UNIVERSITY OF ILORIN

THE TWO HUNDRED AND NINETEENTH (219TH)
INAUGURAL LECTURE

"CHILD SURVIVAL: OBSTACLES AND OPPORTUNITIES THROUGH THE EYES OF A PAEDIATRICIAN IN PRACTICE AND RESEARCH"

BY

PROFESSOR AISHATU AHMED GOBIR

MB, BS (Zaria), MSc (London), M.A (Accra), FMCPaed, FRCP Edin
DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH,
FACULTY OF CLINICAL SCIENCES,
UNIVERSITY OF ILORIN, ILORIN, NIGERIA

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Professor Wahab Olasupo Egbewole SAN
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PROFESSOR AISHATU AHMED GOBIR
MB, BS (ABU), MSc (London), M.A (Accra),
FMCPaed, FRCP Edin
DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH,
UNIVERSITY OF ILORIN, ILORIN, NIGERIA

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The Onikoko family,
My children,
My friends and schoolmates,
Neighbours and colleagues,
Gentlemen of the press,
Ladies and gentlemen

Introduction

In the name of Allah, the Compassionate, the Merciful, I stand before you today to deliver my inaugural lecture titled "Child survival: Obstacles and Opportunities through the eyes of a Paediatrician in practice and research". This is the 219thinaugural lecture of the University. It is precisely the 7th of

the department. The first inaugural lecture from the department titled "Child care in Nigeria: A critical appraisal of traditional and modern concept" was delivered by no other than the late Emeritus Professor Adeoye Adeniyi on a date that has become symbolic in Nigeria. Our late father opened the gate to many good things, including inaugural lectures on the 29thof May, 1980!My teacher, friend and mentor, former Dean, Faculty of Clinical Sciences and Provost, College of Health Sciences, Professor Abdul Wahab Babatunde Johnson, delivered the 100th inaugural lecture, the 3rd from the Department of Paediatrics. His lecture was titled "Microbes and the bellows of young fellows: towards proscribing a pernicious parley". I am not gifted with words and writing like my two teachers mentioned, but I stand somewhere in between, haven learnt a great deal from both men.

Paediatrics is the branch of medicine that deals with the health and care of neonates (<4 weeks), infants (<1 year), other children and adolescents. Simply put, that speciality deals with those from birth to 18 years of age. The word paediatrics is derived from two Greek words: (pais meaning child; and iatros meaning doctor or healer). In the speciality, age is crucial and affects diagnosis, treatment and outcome of diseases and disorders.

Child health refers to a state of physical, mental, social, emotional and intellectual well-being and not merely the absence of disease. This aspect of medicine looks at the child, the family, the environment at home, school and communities to enable the child to develop optimally with full potential.

The two terms have often been used interchangeably; however, it is evident that Child health is a much broader term, and it should be the target of all service providers caring for children.

There are many areas of specialization and focus in paediatrics depending on the child's age, the parts of the body involved, and the diseases that affect them. Somehow, this seems scary in that it suggests that children are divided into tiny bits by all of the paediatricians. This is not the case as every

paediatrician is a general practitioner first and can care holistically for all children. Nevertheless, we have our areas of interest and specialization, e.g. nephrology (kidney-related diseases), pulmonology (lung-related diseases), infectious diseases, neurology (nervous system related disorders), gastroenterology (stomach, intestine and related organs disorders), nutrition, as well as adolescent health. Indeed, a paediatric specialist needs to be called whenever a child requires more in-depth care with respect to disease state. For example, all paediatricians can treat urinary tract infections, but nephrotic syndrome is a disease that calls for long term care by a paediatric nephrologist. In the same way, all paediatricians can treat childhood pneumonia, but childhood asthma calls for more specialist care by a pulmonologist.

Today, my presentation will be in the main areas of pulmonology, infectious diseases and adolescent health. From clinical practice to research and community work, these areas have been my focus, and I will highlight my contributions in this lecture. The title of this lecture acknowledges the significant challenges that children face before reaching adulthood. The main challenges in early life stem from infectious diseases, especially those affecting the respiratory system like bacterial pneumonia. In adolescence, which is a period between childhood and adulthood, mainly behaviour challenges can form the obstacles to a successful journey into adulthood.

According to the Oxford dictionary, an obstacle is "a thing that blocks one's way or prevents or hinders progress." The deaths and illnesses that occur in children related to my areas of interest will be considered obstacles. In adolescents, the health-risk behaviours are evident hindrances to attaining full potential in adulthood and are considered obstacles. At various points in this lecture, interventions that are already recognised or in the pipeline will be discussed as opportunities that will aid child survival.

This lecture will be divided into three main areas

1. Contribution to research and practice in Respiratory Diseases
2. Contribution to research and practice in adolescent health
3. Contribution to community service

Part 1: Contribution to Research and practice in Respiratory Diseases

Respiratory Diseases and Disorders in Children

A brief overview of respiratory anatomy and function

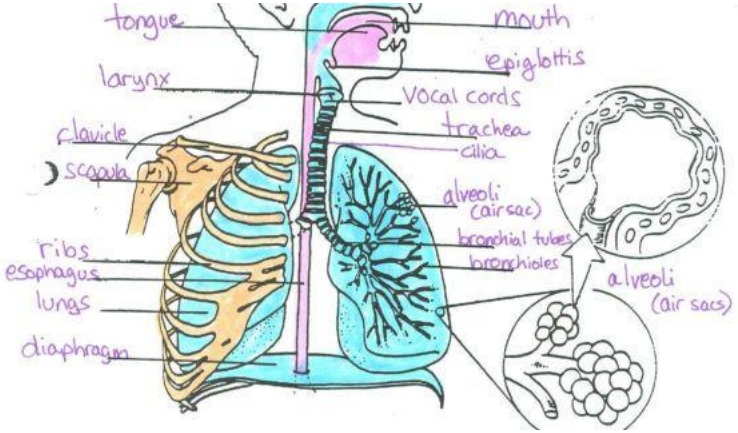
Embryologically, the respiratory system is derived from the primitive gut, an endodermal structure. The system begins forming from the 4thweek gestational age but does not function until birth. In utero, the placenta performs the functions of the respiratory system even though foetal studies have documented respiratory movements in utero.

The respiratory tract is divided into four distinct segments: the nasopharynx, the conducting airways, the respiratory bronchioles and the alveoli.(1) The trachea, bronchi, and bronchioles conduct and transport air from outside and deliver it to the respiratory units-alveoli. The sinuses and the ear are traditionally part of the respiratory tract. **Gas exchange occurs at the alveoli level, providing oxygen to the tissues while removing carbon dioxide from the tissues to be expelled through the airway.**

The airway starts with the trachea, dividing into the left and right main bronchi. There are fourteen generations of bronchioles that reach the lung segments. The right lung has three lobes (upper, middle and lower), while the left has two lobes (upper and lower). All the lobes are divided into respiratory segments that are supplied by the respiratory bronchioles. Overall, the right lung has ten segments, and the left lung has eight segments. The alveoli embedded among

capillaries create an air-blood interface that ensures gaseous exchange.

Figure 1. The respiratory tract showing the parts



Ventilation or breathing is divisible into the inspiratory and expiratory phases. In the inspiratory phase, the diaphragm contracts causing an increase in the thoracic volume, thereby generating a negative thoracic pressure that causes air to rush through the airways to fill the alveoli. On the other hand, the expiratory phase is a passive one achieved with the elastic recoil of the lungs and relaxation of the diaphragm. When the demand for oxygen increases, then laboured breathing ensues. This entails using accessory muscles to meet the increased demand for oxygen. These accessory muscles include the neck muscles for inspiration and abdominal and the internal intercostal muscles for expiration. The stimulus for respiration comes from the medulla and pons, which receive stimuli from various sources. The carotid bodies are specialized cells that detect PaO2, PaCO2, and pH changes. These chemical changes send signals to the higher centres that control respiration.

In respiratory disorders and infections, there are disturbances in the physiological functions of the respiratory

tract of variable severity depending on the disruption caused by the disease. The ventilatory functions of the respiratory system can be evaluated using a set of parameters known as pulmonary function tests. Blood gases can be analysed to evaluate perfusion efficiency. In addition there are several parameters for the assessment of ventilator functions that can be evaluated in health and disease states.

Respiratory infections

Infections are diseases caused by different organisms such as bacteria, viruses, fungi, parasites, protozoa and others. When these disease-causing organisms invade the human body, they result in acute or chronic disease after an incubation period. Infectious diseases are common causes of illnesses and deaths among children. Some diseases occur sporadically, while others occur in epidemics. Depending on the infectivity, an infection can be transmitted from one person to another. Some infections pass from human to human (measles) and from animals to man (Ebola and Lassa).They result in high levels of fear, panic and anxiety among populations when they cause epidemics, for example, the recent Ebola, Lassa, Corona and meningitis epidemics. Indeed, transmissions can occur across borders in a matter of hours, emphasizing the importance of these infections.

Protective Mechanisms of the Respiratory System

By its anatomy and functions, the respiratory system can easily be affected by infectious agents and noxious stimuli from the environment. Hence, nature has furnished the system with protective mechanisms to help reduce vulnerability. These protective factors are both mechanical and immunological. Indeed, the mechanical barriers and mechanisms are the first line of defence from infectious agents and noxious stimuli. Enumerated below are the protective mechanisms.

1. Non-specific/ Mechanical barriers
    a. **Humidification and warming** of the inspired air protect the airway from dryness and cracks

that can compromise the mucosal lining and make invasion by microorganisms easy.

b. **Sneezing** is a reflex action that clears the nasopharynx and nostrils of particulate matter and irritants. All of us will recognise this reflex because it is experienced with noxious agents and irritants such as dust and smoke. .
c. **Cough** is another reflex. Particles and mucus below the vocal cord are cleared by coughing. It is an activity that requires forceful ejection of air through the vocal cords.
d. **The submucosal glands** produce mucus which is essentially a glycoprotein. The mucus helps in trapping particulate matter for subsequent expectoration..
e. **The mucociliary system** maintains constant upward movement to ensure airway clearance towards the outside, where it can be coughed out. Failure of this system results in mucus accumulation in the airway and susceptibility to infections because of easy passage to the distal airway.
f. **The vocal cord** itself can go into spasm when a foreign body or noxious stimuli reach it, thus protecting the lower airway.

2. Specific/immunological- consists of the cell-mediated and humoral arms of immunity
    a. Cell-mediated immunity is vital in the clearance of viral cases of pneumonia, mycobacterial and fungal infections, and also crucial in opsonisation-mediated containment of bacterial pneumonia from *Streptococcus pneumonia* and *Haemophilus influenzae*. The cells involved are **the alveolar macrophages and the wandering monocytes.**

b. Humoral immunity is crucial as specific antigen-stimulated immunoglobulins- **secretory IgA and IgG** produced to protect against infections. Secretory IgA is important in resisting digestion by bacterial enzymes and leads to the neutralization of the bacteria. **The level of IgA is low in children compared to adults and may be responsible for the more frequent and potentially severe respiratory infection in children.** Other humoral factors that are antibacterial include small quantities of IgM, IgE, lactoferrin, interferon, cytokines like Tumor necrosis factor, interleukins-6,8 and 10 and lysozymes.

Risk/predisposing factors for respiratory infections

Despite nature's numerous attempts to prevent the respiratory system's invasion by microbes, these protective mechanisms fail or are evaded due to several factors. Sometimes, the risk factors are multiple in a single host.

These factors are enumerated below

a. **Malnutrition and lack of immunization** are essential host factors. **Lack of exclusive breastfeeding, inadequate complementary** and **lack of immunization** (measles, pentavalent, pneumococcal vaccine)makes a child vulnerable to many respiratory pathogens.
b. **Micronutrient deficiency**: Children who are deficient in **vitamin A, zinc, selenium and vitamin D** are not only predisposed to having acute respiratory infections, and they are more likely to die from the disease.
c. **Sickle cell anaemia** with its immunological deficiencies predisposes children to infections from encapsulated organisms.
d. **Congenital heart diseases** such as ventricular septal defect are also at risk for repeated chest infections.

e. Environmental factors- **poor housing with poor ventilation and indoor crowding, exposure to indoor pollutants** such as cigarette smoke, biomass from cooking, automobile and industrial pollutants are recognized factors associated with more episodes of acute respiratory infections and mortality. **Large families** increase the chances of a child mixing with adults with respiratory infections, thereby creating a clear risk for the transmission of microbes. **Day-care attendance** also offers opportunities for the transmission of respiratory microbes among many children with suboptimal immune protection. Day care attendance is associated with an increased incidence of acute respiratory infections (ARI).
f. **Socioeconomic factors- POVERTY**.
g. **Demographic factors- male gender** is associated with more occurrence of ARI, perhaps because of the role of the X chromosome in immunoglobulin production. The infant is also the most affected with respect to ARI.
h. Geographic factors- the harmattan and rainy seasons are associated with more episodes of ARI.
i. Other factors- children with underlying pulmonary malformation and disorder e.g. bronchopulmonary dysplasia.

It is important to note that infections remain major causes of mortality and morbidity in children, particularly those under the age of 5 years, and constitute major obstacles to child survival. The major disease responsible for child death and hospitalizations is pneumonia.

Tuberculosis will be discussed under chronic respiratory infection that affects children, especially in developing countries.

Acute Respiratory Infections (ARI)

Acute respiratory infections area heterogenous group of diseases affecting the respiratory tract from the pharynx to the alveoli, where the symptoms have not lasted up to 28 days. These diseases include common cold, acute otitis media, acute pharyngotonsillitis, pneumonia, bronchiolitis and laryngotracheobronchitis (LTB).

Pneumonia

Introduction and epidemiology

Pneumonia refers to a pathogen-initiated acute inflammation of the LRT. This leads to inflammation of the lung parenchyma (alveoli, alveoli ducts and the interstitial tissues) and subsequent partial or complete resolution occurs (2). Pneumonia can also be defined as the presence of infiltrates on a chest X-ray (3). Presence of age-related tachypnea with or without chest wall in-drawing, cough <2weeks, is the *WHO* definition for pneumonia and makes it possible for a diagnosis to be made at lower levels of health care. A combination of the clinical findings and evidence of radiographic infiltrates can also be used to make a diagnosis of pneumonia(4).

Over 150million cases are reported yearly, and close to 10% are severe cases requiring hospitalization. More than 6 million cases occur in <5 years. Pneumonia is the leading cause of death among Under- Fives worldwide, causing more than 800,000 deaths globally every year (5). Most of the cases and deaths are in developing countries. Nigeria accounts for about a quarter of all pneumonia deaths in children(6).In Nigeria, pneumonia is the leading cause of death among children - 17%. ***Pneumonia deaths are driven by many other factors such as malnutrition (macronutrient and micronutrient deficiencies (Zinc and Vitamin A especially)), poverty, poor hygiene and overcrowding. Other risk factors are extremes of age, male gender, parental smoking, daycare attendance, contacts of known cases, harmattan, low birth weight, Sickle Cell***

Anaemia, lack of immunization, HIV and congenital heart diseases.(7)

The word pneumonia in this lecture refers to community-acquired pneumonia, and healthcare-associated and ventilator-associated pneumonia will be specifically mentioned when referred to.

Pneumonia related deaths are 3-10 times commoner in developing countries, and sub-Saharan Africa accounts for 30-50% of pneumonia deaths globally. Approximately 50% of childhood pneumonia deaths are associated with air pollution, with indoor air pollution being more responsible for the disease (30%) and deaths(8).

Causative organisms for pneumonia are viruses, bacteria and fungi

Viruses: *Respiratory syncytial virus, Influenza A and B, Measles virus, Parainfluenza virus (1,2 and 3), Adenovirus, Corona virus, SARS, SARS-CoV-2 or COVID-19, Varicella virus, Human metapneumovirus, Rhinovirus*

Bacteria: *Streptococcus pneumoniae, Haemophilusinfluenzae (type b, non-typable), Staphylococcus aureus, Klebsiellaspp, Mycobacterium tuberculosis, Other Streptococcal agents and anaerobes occur rarely, Legionellapneumophila*

Mycoplasma: *Mycoplasma pneumoniae*

Chlamydia: *Chlamydia trachomatis, Chlamydiapneumoniae (TWAR agent), Chlamydia psittaci*

Pneumocystis: *Pneumocystis jirovecii*

Fungi: *Candida spp, Aspergillusspp, Actinomycetesspp, Histoplasma, Cryptococcus.*

Disseminated fungal infections caused by Aspergillus, candida and Norcadia may be related to ventilator use and immune deficiencies as in advanced HIV diseases.

The list of causative agents is not exhaustive, and the list is getting longer as diagnostic capabilities increase, but the list in developing countries remain constrained by the diagnostic limitations.

Clinical features

Pneumonia presents with many symptoms and signs and these also vary with the patient's age. Despite the range and variations in clinical presentations, some symptoms and signs occur more frequently than others. **Tachypnoea is a sensitive sign for the diagnosis**, and age-related tachypnoea has been widely used and propagated by WHO to diagnose pneumonia (<2 months- up to 60; 2 months – 12 months – up to 50; 12mo – 5 years - up to 40) (9)

Some features are also present in patients infected with some causative organisms. The clinical symptoms and signs are mild with little or no systemic disturbances in cases of many viral agents. The young infant below three months may present with poor feeding, fever, irritability and vomiting in addition to respiratory signs of fast and or difficult breathing. Features of varying degrees of respiratory distress from nasal flaring to chest wall in-drawing may be seen (picture 1 below). In addition to these, features of a recent staphylococcal infection or measles may be evident on the skin. (picture 2)

Picture 1shows chest wall indrawing and intercosal recessions

Picture 2 shows hypopigmented areas from staphylococcal infection

It is important to state that making an aetiological diagnosis is impossible without bacteriologic evidence. Guesses of viral or bacterial pneumonia in a patient remain mere guesses based on clinical features. The clinician is always cautious of the fact that bacterial pneumonia can follow closely viral pneumonia. In places where laboratory support is limited, it is best to assume an episode of pneumonia is bacterial.

There are also helpful tests in addition to clinical parameters. This brings me to the area of investigations. These tests are microbiological, immunological, radiological and haematological.

Investigations

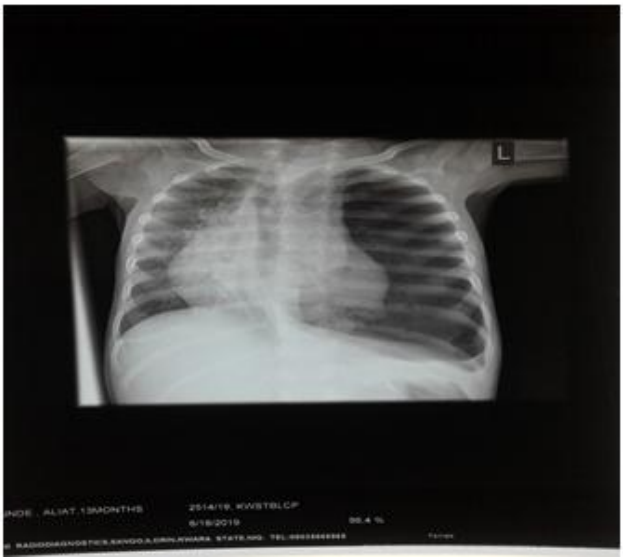
Microbiological investigations seek **to isolate pathogens and test antimicrobial sensitivity patterns.** It is invaluable but not easily accessible in our setting and may not be feasible in some cases. Organisms can be isolated from the blood, sputum, nasopharyngeal swab or washings, and lung and pleural aspirates. Rarely bronchoalveolar lavage may be done to obtain a specimen. Blood culture yield may be as high as 30%, and yields from respiratory fluids may be higher. **Furthermore, this method is used to define the epidemiologic relevance of different causative organisms to plan preventive measures such as vaccinations.**

Pulse oximetry is a simple, non-invasive and easy method used at the bedside to measure arterial oxygen saturation (SpO2). **This should simply be taken as part of the clinical examination of all patients with respiratory diseases**. This method can detect hypoxaemia which is associated with severe pneumonia.

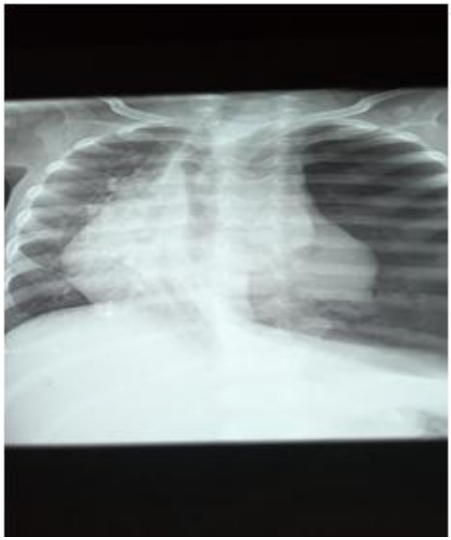
Immunological tests are also helpful. Urinalysis for antigens of encapsulated organisms like Hib and *S. pneumoniae* using countercurrent immunoelectrophoresis to identify organisms even when antimicrobial therapy has been started. Immunofluorescence, Enzyme-linked immunosorbent assay **(ELISA)** and polymerase chain reaction (**PCR)** are very useful in rapidly diagnosing viral pneumonia. For the diagnosis of *M.pneumoniae,* raised serum cold agglutinin titres greater than 1 in 128 is highly suggestive of the disease. Antistreptolysin **(ASO)** titre is increased in Group A β haemolytic streptococcus infection cases. In bacterial pneumonia, C - reactive protein (**CRP)** may be ≥40 mg/dl. These tests are beneficial but not the gold standards for the diagnosis of pneumonia.

Imaging techniques, mainly but not limited to chest X-rays and ultrasound, are important in diagnosing pneumonia and in detecting and defining intrathoracic complications. Chest radiograph taken PA with or without a lateral view is helpful to show alveolar or non-alveolar consolidation and the extent of

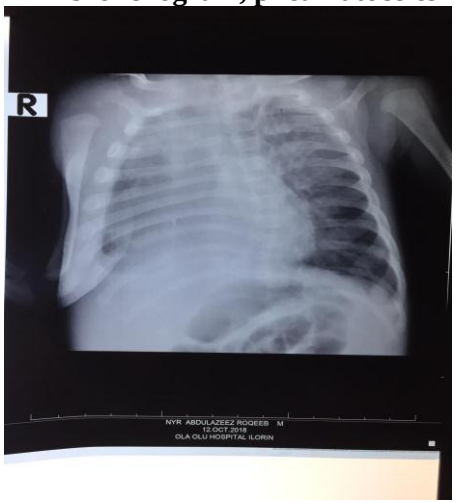
anatomic involvement. The decubitus view of the chest is used for detecting and estimating small pleural collection. It is also useful in the evaluation of the heart size.



This is the film of a 15-month-old female who has SAM and had fever and cough of 2 weeks, fast breathing of a week. Film shows left pyopneumothorax and patchy opacities in both lung fields. Aspirate culture yielded *K. pneumoniae* and *Pseudomonas* spp.



Air bronchogram, pneumatoceles



Rt. Sided lobar pneumonia complicated by pleural collection

New trend in developed countries is to use chest ultrasound for the diagnosis of pneumonia. *Chest ultrasound is more effective in diagnosing CAP, sensitivity 91% versus 73%; specificity 61%*

versus 50%.(10)Less radiation exposure and less false negative compared to CXR. However, ultrasonography is highly operator dependent. Further studies are ongoing in children.(12).

Rarely, chest CT scans and MRI have been used to diagnoseintrathoracic complications of pneumonia.

Haematological investigations are non-specific. Leucocytosis and neutrophilia indicate bacterial pneumonia, while lymphocytosis occurs in the presence of viral pneumonia.
The large CAP and AOM study (COMPAS), Tregnaghi et al. concluded that combination of elevated CRP and CXR findings best diagnose bacterial CAP.(13) The trend while investigating pneumonia cases however is to use non-invasive techniques with little risks such as sputum and urine tests, ultrasound and serology.

In our setting, CXR and blood culture remain our main investigative tools aside from the clinical parameters of tachypnoea and pulse oximetry.

Management

1. Specific treatment with antimicrobials is empirical, initially using epidemiologic profiles of known causative organisms. The Paediatric Association of Nigeria (PAN) recommendations for outpatient care(14) are-
    - Amoxicillin PO 90mg/kg in 2 divided doses or
    - Amoxiclav 90mg/kg in 2 divided doses
    - or cefpodoxime 10mg/kg in 2 divided doses
    - or cefuroxime PO 20-30mg/kg in 2 divided doses

    Duration for each is at least five days.

Indications for admission according to British Thoracic Society(15)

- Respiratory rate >70 b/min in infants and >50 b/min in older children
- Grunting
- Intermittent apnoea

- Oxygen saturation ≤92%- 31-43% of children with pneumonia have hypoxaemia (Lozano, 2001, Ibraheem, 2014)
- Inability to feed or signs of dehydration
- Family unable to provide adequate care at home*

For inpatient care- IV Amoxicillin 150mg/kg/day in 3 divided doses AND gentamicin 5-7.5mg/kg once daily for at least 5 days OR, IV ceftriaxone 50-100mg/kg/day 1 or 2 divided doses ORIV cefotaxime 100-200mg/kg/day in 4 divided doses ORIV cefuroxime 150mg/kg/day in 3 divided doses AND gentamicin

    - Treat for at least 5 days
- Supportive care
    - Supplemental oxygen improves survival. Humidified oxygen is preferred. A flow rate of 0.5L/min -3L/min or more
    - Cylinder, piped or concentrator
- Other supportive measures such as hydration of the patient with IVF, use of vitamin A and Zinc
- Nutritional rehabilitation as necessary

Children who are HIV positive are treated the same way with the addition of high dose co-trimoxazole (trimethoprim 20mg/kg/day) for ten days.

Management of complications as appropriate

Prevention and control

At no time in our life is this section more relevant than at this time when the world is struggling with the COVID-19 pandemic

- Improve personal hygiene by observing cough etiquettes (covering the mouth while coughing and turning away from people), sneezing into a bent elbow, washing hands with soap and water to remove germs picked up from surfaces, sneezing or coughing. It is essential to guard

hands by limiting touching rails, tables and handles. COVID-19 is the best teacher of this.

- Early diagnosis and prompt treatment of cases of CAP reduce the occurrence of complications
- Strengthening routine immunization
- Exclusive breastfeeding and education on adequate and appropriate complementary feeding
- Provision of micronutrient supplementation
- Improving the socio-economic status of the people so that poverty and malnutrition, two crucial predisposing factors, will be less
- Reducing household pollutants such as smoking and cooking with charcoal and kerosene stove

Research and practice

Pneumonia constitutes between 14-18% of admissions in UITH, with a case fatality of 6-13%. Between 2010 and the last five years, pneumonia has displaced malaria as the leading cause of 2011. We gathered data on children one month to 14 years with features of pneumonia.(16) We found that about 80% of all cases are <2 years; 60% are infants; Male preponderance; 70% were in social classes III-V (the lower social class). *Staphylococcus aureus* was the commonest isolate found in patients' blood and was associated with higher mortality than those in whom we did not isolate the organism. Other isolates were *Klebsiellaspp* and coagulase-negative *Staphylococcus*. (16, 17).

The absence of two key organisms- *S. pneumoniae and H. influenzae*- documented elsewhere as significant causes of pneumonia was thought to be due to the limitations in the laboratory. However, recent isolates using Bactec have confirmed the dominance of *S.aureus* in our patients who had pneumonia requiring hospitalization. *Streptococcus pneumoniae* has been infrequently cultured. Likely reasons for our findings include the high prevalence of malnutrition in our environment, a risk factor for staphylococcal infection, and the severity of

staphylococcal pneumonia requiring care at the tertiary centre. Other adduced reasons are the use of across the counter antibiotics that can eliminate *S. pneumonia but not staphylococcus* and the emergence of the superbug, MRSA.

A total of 60 (35.9%) had complications in our study. Heart failure was seen in 86.7%. Other complications were pleural effusion, pneumothorax, acute kidney injury and hypoglycaemia. The mortality in our study was 6.6%. Children with lobar pneumonia, intrathoracic complications, bacteraemia, age below 2 years, and comorbidities, e.g. congenital heart diseases and HIV, had higher mortalities.

We also investigated the role of zinc, a micronutrient that stimulates the activities of many enzymes involved in metabolic and immunologic responses, in the outcome of pneumonia and found that those who had more than one complication had significantly lower zinc levels compared to those with one or none, p=0.020. ((18)).We further examined the role of low arterial oxygen i.e. hypoxaemia, in pneumonia and its related mortality. We used pulse oximeters to measure SpO_2in under-five patients with pneumonia. Hypoxaemia was associated with chest wall in-drawing and restlessness.(19)We also established that hypoxaemia was associated with higher mortality and detectable with a simple handheld device usable at health care levels.(19, 20)

In 2014, we published our findings on the prevalence of adenovirus respiratory tract infection in patients with HIV. Seventy of the 184 patients (38%) tested positive to the Human adenovirus IgG ELISA test, with children 5-12 years having the highest prevalence. (21) We highlighted the risk of severe disease emerging from the virus in immune-compromised individuals. Furthermore, we discussed child-to-child transmission in schools and daycare centres and transmission to and by health care workers. The respiratory viruses are becoming more important as they continue to cause epidemics that can be potentially serious, as we have seen in recent times with SARS,

MERS and the novel coronavirus SARS-CoV-2 causing COVID-19.

There is no doubt that pneumonia is an obstacle to child survival and needs to be fought using all known interventions.

Acute Otitis Media (AOM)

Otitis media refers to a middle ear infection characterized by fluid within the middle ear, irrespective of aetiology.(22) It is regarded as acute otitis media (AOM) when inflammation and pus within the middle ear have accompanying symptoms and signs. This should be distinguished from otitis media with effusion (OME), a relatively common condition that usually occurs as part of rhinosinusitis and is thought to be linked to allergy.(23)

AOM is the second most common URI, after the common cold..(24, 25,26)

In the United States of America (USA), it is the most common diagnosis among febrile children, accounting for over 20% of paediatric clinic visits, and the commonest reason for prescribing antibiotics.(27, 28)Data from some Asia-Pacific countries report a prevalence range of 14% to 42% `among school children.(29) **Malaria, pneumonia and pharyngotonsillitis reportedly ranked higher in the aetiology of fever than AOM in most of these local Nigerian studies.** (30-32) Many cases of AOM often go undiagnosed due to the failure of health workers to "look in the ear" of children presenting with fever.(33)

Risk factors for Acute otitis media *are similar to those discussed for pneumonia, however the host factors* such as the use of pacifiers, co-morbid allergy and craniofacial abnormalities, such as cleft palate ± lip are know risk factors for AOM.

Aetiology

The top three causative pathogens worldwide are *Streptococcus pneumoniae*, *Haemophilusinfluenzae* and *Moraxella catarrhalis*. (34)*S. Pneumoniae* is responsible for close to 50% of cases while *H. influenzae* (particularly the non-typable strains), causes about 25% of cases, and *M. catarrhalis* in about 12% of case and a few others. (27, 29, 34)

Clinical Features

The clinical features found are culled from the paper and presented in Table 1.(25)

Table 1: Symptoms at presentation apart from fever

Symptoms	Percentage occurrence (%)
Otalgia	88
Cough/runny nose	75
Otorrhoea	63
Vomiting	63
Refusal of feeds/ anorexia	60
Diarrhoea	60
Hearing impairment	44
Irritability	24

Alabi *et al*. Tropical Doctor 2006; 36: 31-32.

Diagnosis

Ear examination, suggestive clinical features, a ***swab of the ear discharge*** for microscopy, culture and sensitivity (MCS), ***diagnostic tympanocentesis*** and other more sophisticated tests may be done if indicated. (36-38)

Treatment

The current Cochrane review of the value of empirical antibiotics in children with AOM in high-income countries has shown superiority of the "wait and watch" recommendation over the traditional empirical use of antimicrobials, however, the latter approach can only subsist

where robust health systems exist, which allow for close follow-up of cases.(39, 40)*In a tropical setting like ours* (where a child seen at a clinic may never return for follow-up or return with serious complications), Amoxicillin is often recommended as a first line therapy. The typical clinical course of a child who has received the appropriate antimicrobial agent(s) includes a significant resolution of acute signs within 48 to 72hours. Other antimicrobials may be chosen as appropriate.

The ***use of adjuvant therapy*** like analgesics to relieve earache is equally essential. Although still considered helpful in selected cases by some authorities, is the use of antihistamines and decongestants. In children with drainage through tympanostomy tube, oral prednisolone has been found useful.

Complications may be local or systemic.(42). Chronic suppurative otitis media (CSOM) develops in about 10%, with an associated hearing deficit (deafness).**It is common to see children go around with ear discharge without any alarm being raised by the parents in our environment. This is because they do not know the damage to the child's potential**. Other complications are rare.(43).

I have seen many complications of AOM (mastoditis, meningitis, tetanus, CSOM). However, it is the erosion of posterior auricular blood vessels leading to severe bleeding in a four-year-old boy that has struck me the most. He bled to the point of developing severe anaemia necessitating three units of blood transfusion. The good story is that he survived.

Research and practice

We investigated AOM among children presenting at our emergency room with fever. The prevalence of AOM among 100 children seen at the EPU was 16%.(31)Many of our patients presented with discharge and hearing deficits. In agreement with other authors, males and those from low socioeconomic status were more than 60% of those with the disease in another paper examining the risk factors.

We concluded that there was a need for ear examination in all children presenting with fever in EPU or consulting clinics because it has potentially serious complications such as brain abscess and hearing deficit. (31)

We recently published another article on AOM calling for ear examination in all febrile children and the rational use of antibiotics in AOM. The need for availability of diagnostic tools was discussed.(44)The parents who fail to present to the hospital early continue to be major obstacles to early diagnosis and treatment.

Late presentation to a clinic until discharge appears show the poor attitude of parents to the utilization of health services. The appearance of even ear discharge would not prompt some parents to come to the hospital until more severe complications like a cerebral abscess, mastoiditis and tetanus set in. The late presentation makes complications such as hearing impairment also prevalent. This complication, no doubt, will affect the education of the child. It is a failure on the part of any doctor who examines a child with a fever but does not examine the ears. The reasons for failure to examine a child's ears range from busy clinics, lack of an otoscope, and lack of skills to examine the ears. **The parents (ignorance, poverty, poor housing, etc..), doctors and weak health systems are major obstacles to child survival.**

The discussion of acute respiratory diseases has been limited to two- pneumonia, responsible for the highest mortality in children in Nigeria today, and AOM, which is responsible for high numbers of hospital consultations and hearing deficits in children. No wonder these two diseases were included in the Integrated Management of Childhood illnesses protocol for those at the primary health care centres to identify and manage such cases or refer them promptly to prevent deaths and complications that are obstacles to the survival of children.

It is time to look at a chronic respiratory infection that more than 30% of the world's population have. It is a disease I respect immensely because of its ability to masquerade as any other disease. My focus on it will be brief in this lecture.

Tuberculosis (TB)

Introduction

According to WHO, a third of the world's population is infected, and the proportion infected in developing countries like Nigeria is likely higher. In 2018, an estimated 10 million cases were reported globally with children forming close to 10% of all cases.(45) Globally 205,000 child deaths were due to TB. Nigeria has an incidence of 219 (143-311) cases per 100,000 populations.(45)Sputum of persons with open TB is the most important source of the organism. In the past, children were said not to transmit the disease, but this has changed as we have managed many children with open TB. Globally the TB problem has been exacerbated by HIV infection and the appearance of multidrug-resistant TB. Nigeria is one of the high burden TB countries, and the country has consistently been among the five leading TB burden countries in the world.

There are challenges in diagnosing TB in children because the disease has features in common with other childhood illnesses and disorders such as pneumonia and malnutrition.(46) Therefore, because of the vague constitutional features, clinically, it is missed or misdiagnosed, and the children are not sent for further investigations in line of TB. **That is an obstacle to early diagnosis and treatment.** In addition, the available investigative modalities are not children-friendly; they are not feasible in children; require some modification and or amplification, hence they are less reliable in children. These constitute major obstacles in the care of children with TB.

Aetiology

TB is caused by a group of mycobacterium known as the Mycobacterium tuberculosis complex (*M. tuberculosis, M. bovis, M.africanum, M.microti, M.canetti, M.caprae and M.pinnipedi)* of which the most important is *M.tuberculosis,* a non-motile, aerobic, acid and alcohol fast bacilli (AAFB).The organism is slow-growing, can remain latent in an individual for years.

Risk factors are similar to those for pneumonia and other respiratory infections, however, I will like to single out **Malnutrition, Overcrowding and poor living conditions, Contact with a case of TB- Household contacts have a 30% chance of becoming infected, Low socioeconomic class, HIV-co-infection**.

Primary TB infection

When an individual is exposed to a source of the organism, a high proportion is infected. This happens in childhood, usually before five years, and it is called primary infection. The younger the child, the greater the risk of dissemination. The lung is the site of primary infection in about 98% of cases. This primary infection elicits delayed hypersensitivity response in about 2-8 weeks.(47)Primary infection is usually asymptomatic but phlyctenularkeratoconjunctivitis and skin nodules (erythema nodosum) may occur, in addition to fever, malaise and loss of appetite.(48)

Clinical features

The symptoms are vague, and as earlier alluded to, they can be confused with other diseases. It is always useful to identify whether TB is pulmonary or extra-pulmonary and document sites affected. This is important for the management of the cases and the prevention of transmission.

Pulmonary TB is the commonest.(47, 49) It may occur with other forms of TB. Common features are cough of 4 weeks or more and usually non-productive. In older children, the cough

may be productive of sputum and haemoptysis is found in a smaller percentage of patients.(50, 51) Fever, weight loss and malaise are also frequently found among patients.

A Nigerian child with cough of about four weeks duration, weight loss and fever with remarkable auscultatory findings in the respiratory system, yet minimal dyspnoea is a suspect for TB. The patient mostly would not have respiratory distress comparable to respiratory findings!!!

Disseminated TB affects more than one organ system, and miliary TB is the most severe disseminated disease. Miliary TB shows miliary mottling in several organs, including the lungs.

TB adenitis, TB meningitis, abdominal TB and TB osteoarthritis are other forms of TB that are extrapulmonary.

Investigations

Bacteriological studies: The gold standard in TB is isolating the organism from specimens obtained from the patient. However, obtaining appropriate samples in children is the first challenge.(49) With the advent of drug-resistant TB, it is routine to do drug testing for Rifampicin sensitivity from the onset.

Ziehl Neelsen (ZN) stain remains an important test for identifying acid-fast bacilli in sputum, gastric aspirate, ascetic fluid, pleural fluid, cerebrospinal fluid and other specimens obtained from active Tb cases. However, it is limited by the poor sensitivity, especially in children, because of the illness's paucibacillary nature in them.(47) The stain is positive in about a quarter of children with TB.

The culture of specimens using Lowenstein Jensen (LJ) medium is sensitive and specific, with a yield of about 25-75% in children. This method takes 4-6 weeks before it can yield results. The newer automated liquid culture media are faster and can provide results within 10-14 days.(49).

A radiograph of the chest is compulsory for all suspected TB cases. The radiographs of other sites like the spine and joints can be obtained in other cases as necessary. Other imaging techniques such as CTscan and MRI may be required.

Nucleic acid amplified testing (NAAT) have enhanced the diagnosis of TB because of the speed at which results are obtained from these tests. These tests include Xpert MTB/RIF and Line probe Assay (LPA). The Xpert testing is a real-time PCR based test that inculcates drug testing for a key drug in treatment, rifampicin. Results are available within hours, and the machines are not operator dependent like the smear microscopy. Sensitivity for sputum and stool ranges between 72 and 92% and specificity of 99%.(52). The use of rapid Xpert test methods using induced sputum specimens is about 80% sensitive in detection MTB. Indeed, a special room for sputum induction is desirable for children with respiratory diseases, especially tuberculosis.(53, 54).

Tuberculin skin testing is an old method that relies on the delayed hypersensitivity reaction that is elicited by the tuberculin protein. The most frequently used is the Mantoux test. It is read after 48-72 hours of skin inoculation with the purified protein derivative. The test is fraught with many false positive and false negative results. Severe malnutrition, HIV, measles and other debilitating illnesses, steroid therapy and young age are all causes of a false negative result. A false-positive result can result from poor technique and non-tuberculous mycobacteria. **In my view, skin testing has long outlived its usefulness in the diagnosis of TB and should only be used in centres where other more reliable options are not available. In an era when test results can be obtained within a few hours from more reliable methods, the continued use of this test is not justifiable. For academic purposes, it should still be taught to students. It is useful in the screening of contacts of active cases of TB who have no symptoms.**

Histological examination of specimens obtained from excised lymph nodes, tissues, pleural biopsy would show the typical granulomatous changes described earlier in this lecture.

Interferon-gamma release assays (IGRA)are whole blood-based assays that are limited in diagnosing TB because they do not differentiate between active and latent diseases.(49)

Urine testing of lipoarabinomannan (LAM) is an antigen-based test for MTB. However, it has limited usefulness in clinical practice for now. Management

Treatment

Combination therapy is started with the first-line drugs and continued daily for a length of time depending on the site of TB.

1. In drug-susceptible cases, PTB and others except for CNS, miliary and osteoarticular disease, six months of treatment is given divided into the intensive and continuation phases. Isoniazid (H), Rifampicin (R), Pyrazinamide (Z) and ethambutol (E) given daily for two months in the intensive phase. The continuation phase is a four-month course of R and H, also given daily. 2(HRZE)/4(HR)
2. In CNS, miliary and osteoarticular TB are treated for 12 months with the same drugs mentioned above. 2(HRZE)/10(HR)

Adjuvant therapy with steroids in TB meningitis, pericarditis and massive pleural effusion, and endobronchial disease is beneficial and improves survival from the acute emergencies caused by TB.

Drug resistance (DR). What is of interest is that drug susceptibility must be done in TB cases for Rifampicin sensitivity from the onset. Further need for drug testing may arise in the course of therapy. When drug resistance is diagnosed, a patient must be managed in a special centre using recommended therapy over 20 months. Treatment may be longer in some cases.

The obstacles to successful TB treatment and control are difficulties with diagnosis in children, the prolonged duration of therapy and difficulties with compliance. In our practice, defaulters are indeed rare and mostly associated with relocation from the town or family discord leading to a crisis

with caregivers. The Fixed-dose combination may also make identification of culprit drugs difficult when adverse events occur. FDC have challenges with dosing in children as experienced in our practice-usually inadequate doses.
Tuberculosis is a major obstacle to child survival in Nigeria. Poverty, poor housing, ignorance, poor health-seeking behaviour, family discord, HIV, difficulties with diagnosis, ineffective coordination in TB care, ineffective deployment of INH prophylaxis and long duration of therapy.

Research and practice

In my practice, I have not encountered any other disease that gives the diagnostic dilemma that TB does in children. In 2007, we reported a 13-year-old who was initially evaluated as a case of lymphoproliferative disease because of bone pains, neck swelling, and fever of 2 months.(56)He was investigated thoroughly for lymphoma and leukaemia and the bone marrow aspiration came back negative. The lymph node revealed the typical TB histology described earlier. A discharging sinus developed at the biopsy site, which healed as antiTB drugs were started based on thediagnosis of disseminated TB.

In order to streamline the features that can aid the diagnosis of TB, we published an article in 2017 looking at the clinical manifestations in our patients. Our paper highlighted the paucity of data on those 0-4 years and the probability that many are being misdiagnosed at failure to thrive, malnutrition, pneumonia, nephrotic syndrome, and more. The paper found that cough, fever and weight loss were very frequent in our patients.(57) In more than 80% of our cases, chest radiographs had clues of the disease. Pulmonary TB was still the commonest even in those with HIV. Less than 10% of our cases came as referrals from adult physicians. Perhaps, many more cases would have been found if we had more referrals. This issue has been addressed, and more cases have been detected by referring active cases to our department and screening the patients. In a single

family, we have detected five cases of TB and managed appropriately because of new referrals.

We emphasise the need for clear imaging of the chest in all cases of suspected TB in addition to clinical consideration. Mantoux was not very useful in our evaluation of our patients.

Our practice has not experienced many defaulters from therapy and rates are extremely low, below 3%. These are a result of good counselling and follow up in our clinic. The safety profile of antiTB drugs in children is another reason for the good compliance. Despite the long duration of care, the caregivers can sustain visits and drug use because of the good results. All the antiTB drugs have potentially scary side effect profiles, but these have side effects that are very rare indeed. In our practice, we have collected data on the hepatotoxicity of antiTB drugs for more than a decade now since there was no publication on the subject. We have also obtained data on other side effects. At no point have we had to stop therapy or admit any patient because of this problem (Unpublished clinic data). After collecting the data for five years in 2017, we shared our experience in a publication that examined liver functions before and during the commencement of therapy.(58) Data was collected at baseline, two months and five months from 62 patients. Elevation of alanine aminotransferase and /or aspartate aminotransferase above three times the normal indicated hepatotoxicity. Four (6.5%) cases had elevated enzymes above three times at two months, but the levels were normal at five months. None had levels five times the normal value to warrant stopping treatment. Since then, our practice has been to evaluate liver enzymes at baseline and select those to re-evaluate. The last five years of this practice has been uneventful.

Asthma

Asthma is the most common chronic airway disorder worldwide. The disorder has been increasing due to environmental pollutants and other factors that have driven the increase. Asthma prevalence in children in Nigeria is between

5% and 14.3%. The focus of management is the control of the symptoms and preventing respiratory function decline. In the last 2 decades, corticosteroids have taken centre stage in the management of asthma. In the last decade, inhalational corticosteroids have become constant in the control of symptoms. The changes have been driven by an increase understanding of the pathophysiology of asthma.

It is a disorder that is characterized by chronic inflammation in the bronchioles and is heterogenous and multifactorial in its pathogenesis. It is manifested as flare ups or acute exacerbations usually triggered by viral infections of the respiratory tract, house dust mite, pollens and other irritants. Exercise and emotions can also trigger attacks.

Clinical features

The classical presentation is recurrent, episodic cough, wheezing and difficulty in breathing with chest tightness that resolves spontaneously or with the use of bronchodilators. Any age can be affected outside the neonatal period. Comorbidities include allergic rhinitis, atopic eczema and vernal conjunctivitis.
Investigations are based on spirometry and peak flow rate evaluations of the derangement in pulmonary functions. The chest imaging is also important**.**

Management

Acute exacerbations are managed with bronchodilators while control drugs are mainly corticosteroids. The Global Initiative for Asthma (GINA) guidelines offer recommendations for the management of asthma. It incorporates prevention of flare ups especially environmental control and use of some drugs such as mast cell stabilizers.

Research and practice

Our work on asthma and co-morbidities in African Journal of Respiratory Medicine: A total of 66 patients aged 6-17 years attending our clinic were evaluated using standard tools in

2016. Thirty (45.5%) had allergic rhinitis (AR). Among those with AR, 12(40%) compared to 4(11.1%) of the 36 without AR had poor control, P=0.008. Those with mild AR also had significantly better levels of asthma control. There is a need to consistently evaluate and treat allergic rhinitis in those with asthma to have good control. This has greatly influenced our practice in asthma care. (59). All patients are routinely evaluated for comorbid conditions and are adequately managed.

Inhalational steroids are given to all cases except intermittent cases of asthma. This practice started 3 years ago. We currently have data on these patients which we are yet to publish. We are currently evaluating the ocular side effects of long term steroid use in our patients in collaboration with ophthalmologists.

It will be disrespectful not to mention a disease that's extremely important and impacts child survival. When meningitis visits children, it leaves behind serious challenges such as deafness, blindness, and epilepsy in about a third of cases. Moreover, in the publications on meningitis did I start my research work!

Meningitis

Meningitis is a disease that results in inflammation of the leptomeninges that covers the brain. The disease presents with fever, headache, neck pain and stiffness, convulsions and altered consciousness. Symptoms in young children may be unspecific. Nigeria also experiences an epidemic form of meningitis caused by *Neisseria meningitides in the Northern part*. Aside from bacterial agents such as S.*pneumoniae* and *H.influenzae* Type b, viruses and fungi can be responsible for meningitis.

We investigated the pathogens and outcome determinants of childhood bacterial meningitis in Ilorin and explored the clinical and investigative indicators of aetiology and outcome.(60) In culture-positive cases, *Streptococcus pneumoniae, a gram-positive diplococcus* was the pathogen

responsible for about 80% of our patients, and *Haemophilus influenzae*, a pleomorphic gram-negative fastidious coccobacillus and *Neisseria meningitides, a gram-negative diplococcus* contributed about 5% each. These studies qualified our center for the inclusion in the WHO/ MRC pyogenic meningitis surveillance that has been ongoing in the last decade, and whose findings have corroborated ours on the predominance of *S. pneumoniae* among the causative organisms. We also confirmed the emergence of penicillin-resistant strains of *S.pneumoniae,* and provided evidence for the usefulness of cephalosporins, especially ceftriaxone. Our findings resulted in a change in practice because penicillins then ceased to be used as the cornerstone in the treatment for meningitis in our centre. **We emphasized the need for surveillance in meningitis to ensure the empirical choices of antimicrobials are made evidence-based before laboratory results become available when treating patients.** Despite antimicrobial use, mortality and complications remain high. Perhaps, the most important options for meningitis control are prevention using vaccination, preventing overcrowding, improving ventilation and health education. (61)**It is clear that aside from mortality, the disability the disease leaves a child with limits the child's potential greatly.**

We reported a case of Aspergillus (62) and cryptococcal meningitis(63) in children found to be HIV positive .Both cases were the first to be so reported in Nigeria. The papers highlighted the difficulties with managing such conditions accompanied by high fatality and morbidity. The need for easy access to parenteral antifungal agents cannot be overemphasized because we still have a large number of people living with HIV.

Part 2: Contributions to research and practice in Adolescent health

Introduction

Adolescence is that period between childhood and adulthood that is characterized by biological, physical,

psychological and social changes that are huge and largely asynchronous. It progresses across a wide range of chronological ages that cover 10-19 years (for uniformity and ease of comparison). Some people stretch the age to 21, but I consider anyone up to 19 and more as an adult. So does the Nigerian constitution.

Biological include physical changes such as increase in height and weight and body mass index (BMI), and the development of secondary sexual characteristics. Psychological development involves changes in thought processes, relationships within the family and with the same and opposite sex.

Socio-cultural changes involve relationship adjustments and responsibilities are assigned within family and society, at times with initiation rites as done by the Ebiras and Fulanis and some other tribes.

Out of all the changes, the most consistent and organising changes in adolescence are the development of sexual maturity. Accordingly, early (10-13 years), middle (14-16 years) and late adolescence (17-19 years) are defined in terms of pubertal changes. The other changes are also observed in the early, middle and late adolescence.

- **Irrespective of chronological age, the stages of pubertal development are consistent. In females (pubic hair and breast development) and males (genitalia and pubic hair), the sex maturity ratings (SMR) or Tanners stages are based on pubertal development.**
- When pubertal changes are observed as rated in the staging, they are pointers to reproductive capability.

Understanding adolescents

Erik Erikson and Abraham Maslow developed models that aid in understanding adolescents and aid in their care. These models can be used to increase understanding of the types of stresses children and adolescents are likely to experience at

given points in life and assist adolescents and their families through the stages.

Erickson stages of development emphasized social experiences and the growth of the individual. He contended that each stage presents a psychosocial "crisis" to be resolved, and the outcome determines the progression or regression in development (Erickson, 1968).

Abraham Maslow's hierarchy of needs helps to understand how the complexity of a child moves through adolescence and then adult life. From the young child who has mainly physiological needs right to late adolescence and early adulthood when self-actualization needs become paramount. The hierarchy is listed. Belongingness and love needs according to Maslow, is important in the peer-group influence that affects adolescents.

The changes in the various stages of adolescence are listed below.

Early adolescence: Concrete thinking predominates, Start of awareness of identity, Early emotional separation from parents, Start of strong peer identification, Early exploratory behaviour and experimentation

Middle adolescence : Abstract thinking starts but still thinking about invincibility, May develop a fervent ideology (religious etc), political, Development of personal sexual identity, Continuing emotional separation from parents, Heterosexual peer interest, Early vocational/career plans.

Late adolescence: Complex abstract thinking, Increase impulse control, Further development of personal and sexual identity, Development of ideologies, Social autonomy, Intimate relationships, Financial independence, employment/further education

The usefulness of these stages is to assist the physician who needs to counsel and care for an adolescent. Stage appropriate questions and issues will be discussed in the correct context.

Adolescent crisis is about the struggles and challenges that is faced during this period of life arising from the changes described above. Individuals and their families cope differently with these stages. Growing up has never been easy, but it is even harder due to a changing world in today's society. The volatility, uncertainty, complexity, and ambiguity (VUCA) of today's world.

Risky behaviour that create obstacles in adolescents

- **Drug and alcohol use**- there is an epidemic of psychoactive substance use among adolescents though figures vary in different countries and localities. Lifetime prevalence in Nigeria ranges from 57.2%-87.3%. These figures show that the issue of drug abuse among adolescents has exploded to about 7-10 times what it was about a decade and a half ago. The list of abused drugs has also elongated with many narcotics and increasing intravenous drug use—tobacco, alcohol, cannabis, codeine, heroin, cocaine, tramadol, royphenol and amphetamines. Peer pressure, desire to experiment, little understanding of consequences of their actions, family discord, single parenthood, sibling and parental drug use, chronic prescription drug use for pain as for Sickle cell crises and poor educational achievements have been associated with drug abuse. The behaviour can lead to problems with relationships within and outside the family, psychosis, depression, poor school performance, school dropout, violence, unprotected sexual activity and HIV and hepatitis. Drug overdose can lead to deaths. Violence and crime have been associated with drug use among adolescents. Children from the upper socioeconomic class have been found to have higher levels of drug use in Nigeria. Males also use drugs more frequently than females, although the proportion of females using drugs has been increasing in Nigerian studies.

- **Sexual activity**-According to Aristotle, "in regard to sexual desire, they exercise no restraint," and this quotation sums up the unprotected sexual activity that is in epidemic proportions among adolescents. Part of their dilemma is the physical changes that are at discrepancy with the stage of cognitive development. There are many 12, 13, and 14-year-olds in adult bodies. Many are also in the drug-sex association, making it even more likely that their sexual engagement is unprotected and highly risky. Sexual activity levels among adolescents vary among countries and between local areas, with a wide range of 25-87%. It is almost true that all of them are doing it as they say. Peer pressure, family discord, poor parental supervision, changing moral values, role models and social media influence are some of the factors associated with sexual activity among adolescents. The age of initiation of sexual activity also seems to have become lower in the last two decades. Consequences of sexual activity among adolescents include unplanned pregnancies, HIV and hepatitis B infection, sexually transmitted diseases
- **Sexual abuse** of adolescents is common, either perpetrated by an adult or another adolescent. The abuser mostly has access to the adolescent through relationships in the family or school, or religious gatherings. Both genders can be abused though it is more common among females. There are indications that societal upheavals have had an effect on the prevalence of sexual abuse as it has increased.
- **Violence**- a considerable amount of data is available on the relationship between drugs and violence among adolescents. The association with gangs, cultism and even sexual activity have been explored. I have not worked in these areas and will not dwell on these.
- Suicide and para-suicide

- **Eating disorders**- this was the subject of the dissertation of one of our residents(2020). More robust data on the subject is available from developed countries.
- Other issues- cultism
- **Bullying-** In Nigeria, this was rarely reported. However, the increasing severity of the actions, especially among students in boarding facilities, is a source of concern. There are at least three reports of deaths of students from bullying in schools. It mostly goes unreported, and the bullied may end up as a bully too, just as someone who is abused may become a perpetrator in the future.
- Academic problems

There is no doubt about the obstacles that the issues listed above create to any child's development. The challenges are huge, and the world is struggling with the pandemic. If not killed by these problems, the adolescent goes into adulthood damaged and damaging others; broken and breaking others; bullied and bullying; abused and abusing others; roaming the streets and inviting others into the streets. Definitely, if bedevilled by one or more of these problems, the attainment of adulthood with his full potential is not possible. Sadly, there is data that supports that many adolescents do not have just one, but rather, they end up with multiple problems e.g. drug abuse, HIV, sexually abused, being bullied and walking the streets!

Interviewing adolescents has to be approached with flexibility, confidentiality, and a non-judgemental manner. There is no fixed sequence, and it may be serially done over time as confidence and relation develop between the interviewer and the adolescent. It cannot be achieved hurriedly. Therefore, time and patience are required for success. Areas to explore include: Home, Education, Associations, Diet, Drug and alcohol, Sexual activity, Sexual abuse, Peer group, and School and career.

Research and practice

My dissertation for Fellowship of the National PG College examined two health-risk behaviours among adolescents. One thousand two hundred (1200) in-school adolescents were investigated for drug use and sexual activity using self-administered questionnaires.

The prevalence of drug use was 40.1%, currently used drugs included mild stimulants such as kolanut and coffee (26.4%), alcohol (14.5%), sniffing agents (7.2%), amphetamines (6.7%). Cigarette, cocaine, heroin and cannabis were below 5%. We documented significant multiple drug use and a correlation between cigarette use and cocaine, cannabis and heroin abuse ($p<0.001$). we concluded that the use of socially acceptable substances might pave the way for hard drug use.(64)

A recent community survey among adolescents in Ilorin found the prevalence of drug use to be 43.4%, with the appearance of codeine-containing cough syrup and tramadol on the list compared to earlier surveys. There is a suggestion that in-school adolescents' abuse drugs more.(65)

In an opinion surveyon how best to curb the menace of drug abuse, adolescents favoured organizing frequent education sessions on drugs and their menace; involving law enforcement officers to control availability; engaging experts to counsel and manage drug abusers. The adolescents least favoured sending the drug users to the hospital. Indeed by the time doctors come in contact with many drug users, mental health problems would have surfaced. Indeed, the success of management at such a stage is low, with a high relapse rate.(66)There is no doubt that a multipronged approach is needed to limit drug use and its consequences among adolescents.

In 2003, we published our findings on sexual activity among adolescents wherein 23.7% of 10-19 years olds were sexually active. This meant close to 1:4 adolescents were sexually active. The males were likely to have more than one sexual partner and were more sexually active. We recorded a dramatic lowering of age at first intercourse, 11.3 years.

Unpublished data from the same research suggested that the adolescents were more often involved with other adolescents.(67)

As discussed earlier, sexually transmitted diseases and HIV infection are consequences of unprotected sexual encounters among adolescents where new HIV infections remain high. We examined the influence of knowledge and socio-demographics on AIDS perception and sexual practices among secondary school students who are mainly adolescents. In our paper of 2011, we concluded that education about HIV and AIDS that can lead to the internationalization of the seriousness of the conditions could enhance safe sexual practices among adolescents and young adults. This was better identified among females who were less sexually active and more concerned than the males.(68)

I strongly believe sexual behaviours are learnt, and inclinations to sexual orientation are essentially learned and blossom in the presence of societal permissiveness of such behaviour. When adolescents experiment with behaviours, they can be dropped or consolidated and entrenched in adulthood. In 2010, we reported the case of an adolescent who himself was serially abused by his mother's boyfriend and grew to abuse others.(69)The adolescent was engaged in exactly the same homosexual and sadistic behaviour his own abuser used on him.

Opportunities for child survival

When there is an obstacle, there must be opportunities to address them. These opportunities are listed below

- **Routine immunization:** I remain an advocate for a sustainable and widely accessible routine immunization programme that will control diseases such as measles, pertussis, tuberculosis, pneumonia, meningitis from *S.pneumoniae* and *H.influenzae.* Vaccines remain effective and efficient in controlling many of the respiratory diseases discussed. Nigeria needs to

strengthen its routine immunization programme and limit campaigns that consume huge amount of funds. It is important to note that strengthening the systems for routine immunization will strengthen health systems in general and improve the access of the Nigerian population to essential health services. This will generally improve survival for our children.(70)

- **Revitalizing the primary health care level** must be functional in order to offer the masses early contact with health personnel. This can eliminate complications that may arise from a late presentation at the higher levels of health care which are not geographically accessible to those in the rural areas. At the primary levels, effective food supplementation and food demonstrations for appropriate complementary feeds can be undertaken.
  In addition, I advocate for the use of a standard management plan for pneumonia and AOM to reduce the risk of complications by ensuring prompt treatment/referral. Use of pulse oximeters can be deployed at all levels of health care to detect hypoxaemia and ensure oxygen is administered on time or the patient is referred promptly to reduce fatality.
- **Microcredit schemes and social security** for families need to be strengthened and upscaled. These schemes offer opportunities for families to feed and access basic education. Therefore, these social investments are unique in alleviating poverty and its consequences such as malnutrition. With the potential for malnutrition to be reduced, comes opportunities for better survival into adulthood.
- **Hygienic practices** must be taught to children at home and in schools. Portable water to support such practices must be provided.
- **The school feeding programme** is a welcome development. However, the programmes across the

country need more monitoring and accountability to reduce leakages.

- **Research and developmen**t must focus on the areas of needs because it is a major opportunity for child survival. TETFUND and similar organisations need to be strengthened.
- **Zn Supplementation** during and after treatment for pneumonia and the consumption of Zn rich food is also advocated
- More attention has to be given to adolescent problems to **integrate services that will cater** to their needs because a single adolescent is likely to have a myriad of problems. The services providers have to be drawn from many professionals in the field of medicine, psychology, psychiatry, guidance and counselling, education, social work, addiction therapists etc.
- **Age-appropriate sexuality education** that can lead to responsible sexual behaviour has to be taught in schools and the community. Education about drugs and their consequences have to be taught from childhood.

Recommendations

1. The field of childhood pulmonology has to be expanded in respect of curriculum, and properly funded so as to offer specialized services in the diagnosis and management of respiratory disorders. For example sputum induction and lavage to obtain fluid from the respiratory systems need proper protective kits and environment. This will also aid the training of specialists and impact on child care. Creation of centres of excellence for respiratory and infectious diseases in all the regions will improve accessibility to qualittative care and training.
2. Adolescent health needs more attention, and it is recommended that the branch becomes fully established so that those interested in caring for adolescents can

spend about 18 months learning and caring for adolescents. It is a field that requires all medical specialists and others who are particularly patient and passionate. The PG colleges have to create a robust curriculum for this and bring it on board.

3. The fortification of feeds for Under 5s is important to prevent mortality from many childhood diseases. Vitamin A, Zinc, selenium, and vitamin D are among some needed micronutrients that are needed to enhance immunity and prevent deaths and diseases. Grains, oil, salt, sugar etc. can be considered for fortification.
4. The provision of low-cost housing by the government
5. Enforcement of legislation on air pollution, bush burning, and cutting of trees for charcoal.
6. Education for all, education for all and education for all! This will improve health-seeking behaviour, enhance child care and improve child survival
7. Reinvent exclusive breastfeeding, and support local development of complementary feeds by small scale industries.

Part 3: Community service

Born in Ilorin into the Gobir family, I was raised in many parts of Nigeria. My dad of blessed memory, Mallam Amuda Ahmed Gobir, was an accomplished administrator and teacher. A disciplinarian of the highest order who indulged his children but never spared the bulala. My grandfather and great grandfather were both Islamic scholars who were highly spiritual and versed in the exoteric. My mother, Hajia Khadijat Segilola Gobir, is from the Galadimangeri family. Her father was a teacher and had taught my father and many other prominent Ilorin indigenes in Middle school. Mallam Jimoh Galadima later left to work with the native authority as the treasurer. My other mother, Hajia Khaliat Kosemani Gobir, is from the Ita Ajia family. All my ancestors were renowned for their selfless services, philanthropy and love for family and community. I,

therefore, grew up knowing the beauty of community service. I have consequently served and still serving both the medical community and the Ilorin community to the best of my ability. I have actively served development associations from Gambari to the larger town. These include Gobir Youth Forum, Balogun Gambari Youth Movement, Balogun Gambari Development Association, Ilorin Emirate Youth Development Association, Ilorin Durbar Committee, Ilorin Central Jummat Mosque committee, Imam Gambari Mosque, Ilorin Anchor Men and Women Initiative and Ilorin Eid Praying ground maintenance committee. I have served as the President of the Medical Women's Association of Nigeria (MWAN) in Kwara and the current president of Ilorin Medical Doctors Group. As a daughter of Ilorin and one of the foremost female doctors, I count myself to be fortunate, and I see a great need to always give back to my community. I shall continue to do my best in this regard.

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Finally, I thank the royal fathers present here today- Balogun Gambari of Ilorin, and all others. May Allah be with you all.

Mr Vice Chancellor, other distinguished guests' thank you for your attention.

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