ISSN: 0795 : 5111
Volume 5 No. 1 2010

NJTR

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

NIGERIAN JOURNAL OF TECHNOLOGICAL RESEARCH

- Pure, Applied Sciences and Science Education
- Engineering Technology
- Environmental Technology
- Agricultural Technology

Nig. J. Tech. Res. (2010) 5 (1), 76-81

Climatic Variability And Its Implication On The Outbreak Of Chickenpox In Minna Metropolis, Niger- State.

Yunusa, M. B.
Department of Geography
Federal University of Technology, Minna, Niger State
Email: mbyunusa@yahoo.com
Phone No: 08029026608

Abstract

Climate does affect human health either direct or indirect way. The climatic parameters measure are mean annual rainfall, mean annual temperature and chicken pox cases from 1998-2007; obtained from the Nigeria meteorological Agency Minna and general hospital Minna respectively This gave the researcher the appropriate resolution on the study. A rank type correlation equation was used in order to determine the relationship between chicken pox occurrences and climatic variability. A correlation of 0.14 was obtained for temperature and 0.73 for rainfall. The results indicate that; a continuous increase in temperature will bring about a corresponding increase in chicken pox cases. The rainfall has negative effect on the chicken pox based on the results obtained.

Introduction

Human societies over the ages has depleted natural resources and degraded the local environment. Population growth has led to the modification of the local climate through deforestation and construction to meet the population needs; there by endangering man's survival in the society making him more vulnerable and ill health.

The World Meteorological Organization (WMO) in conjunction with United Nation Environmental Programmer (UNEP) and Intergovernmental Panel on Climatic Change (IPCC), in its second basement report (1995) has projected that; the balance of evidence suggested a discernible human influence on the global climate. Land use changes and fossil fuel burning might have contributed to the observed increase of 0.6^0C in the past hundred years. An increase of 1^0 to 3.5^0C in the global temperature is forecast for the next hundred years. The rate of change is faster than has occurred naturally since the end of the last ice age before the beginning of human settlement over 10,000 years ago.

History and Background of Chicken Pox

One history of medicine book credits Giovanni Filippo (1510 – 1580) of Palermo with the first description of varicella (chicken pox). Subsequently in the 1600s, an English physician named Richard Morton described what he thought a mild form of small pox as chicken pox. Later, in 1767, a physician named William Heberden, also from England, was the first physician to clearly demonstrate that chickenpox was different from smallpox. However, it is believed the named chickenpox was commonly used in earlier centuries before doctors identified the disease.

There are many explanations offered for the origin of the name chickenpox: Samuel (1980) suggested that the disease was less dangerous, thus a chicken version of the pox; the specks that appear looked as though the skin was pecked by chickens; the disease was named after chick peas, from a supposed similarity in size of the seed to the lesions; the term reflects a corruption of the old English word *giccin*, which meant *itching*. As pox also means curse, in medieval times some believed it was a plague brought on to children by the use of black magic. From Ancient times, Neem has been used by Indians to alleviate the external symptoms of itching and to minimize scarring. Neem baths (neem leaves and a dash of turmeric powder in water) are commonly given for the duration. Neem branches are hung at the entrance of households to announce that illness to visitors. Neem branches are kept handy by the affected person to gently brush the skin, to soothe the itching sensations. During the medieval era, oatmeal was discovered to soothe the sores, and oatmeal baths are today still commonly given to relief itching.

Chickenpox is a common illness that causes an itchy rash and red spots or blister (pox) all over the body. It is most common in children, but most people will get chickenpox at some point in their lives if they have not had the chickenpox vaccine.

Chickenpox usually isn't serious in healthy children. But it can cause problems to pregnant women, newborns, teens and adults,

and people who have immune system problems that make it hard for the body to fight infection.

Chickenpox is only contacted ones in a life time and the virus still remain in the body for a long period after healings. If the virus becomes active again, it can cause a painful viral infection called shingles. The illness is a highly contagious viral disease characterized by fever (usually mild) and a rash (sometimes severe) consisting of tiny blisters or vesicles. Caused by one of a group of organisms known as herpes viruses, it can occur at any age but is most common in childhood. In fact, most children have had chickenpox by the age of ten. After one attack, the child is usually immune for life. However, the virus that causes chickenpox remains dormant in the body. Later in life, it can be reactivated, causing a painful outbreak of shingles, or herpes zoster.

The illness itself is usually mild, but it can become severe in newborns and children whose immune system have been weakened by cancer, cancer treatment, AIDS, or immunosuppressive therapy to prevent rejection of transplanted organs. It can also cause severe complications, including pneumonia, in adult who escaped the infection during childhood. Epidemics of chickenpox occur in all seasons but are most common in winter and early spring.

Causes and Symptoms of Chicken Pox

Causes

Chickenpox is caused by the varicella-zoster virus (VZV). Kids can be protected from VZV by getting the chickenpox (varicella) vaccine, usually between the ages of 12 to 15 months. In 2006, the Centres for Disease Control and Prevention (CDC) recommended a booster shot at 4 to 6 years old for further protection. The CDC also recommends that people 13 years of age and older who have never had chickenpox or received chickenpox vaccine get two doses of the vaccine at least 28 days apart. A person usually has only one episode of chickenpox, but VZV can lie dormant within the body and cause a different type of skin eruption later in life called shingles (or herpes zoster). Getting the chickenpox vaccine significantly lowers a child's chances of getting chickenpox, but he or she may still develop shingles later.

Chickenpox is caused by the varicella zoster virus, which spreads from one person to another through droplet carried by air. An infected child can transmit the virus for several days, starting about 24 hours before the rash appear and ending as soon as all the bumps have crusted over. The disease can also be passed from mother to foetus during pregnancy.

Symptoms

Chickenpox causes a red, itchy on the skin that usually appears first on the abdomen or back and face; they then spread to almost everywhere else on the body, including the scalp, mouth, nose, and genitals.

The rash begins as multiple small, red bumps that look like pimples or insect bites. They develop into thin-walled blisters filled with clear fluid, which becomes cloudy. The blister wall breaks leaving open sores, which finally crust over to become dry, brown scabs.

Chickenpox blisters are usually less than quarters of an inch wide, have a reddish base, and appear in bouts over two to four days. The rash may be more extensive or severe in kids who have skin disorders such as eczema.

Some kids have a fever, abdominal pain sore throat, headache or a vague sick feeling a day or two before the rash appears. These symptoms may last for a few days, and fever stays in the range of 100°–102° (Fahrenheit 37.7^0 to 38.8^0 Celsius), though in rare cases may be higher. Younger kids often have milder symptoms and fewer blisters than older children or adults.

Typically, chickenpox is a mild illness, but can affect some infant, teens, adult and people with weak immune system more severely. Some people can develop serious bacterial infections involving the skin, lungs, bones, joints and the brain (encephalitis). Even kids with normal immune system can occasionally develop complications, most commonly a skin infection near the blisters.

Anyone who has had chickenpox (or the chickenpox vaccine) as a child is at risks for developing shingles later in life, and up to 20% do. After an infection, VZV can remain inactive in nerve cells near the spinal cord and reactivate later as shingles, which can cause tingling, itching or pain followed by a rash with red bumps and blisters. Shingles is sometimes treated with antiviral drugs, steroids, and pain medications and in May 2006, the Food and Drug Administration (FDA) approved a vaccine to prevent shingles in people 60 and older.

Chickenpox is contagious from about 2 days before the rash appears and lasts until all the blisters are crusted over. A child with chickenpox should be kept out of school until all blisters have dried, usually about one week. If

you are unsure about whether your child is ready to return to school, ask your doctor.

Zoster, also known as shingles, is a reactivation of chickenpox and may also be a source of the virus for susceptible children and adults. It is not necessary to have physical contact with the infected person for the disease to spread; Those infected can spread chickenpox before they know they have the disease even before any rash develops. People with chickenpox, in fact, can infect others from about two days before the rash develops until all the sores have crusted over, usually four or five days after the rash starts.

Projected Trends in Infectious Diseases

The health implication of climate changes ranges from easily foreseen effect of changes in the intensity and frequency of extreme temperature scenario. In many temperate zones, more heat waves and fewer cold spell, the effects of warmer winter could be beneficial because currently more people die in winter than other times of the year.

As members of the biosphere, human beings may be vulnerable considering the rainforest as the greater supporter of biodiversity of plant and animal species. It has been estimated conservatively that deforestation results in the loss of more than 4000 species per year, at a rate that occurred prior to the appearance of human beings on earth (Piver et al 1991).

Climate Change and Chickenpox

Concern about the potential health effects of climate change began in the mid 1980s, with indications that emission of greenhouse gases from human activities could influence the climate system and result in intensification of the greenhouse effect. Given the clear evidence that many health outcomes are highly sensitive to climatic variations, it is inevitable that long term climate change will influence all natural, human and socioeconomic systems, thus affecting not only health but also many aspects of ecologic and social systems, climate is one factor that may create conditions that facilitate the development of some diseases causing micro organisms (McMichael and Kovats 1999).

Chickenpox is also transmitted person to person. During the baseline period, the seasonal peak was in March (the end f winter). Currently, the peak is observed in April, a month characterized by high climate variability. High climate variability may result in insults to the upper respiratory tract, increasing viral transmission, particularly among infants and childr

Important evidences have been obtained to support the fact that many health outcomes are highly sensitive to climate variations. So it is inevitable that a long term climate change will have some effect on global population health wise. Climate variability and change will influence all natural, human and socioeconomic system, thus affecting not only health but also many aspects of ecological and social systems. Climate is one factor that may create conditions that facilitate the development of some diseases causing micro organisms (McMichael and Kovats, 1999).

It is important for the health sector to understand current vulnerability to CV because this increasing variability may have a greater impact on health than gradual changes in mean temperature, precipitation and other climatic variables. Assessing current vulnerability includes understanding both disease exposure response relationships and current intervention implemented to reduce the burden of climatic sensitive disease. Additional intervention that can be implanted within the time frame of decision makers (5-10 years) need to be identified to reduce the health effects projected to occur with climate change.

Climate sensitive diseases have been identified that have imported health burdens, particularly vector borne diseases. Virus and bacteria quickly mutate, thus allowing for environmental adaptation (McMichael and Kovats 1999). CV and climate change may be additional stresses that increase mutation rates of different micro organisms, thus increasing emerging and re-emerging diseases. Climate is not the only factor that affects the incidence and range of vector borne diseases; recent increases are due at least in part to the collapse of vector-control programs (Michael and Trtanji 1999).

Under such scenarios, the forecasted climate conditions give in 2015 an increase of Acute Respiratory Illness (ARI) and of Acute Diarrheal Diseases (ADD) by oral/food transmission. For ARI, a new outbreak was projected for June. For ADD, an increase in incidence was projected in the first months of the year. A displacement of the seasonal pick from May to July-august may occur. Climate conditions in winter season were projected to be warmer and rainier, and the rainy season was projected to be drier and hotter. Then, it may influence the incidence of ADD.

It is important to note that some Bulto indexes, based on the epidemiological characteristic of the disease, suggest more impact than others.

Therefore, each health outcome is likely to respond differently to climate variability and change. It is important to understand that many factors can influence the rate and intensity of these diseases, such as the complexity of an effective community response.

Justification

Chickenpox is a highly contagious disease that can be spread from person to person by direct contact or through the air from an infected person's coughing or sneezing. The spread has been on the increase in Minna metropolis. This study is to contribute to the partially existing knowledge about the case of chickenpox outbreak and the climate of the study area. With the aim of suggesting ways in which the available climatologically parameters can be put together to mitigating or to reduce the outbreak of the disease.

Scope and Limitation

The scope of this work is limited to Minna metropolis considering the effect of climatic variability on chickenpox. The major limitation of this study is the short duration of data used and non availability of chicken pox data which limit the generalization of the findings of the research

Methodology

Method of data collection

The method of data collection for the study comprises primary and secondary data.

The primary data were the data collected directly from the field study by the researcher, while the secondary data comprises of previous research work from the heritance of climate change and chicken pox and others include Journals, encyclopedia, text books, newspaper, e.t.c.

Meteorological data:-

Data on total annual mean rainfall and temperature for each year during the period of study was obtained from Nigerian Meteorological Agency Minna for a period of ten years (1998-2007).

Disease outbreak data:-

The data for chickenpox disease outbreak were obtained from the General Hospital Minna (1998-2007) with six cases of non-available data. These are 1998, 1999, 2001, 2003, 2006, and 2007. The non-availability of data was attributed to home treatment by the patient.

Method of Data Analysis

Statistical techniques:-

The statistical technique employed for this study is rank correlation. This was use to establish the relationship between climatic parameter (Rainfall and temperature) with chickenpox outbreak in Minna metropolis. Each data were ranked in a descending order of magnitude and the correlation coefficient was obtained, using the equation below.

$$\frac{R=1-(6\sum d^2)}{n(n^2-1)}$$

Where n =No of term

$D=Rx-Ry$

Where R_x=Rank of x value

R_y=Rank of y value

Presentation and Discussion of Result

The focus of this was to examine the effect of climate change on health (case study of chickenpox) In Minna. The objective is to relate climatological data and disease outbreak. The result and analysis of data and effect of climatic variability on chickenpox outbreak in Minna, Niger State, collected for ten years that is (1998-2007) are presented and discussed below

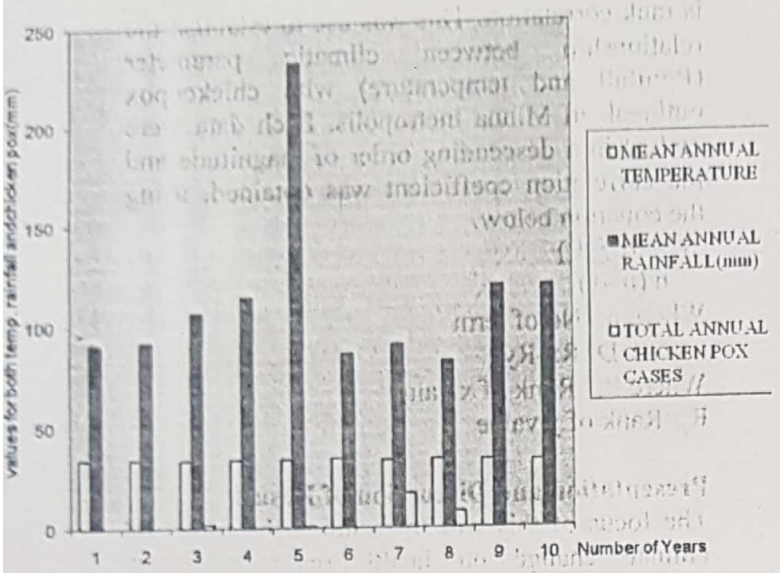

Fig4.1: shows annual mean temperature, Rainfall and chicken pox cases from 1998 to 2007

The data displayed in figure 4.1 above show a general increase in the mean annual temperature over the years except for 2005 that has the lowest temperature. Range of temperature is between 33.93^0 C in 1998 and 32.81^0 C in 2007. Comparing the temperature data with chickenpox outbreak, there is an upward trend in occurrence of the disease. Though there were no data in 1998, 1999, 2001, 2006, and 2007.

There is a general fluctuation in the total annual rainfall with the highest value recorded in 2006 and 2007and lowest value was recorded in the year 2005.

Relating the disease outbreak to the total annual rainfall, there seems to be a little relationship between the two variables. This is mainly because the downward trend was observed in rainfall and there was an increase in case of chickenpox. 2004 has a mean annual rainfall of 90.82 mm with about 17 cases of chickenpox.

From the correlation analysis carried out there exit a strong relationship between rainfall, temperature and chickenpox outbreak in Minna Niger State with rainfall having a correlation of 7.3%, temperature 14%. This indicated data with increase in climatic variability chickenpox cases will receive a corresponded increase. This confirmed other theories that indicate a strong relationship between climatic variability and chickenpox.

Summary

This project looked into the effect of climate change on health in Minna. (A case study of chickenpox), with the view to determine and examine the relationship that exist between climate change and health. This was achieved using meteorological data on weather parameter (Rainfall and temperature) to establish a relationship between climate and disease (chickenpox) outbreak.

The researcher made use of ten-year period (1998-2007) data. Data were obtained from meteorological report on weather variation and General Hospital Minna on disease outbreak. The method employed for data collection was mainly through secondary data collection. The method of analysis was correlation analysis, the result obtained from this analysis indicated that there is a strong between temperature and the disease outbreak; it also indicates that rainfall has no significant relationship on the disease outbreak as the correlation result was negative.

Conclusion

It is certain that climate change contribute a lot to the global body of disease and premature death emerging evidence of the effect of climatic variability has alter the distribution of some infectious disease vector and the seasonal distribution of some allergenic pollen species but has also increased the risk of heat waves related death (confalonieri et al) 2007.

Environmental conditions are already favorable for chickenpox transmission in the study area due to the increase in temperature which is attributed to both natural and man-made factors. From the data obtained in the general hospital Minna indicate that chickenpox cases has been on the increase though the data obtained for the period of study does not prostrate the evidence. This lack constancy between the increases in chickenpox outbreak was attributed to have medication.

Recommendations

Therefore as a result of climatic variability development and spread of chickenpox highlighted in this study, the following are recommended for effective control of this disease.

(1) There is a need for continuous research and study in disease epidemiophology to provide information which is useful to policy makers about the possible consequence of climatic variability. People's perception of these

consequence as well as adapting and mitigation capacity.

(2) There is need for government and non-governmental organization to enlighten the people and provision of health facilities to avert chickenpox.

(3) The government needs to provide free immunization vaccines against chickenpox.

(4) There is also the need for environmental consciousness as any damage done to the environment could have a negative consequence on environment.

(5) Finally there is the need to estimate health risk in relation to future climate and environmental scenarios unlike most recognize environmental health hazards.

However, if this recommendation is implemented side by side with purely medication measures, the endemicity of chickenpox as the case with Africa countries, would have been death a mortal blow.

References

Adefolalu, D. O, (1986). Mean State During the Onset of the West Africa Monsoon Arch. Met. Geoph. Bioci. Ser A33, 327-343.

Burton I, Van, A. M. (1999). Come Hell or High Water. Integrating Climate Change Vulnerability and Adaptation into Bank Work. Washington, DC: World Bank. S

Chan N, Ebi K, Smith F, Wilson T, Smith A. (1999). An integrated assessment framework for climate change and infectious diseases. Environ Health Perspective 107:329–337.

Haines, A, Patz, A.J. (2004). Health effects of climate change. JAMA 291(1). 99–103

IPCC. (1996): Climate Change 1995: Impacts, Adaptations, and Mitigation of climate Change: Scientific-Technical Analyses: Contribution of Working Group II to the Second Assessment Report of the Intergovernmental Panel on Climate Change. R. T. Watson, M.C. Sinyowera, and R. H. Moss (eds). Cambridge University Press, Cambridge. United Kingdom and New York. P880

IPCC. (2000): *Summary of Policy Makers, Emission Scenarios,* Special Report of IPCC Working Group III, Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge.

IPCC (2001) Climate Change 2001: *The Scientific Basis,* Impacts and Vulnerability. Contribution of Working Group II to the Third Assessment Report on the Intergovernmental Panel on Climate Change

IPCC. (2001). Climate Change 2001: Impacts, Vulnerability and Adaptation. Contribution of Working Group III to the Third Assessment Report on the Intergovernmental Panel on Climate Chang AJ, Haines A, Sloff R, Kovats S, Ando M, Carcavallo R, et al., eds. (1996). Climate Change and Human Health. Geneva:World Health Organization.

McMichael, A.J, Kovats, S. (1999). El tiempo el clima y la salud Bol Organ Meteorol Mund 48(1): 16–21. Meteorological Organization. (2001); Informe Final Abreviado de la Decimotercera Reunión de la Comisión de Climatología [in Spanish]. Anexos 1 y Geneva:World Meterological organization

Michael, H.J, Trtanj, M.J. (1999). La predicción climática para la Salud Humana Bol Organ Meteorol Mund 48(1)32:4.

Mitchell, J.F.B, Davies, R.A, Ingram, W.J., Senior, C.A. (1995). On surface temperature, greenhouse gases and aerosols: models and observations. J Clim 10:2364–2386.

Oguntoyinbo and Sonoye (1976); problem of water in Nigeria. A report on water management in Nigeria.

Ortíz Bultó, P.L, Rivero, A, Pérez, A, León, N, Pérez, C.A, (2004). The Climatic Variability and Their Effects in the Variations of the Space-Time Patterns of the Diseases and Their Economic Impact. Technical Report 82. La Habana, Cuba: Research Climate Center, National Program the Global Changes and the Evolution of the Cuban Environment.

Piver, W.T, Fouts and D.P Rall (1991): implication of climate change for human. Health Environmental Professional Vol. 13, pp 97-91

WHO.(2004). Using Climate to Predict Diseases Outbreaks: A Review. WHO/SDE/OEH/04.01. Geneva: World Health Organization.