UNIVERSITY OF ILORIN

THE TWO HUNDRED AND EIGHTY-EIGHTH (288TH) INAUGURAL LECTURE

"THE PANDEMIC OF ANTIMICROBIAL RESISTANCE AND THE EXPERIENCE OF A CLINICAL MICROBIOLOGIST"

By

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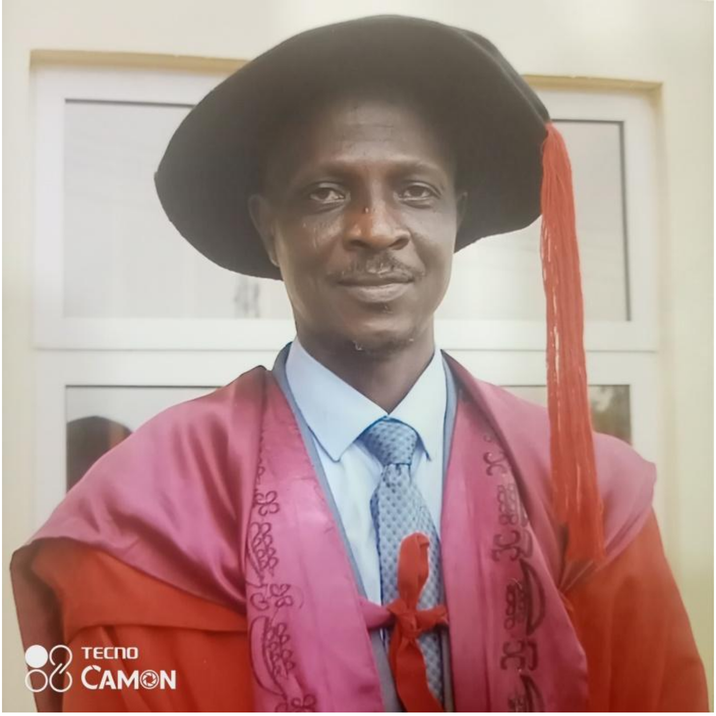

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All Academic and Non-Teaching Staff,
Great students of this Noble Institution, especially students from the College of Health Sciences,
My Lords Spiritual and Temporal,
Gentlemen of the Print and Electronic Media,
Distinguished Ladies and Gentlemen.

Preamble

You are all welcome to my inaugural lecture titled, "**The Pandemic of Antimicrobial Resistance and the Experience of a Clinical Microbiologist**". In the name of Allah, the Beneficent, the Merciful. I feel so elated by this rare opportunity given to me by Allah to pay one of my academic debts as a professor here today. I recall the first inaugural lecture I attended in this University in 1985, presented by the late Professor Matthew Akinyemi Araoye, when I was a medical student. I hardly imagined my turn would come today as an academic to deliver an inaugural lecture. This lecture would have been history today, as I had initially chosen a date in November 2020, which was then truncated by the COVID-19 pandemic lockdown, but Glory to Almighty Allah, for allowing me to witness today, and I thank Him once again for His benevolence.

This is the fourth lecture from the Department of Medical Microbiology and Parasitology, and also the fourth from the Faculty of Basic Clinical Sciences. The first lecture was given by my mentor, Professor Adegboro Boaz, who accepted me into the Residency Programme in 1995, while serving as the Dean of the Faculty. He stated, and I quote, **"I have reviewed your C.V. and see you are from this town; you might not be interested in moving abroad, but I need a replacement in the department. I have trained many Doctors to the Senior Registrar level, but they have left for greener pastures''.** Fortunately, I am now a fully-fledged Professor in the Department and occupying the position he was then, as the pioneer Dean of the newly established Faculty of Basic Clinical Sciences.

Today, I am sharing my experience as a Clinical Microbiologist spanning over 25 years. My experience was mainly with tiny creatures created by God, which ordinary eyes cannot see, except for the trained eyes of a laboratorian. The more you look, the less you see, unless you are familiar with a microscope. You may start to wonder what a laboratorian observe under the microscope. These are fascinating, tiny creatures living in the micro world around us. Glory be to Him, who has created all the pairs, from what the earth produces and from themselves and things unknown to them (**Quran 36:36**).

Introduction

My interest in Medical Microbiology began while I was a 400-level medical student. I was always fascinated by the pronunciation of the medical names of these organisms by one of our lecturers at the time. I used to imitate him, which sparked my interest in medical microbiology. I decided that if I were to pursue residency, it would be my career of choice.

Medical Microbiology, a large subset of microbiology applied to medicine, is a branch of medical science concerned with the prevention, diagnosis, and treatment of infectious diseases. In addition, this field of science explores various clinical applications of microbes to improve human health. It enables healthcare professionals to identify pathogens, develop targeted therapies, and prevent the spread of infections. Furthermore, it supports the development of essential tools, such as vaccines and antimicrobial drugs. Medical microbiologists often serve as consultants for physicians, providing pathogen identification and suggesting treatment options. Using this information, a treatment can be devised. Other tasks may include identifying potential health risks to the community or monitoring the evolution of potentially virulent or resistant strains of microbes. They may also help prevent or control epidemics and outbreaks of diseases.

The Microbes

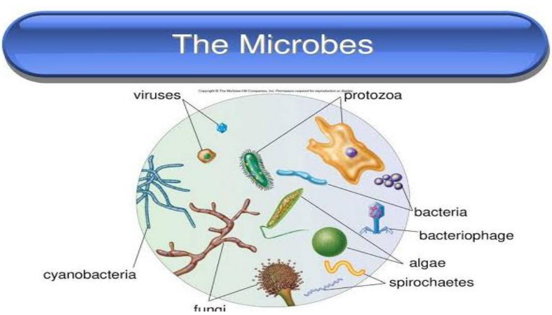

Fig. 1: The Microbes
Source: *http://nurhidayat.lecture.ub.ac.id*

They are living things that are so small, and they can only be seen with a microscope. Some microorganisms, like viruses, are so small that they can only be seen with special electron microscopes. There are five different categories of microorganisms namely bacteria, algae, protozoa, fungi and viruses (Pitt & Barer, 2012). Some of them are ubiquitous airborne forms and are much more difficult to avoid than to find. These microorganisms are prevalent inside us. While we like to think of ourselves as being composed of human cells, we are made up of 90% microbial cells. There are 10 times more cells from microorganisms living inside and outside our bodies every day. Most are helpful to us, such as bacteria that help digest our food. Scientists now believe that the diversity of microorganisms within us helps to resist many diseases (Macro, 2020). The Almighty has created everything with a purpose, even in bacteria and viruses.

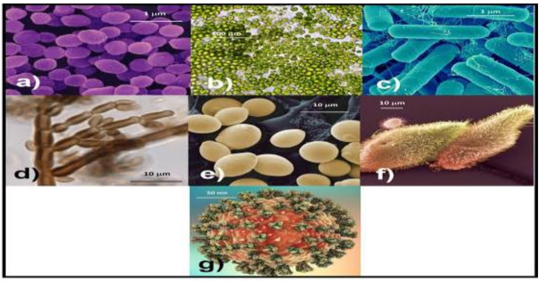

Fig 2: Group of Microbes
Source: *shutterstock.com*

Bacteria

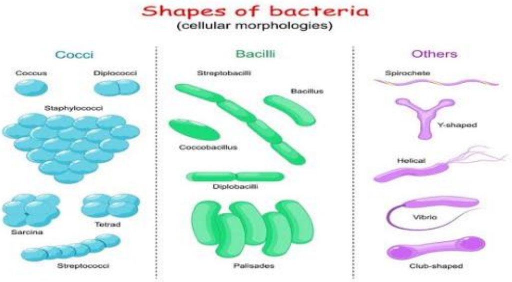

Fig 3: Shapes of Bacteria
Source: *https://www.alamy.com/stock-photo/cocci%2c-bacilli%2c-pirillia.html*

These microorganisms are the oldest living things on Earth and have been postulated to be more than 3 billion years old. Scientists have found fossils of Cyanobacteria, which come in a variety of shapes and are a diverse set of creatures. Only a few of them cause disease, and they are called pathogens. Sometimes, in special situations, bacteria found on our body surfaces or even inside our bodies can become pathogens. They do so by producing harmful substances that invade the body's cells. Some bacteria can predispose infections of the essential organs of the body, such as the lungs, heart, liver, kidneys and others. Infections can be classified by the group to which the pathogen belongs, such as Gram-positive, Gram-negative, or Anaerobic infections. Thus, classification becomes necessary because the treatment of this group of infections requires a different type of antibiotic.

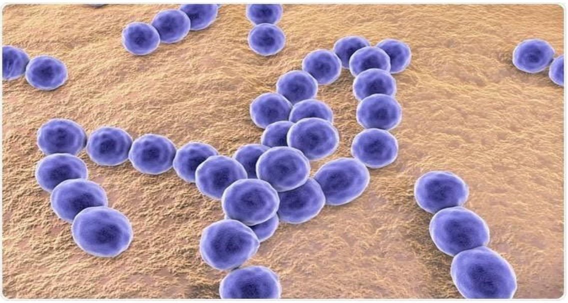

Fig 4: Gram positive Cocci in chains
Source: *Katryna Kon/Shutterstock.com*

Antimicrobials

These are substances that kill microorganisms, such as bacteria or mold, or stop them from growing and causing disease. We have in our midst antibiotics, antiseptics and disinfectants. Antibiotics are typically prescribed by doctors and administered topically, orally, or by injection to treat infections.

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Fig. 5*:* Different Types of Antibiotics
Source*: https://cpdonline.co.uk/knowledge-base/care/antibiotics*

Antibiotic drugs are widely used in the treatment or prevention of diseases. They fight infections caused by bacteria in humans and animals; they either kill the bacteria or make it difficult for the bacteria to grow and multiply.

Fig. **6:** Some Antibiotics in the Pharmacy
Source: *https://cpdonline.co.uk/knowledge-base/care/antibiotics*

There are many antibiotics available in our environment, and they can be classified into three categories: topical, injectable, and oral antibiotics. The injectables, as the name implies, are usually given via needle and syringe; they are somehow costlier. The oral antibiotics that are of many kinds are taken orally, while the topicals are applied on the surface of the body. These antibiotics are sold in pharmacies and patent medicine shops, and they are readily available over the counter. Infections can be bacterial or viral in origin. Viral infections, such as the common cold, do not require antibiotics. Treatment for viral infections primarily focuses on managing symptoms and supporting the body's natural immune response.

This is a significant mistake by both physicians and patients in our environment. Doctors can prescribe a broad-spectrum antibiotic to treat a wide range of infections, and at times, a narrow-spectrum antibiotic, which is effective against a limited number of bacterial types. In some cases, the Doctor may prescribe antibiotics to prevent rather than treat Healthcare Associated Infections, (HAI), which is the prophylactic use of antibiotics before bowel or orthopedic surgery.

Fig. 7: A patient about to take an Antibiotic
Source: *https://cpdonline.co.uk/knowledge-base/care/antibiotics*

These antibiotics also have side effects, such as diarrhea, nausea, vomiting, stomach upset, rash, and some unusual side effects, including attacks on the bone marrow, hearing loss, and the formation of kidney stones, among others.

Antimicrobial Resistance

Antimicrobial resistance (AMR) occurs when bacteria, viruses and fungi change over time and no longer respond to medicines, making infections more challenging to treat and increasing the risks of disease spread, severe illness and death (Ahmed *et al*., 2024). The emergence and spread of drug-resistant pathogens that have acquired new resistant mechanisms, leading to antimicrobial resistance, continues to threaten our ability to treat common infections. Especially alarming is the rapid global spread of multi- and pan-resistant bacteria (also known as superbugs) that cause infections that are not treatable with existing antimicrobial medicines such as antibiotics.

The clinical pipeline of new antimicrobials is dry. In 2019, the WHO identified 32 antibiotics in clinical development that address the WHO list of priority pathogens, of which only six were classified as innovative. Furthermore, a lack of quality antibiotics remains a significant issue. Antibiotic scarcity is affecting countries at all levels of development, particularly in healthcare systems. Antibiotics are becoming increasingly ineffective as drug resistance is spreading globally, leading to more difficult-to-treat infections and death.

Vice Chancellor, Sir, AMR is on the increase; however, according to the Centre for Disease Control and Prevention (CDC), each year in the United States, at least **2,049,442** illnesses are caused by resistance to medicines prescribed to treat bacterial or fungal infections. What is more, **23,000** people die each year when drugs fail to work. Some estimates of the economic effects of AMR have been attempted, and the findings are disturbing (CDC, 2019). For example, the yearly cost to the US health system alone has been estimated at **US$ 21 to $34 billion**, accompanied by more than **8 million** additional hospital days. On the global scale, AMR-related deaths in 2019 were higher than those from **HIV/AIDS or malaria**, leading directly to **1.2 million** deaths and associated with a further **4.95** million deaths (Murray *et al*., 2022). Because AMR has effects far beyond the health sector, it was projected nearly 10 years ago to cause a decline in real gross domestic product (GDP) of 0.4% to 1.6%, which translates into many billions of dollars globally today.

Antibiotic tolerance is another covert threat that researchers have only recently begun to explore. Antibiotic tolerance happens when a bacterium manages to survive for a long time after being exposed to an antibiotic. In contrast, antibiotic-resistant bacteria flourish even in the presence of an antibiotic; tolerant bacteria often exist in a dormant state, neither growing nor dying, but putting up with the antibiotic until they are "re-awakened" once the stress is gone. Tolerance has been linked to the spread of antibiotic resistance. The antibiotic initially appeared to stop the infection, but the symptoms then reappeared because the antibiotic had not fully cleared the bacteria.

The ability to revert to normal and grow after the cessation of antibiotic treatment is the key to tolerant survival. Infections caused by resistant microorganisms often fail to respond to standard therapies, resulting in prolonged illness and an increased risk of death. Antibiotic resistance occurs naturally, but the overuse of antibiotics can speed up the process. As we emerge from the COVID-19 pandemic, there is now a need to focus on the silent pandemic of antibiotic resistance.

Causes of Antimicrobial Resistance

The leading cause of antibiotic resistance is the misuse of antibiotics. When we use antibiotics, some bacteria naturally die, but those resistant to the antibiotic survive, multiply and continue their everyday life. The misuse of antibiotics significantly contributes to the development of bacterial resistance. The inappropriate use of antibiotics has been shown to contribute to the emergence of multidrug-resistant organisms. However, the development of antimicrobial resistance is not limited to just misuse of antibiotics, other factors that contribute to the development of antimicrobial resistance are listed below.

1. **Over prescription of Antibiotics:** Antibiotics are lifesaving medications; they are critical to medicine and medical care, but many antibiotics have been overprescribed. Unnecessary antibiotic intake significantly

leads to antibiotic resistance. The more an antibiotic is used, the more the bacteria adapt and learn how to fight off the drugs. There are currently limited antibiotics available, and scientists are finding it challenging to develop new antibiotics to keep pace with the superbugs (Ramachandran *et al*., 2019). Unnecessary antibiotic usage cause harm to people as well. All antibiotics have their attendant side effects; these range from mild to serious side effects, which can be life-threatening. Since antibiotics work against bacterial infections, some conditions, such as the common cold, do not need antibiotics, and this is a common practice in our environment. Common colds and most cases of sore throat known as viral pharyngitis and bronchitis are caused by viruses. Antibiotics are ineffective for these conditions. Medical doctors are trained to know when antibiotic medications are necessary. However, at times, they often prescribe certain medicines because they have preconceived notions about what patients want and strive to provide satisfying customer experience.

2. **Patients not completing the entire Antibiotic Course:** Most patients do not complete the entire course of antibiotics given to them, and the most common reasons for this are forgetfulness in taking the drug, discomfort experienced from side effects of these drugs. The drugs might be too costly for them to finish, and many times, when the symptoms subsided and they are feeling better, most dosages are never completed. Many patients have a phobia of taking drugs, and the majority does not understand how to take the drugs. Too many medications at the same time for a patient can lead to this non-compliance, and many times there is mistrust on the part of the patient after so many visits to hospitals; this eventually leads to worry and depression, while the result is non-compliance which eventually leads to the

development of antimicrobial resistance (Endashaw *et al*., 2022).

3. **Overuse of Antibiotics in Livestock and Fish Farming:** The use of antibiotics is not limited to humans alone; they are also used in livestock and fish farming. The livestock farming and aquaculture industries are major areas of antibiotic misuse, which have caused serious antibiotic residues and environmental pollution affecting humans. Mass production of antibiotic-resistant bacteria develops, and these resistant organisms are eventually transferred to humans. Taking antibiotics too often or for the wrong reason changes bacteria so much that antibiotics don't work against the targeted pathogen (Martin *et al*., 2015).

Fig. 8: Antibiotics Usage in Livestock
Source: *https://tse2.mm.bing.net/th/id/OIP.Dy6Lxcmmm6cn7oNAUkMWSwHaFc?r=0&rs=1&pid=ImgDetMain&o=7&rm=3*

4. **Poor Infection Control in Health Care Settings:** There is a surge in patients seeking medical care, and hospitals and clinics are seeing more patients with infections. However, it is not always possible to curb or control the spread of pathogens in a population. The identification, isolation, and treatment of all infectious diseases are not feasible, resulting in the introduction of additional pathogens to the hospital community. Misuse and overuse of antibiotics are the leading causes of the emergence of these resistant pathogens in hospital communities (Sirwan *et al*., 2024).

5. **Antibiotic Misuse:** Antibiotic misuse, sometimes called antibiotic abuse or antibiotic overuse, refers to the misuse of antibiotics, with potentially profound effects on health. It is a contributing factor to the development of antibiotic resistance, which includes the emergence of multidrug-resistant bacteria, commonly referred to as superbugs. Some bacteria, such as Staphylococcus, Enterococcus, and Acinetobacter, which were not previously causing infections, can develop resistance and subsequently cause life-threatening infections (Ventola, 2015).

Fig. 9: Display of Antibiotics in the open in a market in Ilorin
Source*:* Akanbi II and Oniye 2025

Storage of Antibiotics

Antibiotics require proper storage. However, the reverse is often the case with most patent medicine sellers, who are usually the first point of contact for the populace. Improper storage of antibiotics can lead to a reduction in their effectiveness, development of antibiotic resistance and even potential health risks. Expired antibiotics may lose their potency and become less effective in treating infections, and overuse can contribute to the development of resistant bacteria. In addition, improperly stored antibiotics are degraded into harmful by-products with their attendant side effects.

Fig. 10: Ideal Storage of Antimicrobials in an air-conditioned environment
Source: Akanbi II and Abdulrazaq (2025)

Below is a detailed explanation of the detrimental impacts of improperly stored antibiotics (Khan *et al*., 2022).

1. **Reduced Efficacy and development of Resistance:** Antibiotics can lose their effectiveness with time when not properly stored, for example, when exposed to ultraviolet light, heat or moisture. This means that when such antibiotics are used, the bacteria are not killed, resulting in treatment failure.

2. **Antibiotic Resistance:** Antibiotic resistance is often a resultant effect of the use of improperly stored or expired antibiotics, which have lost their potency. When bacteria are exposed to sub-therapeutic doses of antibiotics, they adapt to survive and become resistant to future treatments.

3. **Increased risk of Infection:** Due to the reduction in the efficacy of expired drugs, it can result in prolonged and severe infections, eventually requiring more aggressive treatments or prolonged hospitalisation.

4. **Potential Health Hazards:** Over time, the active ingredients of antibiotics degrade, resulting in harmful by-products with potential side effects such as allergic reactions and even serious health problems.

5. **Misuse and Overuse**: Misuse of antibiotics can occur due to improper storage. People might continue to take

expired antibiotics without realising their reduced efficacy, which can lead to treatment failures and potentially increase the risk of antibiotic resistance.

6. **Accidental Ingestion**: Improperly stored or leftover antibiotics can be accidentally ingested by children or pets, causing serious health problems.

7. **Environmental and Public Health Concerns**: Antibiotic resistance in the environment due to improper disposal of expired antibiotics can contaminate water sources and soil, leading to the spread of antibiotic-resistant genes in the environment.

8. **Public Health Risks**: The resultant antibiotic-resistant bacteria pose a significant threat, as infections become more difficult to treat and can lead to increased morbidity and mortality.

9. **Temperature Sensitivity**: Many antibiotics are temperature sensitive, and they are usually degraded when exposed to extreme temperatures, either hot or cold. To maintain the drug's potency, proper storage is essential.

10. **Adverse Drug Reactions**: Such as allergic reactions, nausea, vomiting and diarrhea, can arise from the use of improperly stored drugs.

Role of Medical Microbiology

Medical Microbiology involves the identification of microorganisms for the diagnosis of infectious diseases and the assessment of the likely response to specific therapeutic interventions. One of the most essential roles of a clinical microbiologist is to ensure that antibiotics are prescribed and used appropriately. Medical microbiologists are also at the forefront of identifying new superbugs and play a significant role in the development of new antibiotics.

Super Bugs

Super bugs are strains of bacteria, viruses, parasites and fungi that are resistant to most of the antibiotics and other medications commonly used to treat the infections they cause. They present as a major impediment to the effective treatment of common ailments and have resulted in several outbreaks of diseases in recent times (Painuli *et al*., 2023). Several strains of bacterial super bugs are predominant within the population, and the major ones are:

(a) **Methicillin-Resistant *Staphylococcus aureus* (MRSA):** Causes severe skin infections, which can lead to pneumonia and bloodstream infections, and this infection is healthcare-related.

(b) **Multidrug-Resistant Tuberculosis (MDR-TB):** Tuberculosis is a bacterial infection that is increasingly resistant to several antibiotics. This makes it more challenging to treat and can result in longer treatment times and potential complications.

(c) **Carbapenem-Resistant Enterobacterales (CRE):** These bacteria are resistant to carbapenem antibiotics, which are often used as a last resort for serious infections.

(d) Vancomycin-Resistant Enterococci (VRE): They are resistant to vancomycin, an antibiotic commonly used to treat infections caused by Enterococci.

(e) Multidrug-Resistant *Pseudomonas aeruginosa* (MRPA): This organism can cause serious infections in people with weakened immune systems or those admitted to hospitals.

Consequences of Resistance

1. **Treatment challenges:** Resistant microorganisms become increasingly difficult to treat, potentially requiring more extended and more complex treatment regimens or even alternative medications.

2. **Increased Health Care Costs:** Treatment of resistant infections can lead to higher healthcare costs due to increased hospital stays and the need for more expensive medications.

3. **Public Health Threat**: The emergence and spread of drug-resistant organisms pose a significant threat to public health and the health of workers **(**Dadgostar, 2019**)**.

Contributions to Knowledge

My research interests lie in antimicrobial resistance, the use and misuse of antibiotics in our environment; nevertheless, I also conduct research in other areas of Medical Microbiology and related departments in Pathology and Medicine. I would like to seek your indulgence in narrowing the scope of this presentation to bacteria. Antibiotic-resistant organisms are most common in locations where antibiotics are used more frequently, which accounts for the fact that hospitals harbour many antibiotic-resistant microorganisms. Many of these resistances are mediated by the mobile genetic element called plasmids. Plasmids are natural arsenals, with which these organisms are endowed to resist our antibiotics.

Vice-Chancellor Sir, **Akanbi II** *et al*. (2004) identified the factors responsible for the poor clinical outcomes in these organisms. These organisms are most identified in clinical samples from infected patients sent to the clinical microbiology laboratory on a day-to-day basis. Five species of Klebsiella were identified with large molecular weight plasmids. Plasmids naturally occur in some genera and species but are horizontally transferred among genera. However, plasmids are higher in areas where antibiotic usage is more prevalent. Plasmids play a crucial role in the development of resistance. This horizontal transfer of plasmids facilitates the dissemination of resistance genes among diverse bacterial species, thereby contributing significantly to the emergence and spread of antibiotic resistance.

Akanbi II *et al.* (2005) then determined the susceptibility of *Staphylococcus and Streptococcus species* to some selected β-lactam antibiotics. Many gram-positive bacteria produce β-lactamase, which is an enzyme that hydrolyses the β-lactam ring in β-lactam antibiotics, rendering them ineffective. This extracellular inactivation of antibiotics contributes to bacterial resistance. The greatest production of β-lactamase was found in Staphylococcus, accounting for about 77%, while the remaining 33% was found in Streptococcus. Despite the production of β-lactamases by these organisms, resistance to penicillin is, on average, compared to the marked resistance to ampicillin and cloxacillin. Ampicillin and cloxacillin usage are pretty on the increase because of their availability over the counter.

There are numerous varieties of these oral antibiotics, some in tablet form and the majority in capsule form, which are readily available in the community. Experts advise using antibiotics only, when necessary, to ensure that the bacteria are killed and cannot multiply or spread to other parts of the body. Medical doctors typically prescribe antibiotics for the treatment of bacterial infection. Antibiotics are not effective against viruses. Adequate knowledge of infections helps with their appropriate treatments.

Fadeyi and **Akanbi II** *et al.* (2005) examined the sensitivity pattern of a multidrug-resistant organism, *Pseudomonas spp.*, responsible for urinary tract infections in men. The urinary tract infections (UTIS) include urethritis, cystitis, prostatitis and pyelonephritis. The choice of antibiotics used for first-line treatment of infections depends mainly on the previous antibiogram within a specified locality, among other factors. Most of these isolates were sensitive to ofloxacin, cefuroxime, ciprofloxacin and pefloxacin. Appreciable resistance to ceftazidime and increasing resistance to gentamicin, cotrimoxazole and Ampicillin were observed in the study.

These isolates from urine were generally resistant to isolates from other sources. Most of them were recovered from patients attending the general outpatient department, indicating the extension of multidrug-resistant isolates beyond the hospital setting. There is a need for regular review of the antibiotics prescribing policy in various parts of the country. It is advised that a combination therapy of quinolone and aminoglycoside will be needed to combat infection caused by these organisms to reduce the development of resistance in them.

Urinary Tract Infection (UTI) is a serious health problem worldwide, being a major cause of morbidity and mortality amongst the affected patients, whose number is said to run into millions yearly. However, the true incidence of UTI is not yet known in Nigeria. UTIs usually arise as a complication of catheterisation and other forms of urinary instrumentation. The unholy alliance between UTI and health care infections is a significant source of concern to healthcare providers in any hospital setting today.

Vice-Chancellor Sir, **Akanbi II** *et al.* (2006) investigated the prevalent agents of UTI and their antibiotic sensitivity patterns in Ilorin. Gram-negative bacteria, being members of the Enterobacteriaceae except Pseudomonas, were the major pathogens identified. Most isolates were sensitive to fluoroquinolones and the third-generation cephalosporins. The second-generation cephalosporins showed poor activity against the isolated pathogens. Many of the isolates were resistant to nitrofurantoin and gentamicin. A combination of third-generation cephalosporins and fluoroquinolones that are not contraindicated is recommended for the empiric treatment of UTI before the availability of laboratory-confirmed sensitivity results.

Bacteria are remarkably adaptable organisms that possess an almost unlimited capability to survive under adverse conditions. One of the most effective survival mechanisms among pathogenic bacteria is the production of β-lactamases, enzymes that destroy β-lactam antibiotics, including ampicillin, cloxacillin, and certain cephalosporins. *Staphylococcus species* are common laboratory isolates and are responsible for a wide range of major and minor infections in humans. They are widely distributed in nature and are prominent producers of β-lactamase.

In the study by **Akanbi II** *et al.* (2007) on β-lactamase production by *Staphylococcus species,* the rate was as high as 90%, which accounts for the high resistance to penicillin, Ampicillin, and cloxacillin, common antibiotics in our environment. The development of resistance to these antibiotics may be due to excessive and inappropriate use. No doubt, penicillin is the most abused antibiotic, largely because of its over-counter availability. The resistance of *Streptococcus species* to the tested antibiotics is more noticeable than that of Staphylococcus species. This implies that patients infected with *Enterococcus faecalis, Streptococcus pneumoniae,* and *Streptococcus pyogenes* may not respond well to treatment with Ampicillin, cloxacillin, and penicillin.

Akanbi II *et al.* (2015) analysed the sensitivity profile of *Proteus species.* Proteus is a prominent member of the family of Enterobacteriaceae, and it is responsible for a variety of infections in humans. Such infections include UTI and many opportunistic infections in humans. It also causes opportunistic healthcare infections, including those of the respiratory tract, ear, nose, skin, burns, and wounds. *Proteus species* can be naturally resistant to antibiotics, and there have been numerous reports of extended-spectrum beta-lactamase production by Proteus. Wound infections by this organism were predominant, closely followed by UTI. The *Proteus species* exhibit high sensitivity to Imipenem and Piperacillin and are found to be moderately sensitive to the Cephalosporins and Quinolones.

Therefore, the appropriate use of antibiotics in treating infections caused by these organisms is advocated, as they readily develop resistance to commonly used antibiotics through the production of ESBL. *Streptococcus pneumoniae* is a prominent member of the Gram-positive bacteria family, known to cause numerous critical human infections, including otitis media, sinusitis, and meningitis. Humans are the natural host of pneumococci, and there is no known animal reservouir. Antibiotic resistance is an increasing problem among isolates of *Streptococcus pneumoniae.*

The Vice-Chancellor, **Akanbi II** *et al.* (2016) analysed the activity of newer antibiotics apart from the common antibiotics in use. Carbapenems are β-lactam drugs that are structurally different from the penicillin's and the cephalosporins. Typical examples of the carbapenems are imipenem and meropenem. They are the most potent agents for the treatment of extended-spectrum β-lactamase. Imipenem has the widest spectrum of activity of the β-lactam drugs. Carbapenems are typically the last-line antibiotics for treating infections caused by resistant Gram–negative bacteria. All the Gram-negative isolates were highly susceptible to Imipenem with excellent activity against isolates of *Proteus mirabilis, Salmonella typhi* and other isolates. Imipenem has demonstrated potent antimicrobial activity against commonly isolated Gram-negative pathogens, including those that are multidrug-resistant in our environment. However, to prevent treatment failure, patient management should be based on Imipenem MICs within the susceptible range, which predicts treatment outcomes.

These organisms can enter the bloodstream as a severe complication of infection, such as pneumonia and meningitis. The prevailing etiology of bloodstream infections varies over time from region to region, and this determines the antibiotic choice for both presumptive and definitive management at any given time.

Adedoyin *et al.* (2013) examined the bacterial isolates from blood in children with septicemia. The leading organism recovered was *Staphylococcus aureus*, closely followed by *Salmonella typhi*, and most of these organisms were found to be Gram-positive. The antibiotic sensitivity of most microorganisms underwent a significant shift, with a surprising increase in sensitivity to quinolones, despite being previously resistant to routine antibiotics. *Staphylococcus aureus* in the study was resistant to Co-amoxiclav, Amoxicillin and Ceftazidime. The finding of Co-amoxiclav-resistant *Staphylococcus aureus* may suggest overuse of Co-amoxiclav in treating many infections in Nigeria, despite its enormous cost. The same applies to Amoxicillin and Cloxacillin, which are still commonly prescribed by medical practitioners because they are more cost-effective. A combination of quinolones and gentamicin is advised for the empiric treatment of suspected *Staphylococcus aureus* septicemia.

Furthermore, our team has contributed to determining the bacterial agent and the antibiotic susceptibility of bacteremia in Kwara State. Olowo and **Akanbi II** (2006) further investigated the currently prevalent bacterial pathogens in blood cultures of patients with suspected septicemia, encompassing all age groups and genders. Septicemia is today recognised as a significant health problem, requiring immediate medical attention to forestall a lethal outcome. During the past three decades, there has been a substantial increase in the incidence of this condition, particularly with healthcare associated infections. Bacterial septicemia in any age group is a cause for concern for both managing clinicians and patients alike due to the high morbidity and mortality associated with this condition. The single most common cause was *Staphylococcus aureus.*

Other isolates include *Escherichia coli, Klebsiella pneumoniae, Proteus species*, *Salmonella typhi* and *Acinetobacter species*. Most of the isolates were sensitive to fluoroquinolones and the third-generation cephalosporins, except Acinetobacter, which was 100% resistant to both groups of antibiotics. Gram-positive isolates were resistant to the second-generation Cephalosporins. The use of a combination of third-generation Cephalosporins and Fluoroquinolones was not contraindicated in the empiric treatment of septicemia before sensitivity results were available.

Diarrhea disease is the second leading cause of death in children under five years of age, and it is responsible for the death of about 760,000 children every year. It is both preventable and treatable. Diarrhea can be defined as the passage of three or more loose, watery stools per day, or a more frequent than normal for an individual. Campylobacteriosis is a common diarrhea illness caused by members of the bacterial genus Campylobacter, with *Campylobacter jejuni* and *Campylobacter* *coli* being the most frequently isolated. The food borne Campylobacter species are one of the leading causes of human gastroenteritis worldwide, with emerging antimicrobial-resistant strains, accounting for approximately 5-14% of diarrhea cases globally. Poor hygiene and proximity to animals contribute to easy and frequent acquisition of enteric pathogens, including Campylobacter species, in developing countries.

Mr. Vice-Chancellor, **Akanbi II** *et al.* (2016) determined the prevalence and antibiotic susceptibility patterns of Campylobacter species causing diarrhea in Ilorin metropolis. In this study, the prevalence rate of Campylobacter enteritis in Ilorin was 0.8%. Just one case was positive out of the 12 fecal samples of children presenting with diarrhea examined. In addition to Campylobacter, other bacteria such as *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Proteus vulgaris*, and *Salmonella typhi* were also isolated. The isolated Campylobacter was found to be susceptible to Gentamicin, Erythromycin, Ciprofloxacin and Co-amoxiclav. The findings from this study suggested that Campylobacter species may not be a common diarrheagenic agent among children in Ilorin. Since the prevalence of Campylobacter in this study was very low, other enteric bacteria could be the source of gastroenteritis.

As a rider to the above, **Akanbi II** *et al.* (2016) examined a broader view of bacterial agents of diarrhea in children under 5 years of age. The prevalence of bacteria-associated diarrhea in this study was 23.2%. The bacteria isolated were *Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumoniae, Proteus vulgaris, and Salmonella typhi. Escherichia coli* were the most frequently isolated pathogen in all age groups. The 13- to 20-month age group had the highest occurrence of bacterial isolates. The agents of diarrhea are usually faeco-oral, indicating poor sanitation and personal hygiene due to their mode of transmission. Some isolates were sensitive to Ciprofloxacin and Gentamicin, while the majority was resistant to Ceftazidime, Co-amoxiclav, Cefuroxime, and Ceftriaxone.

Akanbi II *et al.* (2016) determined the prevalence of *Aeromonas hydrophilia* in the stools of children attending selected hospitals in Ilorin. Two isolates of the organism were isolated. *Aeromonas hydrophilia* has been debated in recent times on its role as a cause of diarrhe*a* among children under 5 years of age. This organism is usually found in the stools of children aged 12 -24 months. Infection with this organism usually results in watery stools, and only watery stools yield the organism. The most effective in vitro agents against isolates were Ciprofloxacin and Ceftazidime, with 100% susceptibility. Gentamicin and Augmentin gave an average susceptibility, and the isolates were found to be resistant to Penicillin, Ampicillin, Streptomycin, Cotrimoxazole and Tetracycline. Ciprofloxacin is not usually recommended for children, thus making ceftazidime the drug of choice.

Akanbi II *et al.* (2016) examined the sensitivity pattern of *Streptococcus pneumoniae*. In the past, *Streptococcus pneumoniae* was almost uniformly susceptible to penicillin G, thus making the susceptibility testing of pneumococci unnecessary. Bacterial resistance has been reported to nearly every antibiotic currently available. Many bacteria now exhibit simultaneous resistance to two or more antibiotics and are referred to as multidrug-resistant. Pneumococcus resistance may occur alone or in combination with resistance to another antimicrobial agent. Pneumococcal isolates were primarily resistant to Penicillin G. There is no doubt that Penicillin G is one of the most widely used antibiotics in developing countries, especially among the general medical practitioners.

Penicillin G should no longer be advocated in the treatment of infections caused by this organism; instead, we consider the carbapenems, fluoroquinolones and the third-generation cephalosporins. Another condition of interest is multidrug-resistant Pulmonary Tuberculosis (MDR-TB). This is a form of tuberculosis caused by bacteria that are resistant to at least isoniazid and rifampicin, the most effective first-line anti-T.B. drugs. This resistance can make treatment more challenging, and requires longer treatment courses, or the use of less effective and sometimes toxic second-line drugs. Pulmonary Tuberculosis and HIV are both chronic infections which co-exist and have been closely linked.

Akanbi II *et al.* (2017) determined the prevalence of PTB/HIV co-infection and assessed the socio-economic, demographic and psychological effects of the studied population. The study showed that the overall prevalence of pulmonary tuberculosis among HIV patients is common among rural dwellers and the elderly. Pulmonary tuberculosis had a profound impact on the quality of life of the respondents, showing effects on school and work, general life activities, social contact and their sexual relationships. Thus, the disease could be a major contributor to low productivity.

The Vice-Chancellor, having dealt extensively with the major pathogens, it must be underscored that vectors, particularly arthropods, play a crucial role in the transmission of various pathogens. Other epidemiological factors, such as environmental conditions, human behaviour, and socio-economic factors, also influence the spread of infectious diseases. Understanding these factors is essential for developing effective prevention and control strategies for infectious diseases.

Public health interventions, such as sanitation, hygiene education, and access to healthcare, can also play a crucial role in preventing the spread of infectious diseases. Health care settings represent an environment where both infected people and those at increased risk of infection congregate. However, patients with infections or carriers of pathogenic microorganisms admitted to hospitals are potential sources of infection for other patients and staff. Patients who become infected during their hospital stay are a further source of infection.

Akanbi II *et al.* (2017) determined the prevalence of multidrug-resistant isolates on selected hospital surfaces in the Pediatric ward of a hospital. The surfaces considered were bed rails, lockers, incubators, radiant warmers, medical tables, door handles and the wash sinks. Methicillin-susceptible and methicillin-resistant *Staphylococcus aureus* and the ESBL Producer *Klebsiella pneumoniae* were found on the surfaces. Transmission can occur directly when health workers' hands or gloves become contaminated by touching contaminated surfaces. The findings of this study revealed the presence of pathogenic contaminants on non-critical hospital surfaces. The leading aerobic bacterial contaminants are MRSA and ESBL in a smaller proportion. Cleaning and disinfection of non-critical surfaces should be encouraged at least every 2 hours, and regular hand washing on the part of healthcare workers should be performed before and after every procedure.

The white coat worn by medical doctors is a symbol of professionalism, empathy and a doctor's commitment to caring for their patients. **Akanbi II** *et al.* (2017) examined the degree of bacterial contamination by bacterial agents on the white coat in hospital settings. The findings of this study clearly showed that white coats used by physicians' harbours high loads of aerobic bacterial agents. *Staphylococcus aureus* was the major pathogen isolated from the cuffs of the sleeve and the mouth of the pockets. This study suggested that white coat usage and handling practices form the basis upon which certain precautions should be taken to prevent the degree of contamination among doctors and the possibility of cross-contamination between doctors and their attending patients in healthcare settings.

Healthcare-Associated Infections (HAIs), known as nosocomial infections in the past, are infections acquired while receiving treatment in a healthcare facility. This can occur in various healthcare settings, including hospitals, long-term care facilities, and even ambulatory settings, and may even persist after discharge. HAIs are a significant concern as they can prolong hospital stays, increase health care costs and cause unnecessary pain and suffering for patients. Atata and **Akanbi II** *et al.* (2010) determined the causal relationship between bacteria isolated from the hospital environment and those from the wounds of operated patients. There has been doubt about the role of the hospital environment in the development of HAI in patients, and this therefore underplays the importance of chemical disinfection on hospital surfaces. The consensus is that the environment does not significantly contribute to the causation of HAI. However, the results of this work show that, indeed, endemic hospital bacteria isolates are indeed responsible for surgical HAI in the hospital. The implication of these findings is the contamination of surgical wounds, and hence, the infections of the wound, arise from organisms from the hospital environment. Therefore, chemical disinfection of the hospital environment is among the necessary measures that must be duly observed.

As indicated above, HAIs are acquired while in the healthcare facilities and may occur after medical or surgical procedures. They can be mild or life threatening and they are preventable with diligent prevention efforts. Atata and **Akanbi II** (2013) carried out a retrospective survey of prevalence of HAI in selected private hospitals in Kwara State. The average HAIs in the studied hospital were 15.2%, and the leading bacterial pathogens in descending order are *Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Staphylococcus epidermidis and Klebsiella species.* Surgical wards had the highest rate of infections, and surgical wound infections are the leading HAI in the hospitals studied. Prospective study of HAIs in these hospitals is therefore recommended. Atata and **Akanbi II** (2013) later examined the antibiotic resistance profile of bacterial isolates from surgical sites of patients admitted and operated in a hospital under surveillance, and the relationship between these isolates and those isolated from the hospital environment where the patients were operated and managed was studied.

The isolated bacterial species from surgical sites and the hospital environments were Staphylococcus epidermidis, Staphylococcus aureus, *Streptococcus pyogenes, Klebsiella pneumoniae, Escherichia coli, Enterobacter species, Proteus mirabilis, Proteus vulgaris, Pseudomonas aeruginosa, Bacillus* *cereus, Bacillus megaterium and Bacillus subtilis.* The antibiotics tested against the isolates include Ampicillin, Penicillin, Cloxacillin, Chloramphenicol, Streptomycin, Azithromycin, Erythromycin, Ofloxacin, Sparfloxacin, Ciprofloxacin, Tetracycline and Doxycycline. The result revealed that all isolates showed multiple resistance to all antibiotics used. Multiple Antibiotic-Resistance (MAI) index of isolates ranged from 0.6-0.8. Out of the 147 isolates tested for the presence of β-lactamase, 64% of the isolates possessed the β-lactamase enzyme, and 61.2% also harbored plasmids, implying that some of the β-lactamase enzymes produced are most likely plasmid-mediated. It was concluded that the presence of β-lactamases and the r-plasmid is probably responsible for the observed multiple resistance.

Community Service

- **University of Ilorin Teaching Hospital**

1. I became a Consultant Medical Microbiologist in January 2001and the first alumnus head of the Department of Medical Microbiology and Parasitology.
2. I had the opportunity to serve the hospital in various committees, such as the Laboratory Revolving Fund Committee and the Hospital Infection Control Committee among others.

- **University of Ilorin**

1. The first and substantive Dean of the Faculty of Basic Clinical Sciences (2021 - 2025)
2. Later re-elected as Sub-Dean student affairs again in 2017-2018
3. The first Sub-Dean student affairs of the college 2008 - 2010
4. Head, Department of Medical Microbiology and Parasitology 2009 – 2011, 2014 – 2018

5. Chairman, Faculty of Basic Medical Sciences University of Ilorin Webometric Committee 2007
6. Member, University Project Binding Committee
7. Member, Ceremonial Committee of the University
8. Secured accreditation for Physiotherapy and Medical Laboratory Sciences programme
9. First set of Physiotherapy students graduated in July 2024 under my tenure as the Dean
10. First set of Medical Laboratory Sciences students will also be graduating this July 2025

- **Federal**

1. External Examiner to many Federal and State Universities in Pathology
2. Member of the Federal Medical Team to Saudi-Arabia in 1994 and 2006
3. Consultant to the Federal Ministry of Health on Syphilis/ HIV control 2005 – 2009
4. Recently appointed as a Consultant to National Primary Healthcare Development Agency (NPHCDA) and WHO on Polio eradication 2024
5. Member, NUC Accreditation Team to many Federal and State Universities
6. Returning Officer, 2023 Presidential and Senatorial Election in Kwara South Senatorial District
7. Returning Officer, 2023 Gubernatorial Election in Kwara North

Conclusion

Vice-Chancellor Sir, AMR is a global health issue driven by antibiotic misuse and overuse in various settings in our communities, leading to the emergence of resistant microorganisms threatening the effectiveness of treatment for various infections caused by bacteria, viruses, fungi, and parasites. The overuse and misuse of antimicrobials, particularly antibiotics, are major drivers of AMR, leading to increase morbidity, mortality and health care costs, also causing a silent pandemic that could surpass other causes of mortality by 2050. Addressing AMR requires a multifaceted approach involving rational use of antibiotics, infection prevention and control, development of new drugs and diagnostic tools and strengthened global collaboration and governance. With antibiotic failing to keep up with the increasing rise of multidrug resistance, we are slowly moving into a dangerous post antibiotic era. Recently, the Director General for the Nigeria Centre for Disease Control and Prevention (NCDC), Dr. Jide Idris, has raised an alarm over the growing threat of AMR on May 3rd 2025, in a Nigerian newspaper. He said and I quote:

> *AMR is a silent killer; it kills more than the combination of Malaria, Tuberculosis and HIV/AIDS together. The worst thing is that not much is known about it, especially among the public. It has become a global focus, it is unacceptable that most Nigerians don't know how dangerous AMR is, we must act now.*

Recommendations

1. **Promoting public awareness**: Providing education are essential components to address AMR. It is important to provide the general populace with comprehensive education about proper utilization; the complications associated with excessive usage of antibiotics and the importance of abiding by prescribed treatment regimens. These efforts should address the public, health care professionals and those involved in animal health and agriculture.

2. **Antibiotic stewardship:** This plays a crucial role in combating AMR, and this entail coordinated approach aimed at optimising antibiotic use to improve patient's outcome, minimise antibiotic resistance and reduce health care cost. It involves ensuring that antibiotics are

prescribed and use appropriately, including selecting the right drug, dose and duration of therapy. Rational use of antibiotics when necessary and appropriate dosage given, and this will address resistance to existing drugs. These are all initiatives to improve antibiotic use, improved patient outcomes and decreased adverse effects.

3. **Combination therapies:** Using multiple antibiotics with different mechanisms of action to treat infections will go a long way in reducing AMR. This is a promising strategy to combat AMR. It greatly reduce the risk of resistance development and potentially lowers dosage and side effects. However improper use of combination therapy can accelerate resistance, highlighting the need for careful consideration of drug interactions and resistance mechanisms. However, if people do not change the way antibiotics are used now, these new antibiotics will suffer the same fate as the current ones and become ineffective.

4. **Probiotics and Prebiotics:** This will support a healthy gut microbiome and potentially reducing the need for antibiotics. The two can work together to create a more robust and resilient gut environment. This approach will help in reducing infection and reliance on antibiotics which are major contributor to the development of AMR.

5. **Surveillance Systems:** Monitoring and tracking resistance patterns to inform treatment guidelines, and this will eventually guide treatment decisions. Surveillance relies on voluntary reporting or active collection of data. We need to integrate guidelines on antibiotics usage in humans, animals and the environment. Effective surveillance will help in developing and monitoring therapy and development of new antimicrobials.

6. **Environmental Regulations:** This will reduce antibiotic use in agriculture to limit resistance spread, and this

eventually mitigates selection pressure for resistance. It entails limiting the release of antibiotics into the environment. The major feature of this regulation includes managing waste water, solid waste and agricultural products to minimise the spread of resistance by promoting responsible antimicrobial use, improving sanitation and hygiene.

7. **A Unified Global Intervention**: This involves various sectors and corporate bodies coming together to mitigate the effect of the spread of antimicrobial resistance. This international collaboration will drive research into new antimicrobials, diagnostic and alternative therapies essential for combating AMR. Harmonising policies and regulations across countries will go along way to minimise AMR.

8. **Government Intervention**: In reducing antimicrobial resistance, enacting a law abolishing the sale of antibiotics without prescription is cardinal. They should implement various strategies to limit misuse, recognising the link between misuse and antibiotic resistance; these include enforcing regulations and promoting responsible antibiotic usage through public awareness campaigns.

9. **Improving Infection Prevention and Control**: Hand hygiene with frequent hand washing with soap and water especially in health care settings. Proper food handling to minimise the risk of food borne illnesses that may require antimicrobial treatment. Infection control protocols to prevent the spread of resistant organisms are also a component of this strategy.

10. **Individual Actions**: We need to educate ourselves on how to prevent infections. The need to consult health care professionals about any symptoms and follow their instructions for treatment. Never share antibiotics with others or use leftover antibiotics without consulting a doctor.

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The Vice-Chancellor Sir, permit me to end this lecture with praise to the Almighty Allah. Subu hana Allah, Allah. Walihamdu Lilah Allah, Allahu Akbar Allah Allah, Allahu Akbar Allah.

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References

Adedoyin, O. T., Ibrahim, M., Johnson W. B. R., Ojuawo, A. I., Mokuola, O. A., Ernest, S. K., Adesiyun, O., Adegboye, A. O, **Akanbi II, A. A.**, Odimayo, S., Adebara, O. V., Saka, K. H. (2013). Bacteria Isolates of blood in children with suspected septicemia in a Nigerian tertiary hospital. *The Tropical Journal of Health Sciences*, *20*(1), 31-36.

Ahmed, S. K., Hussein, S., Qurbani, K., Ibrahim, R. H., Fareeq, A., Mahmood, K. A., & Mohamed, M. G. (2024). Antimicrobial resistance: Impacts, challenges, and future prospects. *Journal of Medicine, Surgery, and Public Health*, *2*, 100081.

Akanbi II, A. A., Nyamngee, A., Adedoja, A. A., Njan, A., Olubiyi, S. K., Rejuaro, F. M., Imaam, S. A., & Giwa, A. G. (2017). Antibiotic sensitivity profile of *Proteus Species*associated with specific infections at University of Ilorin Teaching Hospital, Ilorin. *The Tropical Journal of Health Sciences, 24*(3), 49-52.

Akanbi II, A. A., Adedoja, A. A., Nyamngee, A., Njan, A. A., & Olubiyi, S. K. (2017). Prevalence and antibiotic susceptibility pattern of Campylobacter associated diarrhoea among children in Ilorin. *Journal of Applied and Basic Sciences* (JABS), *10*(1), 47-52.

Akanbi II, A. A., Atata, R. F., Salami, A. K., Abdulraheem, I. S., & Babatunde, S. K. (2005). Susceptibility of some bacterial isolates to selected β-lactam antibiotics. *Nigerian Journal of Applied Sciences*, 20, 1762-1766.

Akanbi II, A. A., Fadeyi, A., Atata, R. F., Babatunde, S. K., & Samuel, S. O. (2006). Urinary bacterial isolates and their antibiotic sensitivity patterns in University of Ilorin Teaching Hospital, Ilorin, Nigeria. *Centre Point Journal*, *14*(1), 84-93.

Akanbi II, A. A., Hembaor A. A., Nyamngee A., AbdulAzeez I. M., & Olubiyi, S. K. (2017). Pulmonary tuberculosis in HIV patients attending a tertiary health centre in

Makurdi, Benue State, Nigeria. *The Tropical Journal of Health Sciences, 24*(2), 14 20.

Akanbi II, A. A., Kareem, T. A., Nyamngee, A., Adedoja, A. A., Muhammed, R. F., Abdulkareem, M. B. U. & Olubiyi, S. K. (2017). Association between medical doctor's white coats and bacteria dissemination in a tertiary hospital in Nigeria. *Journal of Applied and Basic Sciences* (JABS), *10*(1), 19-23.

Akanbi II, A. A., Kareem, T., Adedoja, A., Nyamngee, A., Mohammed, B. U., & Atata, R. F. (2017). Bacterial contamination of medical doctors' white coats as contributing factor to hospital acquired infections, *11*(1), 185-194. *International Journal of Biology and Chemical Sciences, 11*(1), 185-194.

Akanbi II, A. A., Nyamgee A., Adedoja, A. A., Njan, A. A., & Olubiyi, S. K. (2017). Bacteria agents of diarrhea in children under 5 years of Age in Ilorin. *Archives of Clinical Research (ACR), 5*, 13-27.

Akanbi II, A. A., Nyamngee, A., Njan, A. A., & Igbodalo, M. (2016). Antibiotic resistance profile of *Streptococcus pneumoniae* isolated from patients attending University of Ilorin Teaching Hospital, Ilorin. *Journal of Basic and Applied Sciences, 9*(1), 11-13.

Akanbi II, A. A., Olubiyi, S. K., & Nyamngee, A. (2016). Susceptibility pattern of gram negative bacilli to imipenem isolated from patients attending Sobi Specialist Hospital, Ilorin. *Journal of Applied and Basic Sciences* (JABS), *9*(2), 106-110.

Akanbi II, A. A., Onile, B. A., Omonigbehin, E. A., & Abdulraheem, I. S. (2004). Plasmid profiles of Klebsiella isolates in Ilorin, Nigeria. *African Journal of Clinical and Experimental Microbiology, 5*(2), 177-181.

Akanbi II, A. A., Opalekunle, B., Adedoja, A. A., Olubiyi, S. K., & Nyamngee, A. (2016). Susceptibility pattern of gram-negative Bacilli to imipenem isolated from patients attending Sobi Specialists Hospital, Ilorin. *Journal of Applied and Basic Sciences (JABS), 9*(2), 106-110.

Akanbi II, A. A., Saka, K. H., Obasa, A., Nyamngee, A., Raheem, R. A., Oshodi A. J., & Olubiyi, S. K. (2017). Prevalence of multidrug resistant bacteria on selected hospital surfaces in paediatrics wards of a Nigerian hospital. *Archives of Clinical Research* (ACR), *5,* 76-79.

Akanbi II, A. A., Salihu, R. B., Nyamngee, A., AbdulAzeez, I. M., Rajuaro, F. M., Immam, A., & Olubiyi, S. K. (2017). Prevalence of *Aeromonas hydrophilia* in children with diarrhea attending some selected hospitals in Ilorin, Nigeria. *Archives of Clinical Research (ACR), 10(2), 85-90*.

Atata, R. F., Ibrahim, Y. K., Giwa, A., & **Akanbi II, A. A.** (2013). Antibiotics resistance profile of bacterial Isolates from surgical site and hospital environment in a University Teaching Hospital in Nigeria. *Journal of Medicine and Medical Sciences*, *4*(4), 181-187.

Atata, R. F., Yakubu, K. E., Ibrahim, Y. K., Philip, F. O., Abdulganiyu, G., **Akanbi II, A. A.,** & Sani, A. A. (2010). Clinical bacterial isolates from hospital environment as agents of surgical wound Nosocomial infections. *Journal of Pharmacy and Bioresources*, *7*(2), 146-155.

Atata, R. F., Ibrahim, Y. K., Olurinola, P. F., Adigun, I. A., Giwa, A., Abdul, I. F., & **Akanbi II, A. A.** (2013). Prevalence of surgical site nosocomial infections in a tertiary health care institutions in Nigeria. *International Journal of Epidemiology and Infection*, *1*(4), 54-57.

CDC (2019). *Antibiotics resistance threats in the United States*. Atlanta, GA: Department of Health and Human Services, CDC: 2019.

Dadgostar, P. (2019). Antimicrobial resistance: Implications and costs. *Infection and Drug Resistance*, *12*, 3903-3910.

EndashawHareru, H., Sisay, D., Kassaw, C., & Kassa, R. (2022). Antibiotics non-adherence and its associated factors among households in Southern Ethiopia. *SAGE open medicine*, *10*, 20503121221090472.

Faari, B. U., **Akanbi II, A. A.**, Fadeyi, A., Wahab, K. W., & Nwabuisi, C. (2015). Prevalence of extended spectrum Beta-Lactamase-producing Klebsiella species at the University of Ilorin Teaching Hospital. *Journal of Medical Investigations and Practice*, *10*(1), 20-23

Fadeyi, A., **Akanbi II, A. A.**, Nwabuisi, C., & Onile, B. A. (2005). Antibiotic sensitivity patterns of Pseudomonas aeruginosa isolates obtained from clinical specimens in Ilorin, Nigeria. *African Journal of Medicine and Medical Sciences*, *34,* 303-306.

Fadeyi, A., Adeboye, M. A., Fowotade, A., Nwabuisi, C., Bolaji, B. O., Oyedepo, O. O., Adesiyun, O. O., Olanrewaju, T. O., Aderibigbe, A., Salami, A. K., Desalu, O. O., & **Akanbi II, A. A.** (2011). Methicillin resistance *Straphylococcus aureus:* Awareness, knowledge and disposition to screening among health workers in critical care units of a Nigerian hospital. *West African Journal of Medicine*, *30*(4), 282-287.

Kareem, T. A., **Akanbi II, A. A.**, Atata, R. F., Mohammed, M. B., & Abdulkareem, K. (2014). Survey on nosocomial transmission potential of white coats won by medical doctors in a tertiary health care center in Nigeria. *International Journal of Current Microbiology and Applied Sciences*, *3*(4), 1-8.

Khan, F. U., Mallhi, T. H., Khan, Q., Khan, F. U., Hayat, K., Khan, Y. H., Ahmad, T., & Fang, Y. (2022). Assessment of antibiotic storage practices, knowledge, and awareness related to antibiotic uses and antibiotic resistance among household members in post-conflict areas of Pakistan: Bi-central study. *Frontiers in Medicine*, *9*, 962657

Marco, M. L. (2020). Defining how microorganisms benefit human health. *Microbial Biotechnology*, *14*(1), 35.

Martin, M. J., Thottathil, S. E., & Newman, T. B. (2015). Antibiotics overuse in animal agriculture: a call to action for health care providers. *American Journal of Public Health*, *105*(12), 2409–2410.

Murray, C. J., Ikuta, K. S., Sharara, F., Swetschinski, L., Robles-Aguilar, G., Gray, A., Han, C., Bisignano, C., Rao, P., Wool, E., Johnson, S. C., Browne, A. J., Chipeta, M. G., Fell, F., Hackett, S., Haines-Woodhouse, G., Kashef Hamadani, B. H., Kumaran, E. A. P., McManigal, B., … & Naghavi, M. (2022). Global burden of bacterial antimicrobial resistance in 2019: A systematic analysis. *The Lancet*, *399*(10325), 629-655

Painuli, S., Semwal, P., Sharma, R., & Akash, S. (2023). Superbugs or multidrug resistant microbes: A new threat to the society. *Health Science Reports*, *6*(8), e1480.

Pitt, T., & Barer, M. (2012). Classification, identification and typing of micro-organisms. *Medical Microbiology*, *24, https://doi.org/10.1016/B978-0-7020-4089-4.00018-4*.

Quran 36:36

Ramachandran, P., Rachuri, N. K., Martha, S., Shakthivel, R., Gundala, A., & Battu, T. S. (2019). Implications of overprescription of antibiotics: A cross-sectional study. *Journal of Pharmacy & Pioallied Sciences*, *11*(Suppl 2), S434–S437

Samuel, S. O., Fadeyi A. **Akanbi II, A. A.,** & Nwabuisi, C. (2006). Bacterial isolates of blood cultures in patients with suspected septicaemia in Ilorin, Nigeria. *African Journal of Medicine and Medical Sciences*, *35*, 137-141.

Ventola, C. L. (2015). The antibiotic resistance crisis: part 1: Causes and threats. P&T: Peer-reviewed *Journal for Formulary Management*, *40*(4), 277-283.