

ZOONOSES!

AN AGE-LONG THREAT TO HUMAN EXISTENCE

PUBLIC HEALTH PRACTICE

THE PANACEA

INAUGURAL LECTURE

BY

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PROTOCOL

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Ladies and Gentlemen

BACKGROUND

Becoming a Public Health Physician I am today did not just happen as public health attractions have been part of me from childhood. Being the fifth among ten, certain interest distinguished me. I was an inquisitive child and asked questions about happenings around me. Though this made my parents uncomfortable and tempted to ignore me sometimes, I never gave up because I believed they had the answers to my questions. They however felt delighted and proud whenever they could provide the answers. While my siblings were scared of taking drugs I could chew mine to the delight of my mother who the strong belief that swallowing tablets would not produce the desired cure for sickness because it would be excreted undigested. I detested filthy environments and coveted personal hygiene. For these reasons family members nicknamed me “doctor” considering my passion for healthy living.

My primary education was full of excitement and I was among the few my school selected to travel to Jos from Barkin Ladi for common entrance examination in 1966. My entrance into secondary education was cut short by the pogrom that ushered in the Nigerian civil war. At the end of the civil war education was not a priority, not by choice in any way but by necessity for most family in the south-eastern part of the country due to economic reality to their disadvantage. My education would have ended at primary level but for the unwavering faith my parents had in me for a bright future and made uncommon sacrifices for me to have continued. Though my mother sold her most valued giant pot to pay my school fees at a critical moment of my early education and my father his bicycle that was the costliest property he then possessed, their sacrifices could not sustain my secondary education. I had the rare opportunity to return to school after another three years out of school (having lost in the first instance three years during the civil war) thanks to my eldest brother who took over the responsibility from my parents. By the time I was through with my secondary education I had lost six years that were devoted to miniature jobs for family survival.

After graduating from secondary school I had no alternative but to work and earn a living, possibly save enough money to further my education. Where else could I have gone but Lagos, the city of refuge then for all job seekers from all parts of the country? After four years of working as a banker I was back to school hoping that my savings would sustain me through the six years of medical education. I was wrong as I exhausted my savings just before the first session ended. As I reminiscent over how I managed to cope during the remaining five years that appeared to have lasted for a decade, I give God praise. As an undergraduate Surgery was an appealing specialty to me and I quickly developed interest for it. However, I lost this interest when I graduated and worked as an Accident and Emergency Medical Officer in JUTH

when I discovered my order side. The crush injuries and burns I managed were too horrendous a memory for me to live with as such sites remained obnoxious in my mind long after I managed them. I could not stand such sights and became uncomfortable practicing in Accident and Emergency Unit. My transfer to work as Medical Officer in the Out-Patient Department came as a respite and gave me the opportunity to be thoughtful in my clinical practice rather than fixed to routine management of clinical cases as was the case erstwhile.

While consulting in Out-Patient clinic I came across chronic illnesses that kept me wondering if preventive measures could not have provided better solutions or at best prevented them. The patients sat for long hours while they waited to be seen during which some dozed off due to exhaustion from long waiting-time fatigue. They waited patiently for their turn to see the Clinician who was time constrained and had little or no time to give them health talk or counselling on preventive measures or at least on how to remain healthy. When a patient was eventually seen, the clinician was always in a hurry as many more were out there waiting for their turn to be seen. There was hardly a day when all the out-patients were seen before the official closing time. The spill-over patients were left with two options, go home for another day or pretend to be very sick and be seen in Accident and Emergency Unit. The large crowd in Out-Patient waiting hall on daily basis made me feel that something was definitely missing in the community. If all was right in the communities where these people live and work then they would not be frequenting the hospital with acute and chronic health problems as I recognized regular comers amongst them. They needed information on disease prevention and also on how to live a healthy life. This I felt falls within the purview of Social and Preventive medicine in the practice of Public Health. Because I have always had the desire to provide the necessary information and sensitization to those exposed to hazards of public health importance I felt obliged to do something.

I recall vividly when I visited a family and during our discussion I saw rats criss-crossing the sitting room freely under our watchful eyes. Baffled at the sight and more so that my hosts were unperturbed I asked to know why they accommodated such dangerous “guests”. They laughed as the household head replied “Ah! they are many in this house” expressing surprise that it was strange to me. My understanding of his response was that he saw no harm in living with rats. I had to spend some time educating them on the health hazards of living with rats. I then began to imagine how many more homes out there were infested with rats, yet the occupants were ignorant of its health hazard and needed to be enlightened. This is a Public Health problem I soliloquized. I may not be far from the truth if I assume that several of us here today are comfortably living

with rats. Some persons I have interacted with express their frustration in getting rid of rats from their homes as the rats kept coming back. But I keep telling them that “there are many ways of killing a rat”. They need to explore all the ways rather than give up. If there is no food for the rats to feed on they will definitely stop coming. But as long as they find something to eat when they come in, they will always be your guest and will keep attracting other rats into your house. Long before I started residency training in Public Health, I was used to educating and sensitizing those I came across on Public Health issues.

As a resident in Public Health I became more active in health talks and demonstrations on Public health issues. This I did especially among religious groups, in the communities during medical students’ postings and in our Family Health clinics. I got invitations within and beyond Jos to give health talks on Public Health issues. At the end of each sensitization I felt fulfilled believing that my audience had acquired the necessary information and knowledge in preventive and social medicine. During my daily consultations in the Family Health Clinic, JUTH I observed that some of the vaccinated under fives were coming down with measles. This observation bordered me so much that I had to carry out a clinical research to measure the antibody response of the under fives after vaccination. This I did using ELISA technique which was the first of its kind in the country then (24, 31). The findings were quite informative. Other observations I made led to my carrying out several researches that established certain factors and relationships that explained to an extent reasons for the observations. Some of the researches were on outcome of routine vaccines among the under fives (26, 30, 31, 38), factors associated with Exclusive Breastfeeding (28, 48) postpartum contraception use among nursing mothers (27, 44) and under five growth faltering and pattern (25).

While in a community during community diagnosis with medical students I observed something strange in the community. So many of the children were almost of the same height and I did a quick oral sampling of their ages which revealed that the children’s ages were nowhere close to each other. It struck my mind that these children were most likely stunted. This was in contrast to the appearance of their mothers who looked apparently well fed. I had to carry out a cross sectional survey that suggested possible reasons for their stunting (40, 43). Other research works I carried out in search of answers to the observations were on intestinal worm infestation and nutritional status of the under fives (29, 42). There were other research works I carried out to satisfy my curiosity over certain observations e.g. determining the factors affecting medical education (10). This was a twenty year retrospective study I carried out during my deanship. This study was to determine what factors affect pass and failure rates among medical students. Community Health Insurance Scheme willingness to pay (45) was a community based survey I believed was necessary

before the commencement of Community Based Health Insurance Scheme. This I did while on Sabbatical with SPDC Port Harcourt. The findings were very revealing as information empirically generated helped the managers determine the premium, modalities of funding the scheme etc for its successful take-off in Nembe LGA Bayelsa State. My belief in finding answer or explanation to every problem or situation has been my motivator from childhood. This became more practical and most fulfilling in my area of specialization. This instinctive observation is in tandem with the principles of epidemiology which is the pillar of Public Health practice. I have continued to fill relevant in my practice of Public Health which I do with passion.

As a Public Health Physician practicing in various communities and populations I observed with great concern human-animal relationship interactions in homes, communities, slaughter houses etc. These human-animal interface activities are commonest among poultry farm dealers. Most of the poultry farms that I have seen are located in residential areas. The owners of these animals do not conceptualize the health implications of unprotected interaction with them and their products. They often claim that their activities are necessitated by economic constraints and hardship especially those using part of their buildings to house commercial poultries. That humans should be aware of and imbibe basic Public Health practices that are necessary to preserve and sustain healthy living is an aphorism.

History records that human-animal interaction that leads to disease conditions, epidemics and pandemics with monumental death toll has been an age long Public Health challenge. Most devastating epidemics of the historic accounts are known to have started as animal diseases transmitted to man. Man gets infected when basic public health practices are not observed while interacting with infected animals. This breach in basic public health practices usually start with individuals who get infected before infecting another thereby initiating man-man transmission that culminates into an epidemic. Therefore, if individuals are aware of the preventive measures and practice them animal diseases will not infect humans and there will be no zoonotic epidemic.

PROLOGUE

Mr. V. C. sir, my initial interest on the choice of a Public Health title for this inaugural lecture was to be on the health status of University staff as relates their life style. The findings I felt would in no small way benefit the University community. No sooner did I start collecting the data on the nutritional status of university staff than a national health emergency occurred. Mr. Patrick Sawyer a Liberian American on an international conference to Nigerian slumped at the international air port, Lagos and was rushed to a private hospital where he was diagnosed with Ebola Viral Disease (EVD). He died few days later after infecting several who came in contact, assisted or more seriously treated him as health care providers in the hospital. Ebola Viral Disease news spread like wild fire in Nigeria and on how to prevent it also went viral as majority of Nigerians lacked the relevant information about EVD. Bitter cola nuts were consumed religiously for its prevention while salt water consumption and bathing were done at wee hours of the night in many homes like the Biblical pass over night. The later practice left several sick and a few hospitalized and one or two persons dead. Of course, nobody wanted to die and Nigerians were desperately willing to do anything to prevent the death sentence called Ebola. Some social and traditional practices as old as man such as hand shake and hugging became taboos to avoid getting infected with the deadly virus Ebola.

As this sudden twist in the society practice occurred I saw the need to have a close look at infections transmitted from animal to man, Ebola being one of such. I noted that most of the deadly diseases of man from ancient times till date are animal related, some are emergent while others are re-emergent with little or no cure but all of them are largely preventable. I also considered the fact that man is always in contact with animals and animal products either as domestic or wild animals. This he does through his occupation, as a pet or casually and therefore needs to be aware of the hazards associated with this relationship as ignorance will not exempt him from being a victim. Man can also get infected and become a victim not because of his contact with an infected animal but because of his contact with a person who has had contact with an infected animal. Zoonoses still represents significant public health threats, but many of them are neglected i.e. they are not prioritized by the health systems at local, national and international levels. They affect hundreds of thousands of people daily especially in developing countries with little effort in place to prevent them.

Having been actively involved in local and national public health activities for the prevention and control of Hemorrhagic Fever Diseases Lassa fever in particular I saw the need to have a close look at the trend of these zoonotic infections. My findings showed that there have been waves of zoonotic epidemics that have

continued to threaten human existence down the ages. With recent sporadic waves of both emergent and re-emergent zoonotic epidemics one wonders if the world is not at the verge of another. Therefore, my choice of a title for this inaugural lecture was not onerous. Though my area of sub-specialization is Biostatistics I believe that my audience will benefit more in an area of public health that is not abstract but relevant to the contemporary events of public health importance. Therefore, my revered audience I feel honored to stand before you today to present the seventh inaugural lecture of the university being the tenth in the Faculty of Medical Sciences and the very first in my department titled “ZONOSSES, an age long threat to human existence; public health practice the panacea”. I hereby covet your attention. Be blessed as you come along with me.

PUBLIC HEALTH PRACTICE EVOLUTION

Public health practice comprises organized efforts to improve the health of people through prevention strategies directed to communities rather than to individuals. Throughout history Public health practice has been directed to the control of transmissible diseases, reduction of environmental hazards and provision of safe drinking water. Because social, environmental and biologic factors interact to determine health Public health practice must utilize a broad set of skills and interventions. Public health is the science and art of preventing disease, prolonging life and promoting physical health. To be efficient it has to be through organized community efforts for environment sanitation, control of community infections, educate individuals in the principles of personal hygiene. It also involves the organization of medical services for the early diagnosis and prevention of diseases developing social strategies which ensure that individuals in the community have standard of living that is adequate for the maintenance of community health. Population based strategies for improving public health practice includes efforts to control epidemics, ensure safe water and food, reduce vaccine preventable diseases, improve maternal and child health and conduct surveillance of health and health related problems. In addition to long-standing efforts to protect communities from contagious and environmental health threats, the public health arena is expanding to encounter contemporary health risks such as obesity, natural disasters, bioterrorism etc.

The evolving definition of public health practice is forged by health hazards requiring collective actions of stakeholders. Throughout history attention has been focused on controlling transmissible diseases by improving the environment and providing safe drinking water. Toilets drained by covered sewers were found in excavations of civilizations dating back to 4000 years in the Indus Valley. In 2000 BC cities including Troy had highly developed water supply system. At the time Joshua and the Israelites settled in the promise land there were rules governing water supply which dictated that there could not be a cemetery around slaughterhouse, Tannery or Furnace within 25 meters of a village water supply. In the Western Hemisphere, impressive ruins of sewers and baths document the achievements of the Incas in public health engineering. The Greeks believed that ill health developed from an imbalance between man and his environment. This is in tandem with the contemporary public health theories of multi-factorial disease causation in which the environment plays a prominent role. In his book on *Airs, Waters and Places*, Hippocrates (460-370BC) summarized factors important to disease as climate, soil, water, mode of life and nutrition. He suggested that houses be located on elevated and sunny areas avoiding marshes and swamps.

The devastating effect of cholera outbreaks in the nineteenth century brought a revolution in Public Health which paved way to amazing achievements of the twentieth century. This major and pragmatic disease control phase started in 1880 which was mainly on sanitary legislation against the environment especially in the area of water supply and sewage disposal. For more than two centuries after these two major areas of disease control started, Public Health practice has remained rudimentary and has received little or no attention by governments, societies and individuals alike. This has encouraged, in no little measure the emergent and re-emergent diseases of public health importance in present society.

While the Roman contribution to medicine was negligible, she provided a world example in matters of Public health practice. Nothing compared with her system of sanitation and water supply and organization of medical services. They realized that diseases were caused by filth and overcrowding. The marshes surrounding Rome, a fertile breeding ground for mosquitoes, were therefore drained as far back as the seventh century BC. By the 6th century Rome was furnished with a network of underground sewers and by the 2nd century Rome was supplied with an estimated 300 million gallons of drinking water a day. The poor carried it from public fountains while the affluent had it piped into their homes. The building of Roman towns was well planned, providing adequate drainage system. Roman architects paid attention to proper town planning in terms of locations, drainage systems and attempts were made to supervise the storage of food. Legislation maintained this system of public health practice and edicts regarding street cleanliness which were passed and enforced as early as 450 BC. Governments and public institutions then saw these basic public health practices as necessities and their responsibilities for a healthy population. Today in the twenty first century good governance especially in developing countries is not measured by the provision of portable and adequate water to the governed let alone ensuring sanitary environment. These necessary public health amenities are rather seen as the responsibility of the governed or simply considered as their problem they have to live with.



Common sites in our cities and communities providing fertile breeding sites for vectors of disease

The early public health practice on environment was followed with vigorous pursuit of health promotion from 1920 by way of putting up health centers to provide basic health services to the populace. Lord Dawson first developed the idea of health center in 1920 in England. What we rather have today are humongous structures that are not maintained, structures without adequate basic equipments to provide comprehensive healthcare services to the teeming population. To say that several of them especially the Primary Health Care facilities are none functional or have become consulting rooms is to state the obvious.

By 1960 Social Medicine took the center stage as it became obvious that Public health approach could not tackle the problem of chronic diseases. Therefore, new concept like risk factors as determinants of chronic diseases was developed. Preventive and rehabilitative aspects of chronic diseases were given priority. In 1960 public health started its new dimension of services to the population at large i.e. community. Healthcare services were taken to where the people are and where the disease thrive and spread. The realization that there is a wide gap between health services for the rich and the poor ushered in Primary Health Care strategy and Social health service. These milestones in the development of Public Health practice demonstrated a steady progress. This appears to have slowed down and Health for all is where we are now after it began in 1981. While we pursue this laudable goal, concerted efforts should also be made

towards reviving basic public health practices that will continue to sustain human population and existence against an age long insurgent called **ZOONOSES** epidemic that still threatens human existence.

For the very fact that the world has become a global village and travel made a lot easier disease spread has also become easier and faster across nations. It is pertinent to mention here that the index case of Lassa fever in Nigeria may have been imported. Miss Laura Wine the Missionary nurse working in a missionary clinic in Lassa village took ill not long she returned from a tour of West African countries during her leave. Though it was contained by what I would regard as divine intervention but not after a couple of other health workers had been infected as secondary cases and paid the supreme price. That was way back in 1969 and today we still have cases of Lassa fever occurring sporadically across the length and breadth of Nigeria and as epidemics including Plateau state. The animal vector (rat) of this deadly disease and several others have not been tamed or brought under control that it should not continue to be a public health problem.

ZOONOSES

Zoonoses are a group of diseases that are naturally and primarily transmissible from animals to humans. They are therefore communicable diseases found both in man and animal. Known as zoonotic diseases they have been recognized for many centuries, and over 200 of such diseases have been described from time immemorial. Zoonotic infections are caused by several types of pathogenic agents which are carried by infected animals interfacing with humans in an unhealthy manner or without adherence to universal precautionary practices. Several of them are endemic while some are re-emergent and of recent there are emergent ones.

Over the years some deadly zoonotic infections have emerged spreading across nations with severe consequences. Of note are the Haemorrhagic Fever Diseases (HFD) for which in recent years is the Ebola Haemorrhagic Disease (EVD). Zoonotic infections should be a thing of concern in our part of the world and indeed Nigeria considering that about 75% of her population is rural and has contacts with domestic and wild animals. It should also be of concern to us considering the fact that Nigeria is now the largest economy in Africa and therefore a business hub for and beyond Africa experiencing high human traffic in and out of the country. Also of concern is the fact that Nigeria's borders with her neighboring countries are expansive, porous and with little or no cross border human traffic control. All these portend vulnerability for Nigerians to the emergent and re-emergent diseases especially the zoonotic infections that are likely to attain epidemic proportions. A case to remember is the importation of EVD into Nigeria in July 2014 from Liberia by Mr. Patrick Sawyer.

It is pertinent and a known fact that over 70% of recently emerging infectious diseases affecting humans are diseases of animal origin, and approximately 60% of all human pathogens are zoonotic infections. The major causative agents of zoonoses are mainly bacteria. Every year millions of people get sick with the following bacterial zoonotic infections viz. Salmonellosis, Campylobacteriosis, Anthrax, Brucellosis, Escherichia coli, Leptospirosis, Plague, Q fever, Shigellosis, Tularaemia. Most of the zoonoses of viral origin are more virulent with high morbidity and mortality in nature spreading like wild fire in densely populated environment especially of note are the Haemorrhagic viral diseases and influenza. Other zoonotic infections that are not as devastating as the bacterial and virus though wide spread are the zoonotic parasites such as Taeniasis, Hydatidosis, Leishmaniasis, Cysticercosis, Toxoplasmosis, Trichinellosis, Trematodosis, Trypanosomiasis. Zoonotic Fungi diseases are also a public health problem occurring in human populations

such as dermatophytoses which are superficial mycoses that may be acquired from infected animals which affect the skin, hair and nails of humans, causing itching, redness, scaling of the skin and hair loss. Another mycosis that can be a zoonotic infection is sporotrichosis. All the zoonotic diseases have various routes of infecting man. Some of the zoonoses are transmitted through direct contact with infected animals. This may occur through direct contact with body fluids or contaminated materials of infected animals or persons e.g. Ebola, Lassa fever. Other zoonotic infections infect man through the bite of an infected animal or vector such as Human rabies or Yellow fever respectively.

Zoonotic epidemics have been with man from time immemorial and have continued to threaten human existence. History has records of disease outbreaks associated with animals. Plague is one zoonotic disease and its epidemics have been severally mentioned in the Bible. Historic books have associated epidemics of plague with rats as far back as 1500-800 BC. It was then said that as soon as dead rats (epizootic) are seen, that area should be immediately abandoned by the inhabitants. Since the dawn of Christian era there has been three great zoonotic epidemics referred to as plague or black-death viz.

1. The first began in the year 542 and estimated to have caused 100 million deaths.
2. The second began in the year 1346 lasting for three centuries claiming 25 million lives.
3. The third pandemic began in the year 1894 and continued up to 1930 with loss of millions of lives across the globe.

These waves of zoonotic pandemics have dramatically influenced the practice of Public health in human history. From earliest civilization some form of Public Health was practiced by authorities in applying social, scientific and medical knowledge to the protection of the health of the community. Crete, Egypt, Greece and Rome built model towns and had finely developed sanitary systems. In Rome public baths were made available to the public *“to wash and undo the fatigues of the day”* after work. Latrines and flush closets were built in public places and made accessible to all and health departments had sanitary inspectors. Some of their teachings in the major religious circles were regarded as a form of public health educator because they focused on sobriety, cleanliness, avoidance of excretal pollution, maintenance of family life, isolation of sufferers from infections, maladies and the ritual abstention from blood likely to convey infections. Yet in this 21st century we do not have public sanitary conveniences and where available they are restricted or are not readily accessible but are under lock and key and at best attract some inducement or payment before use. In most cases this leads to indiscriminate voiding of urine and defecation in open places and drainages.

In prehistoric times, human beings lived as hunters and farmers of food. They were thought to be free from major contagious diseases and because their population was small and travelling was limited chain of transmission of infectious diseases could not be sustained and as a result the spread of these diseases were naturally contained. The 1st wave of change was triggered when hunters started settling into agrarian villages, which started human-to-human transmission of disease. History suggests that smallpox, measles and tuberculosis started 4000-5000 years ago in these small settlements. This certainly is one example of how civilization affected disease patterns. These human settlements occurred in many different parts of the world and later evolved into different civilizations.

The 2nd wave of change was characterized by contact between different civilizations. This contact took place through trade, travel and military movements. During this period, diseases such as smallpox and measles spread from Europe to countries in Asia, such as China, via the Silk Road. This is another example of how civilization affected disease patterns. The high human traffic brought about by trade and military movement across countries promoted the spread of zoonotic infections. Bubonic plague a zoonotic disease, also known as 'Black Death', started in the Roman Empire during the 6th and 7th centuries and spread to China and Japan. Bubonic plague also spread to the rest of Europe and at its height in the 14th century, killed 30-40% of the population of Europe in four years (1347-1350) and 50% of the population of China.

The 3rd wave of change in the 16th, 17th and 18th centuries was characterized by the trans-oceanic travel of seafarers. Smallpox, measles, influenza and typhus spread to the Americas from Europe, destroying about 90% of infected native populations. On the other hand, new diseases like syphilis were brought to Europe by seafarers returning from the Americas. In the same manner, seafarers returning from Africa took yellow fever and malaria that are zoonotic infections to Europe.

Are we now experiencing a 4th wave of change which is propagated by cross border travel? The outbreak of swine flu, first in Mexico then cases all over the world got a lot of people worried. Over 1million people have died in less than a year beginning 2009 from swine flu alone despite the existence of scarier diseases caused by exotic viruses like Hantavirus and Ebola. Influenza still reigns as the number one infectious disease killer in modern times. All these are zoonotic diseases that threaten human existence. A review of past pandemics will elucidate why it is necessary for authorities to respond quickly to any of these zoonotic disease outbreak. Here's a quick summary of the five deadliest pandemics in human history:

The Peloponnesian War Pestilence

The very first pandemic in recorded history was described by Thucydides. In 430 BC, during the Peloponnesian war between Athens and Sparta, the Greek historian told of a great pestilence that wiped out over 30,000 of the citizens of Athens (roughly one to two thirds of all Athenians died). Thucydides described the disease as such, "*People in good health were all of a sudden attacked by violent heats in the head, and redness and inflammation in the eyes, the inward parts, such as the throat or tongue, becoming bloody and emitting an unnatural and fetid breath. Next, came coughing, diarrhea, spasms, and skin ulcers.*" A handful survived, but often without their fingers, sights, and even genitalia. Until today, the disease that decimated ancient Athens is yet to be identified. This was most likely to be a zoonotic disease since it presented with similar features of Hemorrhagic Fever Disease a group of zoonotic diseases.

The Antonine Plague



A case of small pox

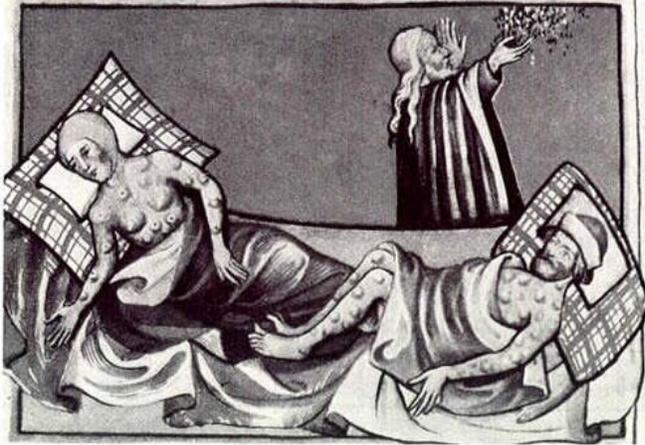
In 165 AD, Greek physician Galen described an ancient pandemic, now thought to be smallpox that was brought into Rome by soldiers returning from Mesopotamia. The disease was named after Marcus Aurelius Antoninus, one of two Roman emperors who died from it. At its peak, the disease killed not less than 5,000 people a day in Rome. By the time the disease ran its course some 15 years later, a total of 5 million people were dead. Though this disease was not linked to any animal we do know that its similarity to cow-pox in conferring cell mediated immunity led to the discovery of small pox vaccine and subsequent eradication of the disease. Edward Jenner 1749-1823 while still an apprentice had been impressed by the chance remark of the dairy maid Sarah Nelmes who could not develop small pox as she had had cow-pox. In May 1796 he attempted his crucial experiment on an 8yr old boy James Phipps by vaccinating him with pus from the hand of the dairy maid suffering from cow pox. Two months later he inoculated the boy with small pox and he did

not contract the infection, he had acquired immunity. There is a link of this disease to animal if not the origin. Scholars believe the Antonine Plague was most likely small pox

The Plague of Justinian

In 541-542 AD, there was an outbreak of a deadly disease in the Byzantine Empire. At the height of the infection, the disease named the Plague of Justinian after the reigning emperor Justinian I, killed 10,000 people in Constantinople every day. With neither room nor time to bury them, bodies were left stacked in the open. By the end of the outbreak, nearly half of the inhabitants of the city were dead. Historians believe that this outbreak decimated up to a quarter of human population in the eastern Mediterranean. What was the culprit? It was the bubonic plague, a zoonotic infection caused by the bacterium *Yersinia pestis* transmitted by *Rattus rattus* rat. The zoonotic outbreak, which is the first known bubonic plague pandemic in human history, marked the first of many outbreaks of plague. This particular zoonotic infection claimed as many as 200 million lives throughout history.

After the plague of Justinian, there were many sporadic outbreaks of the plague, but none was as severe as the Black Death of the 14th century. While no one knows for certain where the disease came from (it was thought that merchants and soldiers carried it over caravan trading routes), the Black Death took a heavy toll on Europe. The fatality was recorded at over 25 million deaths or a quarter of the entire population. It's interesting to note that the Black Death actually came in three forms: the bubonic, pneumonic, and septicemic plague. The first, the bubonic plague, was the most common: people with this disease have buboes or enlarged lymphatic glands that turn black (caused by decaying of the skin while the person is still alive). Without treatment, bubonic plague kills about half of those infected within 3 to 7 days. In pneumonic plague, droplets of aerosolized *Y. pestis* bacteria are transmitted from human to human by coughing. Unless treated with antibiotics in the first 24 hours, almost 100% of people with this form of zoonotic infection die within 2 to 4 days. The last form, septicemic plague, happens when the bacteria enter the blood from the lymphatic or respiratory system. Patients with septicemic plague developed gangrenes in their fingers and toes, which turn the skin black (which gives the disease its moniker). Though rare, this form of the disease is almost always fatal - often killing its victims the same day the symptoms appear.



Gangrene due to septicemic plague

Ancient drawing showing victims of plague

In 1855, another bubonic plague epidemic (named the Third Epidemic) hit the world. This time, the initial outbreak was in Yunnan Province, China. Human migration, trade and wars helped the disease spread from China to India, Africa, and the Americas. All in all, this pandemic lasted about 100 years (it officially ended in 1959) and claimed over 12 million people in India and China alone. The Black Death is considered to be one of the worst natural disasters in history. In 1347 A.D., the great plague swept over Europe, ravaged cities causing widespread hysteria and death. One third of the population of Europe died. The Black Death erupted in the Gobi Desert in the late 1320s and the primary carriers transmitting this disease were oriental rat fleas carried on the back of black rats. China's population dropped from around 125 million to 90 million over the course of the 14th century due to the plague.

The Spanish Flu



Ancient Clinic overwhelmed with cases

In March 1918, in the last months of World War I, an unusually virulent and deadly flu virus was identified in a US military camp in Kansas. Just 6 months later, the flu had become a worldwide pandemic in all continents. When the Spanish Flu pandemic was over, about 1 billion people or half the world's population then had contracted it. It is perhaps the most lethal pandemic in the history of human kind: over 20 million people died, more than the number killed in the war itself.

The "Spanish" flu pandemic of 1918 and 1919 caused the deaths of 20-50 million people worldwide including up to 675,000 in the US. While only about 1% of those infected with the virus died, it became one of the deadliest viruses ever known to man. Although called the "Spanish" Flu, this avian virus was thought to have originated in the United States. The 1918 flu has been described as capable of sickening and killing a person on the same day. The virus is an H1N1 type A influenza. When the 1918 Spanish flu disappeared, no samples of the virus were retained for scientific study. In 1997, however, scientists recovered fragments of the virus's RNA genome from the preserved remains of infected people. The genome of the flu virus is composed of 8 RNA segments. Recently, scientists were able to remake 1918 flu using a technique called reverse genetics

Avian Influenza



Commercial poultries sited in residential Areas



Livestock hawker



Poultry



Livestock hawker

Avian or bird influenza is a disease that mainly affects poultry. Wild birds can also be infected but will normally have no symptoms. Avian influenza can also affect humans, pigs, horses and many other animals. Although all influenzas are related, the type of influenza that infects one animal species usually does not affect another animal species. However, there are exceptions. When humans get infected with avian influenza the symptoms are red eyes and those accompanying a (common) flu-like illness, which is mostly very mild. In chickens, one of the alarming symptoms is the sudden death of many chickens in a short space of time. But the disease may also occur without causing symptoms, or with only fatigue, diarrhoea and respiratory problems. A certain type of influenza, called H₅N₁, is the cause of the current avian influenza epidemic. This type can also cause severe pneumonia in humans, which luckily seldom happens. However, there is a very rare chance that people who get the disease will die. The pictures above show commercial poultries in residential areas. This has become a common site in our cities. One recalls that a government house had a commercial poultry owned by a serving deputy governor who was impeached by the state Assembly for being recalcitrant over closing the poultry. Also hawkers carry these birds on their body to

attract customers as seen in the pictures above. I was shocked when I visited the home of a graduate couple who proudly showed me one of their apartments they had converted into poultry. This is an unthinkable and a despicable practice because it exposes the family and society to zoonotic infections especially avian influenza.

Severe Acute Respiratory Syndrome (SARS)

Severe Acute Respiratory Syndrome (SARS) is one of the emergent zoonotic diseases. It is a viral respiratory disease caused by the SARS coronavirus. When someone with SARS coughs or sneezes, infected droplets spray into the air. One is infected when the infected droplets are inhaled or contaminated particles touched. The SARS virus may live on hands, tissues, and other surfaces for up to 6 hours in these droplets and up to 3 hours after the droplets have dried. World Health Organization physician Dr. Carlo Urbani identified SARS as a new disease in 2003. It was believed that SARS spread from small mammals to humans in China resulting in an epidemic in 2003. Dr. Carlo Urbani diagnosed it in a 48-year-old businessman who had traveled from the Guangdong province of China, through Hong Kong, to Hanoi, Vietnam. The businessman and this doctor who first diagnosed SARS both died from the illness. Between November 2002 and July 2003, an outbreak of SARS in southern China caused an eventual 8,096 cases and 774 deaths reported in multiple countries with the majority of cases in Hong Kong. Within weeks, SARS spread from Hong Kong to infect individuals in 37 countries in early 2003. It then was eradicated by January the following year and no cases have been reported since then. SARS is a dramatic example of how quickly world travel can spread a disease especially zoonotic infection. Hand hygiene and adherence to universal precautions are the most important way of SARS prevention. Mouth and nose covering during coughing and sneezing respectively are important for the prevention of SARS. Also cleaning of commonly touched surfaces with disinfectants and avoiding contact with bodily fluids prevent the spread. In hospitals the use of PPEs such as masks, gloves and goggles during routine and causal services are expedient in preventing the spread of the disease.

Typhus

Typhus a zoonotic infection of rats is an infectious disease transmitted by the human body louse. The disease causes fever, prostration, head and body aches, and an extensive rash. Between 1918 and 1922, an epidemic of unprecedented scale engulfed Russia and her provinces. An estimated 25-30% of the population were infected, and some 3 million people died (this number could be more as no accurate records were kept).

Anthrax

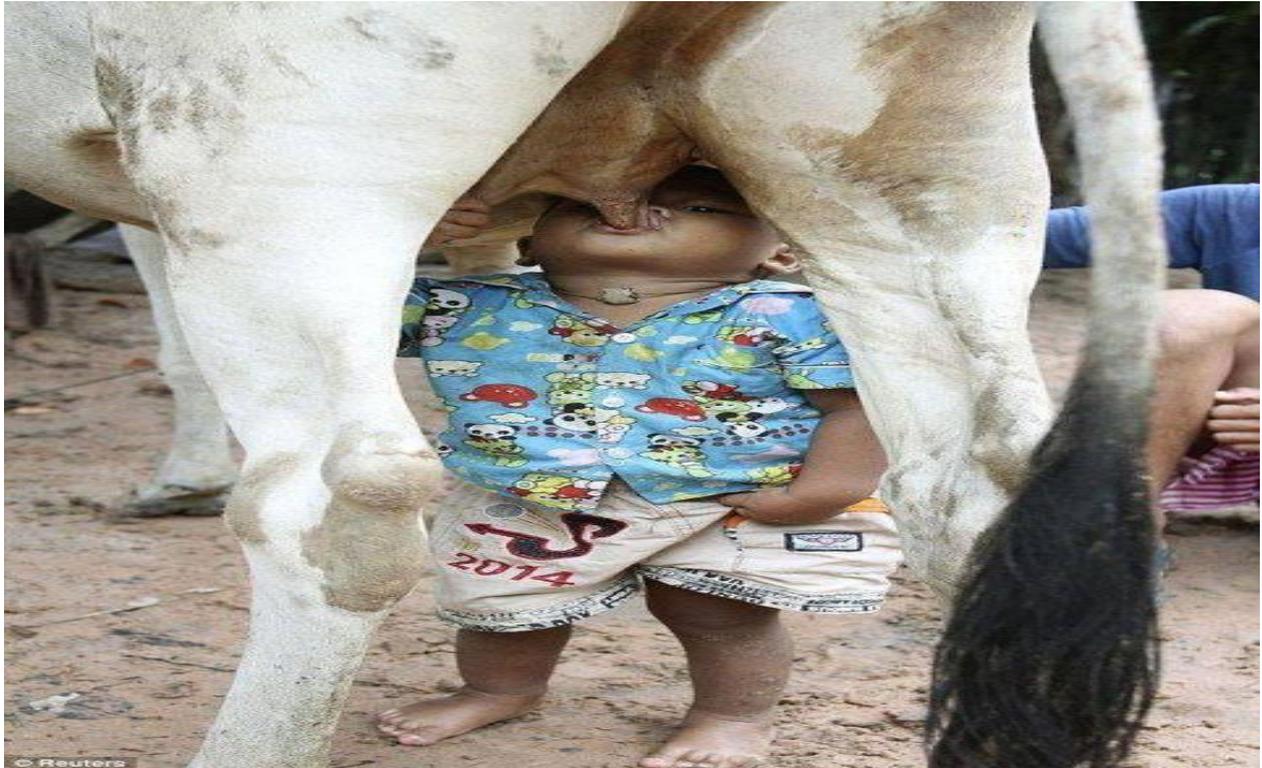
Anthrax used to be a global disease but some countries have succeeded in eradicating it through hygienic handling of abattoirs and animals. The disease is prevalent in East Asia, West and Central Africa, Madagascar and Central America. Due to the breakdown of veterinary services, the incidence of anthrax is on the increase again worldwide especially in Eastern Europe.

Brucellosis

Several other zoonotic infections abound in human populations. Brucellosis is one zoonotic disease that has been ignored yet it affects many children especially among the low socioeconomic status and rural dwellers.



Human contact with aborted foetus



Consuming raw cow milk

Brucellosis has a worldwide spread and it is transmitted through direct contact with ill animals, aborted fetuses, placentas, secretions, birth channels and excrements. Brucellosis can also be contacted from drinking uncooked or unpasteurized milk or eating cheese made from raw milk. Some persons infected with the *Brucella* bacteria do not have any symptoms at all. Common symptoms are fever, chills, insomnia, sexual impotence, generalized constipation, pains and sometimes nervousness and depression. These symptoms are easily confused with symptoms of malaria and therefore people may not think that raw milk has made them ill. Brucellosis can also cause abortion in human as well as in animals.

HIV/AIDS

HIV infection is believed to have originated as a zoonotic disease. Scientists identified a type of chimpanzee in West Africa as the source of HIV infection in humans. They believe that the chimpanzee version of the immunodeficiency virus, the Simian Immunodeficiency Virus (SIV) was transmitted to humans and mutated into HIV when humans hunted chimpanzees for meat and came into contact with their infected blood. Over decades, the virus slowly spread across Africa and later into other parts of the world. We know that the virus has existed in the United States since at least the mid to late 1970s. From 1979–1981 rare types of pneumonia, cancer and other illnesses were being reported by doctors in Los Angeles and New York among a number of male patients who had sex with other men. These were conditions not usually found in people with healthy immune systems. For many years scientists theorized as to the origin of HIV and how it appeared in the human population, most believing that HIV originated in other primates. Then in 1999, an international team of researchers reported that they had discovered the origin of HIV-1, the predominant strain of HIV in the developed world. A subspecies of chimpanzees native to west equatorial Africa had been identified as the original source of the virus.

Hemorrhagic Fever Disease

Hemorrhagic Fever Diseases are diseases caused by virus. Examples are Crimean-Congo hemorrhagic fever, Ebola hemorrhagic fever, Marburg hemorrhagic fever, Rift Valley fever, Nipah fever, Yellow fever and Lassa fever. Yellow fever is a disease that affects monkeys and humans, called "black vomit" in some areas. The disease is found in tropical areas of South America and Africa. There is no explanation as to why the disease does not occur in tropical Asia, despite favorable conditions. Transmission of yellow fever occurs mainly during the rainy season, in moist savannah zones. Mosquitoes transmit Yellow fever primarily from infected monkeys to man and secondarily man to man.



Mosquito sucking blood

Lassa Fever

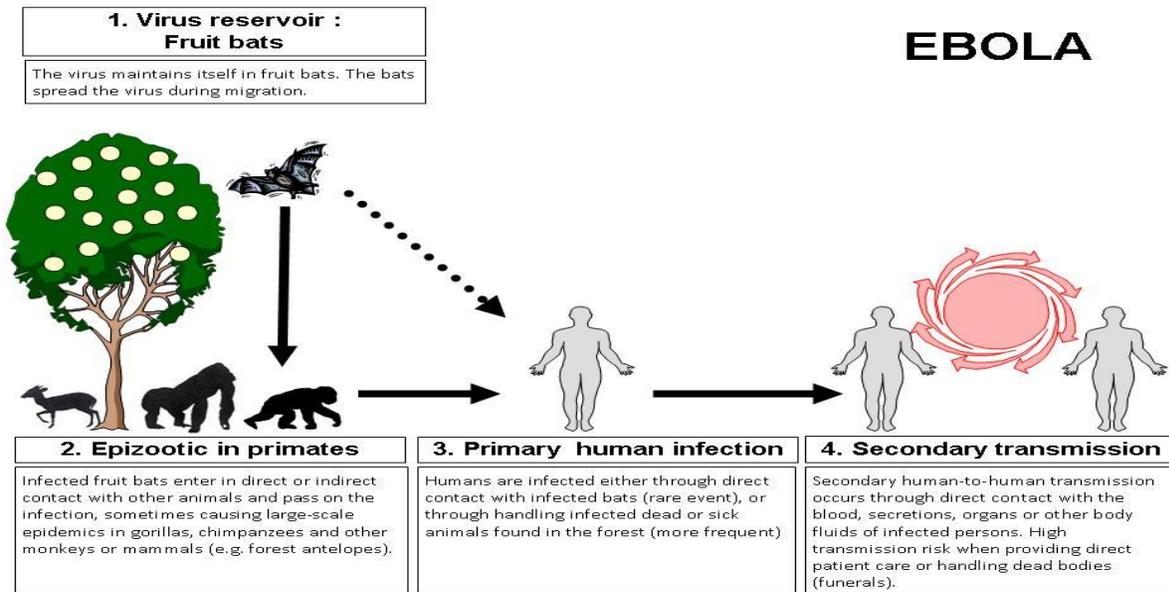
Lassa fever is an acute viral illness caused by Lassa virus named after a town in Nigeria where the first case occurred in 1969. It is a zoonotic disease that is serious and has 50% case-fatality. Since the index case Miss Laura Wine a Nurse working in a missionary clinic in Lassa village was treated in Jos in 1969, there has been sporadic epidemics across the country. There have been several cases and deaths due to Lassa Fever in Jos since after the index case more so in recent years. It is estimated that about 100,000 to 300,000 cases with about 5,000 deaths from Lassa Fever occur yearly in West Africa. The reservoir of Lassa virus is a prolific multimammate rat of genus *Mastomys natalensis*. They are commonly found in and around homes and scavenge on human food remains or poorly stored food. The rat passes the virus in its urine and stool. Man gets infected when the rat's urine or stool contaminates house materials or food items and human touches or eats the contaminated items. Man also gets infected when a person comes into contact with an infected person's blood, tissue, secretions or excretions and contaminated medical equipments. Those living in homes infested with rats are susceptible as well as hospital workers who come in contact with Lassa fever patients and hospital materials and equipments contaminated with patients body fluid. Simple Public Health practices such as avoiding contact with rats and keeping them out of homes protect one from getting infected. Keeping food and food items away from rats also prevents Lassa fever. Proper hand wash, handling of patients, hospital materials and equipments are important public health practices in the control of Lassa Fever.



Mastomys natalensis

Ebola

Ebola is a hemorrhagic fever disease, which is a deadly disease caused by infection with one of the Ebola virus strains. Ebola can cause disease in humans and nonhuman primates (monkeys, gorillas, and chimpanzees).



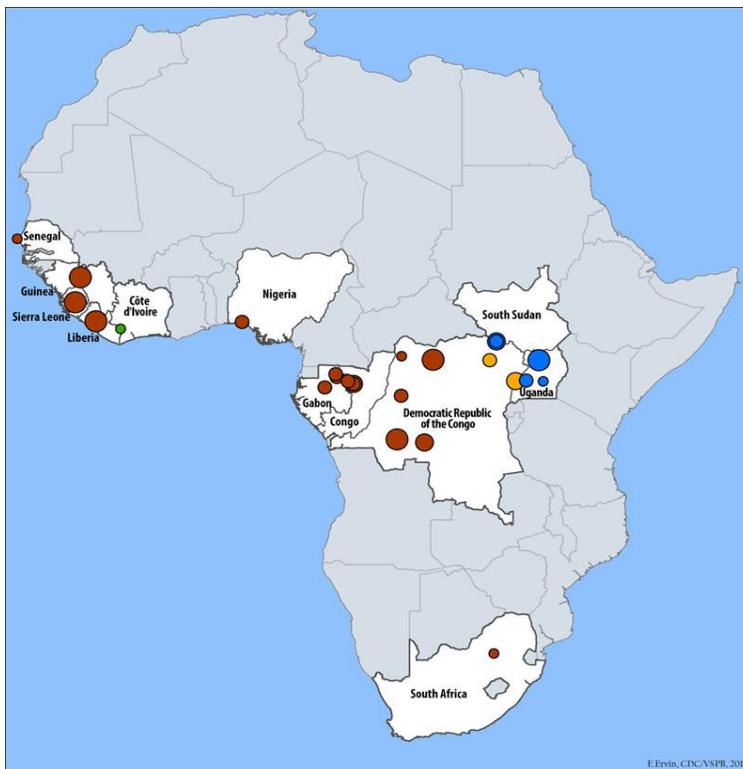
The cycle of Ebola infection



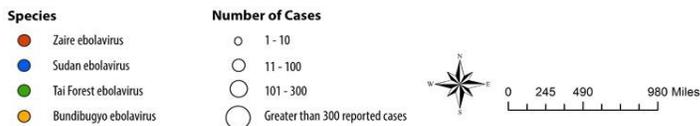
Another victim that succumbed to Ebola

YEAR	1976	1977	1979	1990	1994	1995	1996	2000	2001	2002	2003	2004	2007	2008	2009	2011	2012	2013	2014
CASES	603	1	34	4	53	315	100	425	65	57	178	282	264	155	32	1	47	6	?
DEATHS	431	1	22	0	31	250	68	224	53	43	157	195	187	37	15	1	17	0	>4000

Known Cases and deaths of Ebola Virus Disease over the years



EBOLAVIRUS OUTBREAKS BY SPECIES AND SIZE, 1976 - 2014



Ebola is caused by infection with a virus of the family *Filoviridae*, genus *Ebolavirus*. There are five identified Ebola virus species, four of which are known to cause disease in humans. Ebola viruses are found in several African countries. Ebola was first discovered in 1976 near the Ebola River in what is now the Democratic Republic of the Congo. Since then, outbreaks have occurred sporadically in Africa. The latest outbreak started in Guinea with a 2yr old boy in December 2013 and by the end of 2014 over 8,000 persons who got infected had died. On the basis of evidence and the nature of similar viruses, researchers believe that the virus is animal-borne and that bats are the most likely reservoir.

Other Zoonotic Infections

Trypanosomiasis and Chaga's disease are zoonotic infections of cattle transmitted to man through the bite of infected arthropod vector. The former is wide spread in Africa while the later in the Americas. There are several zoonoses that do not have high morbidity and mortality that attract much attention such as Tapeworms. They form cysts in muscles and organs and are then called cysticercosis. The disease is present globally and is especially a problem in rural communities. Leptospirosis is a zoonotic infection found in water, soil and foods contaminated by urine of infected animals, especially cattle, rats and pigs. Rabies is one of the most important and fatal zoonotic infections. It is present in almost all countries of the world and as much in the cities as in rural areas. An estimated number of over 10,000 persons, mainly children, die of this disease in the world every year. Toxoplasmosis is a very common parasitic disease both in the western world and in developing countries. Toxoplasmosis is especially dangerous to pregnant women and the foetus.

The list of zoonotic diseases is endless. As infectious diseases are transmitted from one infected person to a susceptible person through several routes of infection so it is that diseases can be transmitted from infected animals to a susceptible person. Body fluids through various routes are effective means of transmitting infectious diseases. World deadliest infections are transmitted mainly through body fluids mainly as droplets, aerosols or sexually.

The close interaction between man and animals has promoted the spread of zoonoses. Today there are absurd practices involving man and animal taken to the extreme. Bestiality is as old as man because Biblical history recorded that God frowned at this practice and as a result pronounced capital punishment on it as we read in Leviticus 20:15-16;

“And if a man lie with a beast, he shall surely be put to death, and ye shall slay the beast. And if a woman approach unto any beast and lie down thereto, thou shall kill the woman and the beast; they shall surely be put to death; their blood shall be upon them.” KJV.

Some use the same spoon or plate to eat with their pets or sleep on the same bed, kiss and go to the extreme of having sex with them and yet relate in the same manner with other humans. These practices promote the acquisition and spread of zoonotic infections in human population. Bestiality is said to be common among the gay which is being allowed and promoted in some countries of the world today. These unhealthy and condemnable practices between man and animals are being allowed or promoted in the guise of exercising human rights in some countries. The consequence is unimaginable considering the fact that HIV origin was traced to interaction between man and chimpanzees. Below are some of such unhealthy practices involving humans and animals.

Unhealthy practices between man and animals



A woman backing a chimpanzee



A woman nursing a chimpanzee



A woman kissing a chimpanzee



A woman kissing her pet dog

BIOTERRORISM

Bioterrorism is an intentional release or dissemination of biological agents such as bacteria, viruses or toxins which may be in its natural or human-modified form to cause illness or death in people, animals, or plants. These agents are typically found in nature, but it is possible that they could be mutated or altered to increase their virulence, resistance to known drugs, or their ability for faster spread. The spread could be through the air, water, commonly eaten food or used items. Terrorists tend to use biological agents because they are extremely difficult to detect and do not cause illness for several hours to several days before causing harm. It is also useful to terrorists mainly as a method of creating mass panic and disruption to a state or a country. Commonly used bioterrorism agents spread from person to person and most of them are zoonotic agents.

Bioterrorism is an attractive weapon for terrorism because biological agents are relatively easy and inexpensive to obtain. It also can be easily spread causing widespread fear and panic beyond the morbidity and mortality. Bioterrorism set-back for terrorists use is that it is difficult for them to limit its effect on their enemies only. However, technologists have warned of the potential power which genetic engineering might place in the hands of future bio-terrorists. Bioterrorism agent/diseases are categorized as follows;

Category A: This are high-priority agents which include organisms that pose risk to national security because they;

- Can be easily disseminated or transmitted from person to person
- Result in high mortality rates and have the potential for major public health impact
- Might cause public panic and social disruption and
- Require special action for public health preparedness.

Identified zoonotic agents/diseases of bioterrorism in this category are;

- Anthrax (*Bacillus anthracis*)
- Plague (*Yersinia pestis*)
- Smallpox (*Variola major*)
- Tularemia (*Francisella tularensis*)
- Viral Hemorrhagic Fevers (filoviruses e.g. Ebola, Marburg and arenaviruses e.g., Lassa, Machupo)
- Severe Acute Respiratory Syndrome

Category B: These are second highest priority agents which include those that:

- Are moderately easy to disseminate
- Result in moderate morbidity rates and low mortality rates
- Require specific enhancements of CDC's diagnostic capacity and enhanced disease surveillance.

Identified zoonotic agents/diseases of bioterrorism in this category are:

- Brucellosis (*Brucella* species)
- Glanders (*Burkholderia mallei*)
- Melioidosis (*Burkholderia pseudomallei*)
- Psittacosis (*Chlamydia psittaci*)
- Q fever (*Coxiella burnetii*)

Category C: These include emerging pathogens that could be engineered for;

- Mass dissemination in future because of its availability
- Ease of production and dissemination
- Potential high morbidity and mortality rates with major health impact.

Identified zoonotic agents/diseases of bioterrorism in this category are:

- Emerging infectious diseases such as Nipah virus and hantavirus.

Bioterrorism and History

In the 20th century the first known bioterrorism occurred when attempts to use anthrax were directed at animal populations but this attempt proved ineffective. Soon after World War I started, Germany launched a biological sabotage campaign in the United States, Russia, Romania and France. Anthrax is a non-contagious disease caused by the spore-forming bacterium *Bacillus anthracis*. An anthrax vaccine does exist but requires many injections for stable use. When discovered early anthrax can be cured by administering antibiotics (such as ciprofloxacin). Anthrax is one of the few biological agents that have vaccine.

In 1915 Anton Dilger living in U.S.A. cultured glanders, a virulent zoonoses of horses and mules to infect horses in Britain. He did not succeed before his conspiracy was exposed. However, in 1916, Germany and

its allies infected French cavalry horses and many of Russia's mules and horses on the Eastern Front. These actions hindered artillery and troop movements, as well as supply convoys.

In June 1993 the religious group Aum Shinrikyo released anthrax in Tokyo. Eye witnesses reported a foul odour. The attack was a total failure, infecting not a single person. The reason for this, ironically, was that the group used the vaccine strain of the bacterium. The spores recovered from the attack showed that they were identical to an anthrax vaccine strain given to animals at the time.

In the 21st century in September and October 2001, several cases of anthrax broke out in the United States and were later confirmed to be bioterrorism. Letters laced with infectious anthrax were concurrently delivered to news media offices and the U.S Congress, alongside an ambiguously related case in Chile. The zoonotic bioterrorism letters killed five persons.

Potential Zoonotic Bioterrorism

Tularemia or "rabbit fever" Tularemia is caused by the *Francisella tularensis* bacterium, and contracted through contact with the fur, inhalation, ingestion of contaminated water or insect bites. Its inhalation leads to severe respiratory illness, including life-threatening pneumonia and systemic infection, if not treated. *Francisella tularensis* bacteria occur widely in nature and could be isolated and grown in quantity in a laboratory.

Smallpox disease can be traced to cow pox in the discovery of small pox vaccine and it is a highly contagious virus. It is transmitted easily through the atmosphere and has a high mortality rate (20–40%). Though small pox has been eradicated some virus samples are still available in Russian and American laboratories. Some believe that after the collapse of the Soviet Union, cultures of smallpox have become available in other countries. Smallpox occurs only in humans, and has no external hosts or vectors.

Plague is a disease caused by the *Yersinia pestis* bacterium. Rodents are the normal host of plague, and the disease is transmitted to humans by flea bites and occasionally by aerosol in the form of pneumonic plague. The disease has a history of use in biological warfare dating back many centuries, and is considered a threat due to its ease of culture and ability to remain in circulation among local rodents for a long period of time.

Viral hemorrhagic fevers include Marburg, Ebola, Lassa and Machupo are also potential zoonotic bioterrorism agents. Ebola virus disease in particular, has caused high fatality rates ranging from 25–90% with a 50% average. No cure currently exists, although vaccines are being developed. The Soviet Union investigated the use of filoviruses for biological warfare, and the Aum Shinrikyo group unsuccessfully attempted to obtain cultures of Ebola virus.

Bioterrorism Preparedness

Biological agents are relatively easy to obtain by terrorists and are becoming more threatening in the U.S.A. Their laboratories are working on advanced detection systems to provide early warning, identify contaminated areas and populations at risk, and to facilitate prompt treatment. Methods for predicting the use of biological agents in urban areas as well as assessing the area for the hazards associated with a biological attack are being established in major cities. In addition, forensic technologies are working on identifying biological agents, their geographical origins and/or their initial source. Efforts include decontamination technologies to restore facilities without causing additional environmental concerns. Early detection and rapid response to bioterrorism depend on close cooperation between public health authorities and law enforcement agents. This important collaboration is currently lacking in various countries. All nations awake to the safety of her citizens must put in place structures and framework for early detection, mitigation and management of bioterrorism.

Bio-surveillance

In 1999, the University of Pittsburgh's Center for Biomedical Informatics deployed the first automated bioterrorism detection system, called RODS (Real-Time Outbreak Disease Surveillance). RODS is designed to draw, collect data from many data sources and use them to perform signal detection, that is, to detect a possible bioterrorism event at the earliest possible moment. RODS, and other systems like it, collect data from sources including clinic data, laboratory data, and data from over-the-counter drug sales. In 2000, Michael Wagner, the co-director of the RODS laboratory, and Ron Aryel, a subcontractor, conceived the idea of obtaining live data feeds from "non-traditional" (non-health-care) data sources. The RODS laboratory's first efforts eventually led to the establishment of the National Retail Data Monitor, a system which collects data from 20,000 retail locations nation-wide.

THE PANACEA

Ex 30:21

“So they shall

wash their hands and their feet,

that they die not; and it shall be a statute for ever

to them, even to him and to his seed throughout their generations.”

Public health practice is the panacea to zoonotic infections that have threatened human existence from ancient time to date. What is Public health practice? It is the Science and Art of preventing disease, prolonging life and promoting health through organized efforts and informed choices by societies, organizations, public, private, communities and individuals. Public health is concerned with threats to the overall health of a community based on population and community health analysis. The population in question can be as small as a group of people and as large as a nation or beyond. It is the assessment, policy development, and assurance carried out in the field, as a function of government to provide public services. It is the implementation of programs and services to improve public health as primary responsibility of government. It is the application of proven tools and interventions that generate positive health outcome in the communities by government and government functionaries. It is the application of the essential services through the broad public health system; policy development driven through shared leadership; translation of policy into practice; implementation of evidence-based science into interventions. Public health practice should be actions and decisions to protect and improve health for all people in all places. It is the collaborative efforts of Public health professionals, agencies, partners, and individuals working together to protect and improve the health of people and communities. It is the art and science of improving health for populations of individuals and families in their respective settings at state, local, and tribal levels. It is the strategic, organized and interdisciplinary application of knowledge, skills and competencies necessary to perform essential public health services and other activities to improve the population's health.

God expressly instructed the children of Israel to wash their hands and feet that they die not. This they were to practice as a statute for ever from generation to generation. This also was given to them as a prerequisite for a relationship with him. Probably, this gave rise to the common saying that *“cleanliness is next to godliness”*. The role of thorough and frequent hand wash can never be over emphasized especially before eating, after using sanitary conveniences, before preparing food, at the end of work, getting back home, after

touching animals etc. Avoidance of direct contact with certain animals that are known to be reservoirs of zoonoses and their environment except with appropriate Personal Protective Equipments (PPEs) is important. Always protecting oneself from insect bites especially mosquitoes goes a long way to prevent zoonotic infections transmitted by mosquitoes. Parents closely monitoring and supervising their children to ensure they wash their hands properly and avoid hand-to-mouth activities after animal contact which is a necessary task to be enshrined as traditions in homes. As a routine always looking for and removing ticks from the body of their children if they have rare pets. Domestic animals should be taken appropriate care of by veterinary doctors. When in an insect infested environment the use of EPA-registered insect repellents that contain 20% or more DET (N, N-diethyl-m-toluamide) on the exposed skin for protection that lasts up to several hours is protective. The use of products that contain repellents (such as permethrin) on clothing and treating clothing and gear, boots, socks and tents after working in animal farm e.g. poultry is important. Taking care of the environment to avoid mosquitoes breeding around the houses and getting rid of items and containers that hold water in your environment should be practiced regularly.

Good house location is important. Houses should not be located in swampy areas and should have adequate drainage system. Houses should have good structure with rat proof, window net, adequate space, not congested and should have adequate lighting inside and out doors. Waste generation and final disposal both in the urban and residential areas should be adequately managed by Government and individuals. This will eliminate breeding sites for rodents of Public Health importance. Public sanitary conveniences and running water should be provided by Government and Organizations. Residential, Industrial, Market, poultry farms should be appropriately laid out by government authorities and not left in the hands of individuals. There are specific immunizations available for certain zoonoses and all domestic animals should have them. Yellow fever vaccine is routinely given to the under fives and everybody should routinely have it every 10years.

Harmful and risky cultural and social practices such as corpse bathing, corpse dressing, traditional Corpse inspection, oath taking, residential embalment and preservation, inheritance of clothes belonging to suspicious death, widowhood rituals etc. should be discouraged. Legislation and enforcement of rules and regulations on Abattoirs, hunters, domestic animals, poultry farms and domestic animals for best practices are important. Recognition, commendation and rewards for compliance to ideal Public Health practices should be institutionalized while sanctions and penalties applied to defaulters.

Reducing public health risks from zoonotic infections and other health threats at the human-animal-ecosystems interface (such as antimicrobial resistance) is not straight forward. Management and reduction of these risks must consider the complexity of interactions among humans, animals, and the various environments they live in, requiring communication and collaboration among the sectors responsible for human and animal health, and the environment. World Health Organization is engaging in an ever-increasing number of cross sectoral activities to address health threats at the human-animal-ecosystem interface. These threats include existing, emergent and re-emergent zoonoses as well as antimicrobial resistance, food-borne zoonoses, and other threats to food safety.

Homes should ensure steady source of water and at the entrance into the house for members of the house to wash their hands on arriving before entering the house. This should also apply to all public buildings for every visitor to have access to running water to wash hands both before entering and at exit. Organizations that can provide sanitizers should be encouraged to do so. Hand washing should be taught in primary schools so that they will imbibe the habit early enough. The technique of proper hand wash should be taught and demonstrated to them.

CONCLUSION

To prevent zoonoses and its outbreak we have to collectively and purposefully return to the basic principles and practice of Public Health ideals with emphasis on environmental and personal hygiene at various levels. This is a wake-up call to governments at various levels, non-government and Faith Based Organizations of all creeds, institutions at all levels, communities and individuals alike. Otherwise recent zoonoses outbreaks may trigger off another wave of zoonotic pandemic. Concerted efforts should be focus based and directed to specific potential areas of Public health concern of zoonoses threatening human existence if positive results are to be achieved.

Poultry has become a big business in Nigeria as poultry farms are indiscriminately and widely spread both in rural and urban communities. That most of those who engage in this business have little or no knowledge and necessary skills for bio-safety is to say the least. Avian influenza is one zoonotic infection that has been known to cause the deadliest pandemic in human history as in the early twentieth century known as Spanish flu. It is of Public Health interest that it be prevented because when man is infected the spread is rapid and difficult to contain with poor survival rate. Therefore, the Ministry of Agriculture and Rural development should as a matter of urgency and through the department of Animal Production and Husbandry Services in collaboration with relevant stakeholder institutions and Agencies establish a strategic plan on Poultry industry in Nigeria. This among others should be initiated and vigorously pursued by training and regulation of poultry industries to facilitate prevention, detection and control of poultry diseases especially Avian influenza.

Nigerian policy on livestock business and ownership should be reviewed to meet the challenges of present realities especially as stray animals are regularly seen in our streets both in rural and urban human settlements. Live stocks are hawked openly along the roads and residential houses are used for commercial poultry farms. All these portend great health hazard to human population and should there be an epizootic it will snow-ball to an epidemic which will spread fast especially the viral zoonoses that are deadly. The contemporary society will find it difficult to contain the spread of any zoonotic pandemics because our world is shrinking to a global village that an epidemic in any country will be a fast spreading pandemic.

The time to act is now to avert another wave of zoonoses that have threatened human existence from time immemorial. The university authorities should ensure that the policy regulating poultry farms in her staff quarters are strictly adhered to and if possible the practice should be prohibited. Residential settlements should not be used for livestock business irrespective of economic gains as the consequence will outweigh

the benefits. The stench oozing out from such sites is enough air pollution, nuisance and hazard to warrant its total ban and separation from residential areas. This is in keeping with the principle of environmental friendliness which we should all uphold as custodians of the citadel of learning and character formation.

Never go to bed until you have gotten rid of the dangerous visitors in your house. There are many ways of killing a rat. Though very prolific it is a task that is doable if you determine. Do not give up as doing that maybe a ticking time bomb of deadly zoonotic infection. The followings are some of the deadly diseases transmitted by rats to man; Lassa fever, Plague, Hantavirus Pulmonary Syndrome, Leptospirosis, Rat-bite fever, Salmonellosis, Colorado Tick Fever, Tularemia, Lymphocytic Chorio-meningitis. The list is endless as these diseases are the major zoonotic infections of Public Health importance and there are several others. Rats are known to be the reservoirs of these zoonotic diseases and keeping them out of your house is as good as preventing these deadly diseases. Join the crusade today for a zoonotic free society.

ALSO REMEMBER TO ALWAYS WASH YOUR HANDS

AND

DO NOT BREACH THE NATURAL MAN- ANIMAL BARRIER

ACKNOWLEDGEMENT

I give God the glory for taking me from obscurity to an academic limelight and echelon. It is only proper that I pay tribute to my late Parents Eunice and Sampson who I am ever proud of. They believed in me and made far reaching sacrifices for my education. To my siblings whose love for me has remained steadfast especially Dem Jolly who God used as the first son to ensure that I continued with my education I say, thank you. To my friends too many to mention I appreciate you all. Mention is hereby made of Prof. Charles Nwabuisi and Mr. Chidiebere Ogazi my adolescent Christian friends. To the brethren in Christ especially in AGN God bless you all for your unfeigned prayers. To the V.C. and the University community thank you for this life time opportunity. To my Faculty and Community Health Department staff, thank you for sharing in my academic struggles and joy. I also appreciate Dr. L. O. Idoko for being part of my academic history. To my dearest friend and confidant Vicky, thank you for being my real half. To the wonderful children God has given us thank you for making our home conducive for me to actualize my dream. To my audience I hope I have been able to sensitize you and have added to your knowledge today. Like Jesus would say in John 13:17

“If ye know these things, happy are ye if ye do them.”

Thank you for honouring my invitation at this epoch making event in my academic life. Remain blessed.

CITATION

Professor Chikaike Ogbonna was born on 24th May, 1953 to Mr. & Mrs. Samson Lambert Odemelam of Obizi Amakama Umuahia, Abia State. He had his primary education in three Primary Schools, Dorowa Babuje, Barkin Ladi both in Plateau State and acquired his first School leaving certificate in Umuakatawom, Aba District in 1966. Due to the Nigerian civil war he remained out of school until 1973 when he returned to school and started at class two in Evangel High School, old Umuahia finishing in 1976 as the best graduating student that year with Grade 1. He is married to Victoria Ugochi and blessed with four children.

After his secondary education he worked as a clerical staff in United Bank for Africa Plc. 1976-1981. After graduating as a medical doctor he worked as a house officer and Medical Officer of Health, Jos University Teaching Hospital, 1987-1991. He started residency training program in Public Health in 1992 and was awarded a fellow of Public Health of the National Postgraduate Medical College of Nigerian in May 1997. He acquired a Postgraduate Diploma in Statistics, University of Jos in 2011. He rose from Lecturer I in 1998 to a Professor 1st October 2008. He was appointed Ag. Dean, Faculty of Medical Sciences in 2009 after serving as deputy Dean, Clinical. He was Head of Dept, Community Medicine from 2004-2010 before proceeding on Sabbatical with SPDC Port Harcourt. He served as coordinator, Biomedical Education, Faculty of Medical Sciences in 2009. He has been an external examiner for MBBS professional exams to several Universities from 2001-Date and as examiner, National Postgraduate Medical College from 2002-Date. He has been the Chairman, Haemorrhagic Fever Disease, JUTH 2011-Date. He was the Secretary, Association of Public Health Physicians of Nigeria, 2000-2004 and 2nd Vice Chairman from 2012-Date. Other posts he held are; Assistant Secretary Faculty of Public Health, 2008-2012 and 3rd Senate Member Faculty of Public Health, National Postgraduate Medical College, 2012-date.

Member of the Nigeria Medical Association, Medical and Dental Consultants Association of Nigeria, Association of Public Health Physicians of Nigeria, National Postgraduate Medical College, Associate Fellow of West Africa Postgraduate Medical College. Member, Nigerian Association of Statisticians. He is a visiting professor to College of Health Sciences, Bingham University. He was the Faculty representative Housing Allocation Committee 2001-2005 a member of Faculty examination malpractice committee 2004-2008. Member Faculty representative, Faculty of Education 2008-2010. Chairman, JUTH permanent site structural facility allocation 2010. Secretary,

Most of his research work has been on Maternal and Child health but has lectured mostly in Biostatistics and Research methodology sub-specialty of Public Health. He has trained and supervised twenty four fellows of the National Postgraduate Medical College of Nigeria. He has also co-supervised several fellows both in National and West African Postgraduate Medical Colleges in Public Health. He has 40 articles in local and international peer reviewed journals and has authored a book in his area of specialization titled, “The basics in Biostatistics, Medical Informatics and Research Methodology”. His hobby is in-door and out-door domestic activities, reading Christian literatures.

REFERENCE

1. Anderson LJ. Coronaviruses. In: Goldman L, Ausiello D, eds. *Cecil Medicine*. 23rd ed. Philadelphia, Pa: Saunders Elsevier; 2007: chap 389.
2. Alex Santoso. Five Deadliest Pandemics in History. Monday, April 27, 2009
3. AIDS INSTITUTE. www.theaidsinstitute.org/node/259 last accessed 15/11/2014
4. Adah SO., **Ogbonna C.**, Anga P., Chingle MP., Ashikeni MA., Envuladu E., Agaba C., Audu S., Bupwatda P and Zoakah AI. The impact of advocacy and community mobilization on the utilization of health services at the Comprehensive Health Centre, Gindiri. 2009; 4(1): 11-12.
5. Banwat, ME., **Ogbonna, C.**, Daboer, JC., Chingle, MP., Envuladu, EA., Audu, S., Lar, LA. (2012) Prevalence of Urinary Schistosomiasis in School-aged Children in Langai, Plateau State; pre and post-intervention. Nigerian Journal of Medicine, Vol. 21 No. 2, April – June, 2012; 146-149.
6. Banwat ME, Lar LA, Dakum LB, Igoh CS, Daboer JC, **Ogbonna C.** (2012) FACTORS AFFECTING HOUSEHOLD FOOD SECURITY IN A RURAL COMMUNITY IN NORTH-CENTRAL NIGERIA. International Journal of community Research. 2012; 1(1): 23-29.
7. Brockington Fraser. Public Health from the days of ancients until the renaissance of learning. The history of public health.
8. Bunker J. Improving Health; measuring effects of medical care. *Milbank Q.* 1994; 72: 225-258
9. Centers for Disease Control and Prevention. 1600 Clifton Rd. Atlanta, GA 30333, USA.
10. **Chikaike L. Ogbonna.**, Luret Lar., Jonathan C. Daboer., Moses P. Chingle., Mathilda E. Banwat. A Retrospective Study on Factors Determining the Prospects of Medical Education in University of Jos, Plateau State. *Journal of Medicine in the Tropics.* 2013. 15:1:4-8.
11. Daboer JC, Jamda AM, Chingle MP, **Ogbonna C.** (2010). Knowledge and treatment practices of malaria among mothers and caregivers of children in an urban slum in Jos. *Nigerian Journal of Medicine.* 2010; 19(2); 184 - 187.
12. Daboer JC, Chingle MP, **Ogbonna C.** Malaria paracetamemia and household use of insecticide treated bed nets: a cross sectional survey of under fives in Jos, Nigeria. *Nigeria Medical Journals.* 52(1): 5-9.
13. Daboer, J. C., **Ogbonna, C.** and Jamda, M. A. (2007). IMPACT OF HEALTH EDUCATION ON SECONDARY SCHOOL STUDENT'S KNOWLEDGE OF HIV/AIDS AND THEIR ATTITUDE TOWARDS PEOPLE LIVING WITH HIV/AIDS IN JOS, NIGERIA. *Highland Medical Research.* 5 (1): 69-74.

14. Daboer, J. C., **Ogbonna, C.** and Jamda, M. A. (2008). Impact of Health Education on Sexual Risk Behavior of Secondary School Students in Jos, Nigeria. *Nigerian Journal of Medicine*. 17 (3): 324-329.
15. FAO-OIE-WHO Collaboration. Sharing responsibilities and coordinating global activities to address health risks at the animal-human-ecosystems interfaces. A Tripartite Concept Note, April 2010
16. Hippocrates. On Airs, Waters and Places. Von Julius Springer Med Classics. 1938: 3:19-42
17. Jamda, A.M., **Ogbonna, C.**, Zoakah, I.A. and Daboer, J.C. (2007). IMPACT OF HEALTH EDUCATION ON KNOWLEDGE AND PRACTICES OF URINARY SCHISTOSOMIASIS AMONGST CHILDREN IN MARTIN VILLAGE. *Journal of Medicine in the Tropics*. 9(1): 21-27.
18. Kottek S. Germs from the Talmud: Public Health-1 Water Supply. *Isr J Med Sci*. 1995; 31:255-256
19. Luret A. Lar., Jonathan C. Daboer., Moses P. Chingle., Mathilda E. Banwat., Esther A. Envuladu., Sunday N. Audu., **Chikaïke Ogbonna.**, Ayuba I. Zoakah. Effect of Health Education on Refuse Disposal Practices of Women in Jos, Plateau State. *Journal of Medicine in the Tropics*. 2012: 14: (2): 116-122.
20. Li W, Shi Z, Yu M et al. (2005). "Bats are natural reservoirs of SARS-like coronaviruses". *Science* **310**(5748): 676–9.
21. Lau SK, Woo PC, Li KS et al. (2005). "Severe acute respiratory syndrome coronavirus-like virus in Chinese horseshoe bats". *Proc. Natl. Acad. Sci. U.S.A.* **102** (39): 14040–5. .
22. Miner C.A., Ohize V.A., Afolaranmi T.O., Tagurum Y.O. and **Ogbonna C.** Perception of Environment Health Risks among Workers in a food and Animal Feed Manufacturing Industry, Jos, Nigeria. March 2015. Vol. 27. No. 1. 46-54.
23. McIntosh K, Perlman S. Coronaviruses including severe acute respiratory distress syndrome (SARS)-associated coronavirus. In: Mandell GL, Bennett JE, Dolin R, eds. *Mandell, Douglas, and Bennett's Principles and Practice of Infectious Disease*. 7th ed. Philadelphia, Pa: Saunders Elsevier; 2009:chap 155.
24. **Ogbonna, C.**, Shamaki, D. and Udeani, T. K. C. (1999). Measles Eradication: The Way Forward. *Journal of Medical Laboratory Sciences*.8: ISSN 1116-1043: 73-76.
25. **Ogbonna, C.**, and Okolo, S.N. (1999). COMPLEMENTARY FEEDING PRACTICES AND GROWTH PATTERN OF INFANTS IN JOS UNIVERSITY TEACHING HOSPITAL, JOS, PLATEAU STATE. *Nigerian Journal of Clinical Medicine*. 2 (1): 15-18.
26. **Ogbonna, C.** (1999). How Safe Is Measles Immunization Of Sick Children? *Nigerian Quarterly Journal of Hospital Medicine*. 9 (3): 223-224.

27. **Ogbonna, C.** and Pam, I. C. (1999). Postpartum Contraception: A Study Of A Cohort Of Nursing Mothers In Jos University Teaching Hospital (JUTH), Jos, Plateau State. *Nigerian Quarterly Journal of Hospital Medicine*. 9 (4): 293-295.
28. **Ogbonna, C.** Okolo, S. N. and Ezeogu, A. (2000). Factors influencing exclusive breast-feeding in Jos, Plateau State. *West African Journal of Medicine*. 19 (2): 107-110.
29. **Ogbonna, C.** and Okoronkwo, M.O. (2000). The Prevalence Of Urinary Schistosomiasis In A Rural Secondary School In Jos, Plateau State, Nigeria. *Journal of Medical Laboratory Sciences*. 9: ISSN 1116-1043: 21-25.
30. **Ogbonna, C.,** Okolo, S.N., Kpamor, Z.M. and Abubakar, I. (2000). BCG Vaccination Of Sick Children: How safe! *Journal of Medical laboratory Sciences*. 9: ISSN 1116-1043: 66-69.
31. **Ogbonna, C.,** Idoko, L.O. and Ejembi, L. C. (2000). Measles IgG Seroconversion in Jos, Nigeria. *Nigerian Medical Journal*. 39 (2): 49-51.
32. Okolo, S.N., Okonji, M.N., **Ogbonna, C.,** Ezeogu, A. and Onwuanaku, C. (2001). Levels of Calcium aluminium and chromium in serum of exclusively breastfed infants at six months of age in Savannah region of Nigeria. *West African Journal of Medicine*. 20 (1): 13-16.
33. **Ogbonna, C.** and Okoronkwo, M. O. (2001). Cigarette Smoking Pattern Among Students Of Higher Institutions in Jos. *Journal of Medicine and Medical Sciences*. 3 (1): 11-13.
34. Okolo, S.N. and **Ogbonna, C.** (2002) Knowledge, attitude and practice of health workers in Keffi local government hospitals regarding Baby-Friendly Hospital Initiative (BFHI) practices. *European Journal of Clinical Nutrition*. 56: 438-441.
35. Okolo, S. N., **Ogbonna, C.** and Bode-Thomas, F. (2002). Healthcare Service Auditing and Intervention in an Emergency Paediatric Unit. *Nigerian Journal of Paediatrics*. 29 (3): 71-74.
36. Okolo, S.N., Ezeogu, A.F., **Ogbonna, C.,** Okonji, M. and Onwuanaku, C. (2002). SERUM AND BREAST MILK LEVELS OF SELECTED TRACE ELEMENTS IN EXCLUSIVELY BREASTFEEDING MOTHERS IN JOS, NIGERIA; ANY DIFFERENCE? *Journal of Medicine in the Tropics*. 4 (2): 30-34.
37. Okolo, S.N., Okonji, M., **Ogbonna, C.,** Nwosu, O.K. and Ocheke, M.D. (2002). SERUM ZINC LEVELS IN MALNOURISHED CHILDREN OF PRE-SCHOOL AGE ATTENDING THE JOS UNIVERSITY TEACHING HOSPITAL, JOS, PLATEAU STATE, NIGERIA. *Sahel Medical Journal*. 5 (4): 204-206.
38. **Ogbonna, C.** (2002). POLIOMYELITIS ERADICATION: THE OBSTACLES. *Nigerian Journal of Community Medicine and Primary Health Care*. 14: 1-4.

39. Okoronkwo, M. O. and **Ogbonna, C.** (2003). HIV Infection Status of Blood Donors in Jos, Plateau State. *Journal of Community Medicine and Primary Health care.* 15 (2): 24-28.
40. **Ogbonna, C.,** Parakoyi, D.B. and Okolo, S. N. (2003). Determinants Of Household Nutritional Status: A Peri-urban Cross Sectional survey in Jos, Nigeria. *Journal of Community Medicine and Primary Health Care.* 15 (2): 37-41.
41. Okolo, S. N., Egbuaba, N. H., Onwuanaku, C. O., Okonji, M., Ezeogu, A. F. and **Ogbonna, C.** (2004). Blood Pressure, Weight, Height, Body Mass Index and Heart Rate of Fulani Children in a Rural Community in Northern Nigeria. *Nigeria Journal of Cardiology.* 1 (1): 47-52.
42. **Ogbonna, C.,** Okolo, S. N. and Okonji, M. C. (2004). INTESTINAL WORMS AND NUTRITIONAL STATUS OF UNDER-FIVES IN JOS, NIGERIA: ANY RELATIONSHIP? *Nigerian Journal of Clinical Practice.* 7 (2): 79-81.
43. **Ogbonna, C.** (2006). A Cross Sectional Survey on Nutritional Status of Households in a Peri-Urban Settlement in Jos, Nigeria. *Ebonyi Medical Journal.* 5 (1): 7-11.
44. **Ogbonna, C.** and Pam, I. C. (2006). A Cross-sectional Study on Contraceptive use among Married Women in Jos, Plateau State. *Nigerian Medical Practitioner.* 50 (6): 107-109.
45. **Ogbonna C.,** Nwagagbo F and Fakunle B. Utilization and perception of Community Health Insurance Scheme services by enrollees in Obio Cottage Hospital, Port Harcourt, Nigeria. *Journal of Community Medicine and Primary Health Care.* 2012: 24(1&2): 29-33.
46. Okeahialam BN., **Ogbonna C.,** Joseph DE., Chuhwak EK and Isiguzoro IO. Low rate of proteinuria in hypertensives resident in a rural area of Plateau State, Nigeria. *Afr. J. Med. Med. Sci.* (2013) 42, 183-186.
47. **Ogbonna C.** The Basics in Biostatistics, Medical Informatics and Research Methodology, 3 In One Book. Yakson Printing Press, Jos, Nigeria. 2014: ISBN 978-978-5279-5-2.
48. **Ogbonna, C.** and Daboer, J. C. (2007) Current Knowledge And Practice Of Exclusive Breastfeeding Among Mothers In Jos, Nigeria. *Nigerian Journal of Medicine.* 16 (3): 256-260.
49. Okeahialam B. N., Obindo T, and **Ogbonna C.** (2008) Prevalence of premenstrual syndrome and its relationship with blood pressure in young adult females. *African Journal of Medicine and Medical Sciences.* 37, 361-367.
50. Oluwabunmi OO, Yetunde OT, Zuwera IH, Tolutope OA, Chingle MP, Daboer JC, **Ogbonna C** and Zoakah AI. Utilization of maternal Health Services: a study of two rural communities in North-Eastern Nigerian. *Journal of Medicine in the Tropics.* 2012: 14(1):26-34.

51. Shown, L. D. and **Ogbonna, C.** (2008). Awareness of essential drug revolving fund (EDRF) among doctors in Jos University Teaching Hospital. *Jos Journal of Medicine*. 3 (1): 41-43.
52. Smith, R. D. (2006). "Responding to global infectious disease outbreaks, Lessons from SARS on the role of risk perception, communication and management". *Social Science and Medicine* **63** (12): 3113–3123.
53. Utoo PM., **Ogbonna C.**, Zoakah AI., Araoye MO. Outcome of Health Education on HIV/AIDS knowledge and Mobile VCT Uptake among students of Tertiary Institution in Gindiri, North-Central, Nigeria. *Journal of Community Medicine & Primary Health Care*. 2010;22(1&2):33-40.
54. Winslow CEA. The Untilled fields of Public Health. New York. NY: Health Services. New York County Chapter of the American Red Cross; 1920
55. Zoonoses - Diseases transmitted from animals to humans. Agromisia. (2008). Agrodok-Series No.46. ISBN Agromisa: 978-90-8573-105-4