawa Bello, now a professor of Medicine and Nephrology at the University of Alberta, Canada was an exceptional student, who defined a career path for himself early in life. In our curriculum in Sokoto at the time, undergraduates have a chance to take an elective after their 4th years. He applied to and got accepted by the late Professor OO Akinkugbe, the renowned Hypertension and renal specialist to do the 6 weeks' electives at his Hypertension clinic of the University College Hospital Ibadan. The work he put in and the academic report received by the College of Health Science from Professor Akinkugbe, marked him as someone destined for higher things and so it turned out. Congratulations Professor Aminu on your meritorious rise to the pinnacle of your chosen career in Canada.

Dr Sanusi Bello, now a professor of Human Anatomy at King Faisal University, Al-Ahsa Saudi Arabia, was also from the Sokoto Medical School. Professor Muhammad Makasudi, a Professor of Medicine at Usmanu Danfodiyo University was also inspiring.

At Bayero University I encountered so many good students at the undergraduate level. Among them were many impressive students. Foremost were Dr. Fatima Usman, Dr. Halima Adamu, Dr. Abba Sabo and Umar Isa Umar. Dr. Fatima was so outstanding that she had won a second Commonwealth fellowship to Oxford University for a Doctorate in Neonatal Medicine which she is currently pursuing. Halima is pursuing a career in paediatric neurology. Among the residents, Dr. Fatima Hanga, Professors Zubaida L. Farouk, Shehu U Abdullahi, Garba D. Gwarzo, Patience N. Obiagwu and Drs Hadiza Ashiru, Binta Wudil Jibir, Jamila Sani Ibrahim and Umar Also. At Federal Teaching Hospital Katsina, Drs Ibrahim Magaji, Abiodun Yekini and Nuruddeen Ibrahim were always inspiring.

Among family members, I wish to acknowledge my uncle and father in law, Justice Umaru F Abdullahi CON, Retired President of the Court of Appeal, the late Grand Khadi of Katsina State, Qadi Aminu Ibrahim Katsina, a confidant and beacon of support at all times, my brothers, Muhammad Naiya, Muhtari Ibrahim Katsina, Mallam Misbahu Naiya, Pharmacist Hadi Naiya and the sisters Kilishi, Binta, Rakiya and Asiya. Among my cousins, was Nuruddeen Ibrahim, Mamunu Ibrahim, Mahmoud R. Sanusi and Malik Zayyad and Jaafar Babba Ibrahim.

Among the non-medical academic colleagues, I would mention the late Dr. Rufai Omar Madaki, Dr Hakeem Baba Ahmed, late Professor Noah O Yakubu, former Vice Chancellor University of Abuja. late Dr. Michael Udomah and latterly Professor Ibrahim Bello Kano. Professor Nuhu Muhammed Jamo of the Faculty of Law ABU Zaria has been an exceptional friend. Abdu Muhammed Kanti and Bello Gidado were y school seniors and friends. Mr. Deji Bamigbose was my

NYSC colleague in Sokoto in 1980/81. We have remained friends and prospered together in business as well. Thank you Mr. D. Finally, all my students past and present are greatly acknowledged for their role in our overall development. We thank everyone able to attend and listen to this inaugural event. May Allah reward you all.

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LIST OF PROFESSORIAL INAUGURAL LECTURE TO DATE

S/N	NAME	DEPT	DATE	TOPIC
1st	Emmanuel Ajayi Olofin	Geography	4th March, 1992	The Gains and Pains of Putting a Water Lock on the Face of the Drylands of Nigeria
2nd	Garba Dahuwa Azare	Education	24th June, 2000	BASIC CONCERNS: Revitalizing Nigeria's Primary Education in the New Millennium
3rd	Dajuma Abubakar Maiwada	Education	29th July, 2000	Improving Teaching and Learning in University Education with Particular Reference to Bayero University, Kano
4th	Majekodunmi Oladeji Fatope	Chemistry	7th July, 2001	NATURAL PRODUCTS SCIENCE: Looking Back and Looking Forward
5th	Muazu Alhaji Zaria Sani	Nigerian Languages	13th October, 2001	A focus on Some Segmental and Suprasegmental Features in Hausa Phonology
6th	Isa Hashim	Political Sciences	20th March, 2004	Planning and Budget Implementation in the Health Sector
7th	Abdulla Uba Adamu	Education	24th April, 2004	SUNSET AT DAWN, DARKNESS AT NOON: Reconstructing the Mechanisms of Literacy in indigenous Communities
8th	Auwalu Hamisu Yadudu	Private and Commercial Law	5th June, 2004	LAW AS INTERPRETATION: An Exploratory inquiry from Islamic Law Jurisprudence
9th	Mohammed Sanni Abdulkadir	History	31st July, 2004	STRUCTURING, STRUGGLING AND SURVIVING ECONOMIC DEPRESSION IN NORTHERN NIGERIA: The 1930s As Preview of the present
10th	Muhammad Sani Sule	Bio-chemistry	23rd March, 2013	Enzymology and Radiation Biology in the Understanding of Biochemistry
11th	Essiet Unanaowo	Agriculture	22nd May, 2013	AGRICULTURE SUSTAINABILITY IN THE DRYLAND OF NIGERIA:

	Essiet			Realities and Prospects
12th	Aliyu Kamal	English Studies	5th March, 2014	The Islamic Novel Style and Structure
13th	Abdu Ahmed Manga	Agriculture	9th April, 2014	Horticulture as a Panacea for Food Insecurity and Unemployment
14th	Sa'idu Muhammad Gusau	Nigerian Languages	26th May, 2014	Wakar Baka Bahaushiya (The Hausa Oral Songs)
15th	Abdallah Uba Adamu	Mass Comm-unication	9th July, 2014	IMPERIALISM FROM BELOW: Media Contra-Flows and Emergence of Metro-Sexual Hausa Visual Culture
16th	Ghaji Abubakar Badawi	Library and Information Sciences	29th July, 2015	THE ROLE OF PUBLIC LIBRARIES AS CENTERS OF INFORMATION TO DISADVANTAGED GROUPS: A 2004 - 2014 Study of the Information Needs of Gada Prostitutes in Dawakin Kudu Local Government Area of Kano State, Nigeria.
17th	Mohammed Kabir	Community Medicine	16th September, 2015	Public Health Concern for Chronic Non-Communicable Diseases Surpasses Anxiety Over Most Infections
18th	T.I. Oyeyi	Biological Sciences	30th March 2017	Linking Schistosomiasis and Water Resources Development in Kano State Nigeria: Public Health Impact and Mitigation
19th	Abdulrazaq G. Habib	Medicine	27th April, 2017	Medicine, Science and Society – The Global Health Imperative
20th	S. Y. Mudi	Chemistry	6th July, 2017	Natural Products: Plants as Potential Sources of Drugs
21st	Sani Ibrahim	Biological Sciences	27th July, 2017	BETWEEN LIFE AND DEATH: Water Quality and Resource Evaluation - The Place of Hydrobiologists

22nd	J. Afolabi Falola	Geography	26th October, 2017	The Poor We Have With Us Always
23rd	Umar G. Danbatta	Electrical Engineering	2nd November, 2017	GETTING OUT OF THE WOODS: Diversifying Nigeria's Economy Through the Telecommunications Sector
24th	Adelani W. Tijani	Nursing	23rd November, 2017	Wholesome Alimentation: Path to Radiant Health
25th	Juwayriya Badamasiuy	Private and Commercial Law	21st December, 2017	Uncovering Patriarchy in the Law: Feminist Movement for Re-Interpretation of Islamic Law in Focus.
26 th	Isa Mukhtar	Nigerian Language	25th January, 2018	STYLISTIC THEORIES AND THE LINGUISTICS OF HAUSA PROSE TEXTS: the (SFL) approach.
27th	Ganiyu Sokunbi	Physiotherapy	29th March, 2018	TODAY IT HURTS, TOMORROW IT WORKS: Complimentary and Alternative Therapy for Failed Back Syndrome
28th	Aminu K. Kurfi	Business Admin. and Entrepreneurship	19th April, 2018	Micro-finance as an Elixir for Poverty Alleviation and Wealth Creation in Nigeria
29th	Muhammad S. Khamisu	Arabic	17th May, 2018	Substitution in Arabic Languages Rules and Types
30th	Habu Nuhu Aliyu	Pure and Industrial Chemistry	21st June, 2018	SCHIFF BASES AND THEIR TRANSITION METAL COMPLEXES: The Drug for the Next Generation
31st	Hashim M. Alhassan	Civil Engineering	19th July, 2018	EASING THE BURDEN OF TRAVEL: Can Roadway Capacity Modeling Help?
32nd	Habu Mohammed	Political Science	13th September, 2018	TUG OF WAR OR ECHO IN THE DARK? Civil Society Organizations (CSOs) and the Fight Against Corruption in the Era of Change Mantra in Nigeria
33rd	Bello Idrith Tijjani	Physics	20th September, 2018	NAVIGATING THE DATA LABYRINTH: Application of Some Advanced Statistical Analysis in Atmospheric Physics

34th	Mohammed Ajiya	Electrical Engineering	18th October, 2018	SEAMLESS GLOBAL CONNECTIVITY AT THE SPEED OF LIGHT: Converting Intrinsic Phenomena in Optical Fibers to Capacity Increase.
35th	Abdulrahman Abdul Audu	Pure and Industrial Chemistry	25th October, 2018	MY ACADEMIC VOYAGE IN WATER INTO THE WORLD OF HEAVY METALS
36th	Ibrahim Rakson Muhammad	Animal Science	21st February, 2019	FORAGE AND FODDER PRODUCTION IN NIGERIA: Its Sensitivity in Sustainable Ranching.
37th	Muhammad Bashir Ibrahim	Department of Pure and Industrial Chemistry	14th March, 2019	WATER POLLUTION AND THE QUEST FOR ITS REMEDIATION: The Natural Resource Option
38th	Oyerinde O. Oyesegun	Department of Physical and Health Education,	4th April, 2019	MAN DOES NOT DIE BUT KILLS HIMSELF: The Dilemma of the Health Educator and the Moderating Influence of Health Education
39th	Danladi Ibrahim Musa	Department of Physical and Health Education	25th April, 2019	WAGING WAR ON THE DEADLY QUARTET AND ITS CO-MORBIDITIES: A Physical Activity Panacea
40th	Kabiru Isa Dandago	Department of Accounting	2nd May, 2019	THE ACCOUNTING IN HUMANITY KNOWS NO BOUNDS
41st	Mustapha Hassan Bichi	Department of Civil Engineering	20th June, 2019	MAN, ENVIRONMENT AND WATER - The *Moringa oleifera (Zogale)* Intervention
42nd	Mustapha Muktar	*Department of Economics*	27th June, 2019	PEOPLE, PLANET AND PROFIT: Peaceful Bed Fellows at the Best of Times But Strange Roommates at Present - The Economist's Approach to a Peaceful and Sustainable Co-Existence
43rd	Mohammed Atiku Kano	*Department of Biochemistry*	25th July, 2019	Serum Lipids and Lipoproteins - A Curse or a Blessing?
44th	Rabi'u Mohammed	*Department of Physical and Health Education*	8th July, 2019	EXERCISE AND SPORTS FOR THE ATYPICAL PERSONS: A Multidimensional Analysis
45th	Yahaya, D.B.	Department of Mechanical Engineering	12th December 2019	GETTING OUT OF THE DARKNESS: The Solar Energy Solution

46th	Shehu Alhaji Musa	*Department of Agricultural Economics & Extension*	22nd April 2021	CROSSING THE CHASMS OF AGRICULTURAL DEVELOPMENT IN NIGERIA: Consumer Preference Studies: Market Integration Syntheses and Value Chain Diagnoses to the Rescue
47th	Shehu U.R. Aliyu	*Department of Economics*	24th June, 2021	What Have We Learnt From Modelling Stock Returns In Nigeria: Higgledy-Piggledy?
48th	Kamilu Sani Fage	*Department of Political Science*	8th July, 2021	FROM DIVIDEND'S OPTIMISM TO DASHED HOPES: The Imperatives of Leadership Re-Engineering in Nigeria
49th	Babatunde Olamide Bamgbose	*Department of Oral Diagnostic Sciences*	9th Sept., 2021	MATRIX OF THE KNOWLEDGE OF LIGHT AND KNIFE: The Journey of a Maxillofacial Surgeon into Imaging
50th	Umar Ibrahim Gaya	*Department of Pure and Industrial Chemistry*	4th Nov., 2021	In Search of Catalysts…
51st	Ahmad Muhammad Tsauni	*Department of Economics*	19th December 2024	ECONOMIC PROGRESS ON A TIGHTROPE
52nd	Bashir Muhammad Fagge		27th February, 2025	*AN ODYSSEY INTO FOODS OF ANIMAL ORIGIN: Fortifications and Modifications for Health and Sustainable National Development*