

**UNIVERSITY OF ILORIN**



**THE NINETY-FIFTH  
INAUGURAL LECTURE**

**“THE CHILD’S GUT AND ITS GUTS”**

**By**

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Sister Institutions,  
My Lords Spiritual and Temporal,  
Distinguished Invited Guests,  
Gentlemen of the Press,  
Friends,  
Mothers (**I recognise and appreciate you all specially**),  
Relations,  
Great Students of University of Ilorin and other Institutions,  
Distinguished Ladies and Gentlemen

### **Introduction**

Mr Vice Chancellor Sir, I am grateful to God Almighty my creator who deemed me worthy to stand before this august gathering to deliver this Inaugural lecture. This will probably be the first inaugural lecture by a home grown Lecturer / Consultant, and Professor in the Department of Paediatrics, University of Ilorin. I appreciate the effort of the current Vice Chancellor in ensuring my elevation to this exalted position.

I am grateful to the entire University community for giving me the opportunity to share with the academia and the

whole community my experience as a Doctor and a Paediatrician, and my humble contribution to the advancement of knowledge.

### **My Foray into the Field of Medicine and Paediatrics as a Specialty**

I was a secondary school class three pupil when I caught a rat alive, restrained it and used a razor blade to dissect the animal. I brought out the intestines and was fascinated by the circulatory system as blood was flowing in the vessels. An elderly woman who saw me experimenting with this animal castigated me and reported me to my father. I ignored her, closed up the rat using a thread and needle and set it free to go (don't ask me about the survival of the rat). That singular act was the catalyst to my interest in medicine as a profession.

I gained admission into three Universities to study medicine (University of Ibadan, University of Ife and University of Lagos). I opted for Lagos then because of the cheap food and good accommodation being offered by the University.

On completion of my course, during my House job at the State Hospital, Obafemi Awolowo University Teaching Hospital Ile Ife, there were only two of us in Paediatrics, after the two of us, the next in line was the Consultant. This afforded me the opportunity of maximum exposure to children and their diseases. There and then, I fell in love with children because the treatment of their condition is very rewarding, one moment they are sick, the next moment they are playing around. This indeed was fascinating to me.

It was not by accident therefore that I joined the services of the University of Ilorin Teaching Hospital as a Junior Resident in Paediatrics under the tutelage of Late Dr M.A. Adedoyin, Dr K.T. Joiner and Prof (Mrs) O.Fagbule (Now Olugbile) who groomed me and ensured that I excelled in the chosen field of Paediatrics. Prof Adeoye Adeniyi took over this mentorship after his meritorious service to this great University as a two term Vice Chancellor. He has since been my mentor, adviser, father, and

confidant. I have gained a lot from the wealth of experience of Baba. Baba I am grateful.

Children are the most amazing people of all. These tiny bundles of energy are a constant source of inspiration to me and perhaps most of us here present. Children are the most rewarding patients to have in terms of their response to management. I always tell the story of a two year old who was brought in a coma from a severe attack of malaria and anaemia. He was given up for dead by the parents. His condition was managed, he responded well to treatment, and the next morning, I met him at the gate of the hospital insisting that he must return home and not to the ward.

Another case that I recall often is that of a severely dehydrated child who was brought in shock. Within four hours of fluid therapy, he was sitting up and eating normally. When he saw me, he took my stethoscope and started examining me.

It is pertinent to note here that the basic health indices for Nigeria has been consistently, persistently and abysmally low over the years and these health factors impact negatively on the health of children especially those below the age of five years. “*The State of the World Children*” which chronicles the health indices of different countries by UNICEF gave the following extracts as the figure for Nigeria in 2009:

- a. Under 5 mortality ranking 18<sup>th</sup> position from the rear
- b. Under 5 mortality rate 138 per 1000 live births
- c. Percentage of under 5 who are underweight 24%
- d. Percentage of under 5 who are severely malnourishe 9%
- e. Percentage of under 5 with wasting (WHO standards) 11%
- f. Percentage of under 5 with stunting (WHO standards) 43%
- g. Percentage of the population using improved drinking water source (2008) 58%
- h. Percentage of under 1 receiving DPT 3 41%
- i. Percentage of routine EPI vaccines financed by government 79%
- j. Percentage of household sleeping under ITNs 8%

k. Percentage of under 5 sleeping under ITNs 6%

All the indices are below expectations for a positive impact on the health of children.

**My Contribution to knowledge in Paediatrics:** My area of interest is Gastroenterology / Nutrition and Neurology. I actually inherited the Neurology clinic from Dr K.T. Joiner when he left to take up an appointment with the West African Health Community as the Executive Secretary. Over time I have come to realise the working relationship between the GIT and the Nervous system to an extent that I was able to integrate the two and work on both.

The title of this inaugural lecture is derived from the relationship that exists between these two body systems and the ability of the gut to withstand and cope with all situations in which it finds itself in childhood, hence, “**The child’s gut and its guts**”.

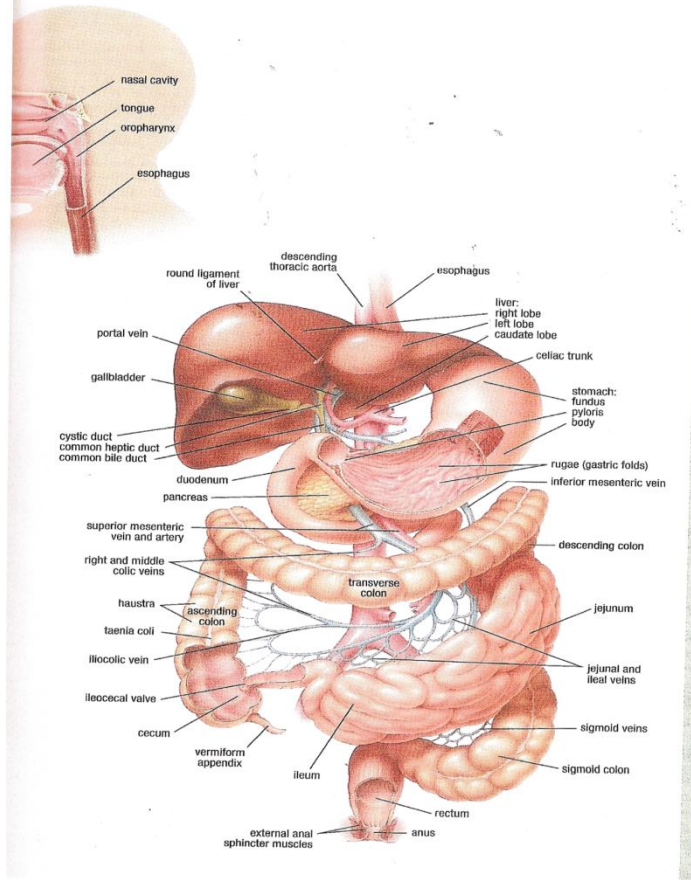
Who is a “**Child**”? : Article I of the Convention of the Rights of the Child defines a child as a person aged 18 years and below whilst the International Labour Organisation (ILO) defines a child as a person below the age of 16 years.

- *Stedmans Medical Dictionary* defines “**gut**” as embryonic digestive tube, synonymous with *intestines*
- The Oxford Advanced Learners Dictionary defines “**Gut**” (noun) as “*the tube in the body through which food passes when it leaves the stomach*” (synonymous – *intestine*) and
- “**guts**” (plural) –
  - “*the courage and determination to do something difficult or unpleasant*”, or
  - “*the most important part of something*” or
  - “*work hard to achieve something*” or
  - “*have strong and unusual qualities*”

Simply put, the gut of the child has got the power, effrontery, zeal, determination, strong and unusual qualities to withstand all insults that it is subjected to and achieve results.

Lets consider the anatomy of the Gastrointestinal system.

**Figure 1** shows the gross anatomy of the gastrointestinal tract (GIT) in humans, **children inclusive**.



**Figure 1: Gross anatomy of the gastrointestinal system**

The gastrointestinal tract of children is structurally exactly like that of the adults, but it is the maturity level that differs from that of adults; it matures as the child grows. We should therefore not leave here with the impression that the gut of a child is inferior to that of an adult. Their “*gut has got guts*” to handle the different items delivered to it.

The GIT is a very vital organ that has the following functions:

1. **A machine** – it masticates and breakdown / pulverise solid materials into a paste that is easily handled and swallowed
2. **A propeller** – the bolus of food is propelled along the gut through peristalsis
3. **A mixer** – the food deposited in the gut is mixed and re-mixed to make it smoother and fluidy for easy digestion / absorption
4. **A secretor** – secretes the digestive juices containing the enzymes that are required for breaking the macromolecule to micromolecules that will be easily absorbed
5. **An endocrine organ** – producing hormones such as gastrin, secretin etc
6. **An immunologic agent** – the gut is the **largest immunologic organ in the body** especially in children. All diseases of the gut get referred to the GIT eg. vomiting and diarrhoea are common symptoms in children even though the disease might not be in the gut. This situation deceives the parents and uninitiated to assume that the problem is in the gut, hence, they purchase and apply ineffective, useless drugs that may be injurious to the children without knowing that the problem is not in the intestine. Such drugs include: Metronidazole (Flagyl), Avomine, Diastop, etc.

7. **A perfect sieve** - the gut is capable of allowing some nutrients to cross the mucosa into the body system whilst denying some passage
8. **A fluid regulator** – massive absorption of fluid across the mucosa of the gut ensures adequate hydration of the body. Fluid is also secreted into the lumen of the intestine but the net result is absorption of fluid into the body
9. **A barrier agent** – the mucosal barrier prevents harmful germs from crossing the mucosa into the body system through several mechanisms such as mechanical barrier and immunological barrier. The latter mechanism was well researched by our group. Part of the “**gut of the gut**” is its ability to confront and fight infective agents invading the body through the intestines.
10. **A reservoir** – the finished product / waste are kept in the large intestine for active re-absorption of water, hence, solidification of stool.
11. **A waste depot / disposer** – the gastrointestinal wastes are held in the rectum for some time before appropriate disposal at the auspicious time.

There is likely some more important functions of this “**gutsy**” organ that is yet to be identified.

It is this capability of the gut that informed our research into how the child’s gut is able to withstand and curtail the activities of the various antigenic challenges it is subjected to. This is an organ that is exposed to all forms of items ranging from food, drugs, water, all manner of agents (bitter, sweet, sour, bland, salty, peppery, very hot pepper, hot, warm, cold, freezing cold, watery, slimy, semisolid, solids, rock-solid, nuts, pellets, bolus, big bolus, etc) and it is still able to cope and seldom complain. Even the gut of the newborn baby is well adapted to the food and drugs including other items that are appropriate to the level of development of the gut and it is capable of handling them.

A simple experiment to convince the doubting Thomas is to put a speck of pepper in one's eyes and see the outcome, then one will appreciate the “**gut of the gut**”. What has empowered the gut to be able to withstand these series of agents ?

Within the intestine lies the first line of defense of the immune system, with over 80% of the human immune system found in the intestinal mucosal barrier. Keeping the intestinal mucosal healthy is the most important part of maintaining and sustaining a healthy body,<sup>1</sup> “*ono ofun, ono orun*” (“*Your gut is the way to heaven*”) as the Yoruba will say. Also “*emi tio jata, emi kukuru / yepere*” , that is “ *he who does not eat well is usually unhealthy with a shortlived life*”. **You eat well, you stay healthy, you eat well you stay alive.**

The intestinal mucosa is said to be the body's second skin which serves as the first line of defence against pathogens. The intestinal mucosa contains several lining antibodies known as immunoglobulins sIgA, IgG, and IgM.

The gut is observed to respond to all insults in the body, be it inflammatory, traumatic, psychological, emotional, etc. For example, a bout of Malaria can make a child start vomiting and have frequent stools, not necessarily because the intestines are infected, but the gut responds by immunological reaction to the insult. A sudden bad news like the loss of a loved one or fear can get one racing to the toilet. Constricting the carotids as it occurs in strangulation leads to hypoxia (lack of oxygen supply to the brain) which can lead to uncontrollable passage of stools, etc. These are not direct injuries to the gut but the gut is manifesting the symptoms in response. This unique response of the gut sensitised our research group to look at the ability of the gut to withstand these insults. What has empowered the “**gut to have this gut**” to withstand all these recurrent and persistent challenges on a daily basis?

### **Diarrhoea.**

Diarrhoea is passage of loose watery stools, a common condition in childhood and a leading cause of morbidity and mortality in this environment. Diarrhoea is a killer in childhood as a result of dehydration (loss of body water) and loss of electrolytes (body salts that are essential for cellular activities). With the advent of oral rehydration therapy, a therapeutic measure that has been described as a *cheap, readily available, affordable, accessible, acceptable, effective treatment and appropriate technology*, death resulting from diarrhoea has reduced remarkably.

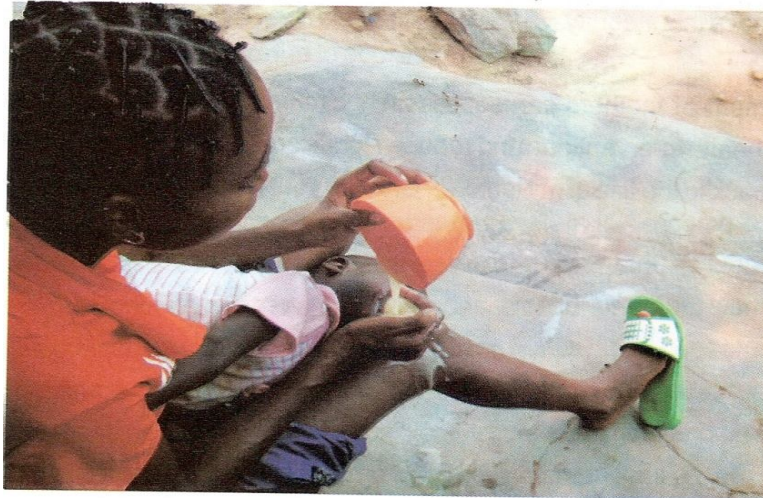
Despite its proven effectiveness, the awareness of the use of ORT for the management of diarrhoea was low as evidenced by our findings of low level of knowledge in the mothers, and the continued use of agents that are not useful, but could be harmful in the management of the condition.<sup>2</sup> Patent medicine dealers are usually patronised by the mothers first when their babies have diarrhoea. We therefore studied the level of knowledge and awareness in the patent medicine dealers.

The study revealed that only 33% of the stores were manned by the owners whilst 66% of the attendants have no knowledge of what they are treating. Of the employees attending to the patients, 30% were primary school pupils. Over 68% of the store keepers / attendants did not ask questions about the diarrhoeal episodes, whilst 81% did not ask to see the child. Over 80% did not offer advice on the use of oral rehydration therapy, rather all (100%) recommended antidiarrhoeal drugs either singly or in combination. Mothers were using such drugs as Diastop, Flagyl etc which very often worsen the situation of the children. This study further emphasised the need for more education of mothers on the use of ORT, and the need for training and retraining of Patent Medicine Dealers.

The laws regulating the establishment and running of patent medicine stores, and assessment of appropriate qualifications required for licensing are long overdue for review.

In a study we carried out 10 years later, we discovered that with the advent of oral rehydration therapy, there was a dramatic reduction in the number of cases of severe dehydration in children with diarrhoea disease in Ilorin.<sup>3</sup> The parents were more aware of the efficacy of ORT and had started giving it to the children at home before presentation in the hospital. Also the parents present early in the hospital, but the use of antidiarrhoeal drugs was still common. There is therefore the need for further training and retraining of health workers and mothers on the home management of diarrhoea, and to discontinue the use of drugs that are not indicated in the management of diarrhoea, whilst ORT use should be strengthened.

Even when the gut is protesting as a result of the illness, i.e., when the child develops loss of appetite, often times there is an attempt by the mother to force the gut to accept what it has rejected by force - feeding the baby



**Figure 2: This is a common feature seen in this environment:  
A mother force - feeding the baby who has lost appetite due to  
ill-health**

*\*\*\*With the kind permission of Dr Oladokun*

This practice does not only insult the sensibility of the gut, it challenges its attempt at protecting itself, and the complications that can follow this process such as aspiration, pneumonia, and occasionally death. This dangerous habit is still rampant today, mothers should be aware of the dangers inherent in this practice and desist from force-feeding their babies. *If a baby is not eating well, it is an indication of ill health*, the cause should be looked for and treated and the appetite will return.

The response of the gut to all insults in other organs in the body led to the research into the pathogenesis of diseases referred to the gut. Using endoscopic machine (medical equipment called fibre optic scopes that are capable of being manipulated into the intestines), **Figure 3**, the intestines were visualised directly and biopsies (small pieces of gut tissues) were obtained without cutting open the patient. These biopsy tissues are subjected to laboratory processing and the tissues are then observed under the microscope.



**Figure 3: Endoscopic machine**

We found that the lining of the gut are infiltrated with intra epithelial lymphocytes which migrate to the gut lining to fight offending agents and keep them in check. Also the mucosa shows other features of inflammation.

Immunological studies by assaying autoantibodies showed elevated levels of:

- antigliadin antibodies,
- antismooth muscle antibodies,

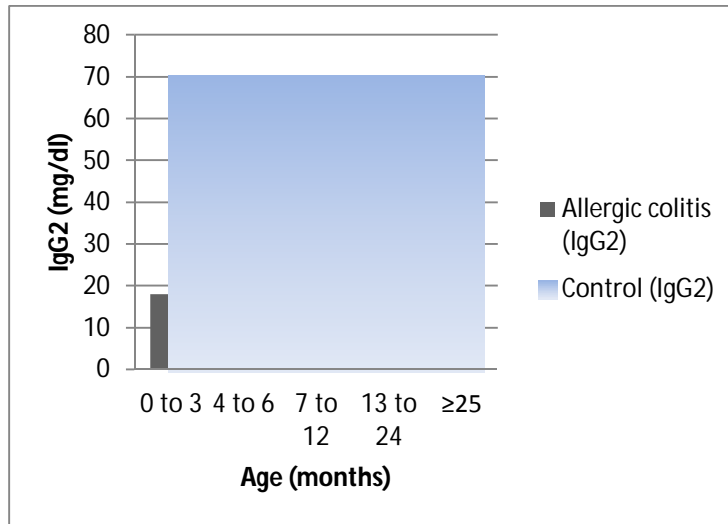
- antireticulin antibodies and
- antiendomysial antibodies

in children with inflammatory bowel disease.

Our humble contribution in the advancement of knowledge in this area include:

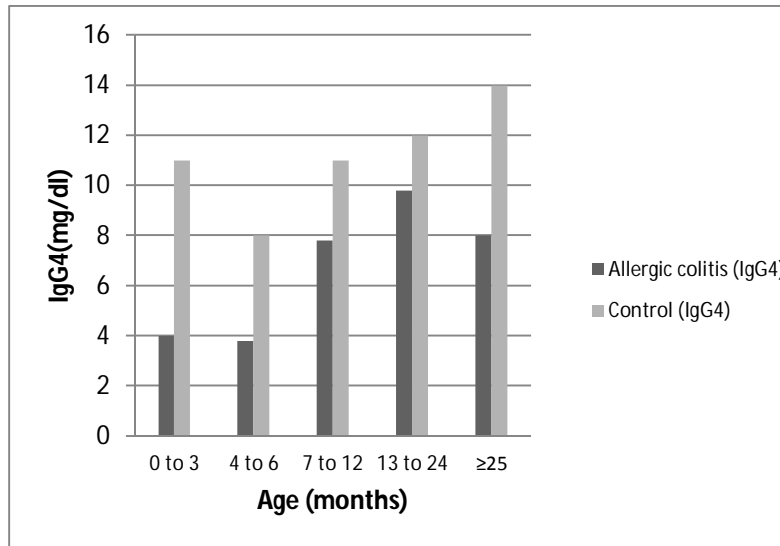
### **The role of minor immunodeficiency in the pathogenesis of inflammatory conditions of the gut**

The known mucosal barrier agents in the gastrointestinal tract include the physical barrier which prevents large molecules from crossing the wall of the intestine, secretory immunoglobulin A which is a well recognised mucosal barrier immunoglobulin by its effect of binding with the antigens thus impairing its action on the gut, the chemical substances released into the gut such as hydrochloric acid in the stomach which kills some of the pathogenic agents etc. We felt there must be some other mucosal barrier mechanisms that were at play in this system because, the secretory IgA is normal in some situations where there is disease. We then flashed our search light on the other immunoglobulins, i.e. Immunoglobulin M, Immunoglobulin G and its subclasses IgG subclass 1 (IgG1) is the predominant IgG accounting for 60 to 70% of IgG, followed by IgG2 whilst IgG 3 and IgG4 subclasses account for a small proportion, therefore, a deficiency of IgG2, 3 and 4 will not affect the total IgG levels adversely. In **1994**, whilst at the Great Ormond Street Children Hospital in London, our team assessed the IgM , IgG and IgG subclasses in some inflammatory conditions of the intestine We found that immunoglobulin G subclasses 2 and 4 were very low in children with these conditions compared to the normal children.<sup>4</sup>



**Fig 4: Mean serum Ig2 subclass concentration in the different age groups in allergic colitis and in controls**

At that time, Immunoglobulin G subclasses were just being recognised as mucosal protective immunoglobulins. This pioneering work opened the floodgate for series of work on IgG subclasses in immune status of the different body systems such as the respiratory, genito-urinary and dermatologic systems.



**Fig 5: Mean serum IgG4 subclass concentration in the different age groups in allergic colitis and in controls**

Further research on these groups of patients revealed low levels of CD3 and CD4 T lymphocytes with an accompanying elevated CD8 T lymphocytes thus corroborating some degree of immunodeficiency in the children.<sup>5</sup> A normal Ig A, IgG, IgM, IgG 2 & 4 subclass, normal CD3 and CD4 would have prevented these disease conditions

The finding of this study was one of the earliest confirmation of the role of immunoglobulin subclasses 2 and 4 in gastrointestinal diseases, and has opened the floodgate for the role of IgG subclasses in other disease conditions in childhood. This study contributed knowledge in the area of gut immunology and mucosal barrier. We now know that gut barrier mechanism goes beyond secretory IgA.

The observed increase in the incidence of febrile illness, diarrhoea and respiratory infections towards the end of the first half of the first year of life (**which mothers erroneously attribute to teething**) is partly due to the low levels of IgA, IgG2 and IgG4 which coincides with the period that the baby is being exposed to new antigens in the diet.

We have made effort to study the role of IgG subclasses in some gastrointestinal conditions in this environment but this has been hampered by lack of facilities. We look forward to being able to resume and reinvigorate these studies in the future as research empowerment is supported at our centre here in Ilorin

#### **Bowel Habit of the Newborn:**

The bowel habit of the newborn differs from place to place, with factors such as the race, diet, infections etc having a role to play. There are indications that black infants attain some neurological maturity of their gut earlier than their Caucasian counterparts of the same gestational age.<sup>6</sup> The interaction between the gut and the nervous system is well exemplified here. **The gut of the newborn is fully formed but the maturity is not fully developed.**

Most mothers will exercise fears if there is a passive delay in the passage of the first stools in their newborn babies (most babies pass their first stools during delivery and may be missed). Therefore, a knowledge of the pattern of the bowel habits of newborns, especially the preterms, will add to our understanding of the physiology of the large bowel. This information will guide the clinician in making a timely choice of intervention without unnecessary invasive and expensive investigations, and the parents fear will be allayed based on known fact.

We investigated the pattern of the bowel habit in preterm babies in the first ten days of life. We observed that once the passage of stool was initiated,

- ✚ there is a direct relationship between stool frequency and the volume of milk ingested<sup>7</sup>
- ✚ there was an inverse relationship between the gestational age of the baby and the duration of passage of transitional stools.<sup>8</sup>

Infact, most babies will stool with every breast feeding (due to *gastrocolic reflex*), hence, mothers and practitioners should not interpret frequent stooling with breast feeding in the neonatal period as abnormal but a reflection of a normal physiology in the newborn.

To the mothers, this is a very important point as we have seen situations where frequency of stooling on feeding has been interpreted by the uninitiated to mean: *jedi-jedi*; or *the breast milk is too sweet*; or *the mother is eating too sweet foods*; or *oka-ori* etc. These are all misconstrued ideas which are false. Mothers should feel free to eat what they like during the breast feeding period and stay healthy.

Breast milk is still the best food for the newborn and one of the advantages is that it enhances proper bowel motility and maturation of the gut through the “**gut promoting factor**” in it.

The concept of “*jedi-jedi*” is not clear, several conditions have been labelled as *jedi-jedi* in children such as:

- passage of bloody stool
- passage of mucoid stools
- passage of small frequent stools
- anal itching
- low back pain
- frequent passage of flatus
- smelly stools etc

If a child is having any of these complaints, such a child should be taken to a health facility for proper assessment and management rather than either: **a)** restricting the child from taking some foods which are believed to cause “jedi-jedi”, whilst denying the child the nutritious value of these foods or **b)**

administration of “agbo” (local herbs) which might be injurious to the child.

### **The Gastrointestinal Tract and Human Immunodeficiency Virus Infection**

I cannot conclude the talk on the gut without considering the gut and HIV infection. The gastrointestinal system is the most affected organ in the body in HIV infection and it constitutes probably the first system to show the symptoms . This is because the gut has this capacity to identify and challenge this foreign body in the system of the child. **Diarrhoea is one of the first presentations in children with HIV / AIDS.** A word of caution, I am not saying that every child with diarrhoea has AIDS!!!

HIV is fast becoming a public health problem with an estimated 2.5 to 5.2% of the adult population being infected in sub Saharan Africa .<sup>9</sup> Children have their own share of the insult. Following infection, there is rapid and widespread dissemination of the virus with the virus going for the T cells and significantly reducing the CD4 lymphocytes, hence, immunodeficiency. In children, oral candidosis is the most commonly recognised oral presentation of HIV infection due to the precipitous drop in CD4 lymphocyte levels. Fungal infection control is through cell mediated immunity, hence, fungal infection thrives in HIV infected infants.

We looked at children with HIV infection viz-a-viz oral manifestation of the disease and we discovered that oral candidosis (i.e. oral thrush, the Yoruba call it “*majata*” or “*efu*”) is a common and early manifestation of HIV infection in childhood.<sup>10</sup>



**Figure 6: Extensive oral candidosis (thrush)**

We concluded that the finding of extensive intractable oral candidosis which is refractory to simple oral antifungal agent therapy in infants should raise the suspicion of HIV infection and such children should be screened for HIV infection after parental consent.

*Miconazole gel* was very effective in the management of intractable oral candidosis in this study, but again, the drug is no more registered and has gone into extinction in Nigeria.

### **Micronutrients Research**

Micronutrients are essential constituents of the human diet required in minute amounts that are essential for metabolism that are either inadequately synthesized or not synthesized at all in the human body. Only small amounts of these substances are needed for carrying out essential biochemical reactions (e.g.,

acting as coenzymes or prosthetic groups). Overt vitamin or trace mineral deficiencies are rare in Western countries due to a plentiful, varied, and inexpensive food supply; but such cannot be said of the developing countries, (Nigeria inclusive) in which lack of micronutrients abound.

**Table I: The trace elements, its deficiency and toxicity**

<b>Element</b>	<b>Deficiency</b>	<b>Toxicity</b>	<b>Tolerable Upper (Dietary) Intake Level</b>
Boron	No biologic function determined	Developmental defects, male sterility, testicular atrophy	20 mg/d (extrapolated from animal data)
Calcium	Reduced bone mass, osteoporosis, osteomalacia	Renal insufficiency (milk-alkali syndrome), nephrolithiasis, impaired iron absorption	2500 mg/d (milk-alkali)
<b>Copper</b>	<b>Anemia, growth retardation, defective keratinization and pigmentation of hair, hypothermia, degenerative changes in aortic elastin, osteopenia, mental deterioration</b>	<b>Nausea, vomiting, diarrhea, hepatic failure, tremor, mental deterioration, hemolytic anemia, renal dysfunction</b>	<b>10 mg/d (liver toxicity)</b>

<b>Element</b>	<b>Deficiency</b>	<b>Toxicity</b>	<b>Tolerable Upper (Dietary) Intake Level</b>
Chromium	Impaired glucose tolerance	Renal failure, dermatitis, pulmonary cancer	ND
<b>Fluoride</b>	<b>Dental caries</b>	<b>Dental and skeletal fluorosis, osteosclerosis</b>	<b>10 mg/d (fluorosis)</b>
<b>Iodine</b>	<b>Thyroid enlargement, T<sub>4</sub>, cretinism</b>	<b>Thyroid dysfunction, acne-like eruptions</b>	<b>1100 g/d (thyroid dysfunction)</b>
<b>Iron</b>	<b>Muscle abnormalities, koilonychia, pica, anemia work performance, impaired cognitive development, premature labor, perinatal maternal mortality</b>	<b>Gastrointestinal effects (nausea, vomiting, diarrhea, constipation), iron overload with organ damage, acute systemic toxicity</b>	<b>45 mg/d of elemental iron (GI side effects)</b>

<b>Element</b>	<b>Deficiency</b>	<b>Toxicity</b>	<b>Tolerable Upper (Dietary) Intake Level</b>
Manganese	Impaired growth and skeletal development, reproduction, lipid and carbohydrate metabolism; upper body rash	General: Neurotoxicity, Parkinson-like symptoms Occupational: Encephalitis-like syndrome, Parkinson-like syndrome, psychosis, pneumoconiosis	11 mg/d (neurotoxicity)
Molybdenum	Severe neurologic abnormalities	Reproductive and fetal abnormalities	2 mg/d extrapolated from animal data
<b>Selenium</b>	<b>Cardiomyopathy, heart failure, striated muscle degeneration</b>	<b>General: Alopecia, nausea, vomiting, abnormal nails, emotional liability, peripheral neuropathy, lassitude, garlic odor to breath, dermatitis</b> <b>Occupational: Lung and nasal carcinomas, liver necrosis, pulmonary inflammation</b>	<b>400 g/d (hair, nail changes)</b>

Element	Deficiency	Toxicity	Tolerable Upper (Dietary) Intake Level
Phosphorous	Rickets (osteomalacia), proximal muscle weakness, rhabdomyolysis, paresthesia, ataxia, seizure, confusion, heart failure, hemolysis, acidosis	Hyperphosphatemia	4000 mg/d
Zinc	Growth retardation, taste and smell, alopecia, dermatitis, diarrhea, immune dysfunction, failure to thrive, gonadal atrophy, congenital malformations	General: Reduced copper absorption, gastritis, sweating, fever, nausea, vomiting Occupational: Respiratory distress, pulmonary fibrosis	40 mg/d (impaired copper metabolism)

**\*\*Harrison's Principles of Internal Medicine<sup>11</sup>**

Zinc, selenium and copper are very important trace elements that have a role to play in the diseases of the gastrointestinal tract.

**Zinc:** Zinc is an integral component of many metalloenzymes in the body; involved in the synthesis and stabilization of proteins, DNA, and RNA and plays a role in fetal growth, and embryonic development.

Zinc deficiency has been observed in inflammatory bowel disease, malabsorption syndromes, cases of malnutrition and sickle cell disease. In these diseases, mild chronic zinc deficiency can cause stunted growth in children, and impaired immune function. Zinc is important in immune cellular response in man as it decreases natural killer cell activity.<sup>12,13</sup>

Zinc deficiency can result in diarrhea, muscle wasting, brown fluffy hair, and undue irritability in a child **Zinc supplementation is now an effective adjunctive therapeutic strategy for diarrheal disease in children.**<sup>12,14</sup>

### **Copper**

Copper is an integral part of numerous enzyme systems including amine oxidases, ferroxidase (ceruloplasmin), cytochrome-*c* oxidase, superoxide dismutase, and dopamine hydroxylase. **Copper is also a component of ferroprotein, a transport protein involved in the basolateral transfer of iron during absorption from the enterocyte.** As such, copper plays a role in iron metabolism, melanin synthesis, energy production, neurotransmitter synthesis, and CNS function; the synthesis and cross-linking of elastin and collagen; and the scavenging of superoxide radicals. Dietary sources of copper include shellfish, liver, nuts, legumes, bran, and organ meats.

### **Selenium**

Selenium is a component of the enzyme glutathione peroxidase, which serves to protect proteins, cell membranes, lipids, and nucleic acids from oxidant molecules. As such, selenium is being actively studied as a chemopreventive agent against inflammatory bowel diseases, gastrointestinal infections and certain cancers.

*The role of micronutrients in the pathogenesis of GIT conditions was also studied in children with inflammatory bowel*

*disease<sup>15</sup> and allergic colitis<sup>16</sup> by our research group at the Great Ormond Street Children Hospital in London.*

Children with inflammatory bowel disease were found to be deficient in the trace elements (selenium, copper and zinc). Zinc and Selenium protects cellular membranes against oxidative damage, hence, a low level of the trace elements enhances free radical mediated tissue injury through cell membrane peroxidation leading to more tissue damage, hypoalbuminaemia (reduced albumin synthesis) and further low selenium and zinc. With chronic hypozincaemia and hyposelenaemia, further free radicals tissue injury results and the vicious cycle continues.

The findings of this study opened the floodgate for research into the role of micronutrients in the pathogenesis of diseases, and informed the use of trace element as supplements in many gastrointestinal disease conditions including diarrhoea disease, allergic colitis, and inflammatory bowel disease.

The level and degree of malnutrition in our environment is very high with the prevalence of malnutrition being as high as 45 percent in children in this environment, coupled with the advent of HIV / AIDS, it could be reliably assumed that the incidence of trace element deficiency will be high in our children.

This deficiency could result from:

- ✓ inadequate intake,
- ✓ reduced absorption,
- ✓ increased intestinal loss (especially in the diseased intestine)and
- ✓ the inflammatory process.

Malnutrition is associated with more than 50% of childhood death. A malnourished child is deficient in these trace elements, hence, increased susceptibility to diseases and infection, and death. The vulnerability of our children to infections supports these findings. If the gut has been able to ensure adequate absorption of these trace elements, disease would have been kept far away from them, .... **“the gut has its guts”**.

**Infections and Malnutrition:** There is a sequential but unholy relationship between malnutrition and infections such that malnutrition predisposes to infection and infection leads to malnutrition in childhood.<sup>17,18,19</sup> If this vicious cycle is not interrupted by way of interventions, the child will subsequently die. One of the very common infections in these patients is urinary tract infection (UTI). Infection of the urinary tract in malnourished children poses a challenge to the Paediatrician because

1. The affected child may not present with the classical symptoms of UTI like adults do
2. It can occur as an occult (hidden ) infection
3. The child's response to an infection is suboptimal because of reduced immunity,
4. It militates against the survival of the already immunocompromised child; and
5. Malnourished children with UTI will not respond well to treatment, unless the infection is cleared.

For the above stated reasons, we carefully examined the urine in a group of malnourished children,<sup>20</sup> and found that there was indeed a high prevalence of UTI (20%) in them, with Marasmic / Kwashiokor and Kwashiokor being more affected, (a wide range of organisms was isolated in the urine (*Escherichia coli* and *Klebsiella species* dominating), including unusual ones like fungal agents. The antibiotic sensitivity though high with the cephalosporins, complete or prompt response to therapy may be suboptimal in the presence of florid or frank malnutrition.

It was recommended from this study that all malnourished children should be investigated routinely for UTI even if there are no signs of urinary tract infection in them.

**What then – the following may be the result when the gut has lost its guts:**



**Fig 7: A severely malnourished patient with Kwashiorkor and extensive dermatosis and generalised oedema**



**Fig 8: Cancrum oris (Noma) in an immunocompromised boy**



**Fig 9: Extensive pedal oedema, desquamation and excoriation in a child with kwashiokor**

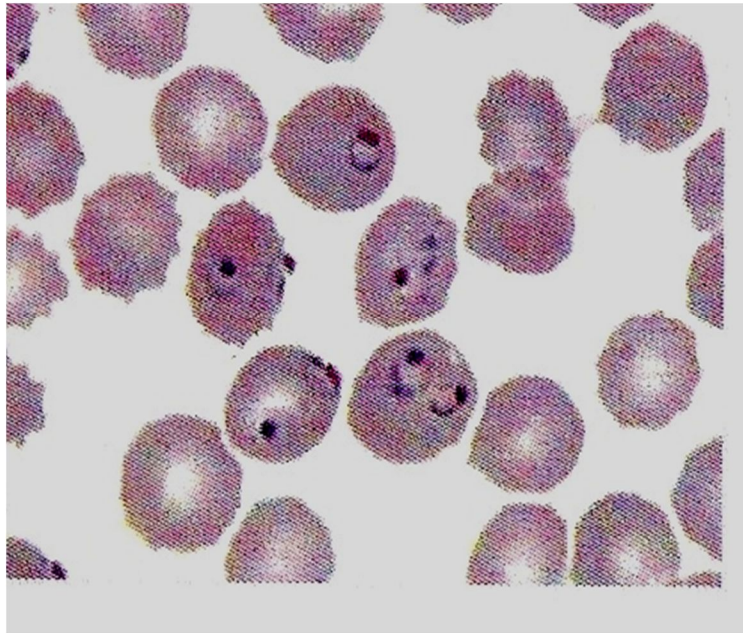


**Fig 10: A child with features of Rickets with Harrison's sulcus, rickety rosaries and pectus carinatum (pidgeon shaped chest)**

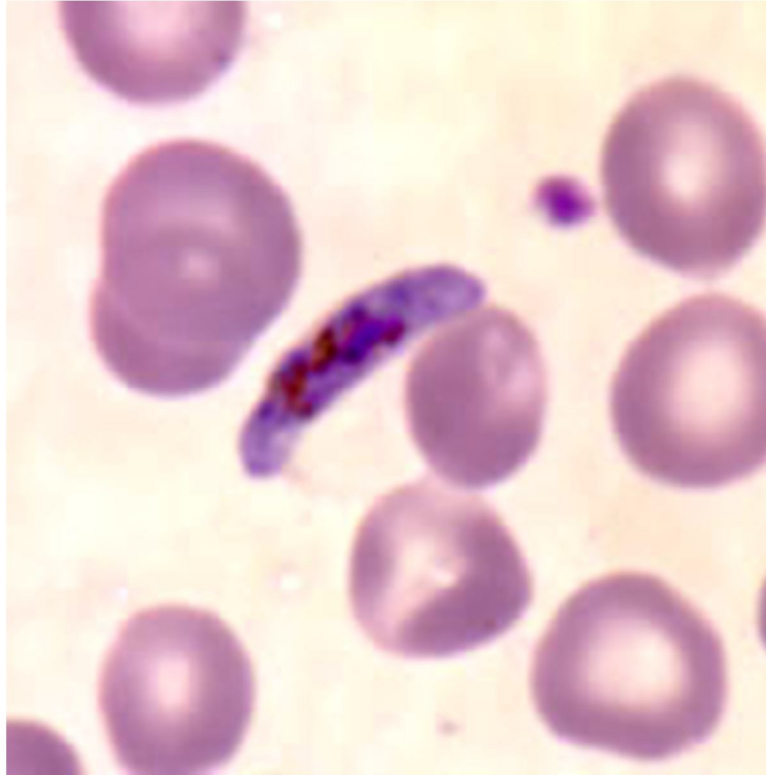
**Mr Vice Chancellor Sir**, this lecture is not all about the immunology of the gut only, we also studied other diseases afflicting children, since the human being should be seen holistically, with the different systems working in unison for the good of man.

## **Malaria**

Malaria remains a major killer disease in this environment for years past and recently has continued to be so in an alarming proportion, contributing a large proportion to the morbidity and mortality in childhood. The increase in the rate of drug resistance has led to the high incidence of serious life threatening complications such as Cerebral malaria, severe anaemia to mention a few.



**Figure 11: Blood film showing ring forms of malaria parasites (*Plasmodium falciparum*)**



**Figure 12: Blood film showing gametocyte of *plasmodium falciparum***

Cerebral malaria which is the most lethal complication of falciparum malaria has become a serious complication that is ravaging and incapacitating afflicted children, with survivors developing serious neurological sequelae.<sup>21</sup>

Initially, Quinine was the drug of choice for cerebral malaria in view of the resistance of the parasite to the commonly used drugs. With the advent of artemisinin derivatives, the

efficacy of this set of drugs in the management of patients with severe / complicated malaria became issues of research.

This informed our group's attempt at comparing intramuscular artemeter and intravenous quinine in this group of patients. This study showed that children treated with artemeter had a shorter fever clearance and coma resolution time, though, parasite clearance was better achieved with quinine.<sup>22</sup> The findings of this study opened the floodgate for further research into the artemisinin derivative group. The request for the reprint of this paper from all over the world was overwhelming. Also this study was included in the Cochrane Library meta-analysis on the use of artemeter in the treatment of severe malaria.

Only recently (**year 2010**), our group again compared another artemisinin derivative drug (**artesunate**) with quinine and the findings did show clearly that children treated with injectable artesunate survived better with less complications compared to those that received quinine (AQUAMAT study).<sup>23</sup>

The findings of this study led the WHO to issue an advisory on the need for a change in the management of cerebral malaria. This study earned our department i.e. the Department of Paediatrics, University of Ilorin the "**Best Researcher of the Year Award**" for year 2010.

**Congenital / Neonatal Malaria** which were thought to be rare in the past,<sup>24,25</sup> suddenly became a condition of clinical importance in the late 1990s. Newborn babies were having fever and malaria parasite was seen in the blood film of these babies which is unusual. Normally the placenta is very efficient at warding off malaria parasite and preventing it from crossing into the baby. **Also the maternal antibody against malaria parasite that crosses to the baby is supposed to be protective against clinical malaria for the first half of the first year.** However, with massive parasitemia of the placenta, some parasites can get into the system of the baby through breaches in the placental vascular membrane and cause malaria in the newborn.

Our group then studied neonates for malaria infection and the study showed a hospital prevalence of 8.9% in newborns presenting with fever.<sup>26</sup> Emanating from this study is the recommendation that a blood film for malaria parasite should be part of the work up of a neonate with fever.

Also, the determinants of **poor prognosis** in cerebral malaria caught the attention of our study group, hence, the study of factors that are likely to indicate poor prognosis in children with malaria.<sup>27</sup>

We observed that:

- the younger the patient, the worse the prognosis (mothers should be aware of this and ensure that they present in the hospital immediately they notice unusual features in their babies);
- presence of low blood sugar (hypoglycaemia), more so in these group of patients who lose appetite and will not feed well;
- coexisting low blood levels (anaemia) which results from the malaria parasite rapidly destroying the red blood cells;
- presence of acidosis; and
- delayed presentation in the hospital. (Most of our patients reported late in the hospital).

One might pause to ask here that what is the relationship between **the gut and malaria**?. Mothers will notice that often times when their children have malaria, one of the early symptoms is vomiting and / or diarrhoea. Even though the problem is not in the intestine, the gut responds to malaria infection and indeed all insults in the body by giving these symptoms. Mothers should therefore not be deceived by these presentation and assume that the problem is in the abdomen. All diseases of the organs of the body get referred to the gastrointestinal system, and with its vast surface area (said to be

about the size of a football field in an adult), makes it **the largest immunological organ in the human body**.

In an attempt to tackle mosquitoes in this environment, households often spray insecticides to kill mosquitoes often oblivious of the health hazards this pose to the children. In a study of cases of bronchospasm (cough with difficulty in breathing, fast breathing and noisy respiration that occurs more at night) in infants.

We found the trigger factors of this condition to include:

- ✚ the history of insecticide spray in 36%,
- ✚ fumes from frying oil in 12 %,
- ✚ smoke from kerosene stove in 10%,
- ✚ firewood smoke in 8% ,
- ✚ mosquito coil smoke in 3% etc of all the patients.<sup>28</sup>

Mothers should be aware of these trigger factors and eliminate them from the environment of the children. **Insecticide treated bed net still remains the best mosquito control measure with proven efficacy, so mothers are encouraged to use insecticide treated bed nets.**

#### **Intestinal obstruction:**

Earlier on in this presentation, I referred to the gut as a “propeller” which is capable of moving / propelling the gastrointestinal content by peristaltic movement in a downward direction whilst the processing of the food continues. In children between the age of 6 months to 3 years, an accident can occur along the intestine as a result of the overzealousness of the gut with the peristaltic activity thus making a part of the gut to telescope (shoot) into another part resulting in **intussusception**, leading to intestinal obstruction.

This life threatening condition if not treated urgently and promptly can lead to death rapidly in children.

Our group studied the factors that are responsible for increased morbidity and mortality in these patients and observed **poor outcome** in those with:<sup>29</sup>

- ❖ delayed presentation beyond 48 hours from the onset of symptoms;
- ❖ respiratory distress (difficulty in breathing) at presentation;
- ❖ high temperature;
- ❖ severe acidosis;
- ❖ severe dehydration; and
- ❖ delayed surgical intervention beyond 48 hours from admission

The Bible says in Exodus 15: 26 “...if thou will give ears to his commandments and keep all his statutes, I will put none of these diseases upon thee.....”. Parents are therefore advised to take their children to the hospital early for proper assessment if and when they notice anything unusual in them. “*A stitch in time saves nine*”

#### **Seizures (convulsions, “*giri*”or “*warapa*” in Yoruba)**

Seizures are recurrent, paroxysmal, abnormal neuronal discharges leading to loss of consciousness with or without motor activity and / or abnormal behavioural pattern. Seizures are jerky movement of the body with associated altered state of consciousness.

Seizures either following fever or not is very common in childhood. Febrile seizures are commonly seen in children between the age of six months to six years, accounting for a large proportion of admissions into the children emergency room.<sup>30</sup>

Intramuscular paraldehyde is commonly used to abort the seizures. This drug has to be given by injection, requires high skill on the part of the health worker and in an emergency, the nerve supplying the lower limbs called Sciatic nerve could be damaged from the needle hitting the nerve thus leading to paralysis of the limb. In view of this observation, the use of another sedative drug named Midazolam given rectally (pushed into the anus of the child) was studied. Midazolam is commonly used for short time sedation, an anticonvulsant, muscle relaxant

with a very rapid of onset, short duration of action and fast recovery from its effect. We found that Midazolam acts faster, and is as effective and efficacious as paraldehyde, with the advantage of its ease of administration with less skill required for its administration.<sup>31</sup> while the definite cause of such seizure is treated.

This drug would have been appropriate at the primary health care level for the control of seizures, but it was not registered for use in the country shortly after this report and has since gone into extinction. The National Agency for Food and Drug Administration and Control (NAFDAC) would probably reconsider the registration of drugs to include very efficacious drugs that could be of immense benefit to the care of patients.

**Seizure Disorders of Childhood** (previously referred to as Childhood Epilepsies): Seizure disorders of childhood are common in the developing countries, with generalised seizures predominating. Skull x ray is a useful tool commonly requested for during the course of the management of this group of patients. Common radiological findings reported in children with seizures include intracranial calcifications, healed fractures, and raised intracranial pressure<sup>32,33</sup>

We studied and observed that children with generalised seizures following birth asphyxia had an abnormality on the skull x ray which is called “calcification of the falx cerebri”. There was a strong correlation between these abnormal skull x-ray finding and generalised seizures, and history of birth asphyxia in the children.<sup>34</sup> When this important finding was sent to a journal, one of the reviewers who happens to be an elderly Radiologist rejected the paper on the grounds that I quote “*these young researchers are trying to invent a new sign*”. Undeterred by the age and authority of our senior expert, we did not see why young researchers could not invent a sign when their findings are based on verifiable and convincing evidence - based facts. It is gratifying to note that this work was published unedited by

another journal, but timidly; we could not dare attribute the sign to ourselves.

Young researchers should be more proactive in making the case for the presentation / acceptance of their research findings and refuse to be intimidated by comments of perceived authorities in the discipline, if their observations are reproducible and scientifically sound.

Concerning the management of seizure disorders in a resource poor environment like ours, the common childhood seizures should be **focussed** on in terms of the resources for management. It was observed that 62% of childhood seizures in Ilorin were generalised tonic / clonic seizures, followed by partial complex seizures accounting for 17%. Native drug (“*agbo*”) was administered to 58% of the children, whilst only 11% were on prescribed anticonvulsants , and 30% were on both drugs. Orthodox drug compliance was very low and we were able to trace this to the high cost of the efficacious drug.<sup>32</sup> It was concluded that poor drug compliance remains a major constraint to adequate seizure control, further compounded in this environment by non availability of drugs and the unaffordable cost. We recommend that children on anticonvulsants be given their drugs **free** and the government should ensure availability of such drugs.

### **Tetanus**

Tetanus remains a major public health problem despite the implementation of the National Programme of Immunisation (NPI) over the years.



**Figure 13 : A child with tetanus**

Concerning neonatal tetanus, the mothers are an important factor in the care of the newborn, hence, we studied the socio-demographic characteristics of the mothers of babies with neonatal tetanus. The findings were quite revealing.<sup>35</sup>

- Primiparity in 56.7% of the mothers
- Thirty one percent(31%) were single parents
- Thirty seven percent (37.8%) were teenagers

- Eighty three percent of the mothers were below 30 years of age
- Majority of the mothers did not receive formal education (no formal education at all in 56.8%) and 40.5% had primary education. Only 2.7% of the mothers had secondary education
- Forty percent did not attend antenatal clinic **at all**
- Over 70 % of the mothers did not receive tetanus toxoid during antenatal care
- Forty three percent of the mothers delivered at home, 21.6% in church and 18.9% in herbalist home

It was concluded from this study that teenage mothers, low educational attainment of the mother, single motherhood, primiparity, lack / or inadequate antenatal care and poor cord care are factors predisposing to neonatal tetanus morbidity. It was recommended that efforts should be intensified to target these groups of mothers.

### **Medical Education**

I have been actively involved in the training of medical students, residents and students in the medical and allied professions. My involvement in curriculum development and evaluation at the postgraduate level has changed the face of modern docimology and evaluation in the country, through the National Postgraduate Medical College of Nigeria both as Faculty Secretary and currently Chief Examiner of the Faculty of Paediatrics. The responsibilities of these positions has opened a new horizon in my career, and has strengthened me for future challenges in medical education.

### **Ethics**

During the course of a medical practitioner's training and clinical activity, he or she is required to be guided by the ethics of the medical profession which emphasise three key elements:

- A. Autonomy - Respect
- B. Beneficence – Do no harm
- C. Justice

In pursuit of excellence and keeping to the ethics of our profession, we felt the need to reiterate and reinforce information on the principles guiding the conduct of research in human subjects in the current dispensation. These principles were succinctly elucidated in our contribution on this issue<sup>36</sup>

**Recommendations:**

Mr Vice Chancellor Sir, Distinguished Ladies and Gentlemen, as is the tradition of inaugural lectures, and in order to further empower the guts of the gut, I hereby recommend as follows:

**To the Government:**

1. The economy of a country is judged by the nutritional status of its children, a situation where close to 45% of our children suffer one form of malnutrition or the other is an indication of poverty. There is the need for the provision of better nutrition for our children who are the leaders of tomorrow.
2. Strengthening of routine immunisation against the communicable diseases which predisposes to malnutrition and its attendant problems is desirable.
3. The drug regulatory body i.e. National Agency for Food and Drug Administration and Control (NAFDAC) should reconsider the criteria for the registration of drugs in the country such that effective drugs with proven efficiency are readily available and affordable
4. The provision of the very potent antimalarial drugs such as the artemisinin based drugs should be given **free** to children so that the incidence of severe malaria will reduce with the attendant reduction in morbidity and mortality
5. The laws regulating the activities of the patent medicine dealers need to be reviewed, paying special attention to

appropriate qualifications and requirements for licensing. Regular update courses should be organised for the patent medicine dealers and certification at such courses should be made a requirement for licensing / renewal of licenses.

6. Information, Education and Communication materials containing health education and nutritional messages should be made available routinely to mothers and potential mothers at antenatal and child welfare clinics at no cost.
7. The signing into law of the National Health Bill as passed by the Legislature by Mr President will promote and improve medical care to the citizenry (especially children).

**To the University:**

1. Universities should create an avenue for research findings to be translated to concrete practical terms in the immediate communities in which they are sited. This will afford the communities the opportunity of being direct beneficiaries of such research works.

**To the mothers:**

1. If you notice anything unusual in your child, report at a health facility for proper assessment of your child, delay in presentation invariably leads to complications, and is more expensive
2. Breast milk remains the best food for the infant. Frequent stooling with active breast feeding is normal and does not require any treatment
3. Malaria kills, desist from self medication. It is not all fever that is malaria, there may be other serious conditions causing fever in the baby that may be deadly
4. Ensure your babies are fully immunised to prevent communicable diseases that put a lot of stress on the immune system of a child. Immunisation is safe and effective
5. Good nutrition prevents illness

**In conclusion** Mr Vice Chancellor, Distinguished Ladies and Gentlemen, children are the leaders of tomorrow and an investment in the health of a child is an investment in the future of the country. It is the right of a child to have good health, good nutrition and all the other rights of the child as enacted in the article of the Organisation of African Unity on the “Rights of the Child”. As I speak, only a few states in the federation have passed into law the “Child Rights Act” with Kwara state taking the lead.

The signing of the National Health Bill into law will go a long way in ensuring good health and a better future for all our children.

### **Acknowledgements**

My most sincere and unalloyed appreciation goes to God the Almighty, my creator who has been so kind and merciful to me in ensuring that by his protection I was able to achieve my potentials despite all the odds.

I cannot thank enough the following people who had in one way or the other impacted positively on my life and had contributed in no small measures to the success story that I am today.

I am indeed grateful to my lovely and caring parents, my father Pa Zacheaus Babalola Ojuawo (of blessed memory) and Mrs Mary Ogbola Ojuawo who toiled day and night to make sure I had western education. My parents did everything they could to see me through my education in the face of scarce resources. My father ignored the pleadings of my paternal grandmother who interpreted my being delivered on the day my mother carried planks from the farm to the house as an indication of my being destined to be a “**Carpenter**”. But for his love for his children and his understanding of the value of western education which he was not opportune to have, he struggled to give all his children education.

I thank my Uncle Chief Afolabi Ojuawo who actually is the father figure for me all through my life in the sense that I had

to leave my parents at the age of five years to stay with this “**Teacher**” (you know what that means in those days), and I was moving with him from one town to the other on transfer until I gained admission to read medicine in 1975. By default, I acquired another mother in 1963 when Chief (Mrs) Alice Anike Ojuawo got married to my Uncle, hence, I became the first son of the family; a position that I still occupy till today. My Uncle entrenched the spirit of hard work, discipline and perseverance in me, qualities that I cherish and hold on to fervently till today. Thank you Sir for setting my foot on the right path.

To my senior brother, Chief & Mrs Oluwole Ojuawo, (Chief Oduno of Ise Ekiti), who is the head of our family, you have been a source of inspiration to me and I will always cherish the brotherly love that you have always showered on me even till date. God will reward you abundantly for your investment in my education.

My teachers right from the primary school till postgraduate days deserve appreciation from me. They are many and I cannot list them here but I will specially recognise Mrs Aluko (my teacher in primary one who had special interest in me being the son of her friend), my Principal at Ondo Grammar School, Late Chief Akinbobola who identified me as a Leader as early as my Secondary school class I and encouraged me to work hard to make it in life. Also at secondary school level I appreciate Rev Adetunji, Pa Fadase (late), my Science teachers at different levels. At the University level: Prof Olikoye Ransome - Kuti, Prof O. Olumide, Prof (Mrs) Oyin Elebute, Prof (Mrs) Akinsete, Prof A Akinyanju, Prof O Emuveyan, Prof Afonja – all the aforementioned person had occasions to see in me the potentials of being the best and encouraged me, I am happy that I did not disappoint them by garnering prizes including “***the best overall student in the final MBBS examinations in April 1980***”. To you all I am grateful.

I appreciate my teachers (Consultants) during my residency training programme in Ilorin starting with Professor

Emeritus Adeoye Adeniyi (Baba Agbalagba, I thank god for your life, baba remains my adviser and motivator till today. His usual statement each time issues come up to be resolved is “*Ayo ma worry, God is in control*”, and haven been said in that soothing tone, I relax and all works out. Dr M.A. Adedoyin (of blessed memory) recruited me into the department of Paediatrics in 1982 and he laid a good foundation for me to be a good Paediatrician. Prof (Mrs) Doyin Oluwole (then Fagbule), Dr K.T. Joiner, Dr A.B. Bello (late) were highly instrumental to my achieving excellence in my chosen career at the residency level. They all ensured I was properly trained and moulded, not only in knowledge and skill, but also in character.

I cannot thank enough my colleagues (Prof P.J. Milla, and Dr K.J. Lindley) at Great Ormond Street Children Hospital London, We worked together and collaborated in our research work as a team. The short period of my stay in this centre turned out to be one of the most productive years of my research work. This was due to their cooperation and the provision of a conducive environment for active research work.

To the academia, I thank my colleagues for giving me the opportunity to deliver this inaugural lecture. My profound gratitude goes to the Vice Chancellor, Prof Is-haq Olanrewaju Oloyede who had to take up the injustice that was meted out to me concerning my promotion to the Readership position and ensured that the injustice was corrected (he was the Deputy Vice Chancellor, Academic then).

A former Vice Chancellor Prof S.O. Amali deserves my appreciation because he ensured that I did not suffer the same fate in subsequent promotion exercises. Prof Y.A. Quadri deserves a special mention here because he has been a father, an adviser, confidant and friend. He would never really know the crucial role he played in my success story; he acted appropriately and promptly when the need arose, he is very dear to me.

To my Provost, Prof A.B.O. Omotoso, I say thank you to a friend, confidant, adviser, and my strategist who will always have a simple solution to what is perceived as a big problem.

To the Teaching Hospital, I am indebted to this “*my laboratory*” where I had all my practical sessions as a Resident for 8 years and have since been practising my trade as a Consultant Paediatrician over the past 21 years.



**Fig 14: University of Ilorin Teaching Hospital: my laboratory**

I am indeed grateful to all the former / Current Chief Medical Directors that I have had to work with, who made sure I get the necessary support to perform my duties as a Consultant and Researcher in the hospital. Prof Daramola, Prof O. Fakeye, Dr S.K. Kuranga and Dr O. Latinwo are all appreciated.

The Consultants, Residents and Administrative staff in the Teaching Hospital that I have had to interact with during the

course of patients' care are all recognised and appreciated, But for your cooperation, the situation would not have been as it is today.

At the departmental level, I was employed as Lecturer I in 1990 and during my sojourn in the department, the following contributed immensely to my achievements either by way of collaboration in research work, or by the cordial interaction and good relationship which is the hallmark of the “*Paediatric family*” that is evident to all in UITH.

- ❖ Prof WBR Johnson – my teacher, my motivator and friend
- ❖ Drs O Mokuolu, OT Adedoyin, SK Ernest, O Adesiyun, A Abdulkarim, AR Adegboye, MAN Adeboye, SK Afolabi, A Saka , R Olaosebikan and O Katibi - have been very wonderful to me and I remain most grateful to them
- ❖ My residents both old and new (many of them are consultants, and majority of them I supervised their dissertation), I thank you all for the role you played in my life and your contribution to this success story. I could not have achieved this without your support
- ❖ The Nursing staff in the various wards and units of the hospital where I have been involved in the management of patients are appreciated, without your cooperation and support, I would not have achieved what we are celebrating today. A lot of the credit goes to you, ADNS Fakeye, Matrons Isiah, Babamale, and Bodunde (all retired) who taught me the intricacies of Paediatrics in practical terms when I first resumed as a Resident (they know what each Consultant prefers and would let you know what and how to do it, thus saving you embarrassment from the consultant. You ignore their wise advice at your own peril). The newer generation are not left out, CNO Ajala, David, Ajiboye, Maiyaki etc, to you all I am grateful.
- ❖ I also want to acknowledge the support and contributions of the administrative staff in the department of Paediatrics most especially Mr Shehu Afunsho, an Administrative Assistant popularly referred to as “*Director of*

*Administration of the Department of Paediatrics*” (the longest serving administrative staff of the department) whose wise counsel, borne out of experience always makes things work.

I thank the Arinjale of Ise –Ekiti and the current Chairman of Ekiti State Council of Obas, “*Kabiyesi o, ki ade pe lori, ki bata pe lese, igba odun, odun kan*” for gracing this occasion  
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Same for Rev (Dr) SO Gbenjo and the entire members of First Baptist Church Ilorin, I thank you for your prayers, counselling and moral support.

To my extended family, In-laws, friends, well wishers, I am grateful.

Gentlemen of the press, thank you for your presence

I thank all the students that are present here.

To my immediate family, you have been most wonderful. I thank you for your understanding, support, endurance and perseverance.

I thank in a special way my best friend, my sister, my caring loving wife and mother, Mrs Morohunmubo Oyebola Ojuawo. She has been a source of inspiration to me, always there

when I needed her most, and a prayer warrior who interceded on my behalf when the need arose. True to the adage that behind a successful man, there is a woman, in her case, she was always beside me, indeed she stood by me all through and had to keep the home front going in those periods that I am called to duty. You are indeed a virtuous woman.

I thank our two children, Dr Ayodeji Ojuawo and Miss Ayobola Ojuawo also a medical student, both of you have been a source of joy to the family, we are proud of you.

To the entire members of staff of Kiddiz Medical Centre, I appreciate your support and total commitment and dedication to the course of the institution. You all have been very wonderful. I thank the Sweet Mothers that graced this occasion, I want to believe that you will continue to give the best care to your children, continue to love and cherish these precious gifts from God.

To our vibrant and energetic Vice chancellor, I cannot thank you enough for the opportunity offered me to carry out this important requirement of a Professor in the academic environment. You have been very instrumental to the success being celebrated today, God will in his infinite mercy reward you abundantly.

Vice Chancellor, Ladies and Gentlemen, I thank you all for honouring me with your presence at this occasion, God will honour and bless you all.

## References

1. **McEvoy M.** Metabolic healing. Biohealth 304, April 2011. On line:http/
2. **Ojuawo A** and Oyaniyi OT. Treatment of diarrhoea by proprietary medicine vendors. Nig J Paed 1993; 20: 41-4
3. **Ojuawo A,** Njoku A and Adedoyin OT.the impact of oral rehydration therapy on childhood diarrhoeal diseases in Ilorin. Nig J Paed 2003; 30: 23-6
4. **Ojuawo A,** Milla PJ and Lindley KJ. Serum immunoglobulin and immunoglobulin G subclasses in children with allergic colitis. WAJM 1998; 17: 205-9
5. **Ojuawo A,** St Louis D, Lindley KJ and Milla PJ. Non infective colitis in infancy: evidence in favour of a minor immunodeficiency in its pathogenesis. Arch Dis Child 1997; 76: 345-8
6. Eregie CO, Nwogbo DC. A simplified method of estimation of gestational age in an African population. Dev Med Child Neurol 1991; 33: 46-52
7. Adegboye OA, **Ojuawo A** and Adeniyi A. Bowel habits of preterm infants in Ilorin. Nig J Paed 2003; 30: 50-3
8. Adegboye OA, **Ojuawo A** and Adeniyi A. The time of passage of the first stool by preterm infants in University of Ilorin teaching Hospital, Ilorin. Sahel Med J 2002; 5: 133-6
9. Hunter DJ. AIDS in sub-Saharan Africa: the epidemiology of heterosexual transmission and the prospects for prevention. Epidemiology 1993; 4: 63-72
10. **Ojuawo A** and Owolabi O. Intractable oral candidosis as an indicator of HIV infection in infants. Nig J Clin Pract 2003; 6: 42-5
11. Fauci AS, Braunwald C, kasper DL, Hauser CL, Longo DL, Jameson JC and Volcazo J. In Harrison's Principles of Internal Medicine. 17<sup>th</sup> ed. The Mc Graw – Hill Companies Inc 2008.
12. Whiteside TL and Herberman RB. The role of natural killer cells in human disease. Clin Immunol Immunopath 1989; 53: 1-23
13. Vander-Wal Y, Van der Slys, Vere A, Verspaget HW et al. Effect of zinc therapy on natural killer cell activity in

- inflammatory bowel disease. *Aliment Pharmacol Ther* 1993; 7: 281-6
14. Flemming CR, Huizenga KA, Mc Call TT, Gildea J, Dennis R. Zinc nutrition in Chron's disease. *Dig Dis Sci* 1981; 26: 865 – 70
  15. **Ojuawo A**, and Lindley KJ. The serum concentration of zinc, copper and selenium in children with inflammatory bowel disease. *Cent Afr J Med* 2002; 48: 116-9
  16. **Ojuawo A**, Lindley KJ and Milla P. Serum zinc, selenium and copper concentration in children with allergic colitis. *East Afr Med J* 1996; 73: 236-8
  17. Philips I, Whatson B. Acute bacterial infections in Kwashiokor and Marasmus. *BMJ* 1968; 1: 407-9
  18. Berkowitz FE. Infections in children with severe Protein Energy Malnutrition. *Ann Trop Paed* 1983; 3: 79-83
  19. Oyedeji GA. The pattern of infections in children with severe PEM. *Nig J Paed* 1989; 16: 55-61
  20. **Ojuawo A** and Nwofor C. Urinary tract infection in children with severe Protein Energy Malnutrition in Ilorin. *Nig Med J* 1996; 31: 52-4
  21. Warrel DA. Cerebral malaria, *Quart J Med* 1989; 71: 369-71
  22. **Ojuawo A**, Adegboye AR and Oyewale O. Clinical response and parasite clearance in childhood cerebral malaria: a comparison between intramuscular artemether and intravenous quinine. *East afr Med J* 1998; 75: 450-2
  23. Mokuolu OA, Adedoyin OT, Johnson WBR, **Ojuawo A**, Ernest SK, Adesiyun OO, Abdulkarim A, Adegboye AO et al. Artesunate versus quinine in the treatment of severe falciparum malaria in African children ((AQUAMAT): an open-label, randomised trial. *Lancet* 2010; 1016: 1-10
  24. Dimson SB. Congenital malaria in England. *BMJ* 1954; 6: 1083-5
  25. Correl G. Congenital malaria. *Trop Dis Bull* 1950; 47: 1147-67
  26. **Ojuawo A** and Oyewale BT. Neonatal clinical malaria in Ilorin, Nigeria. *Sahel Med J* 2001; 4: 74-77

27. Salisu MA, **Ojuawo A**, Olarewaju WI, Mokuolu OA, Adeniyi A and Oyewale TO. Determinants of poor prognosis in children with cerebral malaria in an urban city of Nigeria. *Trop J Health Sci* 2007; 14
28. **Ojuawo A**, Olarewaju WI, Owolabi O and Omotesho O. Household triggers of bronchospasm in children aged less than two years with hyperreactive airway: a multicentre experience. *Sahel Med J* 2005; 8: 55-9
29. **Ojuawo A**, Olateju R and Rahman GA. Poor prognostic factors in intussusception in childhood as seen in Ilorin Nigeria. *Sahel Med J* 1999; 2: 82-5
30. Fagbule D, Chike – Obi UD and Akintunde EA. Febrile Convulsion in Ilorin. *Nig J Paed* 1991; 18: 23-7
31. **Ojuawo A** and Owolabi O. Comparison of rectal midazolam and intramuscular paraldehyde in the control of seizures in children with febrile convulsion. *Nig Med J* 2001; 40: 67-70
32. **Ojuawo A** and Joiner KT. Childhood epilepsies in Ilorin, Nigeria. *East Afr Med J* 1997; 72: 72-5
33. Hauser WA, Kirland LT. The epidemiology of epilepsy in Rochester, Minnesota: 1935 through 1967. *Epilepsia* 1976; 16: 1-3
34. **Ojuawo A** and Braimah KT. Skull radiologic findings in children with seizure disorders. *Sahel Med J* 2001; 4: 62-5
35. **Ojuawo A** and Owolabi O. Sociodemographic characteristics of the mothers of babies with neonatal tetanus in Ilorin. *Trop J Health Sci* 2001; 8: 17-20
36. **Ojuawo A**, Olatunji PO and Mokuolu O. Bioethics: the principle guiding the protection of participants in medical research. *Trop J Health Sci* 2005; 12: 1-6