THE INFLUENCE OF WEATHER ELEMENTS ON THE OCCURRENCE OF SOME COMMON DISEASES IN KAFANCHAN, KADUNA STATE, NIGERIA

BY

Marcus BAKO

BEING AN M.SC RESEARCH PRESENTED TO DEPARTMENT OF GEOGRAPHY FACULTY OF SCIENCE AHMADU BELLO UNIVERSITY, ZARIA

OCTOBER, 2012

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DECLARATION

I declare that this thesis entitled 'The influence of weather on the occurrence of some common diseases in Kafanchan, Kaduna State, Nigeria' was carried out by me in the Department of Geography under the supervision of Prof.O.F Ati and Prof.E.O Iguisi. The information derived from other literatures has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at any University.

Marcus Bako……. Sign----------

CERTIFICATION

This Thesis 'The influence of weather on the occurrence of some common Diseases in Kafanchan, Kaduna states, Nigeria' by Marcus Bako meets the regulations governing the award of the degree of masters of science of Ahmadu Bello University, Zaria, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This work is dedicated to Almighty God and to my late Brother Elisha Tourman whose life was claimed by an accident on 25 August 2012.

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First and foremost, my appreciation goes to the Almighty God, the Alpha and Omega, for His idea, inspirations and guidance towards the actualization of this thesis. Secondly, profound gratitude goes to my late Brother Elisha whose moral, financial and spiritual support and encouragement stop me from quitting from this programme that extended far beyond the duration of two years. Unfortunately death (on 25 August 2012) abruptly snatched him away through an accident and could not allow him to see me graduating...adieu Brother. And my Brother and sisters for their all round support, I pray that God in His infinite mercy will continue to support, strengthen and give them good health and long life to harvest from their good handwork. I equally appreciate my in-laws especially Mr.Andrew Kazzah for their encouragement and support.

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ABSTRACT

The critical elements of weather such as rainfall, temperature and relative humidity influence diseases. Although medical science has made remarkable progress in fighting diseases through modern technology, the health of the human population is still influenced to a great extent by weather and climate. This study helps in determining the role weather elements play in diseases outbreak and transmission. The objectives of the study are to identify weather induced common diseases in Kafanchan, assess the nature of the relationship between common diseases and weather elements responsible for them and to examine the seasonality of common diseases in the study area. The methodology used in this research involve the collection of monthly data of temperature (minimum and maximum), rainfall and relative humidity for 10 years(1999 to 2008) in Kafanchan from the Water Board of the same town. Medical records of the diseases: malaria, typhoid, meningitis, measles, diarrhoea, cough, pneumonia and cholera were obtained from three hospitals using purposive sampling method based on their spatial spread within the study area and the duration of their existence, if up to 10 years and availability of records. These diseases are among the common diseases in Kafanchan. Correlation and Regression analysis statistic were used to assess relationship between weather elements (rainfall, temperature and relative humidity) of Kafanchan and the occurrence of common diseases. ANOVA was used to find out if there is significant different in the seasonality of occurrences of the common diseases The Pearson Product Moment Correlation Coefficient and stepwise and enter methods of Regression Analysis were used. The descriptive statistics indicates that malaria and typhoid have the highest number of frequency of occurrence in all the variables. Measles and meningitis rarely

occur, but when they occur is usually during the hot period. The results of the research indicated that Although various diseases are influenced by different weather elements as shown by the stepwise regression analysis result, i.e. humidity has high impact on Malaria, Pneumonia and Diarrhoea, temperature on Measles and Meningitis, rainfall on Typhoid and Cholera. The collective or aggregate effect of all the weather variables on the diseases was not ignored .The enter method of regression, on the other hand, indicates that the aggregate weather elements (rainfall, relative humidity and temperature) have a collective influence on Malaria, Typhoid, Diarrhea and Meningitis, while Measles, Cholera, Pneumonia and Cough are not significantly influenced by the aggregate weather elements. Cholera, Pneumonia, and Cough shows no significant seasonal variability while Malaria, Measles, Typhoid, Diarrhea and Meningitis shows significant seasonal variability in their occurrences.

CHAPTER ONE:

INTRODUCTION

1.0 BACKGROUND OF THE STUDY

While our personal health may seem to relate mostly to prudent local environmental exposures and health care access, sustained population health requires the life supporting "services "of the biosphere. Population of all animal species depend on supplies of food and water, freedom from excess infectious diseases and the physical safety and comfort conferred by climatic stability. The world's climate system is fundamental to this life support (WHO, 2003).

The characteristics, geographical distributions and seasonal variations of many infectious diseases are prima facie evidence that their occurrence is linked to weather and climate. Factors such as temperature, precipitation and humidity affects the life cycle of many disease pathogens and vectors (both directly and indirectly through ecological changes) and this can potentially affect the timing and intensity of disease outbreaks. Human societies have had long experience of naturally occurring climatic vicissitudes. The ancient Egyptians, Mesopotamians, Mayans and Europeans population (during the four centuries of the little ice-age) were all affected by nature's great climatic cycles. More acutely, disaster and disease outbreaks have occurred very often in response to extremes of regional climate cycles such as the El Nino /Southern Oscillations (ENSO) cycles (WHO, 2003). Climate can affect human health directly (impact of thermal stress, death and injury in flood and storm) and indirectly through changes in ranges of disease vectors (mosquitoes), water borne pathogens, water quality and food availability and quality. Climatic factors are an important determinant of various vector borne diseases, many enteric illnesses and

certain water related diseases. Relationships between year to year variation in climate and infectious diseases are more evident where climatic variations are marked and in vulnerable populations (WHO, 2003).

Variation in weather and climate affects the human body significantly. The physiological function of the human body responds to changes in weather condition. Several specific body disorders such as heat and stroke occur only under particular climatic conditions. Likewise the outbreak of several illnesses and diseases are induced by climate. Indeed, the periodic or seasonal nature of outbreaks of some human diseases suggests that climatic conditions play an important role in the seasonal variation (Adebayo 2000).

Many diseases are highly sensitive to changing temperatures and precipitation. These include common diseases such as malaria, typhoid, cough, diarrhea, measles, asthma, meningitis and dengue fever as well as other major killer such as malnutrition and diarrhoea (WHO, 2007). The Director – General of the World Health Organization (WHO) gave this report on World Health Day (WHD, 2008) that human beings are been exposed continually to the effects of climate sensitive diseases which kill in millions. The medical profession in its efforts to combat malaria and other seasonal diseases has long recognized the power of rainfall as it helps in the breeding of mosquitoes. Certain disease also shows a seasonal trend. It is well established that malaria, cold and cough may reach epidemic proportions during wet and cold seasons. Cerebrospinal Meningitis is mostly common during the warm seasons. The variation from year to year in the general character of a particular season is reflected in the degree of severity of the outbreak of certain diseases, thereby making the climate an important factor that enhances diseases establishment in man (Lixia, 2003). The greatest effect of climate on transmission of diseases is observed at the extremes of

the range of temperature at which transmission occurs. Health risk due to climate will differ between countries that have developed health infrastructure and those without this infrastructure (Michael, 1995).

Of all diseases that have plagued man, malaria has probably been responsible for the greatest morbidity and mortality from antiquity especially in the tropical regions. Temperature is an important factor in the spread of malaria and other mosquito – borne diseases; Global climate change will affect daily temperature variations, which can have a more pronounced effect on parasite development (www.webwire.com, 2009).

The temporal and spatial changes in temperature, precipitation and humidity expected to occur under different climatic scenarios could affect the biology and ecology of vectors and intermediate hosts and consequently the risk of disease transmission (WHO, 2005). Climatic factors, particularly temperature and rainfall, may have a profound impact on transmission cycles of diseases by influencing the availability of vector breeding sites, extending vector longevity, altering host breeding of migration pattern and maintaining aggregation of vectors and host around water bodies(Hensel, 1979). Malaria is one of the world's most common and serious health problems. It is responsible for at least more than one million deaths every year in the world majority of which occurs in the most resource poor countries (La'ah and Zubairu, 2007).Cerebrospinal Meningitis (CSM) is partly a weather stress disease and it shows a markedly seasonal character. They invariably begin with drier and colder weather towards the end of November and reach its peak in March and April and subside rapidly in May at the onset of the rainy season (Doney, 2008). The meteorological parameter which most closely parallels them is the mean minimum temperature, which is at its lowest level in December and January (13^0C). In Sub-Saharan African,

especially in Nigeria, the situation is further compounded by the people. Approximately 80 percent of these diseases and 90 to 95 percent of death related to these diseases in the world are recorded in Africa (Global Health Report, 2005). For example, Malaria is the leading cause of mortality to children in Africa and accounts for about 40 percent of health expenditure in most independent countries of Africa (Doney, 2008).

1.2 STATEMENT OF THE RESEARCH PROBLEM

Human societies have had long experiences of naturally occurring climatic vicissitudes. The ancient Egyptians, Mesopotamians, Mayans and European populations (during the four centuries of the little Ice-age) were all affected by nature's great climatic circles. More acutely, disasters and diseases outbreaks have occurred often in response to extremes of regional climatic cycles such as El-Nino/Southern Oscillation (ENSO) cycles.

The studies of the relationship between weather and the occurrence of diseases have taken various approaches globally; Ogbaji (2006) studied the role of temperature in the distribution of Malaria in Zaria. His result shows that there is a positive relationship between temperature extremes and the prevalence of malaria. December to February recorded less cases of malaria while March to May recorded more cases. Chaves and Pascual used a range of mathematical tools to illustrate a clear relationship between climatic variables and the dynamics of cutaneous leisthmaniasis, a skin infection transmitted by sand flies in Costa Rica. The results indicated that cutaneous leisthmaniasis display three-year cycles that coincide with those of EL-Nino.

Tong (2002), performed an ecological time series analysis to examine the ecological association between climate variability and the transmission of Ross River Virus (RRV) disease between 1985 and 1996 in Queensland. Information on the notified RRV cases was obtained from the Queensland Health, and climate and population data were supplied by Australian Bureau of Meteorological and Australian Bureau of Statistics respectively. The results indicated that although many factors can affect the RRV transmission cycles, RRV disease is generally sensitive to climate variability At Macro level, rainfall, temperature and tidal level appeared to be important meteorological determinants in the transmission cycles of RRV diseases. A group of scientists led by Dr. Andrew Githeko (April, 2010) have devised ways of predicting malaria epidemics before it occurred in Kenya, Uganda and Tanzania using technology that uses computations of climate data to look for conditions that could hasten the breeding of mosquitoes. Ilemona (1983) carried out a research on the occurrence of Pneumonia among children below the age of 5 years in Zaria. He established that the occurrence of this disease widely depends on the variability of weather. The colder months recorded more cases of the disease.

Bukhari (2009) studies temperature and rainfall variability and the outbreak of meningitis and measles in Zaria L.G.A. He observed that there is a positive significant relationship between temperature and the outbreak of CSM. Measles showed a negative relationship with rainfall while CSM has no significant relationship with rainfall. Gellert *et al* (1998) studies malaria prevalence and outcome among the in-patients of the Paediatrics Department of State Specialist Hospital, Maiduguri. His findings reveal that it is malaria that is responsible for school absenteeism and low productivity on farms and at the work places. In most cases, the

study suggests general-shifts in the distribution of the diseases rather than specific changes for any particular location.

Most of the studies like on association between climatic variation and disease incidence could not account for the complex web of factors that influence diseases and thus may not be reliable indicators of future change. Most of the studies only used a single parameter of climate i e. temperature and correlate it with a single disease. There is no study to the best of my knowledge that correlates several climatic elements with common diseases especially in the study area. This is one of the concerns of this study. Though issues on climate and diseases in Nigerian are much discussed as mentioned earlier, this work is however to the best of my knowledge the pioneer work in Kafanchan .This is the gap that this study has filled.

1.3 RESEARCH QUESTION

From the foregoing, some pertinent questions one can ask include:

(i)What are the common diseases prevalent in the study Area?

(ii) What is the relationship between these diseases and weather condition?

(iii) Does the occurrence of these diseases exhibit seasonality?

1.4 AIM AND OBJECTIVES

1.4.1 Aim

The aim of this study is to assess the relationship between the weather elements and occurrence of some common diseases in Kafanchan Area of Kaduna State.

1.4.2 Objectives

The objectives of this research are to;

- identify common weather induced diseases in the study area

- assess the nature of the relationship between common diseases and weather elements responsible for them.

-Examine the nature of seasonality of these common diseases

1.5 SIGNIFICANT OF THE STUDY

Climate is an inevitable dominant element of man's environment and powerful factors in his well-being. Its critical elements such as temperature, rainfall and humidity can influence diseases. Although medical science has made remarkable progress in fighting diseases through modern technology, the health of the human population is still influenced to a great extent by weather and climate. It is also good to know that the environmental conditions that favour persistence of the vectors that transmit most of these diseases need also to be considered.

This study is quite significant because it will help in determining the role that meteorological elements play in diseases outbreak and transmission. It will also provide information on what enhances the survival of the causative agents of the diseases. This study therefore wishes to device a systematic method of unveiling and curbing common diseases in Kafanchan Jemaá Area of Kaduna State.

1.6 HYPOTHESIS

(1) There is no significant relationship between weather elements (rainfall, temperature and humidity) and the occurrence of common diseases in Kafanchan.

(2) There is no significant seasonal variability in the occurrences of common diseases in the study area.

1.7 SCOPE OF THE STUDY

Common diseases are endemic throughout the tropical areas and there are many factors that are responsible for their outbreak. The study is interested in assessing the effect of weather elements on common diseases in Kafanchan area of Kaduna State. The study is concentrated in the main town of Jema'a Local Government (Kafanchan) because this is the area where the weather data and Hospital records are concentrated. The study did not delve into medical laboratory analysis and investigation of how the diseases are treated. Equally the study focuses only on some selected clinics/ Hospitals in the study area that had records of common diseases up to 10 years (1999 to 2008) since most of the Hospitals did not have organized data more than 10 years.

CHAPTER TWO

REVIEW OF THE RELATED LITERATURES

2.0 INTRODUCTION

Every day man, wherever he may be on the earth's surface has to live with the weather. In regions of the world where weather exhibits day to day changes it is general to open a conversation with a few commands about the weather, with the result that we are made more and more aware of the elements and the part they play in our lives.

In the more developed countries the weather forecast is listened to frequently, for it helps one to decide just how to dress in order to be at ease with the weather. In less develop areas, where such a service may not be available, man just awaits the occurrence of changes and then does his best to adapt to them. `

The sensitivity of a human population to a group disease under global change depends on the combined responses of the pathogenic vector climate and host population. This combination has the potential to generate significant complexity. The geographical location is also a key determinant of the sensitivity of a species to environmental change. A change in the suitability of the weather within the current geographical distribution of the disease will after the development, survival and reproduction rate of vectors and pathogens and so affect the intensity of disease transmission and resultant exposure of the population to the disease. The extent to which the exposure changes, following a new introduction of a vector or pathogen or a change in the density of an endemic vector with climate change, depends on the position of the

particular habitat relative to geographical distribution of the vector or pathogen in a relation to climate.

There is a general agreement that weather has a profound influence on human well-being. Most of the researches have been done by medical scientists and a minor amount of the work has been performed by climatologists. This section will attempt to describe much of the known relevant research that have been done on this area for example; some of the researches suggest that extreme weather events appear to have the greatest influence on health. Driscoll (1971a) correlated daily mortality for 10 cities with weather conditions in January, April, July and October and found that large diurnal variations in temperature, dew-point and pressure were associated with many high mortality days. In addition, hot humid weather with concomitant high pollutant concentrations were also contributory mechanisms other studies do not attribute large variations in mortality to extreme events, but rather to the normal seasonal changes in weather (Ericsson,2010).

Climate has potential to alter the average exposure of human populations to vector-borne diseases by changing the geographical distribution of condition that is suitable for the vector and diseases pathogen. An increase in global temperature will result in an expansion of warm temperature regiment into higher altitude and latitudes. Any associated changes in rainfall in tropical and subtropical zones will also render habitats more or less suitable for vector. In addition, the implications of the asymmetrical increases of temperature with global warming for the epidemiology of victor-borne disease need to be clarified. Greater effects of low temperatures on vectors survival, behaviour, and disease transmission in cold limited climates than from smaller and less frequent increases in extreme maximum temperatures. These changes would make temperature environments more receptive to many tropical

vector-borne diseases while having less negative efforts on tropical environments (Gagge, 1979).

There is no reason to believe that vector-borne diseases are exception to experience of small and gradual changes in seasonal activity and expansion of ranges to higher altitudes and latitudes. The issue for workers in the field is to establish adequate baseline data on seasonal transmission patterns, prevalence or disease and geographical distributions, benchmarks to monitor and assess the consistency of changes with known physiological processes and sufficiently accurate monitoring data in strategic locations to be able to detect the changes as they occur around species range boundaries initially (Griffiths, 1976).

Several specific body disorders such as heat stroke occur only under particular climatic conditions. Likewise the outbreak of several illnesses and diseases are induced by climate, indeed, the periodic or seasonal nature of outbreaks of some human diseases suggest that weather conditions play important role (Ayoade, 1982). In addition, many important diseases are highly sensitive to changing temperatures and precipitation. These include common vector-borne diseases such as malaria, cholera, typhoid and dengue as well as other major killers diseases such as malnutrition and diarrhoea. Climate change already contributes to the global burden of disease, and this contribution is expected to grow in the future (Healthscout, 2010).

Weather and climate have affected human health for millennia. Now, climate change is altering weather band climate patterns that previously have been relatively stable. Climate experts are particularly confident that climate change will bring increasingly frequent and severe heat waves and extreme weather events, as well as a rise in sea levels. These changes have the potential to affect human health in several direct and

indirect ways, some of them severe. Heat exposure has a range of health effects; from mild heat rashes to deadly heat stroke Heat exposure can also aggravate several chronic diseases, including cardiovascular and respiratory diseases (Hore, 1979). The results can be severe and result in both increase illness and death. Heat also increases ground-level ozone concentrations, causing direct lung injury and increasing the severity of respiratory diseases such as asthma and chronic obstructive pulmonary diseases (Ilemona, 1983).

The world's climate is showing signs of a shift, becoming warmer, with more precipitation and weather extremes. Potential effects of this climate influence are lively to include more variable weather, stronger and longer heat waves more frequent heavy precipitation events, more frequent and severe droughts, extreme weather events such as flooding and tropical cyclones, rises in sea level and increased air pollution (Kalkstein and Valimont, 2008).

The variation from year to year in the general character of a particular season is reflected in the degree of severity of the outbreak of certain diseases. Every facet of human life is under the constant influence of the atmospheric environment, through the nature, occurrence and variability of its critical characteristics. Weather more than any other element of the environment exercise considerable influence on man (Kaplan, 2009).

Despite the recognition if the incidence of climate on human physiological processes and outbreak of disease, relatively very little, research has been directed at studying the actual health consequences of influence of weather on health especially in Kafanchan.

2.1 CONCEPTUAL FRAMWORK

2.1.1 Disease Triangle

The location and distribution of health facilities in space as well as government expenditure on health, according to Meade, Florin *et al*. (1998) in their concept of disease triangle are a part of habitat. The concept of disease triangle as advanced by Meade *et al (*1988) provides explanation for the variation in space of human disease and health. The triangle which has its vertices habitat, population and behaviour explains the causes and spread of disease over space.

While habitat in the triangle comprises both the biotic and abiotic elements of the environment, population is concerned with humans as organisms and host of diseases. The observation aspect of culture emanating from cultural precepts, economic constraints, social norms and individual psychology is implied by behaviour in the disease triangle.

Habitat conditions that are of consequence to an individual`s health status include houses and work places as well as their conditions. Conditions here, include whether there is adequate ventilation, facility for heat regulation what materials the roofs and walls are made of, location of kitchen, availability of piped borne water and flush toilets as well as the presence of allergenic materials within the house. Waste disposal, drainage condition, number of people living together and road conditions, whether tarred or untarred are also components of habitat. Transport system as well as the availability and accessibility of health facilities and government are also part of habitat in the disease triangle.

Population involves those elements that have implications for an individual`s susceptibility or resistance to disease. These include genetics, age, immunology, nutrition and literacy.

The concept of disease triangle is apt in the study of Some common diseases essentially because the latter is largely habitat dependent and its prevalence is affected by habitat, population and behaviour. For example, while the pathogens vectors breed well in puddles of still water found around the home or in unhygienic water storage conditions within the home, its continued existence is encouraged or discouraged by conditions within the home such conditions include whether windows are screened, cleanliness of the toilet, bathrooms, kitchen, adequacy of ventilation and the availability of temperature regulation facilities among others.

The epidemiological climate approach is concerned with macro and micro-climates. According to this approach, the macro-climate is climate in the ordinary meteorological sense consisting of the elements of weather temperature, rainfall, humidity among others. While micro-climate is the sum of those intimate living conditions in which a given individual finds himself, which affect his susceptibility to illness and condition resisting against it (Adebayo 2000).

2.2THE ELEMENT OF WEATHER AND DISEASES

2.2.1 Effect of Temperature

The impact of temperature on morbidity and mortality can be assessed at both the seasonal and daily level. The variability in occurrence of numerous illnesses is linked to somewhat predictable seasonal trends in temperature although significant year to year differences do occur.(Campbell and Corvalan,2009).Medical disorder such as

bronchitis, peptic ulcer, adrenal ulcer, glaucoma, goiter, eczema and herpes zoster are related to seasonal variations in Temperature. Heart failure (most often myocardial infarction) and cerebrovascular accidents represent two general mortality categories that have been correlated many times with ambient temperatures (Hoeprich, 1977).

Complications from these disorders can be expected at higher temperatures since the body responded to thermal stress by forcing blood into peripheral areas to promote heat loss through the skin. This increases central blood pressure and encourages contraction of blood vessels near the core of the body. However, increases in heart diseases are also noted at very cold temperature as well (Michael1995). Strong negative correlations have been found between winter temperature and deaths in certain North America, northern Asian and European Countries (Hoeprich, 1977).

The degree of seasonality in the climate of a region also appears to affect mortality rates. Katayama and Momiyama – Sakamoto (1970) reported that Countries with smaller seasonal temperature ranges exhibit steeper regression lines in temperature mortality correlations than do Countries with greater temperature ranges. Maximum death rates in warmer countries are found at below normal temperatures, and in cooler countries similar temperatures will produce no appreciable rise in mortality.

There are conflicting evidences concerning the impact of daily temperature fluctuations on human mortality some studies contend that mostly long-term (i.e monthly and annual) fluctuations in temperature affect mortality (Sakamoto and Katayama-Sakamoto, 1970) and only small, irregular aberrations can be explained by daily temperature variability. However, Kalkstein and Volimont (2008) report that daily fluctuation can increase mortality rate by 50% in certain cities. This has been

corroborated in a detailed study of New York City Mortality where large increases in total and elderly mortality occurred during the 1980 heat wave.

Much of the temperature – mortality researches have concentrated on heat and cold episodes. It appears that hot weather extremes have a more substantial impact than cold, and many "heat stress" indices have been developed to assess the degree of impact. Driscall (1971b) related in different metrological variables with total mortality and other more specific mortality classes (cause of death, age) and identified high temperature and mortality.

Although most researchers have preferred the use of maximum temperature as the primary predictor of mortality, others continue to utilize average daily temperature as their primary weather statistic. While Kallamullah (2002) found that maximum temperature with a 1 – day lag was the single most important predictive weather/mortality variable Griffiths (1976) work at strictly with daily average temperature to evaluate cardiovascular diseases; others have even used weekly averages (Kaplan, 2009). Those who used daily averages cite the importance of warm nights in contributing to mortality, something that is neglected when utilizing maximum temperatures alone (Gagge, 1979). However, others report that daily averages tend to mask the effect on mortality of large daily oscillations in temperature (Doney, 2008). During extreme heat episodes, heats stroke risk is increased as demonstrated by the 1980 heat wave in St. Louis, which resulted in a tenfold increase in total deaths.

Most researches indicate that mortality rate during extreme heat vary with age, sex, and race. Miller (1970) found that mortality rate during heat waves increase with age. The elderly seem to suffer from impaired physiological responses and often are

unable to increase with advancing age. (Malek, 1999), and many of the medications commonly taken by the elderly have been reported to increase the risk of heat stroke (Gagge, 1979). Many studies have provided evidence that mortality rates increase during period of cold weather. In general, total mortality is about 15% higher on an average winter day than on an average summer day (National Center for Health statistics, 1978). However, increases in mortality during exceedingly cold period are less dramatic than their hot weather counterparts (Kalkstein and Volimont, 1984). The impact of cold on human well-being is highly variable. Not only is cold weather responsible for direct causes of death such as hypothermia, influenza, and pneumonia, it is also a factor in a number of direct ways. Death and injury from falls, accident, carbon monoxide poisoning and house fires are all partially attributable to cold (U.S. Department of Commerce, 1984).

Cold has caused some people to suffer from hypothermia. The cold has also created some eye-catching art, and caused us to repeat the cold and illness mantras we have heard all our lives. The cold allows the virus itself to be more fit and able, and of course, the biggest issue is we get together in the cold weather and congregate and we sneeze and cough "said UT Houston Infectious Disease Professor Dr. Charles Ericsson. Moreso, cold air can trigger asthma. The cold can increase blood pressure because it constricts blood vessels and the body reroutes blood to the vital organs. And if you add exertion some people with heart problems can end up with chest pain.

Furthermore, temperature affects many parts of the malaria life cycle. The duration of the extrinsic phase depends on temperature and on the species of the parasite the mosquito is carrying .The extrinsic cycle normally lasts nine or ten days, but sometimes can be as short as five days. As the temperature decreases, the numbers of days necessary to complete the extrinsic cycle increases for a given plasmodium

species, P. *Ovale Vivax* and P. *Falciparum* have the shortest extrinsic incubation times and therefore are more common than P. and P. *Malariae*. The extrinsic phase takes the least amount of time when the temperatures is 27^{o}C. The time required for development of the Ookinete, the egg of the parasite, in the midgut of the anopheline mosquito, decreases as temperature increases from 21^{o} C or27^{o}C. Below 20^{o}C, the life cycle of P. *Falciparum* is limited Malaria transmission in areas colder than 20^{o}C, can still occur because Anophelines often live in houses, which tend to be warmer than external temperatures. Larval development of the mosquito also depends on temperature (Russell *et al*, 1963). Higher temperatures increase the number of blood meals taken and the number of times eggs are laid by the mosquitoes (Martens *et al,* 1995).

The intersections of the ranges of minimum and maximum temperature for parasite and vector development determine the impact of changes in temperature on malaria transmission. The minimum temperature for mosquito development is between 8-10^{0}C, the minimum temperatures for parasite development are between 14-190C with P. *Vivax* surviving at lower temperature than P. *Falciparum*. The optimum temperature for mosquitoes is 25-27^{0}C, and the maximum temperature for both vectors and parasite is 40^{0}C (Michael 1995). There are some areas where the climate is optimal for malaria and Anopheles mosquitoes are present, but there is no malaria. This is called Anophelism without malaria "which can be due to the fact that the Anopheles mosquitoes present do not feed primarily on humans or because malaria control

techniques have eliminated the parasite. If any changes, whether environmental or otherwise, were to occur to bring another species to the area that does act as a vector

for human malaria, then the potential for cut breaks of malaria is very high since there is no immunity in the human population then.

Air temperature, humidity and barometric pressure are often cited as a reason for headaches but until now there has been little concrete evidence increase to back this, Kenneth Mukamal of Beth Israel Deaconess medical centre in Boston and colleagues said. His team studied more than 7,000 men and women diagnosed with headache or migraine at the hospital emergency room between May 2000 and December 2007. The research team equally showed that each temperature increase of 5 degrees Celsus – about 9 degrees Fahrenheit – appeared to increase the risk of severe headaches by nearly 8 percent compare to days when weather was cooler. The study found that of all the environmental factors tested, higher air temperature in the 24 hours before a hospital visit was most closely associated with headache symptoms.(Kalkstein and Volimont, 1984).

2.2.2 Effects of Humidity

Humidity has an important impact on mortality since it influences the body's ability to cool itself by means of evaporation of perspiration. In addition, humidity affects human comfort and the perceived temperature by humans is largely dependent upon atmospheric moisture content. (Ayoade, 1988)The effects of low humidity can be especially dramatic in winter, when low moisture content induces, hosts upon the nasal pharynx and trachea. When very cold, dry air passes through these organs, warning occurs and air temperatures in the pharynx can reach 30 dog. F. The ability of this warmer air to hold moisture increases dramatically and moisture is extracted at a prodigious rate from the nasal passages and upper respiratory tract, leading to excessive dehydration of these organs. This appears to increase the chance of

microbial or viral infection since a rise in the viscosity of bronchial mucous seems to reduce the ability of the body to fight offending micro-organisms that may enter the body from the atmosphere. This explains why Greer and Fisman (2008) found negative correlation between relative humidity and winter absenteeism in a number of Canadian Schools.

In the summer, high moisture content during hot periods can lessen the body's ability to evaporate perspiration, possibly leading to heat stress. Recent weather/mortality models developed for the National Oceanic and Atmospheric Administration indicate that dew point temperature is directly related to mortality in several eastern cities when temperatures are very hot (Kalkstein and Volimont, 1984). Another summer study indicated that mental well-being may also be influenced by summer relative humidity (Persinger, 1975) found significant negative relationships between relative humidity and 'mood scores' which represent a measure of happiness. Persinger (1975) found relative humidity to be significantly related to a linear combination of three mood variables (vigor r= -82, social affection; r=76, elation r=-56).

More so, relative humidity also affects malaria transmission plasmodium parasites are not affected by relative humidity, but the activity and survival of Anopheline mosquitoes are. If the average monthly relative humidity is below 60% it is believed that the life of the mosquito is so shortened that there is no malaria transmission

2.2.3 Effects of Precipitation

Most of the precipitations/mortality researches to date have concentrated on the impact of snow and other forms of severe winter weather. Banzer (2009) found cold weather and snow to be statistically related to death from stroke and heart attack-a finding that has been corroborated by others. In a 1978 blizzard in Rhode Island,

emergency room admission for cardial infection related cases rose markedly three days after the storm, and mortality from ischemic heart disease showed a large increase for a five – day period after the storm. The authors attributed this rise to an increase physically and physiological stress imposed by the storm. Malek (1999) concurs, suggesting that an eight-day increase in deaths from ischemic heart disease following a number of blizzards was most likely a function of after-storm activities (snow shovelling, car pushing *etc*).

In a study on the effects of snow accumulation in five U.S cities Kalkstein (1984) has determined threshold values of accumulated snow above which mortality rates appear to rise. In New York, significant upward trends in mortality were noted the day after snowfall if two or more inches of snow had accumulated. In Detroit, where snow is more common, the snowfall accumulation exceeded six inches before mortality increase was noted. No significant relationship between snowfall accumulation and mortality was apparent in Chicago. Kaplan (2009) found increase in deaths from ischemic heart disease on, and for three days after, a four-inch or greater snowfall in Toronto and major peak in cardiovascular deaths in Minneapolis. Paul also appeared to follow days with heavy snows, with the rise most rapid the day after the day after the storm.

Summer rainfall appears to have a limited impact on mortality. Kalkstein(1984) has shown that a significant decline in mortality is experienced the day after summer precipitation events in all of the five USA cities studied (New York, Philadelphia, Chicago, Atlanta, Detroit). The precipitation event itself may have an indirect impact as the cooler temperatures coinciding with a summer rainfall provide relief from excessively warm weather. However in certain specific cases, rainfall might induce increases in mortality. It was found that fatal automobile accidents increased in

frequency during very light rain episodes (less than .01inch) and heavy rainfall (greater than 0.1 inch per hour).

Anopheline mosquitoes breed in water habitats, thus requiring just and right amount of precipitation in order for mosquitoes breeding to occur. Little is known about the biology of this aquatic phase (different type of water bodies in which to breed. Too much rainfall or rainfall accompanied by storm conditions can flush away breeding larvae. Not only the amount and intensity of rainfall, but also the time of the year, whether in the wet or dry season, affects malaria survival (Russell *et al,* 1963). Rainfall also affects malaria transmission because it increases relative humidity and modifies temperature, and it also affects where and how much mosquito breeding can take place.(Pampana, 1969).

2.2.4 Frontal Passages, Sunshine and Cloud Cover Impacts

Frontal passage may have a profound impact on well-being and mortally as large variation in weather conditions can occur in a very short time. Rapid changes in temperature have been shown to produce a number of physiological changes in the body. Rapid drops may affect blood PH, blood pressure, urination volume and tissue permeability (Persinger, 1975). Outbreaks of epidemics may also be related to frontal passage. In his study of 59 years of data, Persinger (1975) noticed sudden large increases in influenza outbreaks in Germany, Norway, and Switzerland often followed the passage of a surface trough. In general, these outbreaks occurred simultaneously with the influx of cold air over northern and western Europe (the passage of surface waves is often followed by rapid influx of cold air). The influenza outbreaks in Europe most frequently occurred between January and March when cold air masses most commonly intruded over the area (Fabian and Morry, 2003)

A number of studies have also found relationships between the numbers of reported migraine attacks and rapid changes in barometric pressure. Miller(1977) found fewer occurrences of attacks when barometric pressure was low. This was partially attributed to a decrease in sunshine during low-pressure intrusions, as solar radiation is a suspected triggering mechanism for migraine onset. However a Canadian Climate Center Study (1981) found migraine were mostly to occur on days with falling pressure, rising humidity, high winds and rapid temperature fluctuations.

Rusell *et al* (1963) cites some startling relationships between pressure changes and human well-being. He describes research that indicates that cancer mortality rate seems to increase during low-pressure fluctuations. He noted that rapid pressure fluctuations may penetrate buildings and propagate wave energy from their source like ripples in a pond. Humans appear to be quite sensitive to such changes. The reduction of solar radiation by cloud may also have effects on well-being. By increasing the brightness level, the autonomic nervous system is affected by contraction changes in the eye pupil. According to Persinger (1975), this increases the rate of physical activity and leads to a general feeling of well-being. Ericsson (2010) notes that the sun's ray cause chemical changes in neurotransmitter or hormone synthesis in brain, perhaps stimulating production of the hormone epinephrine, which stimulates the mind and body. Conversely, very low light intensities are often associated with states of relaxation, tiredness and sleepiness.

2.3 MALARIA

The name malaria is derived from the Italian Malaria, meaning bad air. The disease is also known as Paludism, from the Latin Palus, a marsh. Both names reflect the early opinion that the disease was spread by miasma, or mist, arising in marches.

From time immemorial, malaria has always been one of the most widespread human diseases, affecting mostly the inhabitant of tropical climates. It is also one of the oldest diseases. It is mentioned in the earliest Egyptian, Indian and China's writings and its clinical symptoms were described by Hypocrites 400 years before the Christian era (Wilcocks and Manson-Bahr,1976).

2.3.1 Transmission of Malaria

In nature, malaria is transmitted from man to man by Anopheles mosquitoes of which there are hundreds of species, some very efficient, others not so efficient, and still others not capable of transmission. Transmission depends not only upon the presence of gametocytes in the blood, but also upon the infectivity of these mosquitoes. Malaria can, however, be transmitted in other ways: by design or by accident, by the inoculation of blood from an infected person to a healthy person (Wildcocks and Manson Bahr, 1976). According to Richard Carter *et al* (2000) Malaria is a widespread tropical disease caused by a Parasite (Plasmodium) transmitted to human by mosquitoes.

Malaria is a parasitic disease caused by the introduction and reproduction within the human body of a Sanguicolous protozoan of the genus Plasmodium transmitted by a mosquito (the Vector), the female Anopheles (Luber and Prudent 1989).

2.3.2 Symptoms of Malaria

The incubating period of Malaria Parasite varies to some extent, depending upon the strain of plasmodium; it is approximately two weeks. In some instances, however, clinical manifestation may not appear for several months after the primary infection.

Plasmodium falciparum is the fatal form of malaria which can kill a non-immune person within a week or two of a primary attack unless appropriate treatment is given in time. In patients from countries in which malaria is not endemic and who therefore have no hereditary resistance, the primary attack does not at first show tertian periodicity of fever. It begins as a quotidian rise of temperature, with general malaise and a feeling of chillness, becoming tertian a few days later. The tertian fever, like that of P. *vivax* is accompanied by characteristic clinical syndrome of three stages – cold (lasting 1-2 hours, when the patient shivers and piles on the bedclothes), hot (lasting 3-4 hours, when the patient and his bedclothes are snaked in sweat and the temperature falls rapidly, to leave the patient relieved but exhaustedly (Michael, 1995).

In some cases there may occur marked prostration and occasionally the passage of dark red even block the destruction of the red blood cells by the disrupting malaria parasite and in part to anaphylaxis cause by hypersensivity to the strain of this parasite (Monath, 1993). Blood and mucus may be present in the stools, simulating dysentery of low grade fever for several days (Monath, 1993).

2.3.3 Endemic Malaria

In Africa, malaria is rampant everywhere, it is widespread in intertropical Africa, in the Savannah region; it also takes the form of small seasonal epidemic in some Sahara Oases. It is highly prevalent in Nigeria, Madagascar and Comoros.

Malaria is closely dependent upon the local climate, which influences the ecology of mosquitoes. This in turn determines disease condition, areas defined as halo-endemic, meso-endemia or hyper endemic according to the extent of the malaria problem.

In the hot, humid equatorial area, anophelixes find ideal conditions in which to lay eggs. Stagnant surface water, humid, water collecting in tree hallows, palm leaves and other hallow objects make ideal larval habitats for mosquitoes. Since these conditions remain stable where the rainy season last two to three months when they occur malaria is said to be occasional (Benzer, 2009).

Small increases in mosquito at low temperature were shown to increase the risk of transmission disproportionately, and it was concluded that vulnerable communities in malaria free areas are those with unstable malaria are likely to be at increased risk of future outbreaks. An increase of 12 to 27% in the epidemic potential of malaria transmission compared with current areas of endemicity has been projected as an indication of the sensitivity of malaria to climate change (Thomas, 2009)

Modelling studies indicate that higher temperatures will lead to an increase in the population that is exposed to malaria as a result of an expansion of the geographical distribution of vector-borne diseases into higher altitudes. A mathematical model, designed to identify malaria epidemic prone regions, was used to explore possible changes in epidemiology with projected global climate change in the African highland.

It was assumed free water for breeding sites would be available when higher temperatures occur because water is not purely limiting. Most malaria epidemics in the endemically unstable highlands are due o plasmodium *falciparum*, the cause of the most severe form of clinical malaria. A plea was made to accord these areas special status and recognize them as having a high risk under climate change. An increase in average temperature has the largest effect on epidemic potential where parasite development is limited by low temperatures in temperate areas consistent with the

conceptual models. Infected mosquitoes introduced through airports are also likely to survive longer in the future if there is increased rainfall and will therefore enhance the problem known as airport malaria (Miller, 1977).

Both the direct and indirect effects of increased temperature on anopheline mosquitoes, malaria parasites, and their host bas been examined. It was concluded that the most likely effects of climate change would be on the availability of surface water for larval habitats. It may be assumed that any increase in the density of foliage of plants growing in an enriched Co_2 atmosphere will provide more favourable shelter for adults of some species of mosquitoes, extending their longevity. If the residual soil moisture also increases as the water use efficiency of plant increases, there may also be an increase in the amount of surface water during the season and the expanded range of sheltered habitats preferred to above (Beniston, 2002).

The malaria situation appears to be worsening globally. There have been, recently, reported cases of sporadic epidemics in areas where transmission has been interrupted. In recent years there has been resurgence of malaria in Europe (Matthew, 2005).

In malaria endemic, areas those at greatest risk of dying from the disease are children under age 5 years, pregnant women, people moving from non-malicious zones for reasons of work, migration, refuge, war or tourism and travellers who visit endemic countries, thereby causing consequent complications of abortion, low birth weight babies, still births and neonatal mortality. About 60% of all miscarriages are due to malaria.

Malaria remains a threat to majority of people in Africa. It is one of the major health problems in one out of every ten persons admitted into the hospitals. Each year

malaria kills about three hundred thousand (300,000) people in Nigeria and about one million (1000, 000) people most of them children in Africa.

The disease remains major causes of high mortality and morbidity rate among fewer than five children in Nigeria it kills a child some where in the world every 30 seconds, but majority in Africa. Malaria is a major factor in Africa's high rate of infants and maternal mortality. It affects primarily the poor who tend to live in malaria endemic areas and in dwelling that offer little or no protection against mosquitoes (Coleman, 2010)

The study conducted in a rural area of Giomea. A high proportion of children were infected by malaria parasite. It consisted of 784 children less than 5 years of age and 36% of them had malaria. The period of high transmission occurs between May and November (Hore, 1979).

According to study conducted in the highland of Western Kenya show 23 children were admitted into the hospital with malaria aged between 1 and 6 years where malaria occurs as epidemics due to low immunity. While before now malaria, diarrhoea and acute respiratory infection were reported to be the major disease in Sudan. Malaria is now considered endemic throughout the country. In two years the prevalence rate from 198/1000 to 250/1000. Above 40% of our patient attendance nation wide was due to malaria with a current estimate rate of 7-8 million cases and 35,000-40,000 deaths per year (Greer, 2008).

According to a research conducted in Sudan about 670,000 under five children die from preventable diseases every year. Malaria, acute respiratory infection and diarrhoea disease combined with malnutrition are leading causes of morbidity among under five, however, the leading causes of death is malaria (29%) followed by

diarrhoea (13%) and respiratory infections (11%).In a community survey conducted 130km South of Bungoma district in Western Province of Kenya revealed prevalence of malaria transmission which occurs throughout the year. It was reported that it was the principal cause of death at the district hospital and is a major contributor to the province's high mortality rate among children aged less than 5 years estimated to be 110 deaths per 1000 live birth.

In rural areas, the rainy season is often a time of intense agricultural activity, when poor families earn most of their annual income malaria makes them oven poorer (Coleman2010).

The world declaration on the control of malaria adopted at 20 to 27 October 1992 conference in Amsterdam, states that malaria afflicts, the poor and under-privileged most severely due to poor standard of living.

Tropical Africa (Africa South of the Sahara) with about 9% of the world's population is the worst affected by the malaria scourge. Estimates show that about 90% of the World's deaths occur in this region of the world. Malaria is directly responsible for one in five childhood deaths in Africa and indirectly contributes to illness and deaths from respiratory infections, diarrhea disease and malnutrition (Miller, 1977).

In Nigeria, transmission of the disease occurs through out the country in both rural and urban areas and also throughout the year, Nigeria is therefore, a malaria endemic country. Due to incomplete and irregular reporting the actual incidence of malaria mortality rate are unknown, however, current estimate attributes 200-300 thousand deaths due to malaria in the country every year. Also malaria ranks among the top three causes of death and also accounts for 25% of infant mortality and 30% of all childhood deaths and is associated with about 11% of all maternal deaths. Studies

evaluating autopsy records in Nigeria in the early fifties showed that malaria was responsible for 10-12.5% deaths in infants and children (Miller, 1977).

Malaria is consistently the commonest cause of out-patient visits in our health facilities accounting for 63% of all diseases reported in these facilities and remain one of the leading causes of morbidity and mortality in the country. It is estimated that approximately 50% of the adult population experience at least one episode of malaria per year.

The malaria situation appears to be worsening globally. There have been, recently, reported cases of sporadic epidemics in area where transmission had been interrupted. In rent years there has been resurgence of malaria in Europe from 20,000 indigenous cases in 1992 to more than 100,000 in 1995. In addition, about 3000-4000 imported malaria cases are reported yearly in Europe (Miller, 1977).

Apart from the disease burden which can be measured in terms of morbidity and mortality, malaria burden can also be measured in socio-economic terms. That is the social and economic costs of malaria to an endemic country. These cost can be attributed to treatment cost, productivity lost and earning loss due to days lost from illness or from look after an ill person, cost of providing treatment facilities and cost of years lost from pre-mature death and also cost due to absenteeism from school; Malaria also impedes social and economic development making the poor poorer (Benzer,2009).

Malaria is also thought to drive away potential development opportunities by making certain zones unsuitable for habitations, deterring international trade and foreign investment and jeopardizing the development of sectors such as tourism. Economic development may also be retarded by reduced access to international flows of

knowledge and technology because companies may not be willing to send representatives to malarious countries. Malaria is therefore, both a cause and consequence of under development (CHRR, 2008).

2.4 MENINGISTIS

This is an infectious disease which is caused by a specific organism, the meningococcal which invades the blood stream and is carried to the meninges where it sets up a purulent inflammatron, producing the main clinical symptoms and signs of the disease (Matthew, 2005).

Meningistic is an inflammation of the leptomeninges and underlying subarachnoid cerebrospinal fluid. Cerebrospinal meningitis is endemic throughout the tropics and sub-tropics. In the temperate zone the disease is sporadic, but occasionally breaks out into devastating epidemics (Wilcocks and Manson –Bar, 1976). The disease was first described in the epidemic form in the nineteenth century, but it cause remained unknown until 1997 when Weichselbaum described on intracellular diplococcus now commonly called the "Mening^{b}coccus" as the etiologic agent. The meningococcus is antigenically divisible into four groups which are groups A, B, C, and D of all these groups, group A is the most prevalent in Africa, Group B has been responsible for outbreak in Europe.

The organism (Meningococcus) is a gram negative diplococcus. It is common but by no means always found within polymorphonuclear leukocytes. Its occurrence in large number outside the cell is considered a grave pronotic sign, since phagocytesis or ability of the leucocyte to engulf and destroy the bacteria is the main defence mechanism of the body against the disease.

The word meningitis, *Sankorau* (Hausa word- stiff neck) is well known disease in this part of the world. It has been documented as far back as the fifteenth (15^{th}) Century. It has been associated with high death rate and morbidity (Hoeprich,1977). Cerebro-spinal meningitis is a major public health problem in countries in the so-called meningitis belt of Africa, a zone that stretches across the middle of the continent from the Atlantic ocean in the West to the Red Sea in the East, for a long time now, this zone has always witnessed epidemics resulting in high death rate, leaving a trial, blindness, deafness and paralysis. (Sawa, 2007). These zones include Cameron, Central Africa Republic, Chad, Benin Republic, Ghana, Burkina Faso, Niger, Mauritania, Nigeria, Senegal, Ethiopia, Togo and other countries in this zone (Meningitis Belt).

The outbreaks are caused by meningococcus (a bacterium) the disease is associated with hot, dry climate conditions, poor environmental conditions and low socio economic standards. In the absence of prompt treatment, the fatality rate is high (CHRR,2008).

Several micro-organisms have been isolated causing cerebrospinal meningitis. These are meningococcus, pneumococci, Haemophilusinfluenae, staphylococcus, streptococci, and some strains of viruses. Generally, there are three types of cerebrospinal meningitis. These are bacterial meningitis, viral meningitis, tuberculosis, meningitis (CHRR, 2008)

2.4.1 Symptoms of Meningitis

Infection of the heat regulating centre leads to continuous pyrexia resulting into fit in adult or convulsion in children. Whenever the neck region of the meninges covering the spinal cord is irritated and the neck is flexed forcibly the patient experiences

severe neck pain. Hence he prefers to straighten the neck always leading to neck rigidity similar irritation of the meninges around the sacral Segment of the spinal cord brings about inability to straighten the knee when the hip is flexed (positive Kerning Sign). A total of 41,930 Meningitis cases and 3,639 deaths were reported. A few studies is Sub-Saharan Africa have reported the rates of bacterial Meningitis during non-epidemics period and characterized Meningococci the specific agent causing endemic Meningitis.

The incidence of cerebrospinal Meningitis according to the international Journal of Public Health of 1999 (page 499) says that Meningitis is higher in inter when upper respiratory track infections occur and during the dry season when people Migrate from the rural areas and return to their villages when the rain begins. Also it is reported that the group affected is mostly children and the disease caused by enterovirus is, more common in the summer and early fall than in other seasons of the year.

The number of carriers is inversely proportional to the number of people affected by the organism. Those who get meningitis do so early in their exposure to the organism when the numbers of carriers are at their peak the number of clinical cases will be reduced.

In the year 1996 in India an epidemic was recorded in which about 37% died and those affected were below 1 year of age. The India outbreak was most severe in congested areas. (Wilcocksand Manson-Bahr, 1976). Also recorded that special conditions exist in Africa which favour the occurrence of epidemic waves.

There was a record of 10,000 cases each year within an average mortality rate of about 12% in some area like northern Sahara, equatorial forest to the South, stretching

from the Sudan West wards through Chad and Northern Nigeria. This was discovered by the World Health Organization (W.H.O) in 1969. The discovery of the epidemic wave is that meningitis occurs frequently between the month of January and March in which the weather is dry and the night is very cold. At other time of the year in this area, carriers maintain the infection at a low rate and actual disease is sporadic. There seem to be no evidence that disease is provoked by organisms of increased virulence, but lack of immunity in individual is probably a factor (Adefolalu 1984).

The organism is contracted from one person to the other via the nasopharynx and the nasal and bucca discharged one organism gain entrance into the meninges, the meninges become inflamed leading to Meningitis. The viral type of meningitis is usually insidious in onset, while that of bacteria is more sudden. Whenever this organism or infection spreads to the ventricles of the brain, the offending organism and the toxins; the infection of the cerebrospinal fluid by pyegenic organisms makes the fluid to become purulent and cloudy or milky in colour as opposed to the colourless nature of the fluid. This cloudiness and increase volume of cerebrospinal fluid leads to increase intracranial pressure and blood pressure. The increase intracranial pressure leads to severe headache (Greer and Fisman, 2008).

Generally speaking the statistical data about cerebro-spinal meningitis (like other activities) in Africa are inadequate and deaths are under reported. The under reporting is mainly due to the fact that majority of the cases are in the neglected, under privileged, deprived ignorant and poverty stricken sector of the community, (the urban slum, the belt of poverty and neglected rural areas) (Coleman, 2010).

According to the Professional Nurses Journal October 2001, Meningitis is more likely in childhood than at any other age and there an estimated 1,600 cases per year in England and Wales in children under the age of five (5) years.

As earlier mentioned the causative agent of meningococcal meningitis was identified only in 1887. Major outbreaks were subsequently noted during the two world wars and epidemics have been reported on African continent since 1909. Asia has had some major epidemics of Meningococcal disease in the last thirty (30) years (China 1979 and 1980, Vietnam 1977, Mongolia 1973 -1974 and 1994-1995, Saudi Arabia 1987, Yemen 1988. The largest and most frequently occurring outbreaks have been the semi-Arid areas of sub-Sahara Africa. This area, known as the African Meningitis belt stretches from Senegal to Ethiopia, with an estimated total population of approximately 300 million.

Cerebro-spinal Meningitis is not new to the Savannah region of Northern Nigeria of which Kafanchan is a part major epidemics tend to occur, on the average every decade with high mortality rate. There is however, a yearly seasonal variation in the prevalence of the disease which is endemic in this part of the country. In other places the occurrence is determined in some degree by such factors as overcrowding and low standard of hygiene (Buchaman, 1955) P.45. Cerebro-spinal Meningitis (CSM) is partly a weather stress disease, it shows a markedly seasonal character. The invariably begin with drier and colder weather towards the end of November and reach its peak in March and April and Subsides rapidly in May at the onset of the rainy season. It has been suggested that they are related to the dry wind, dust heat which is the characteristic of weather in Northern Nigeria at this season; but the meteorological parameter which most closely parallels them is the mean minimum

temperature, which is at its lowest in December and January (13%). When the epidemic begins and rises steeply until May, follow closely the curve of weekly notification drops precipitously. A possible explanation of this may lie in the fact that during the colder weather the Northern dwellers tends to crowd together in doors during the Night, instead of sleeping outdoor as they do in the hotter season because of poverty six to ten people have access to a single room thereby making it over crowded. Experience in Northern Nigeria has shown that proximity and overcrowding are cardinal factors in the transmission of the disease. Some support is lent to the climatic hypothesis by the fact that throughout the Northern Nigeria the disease occurs in annual waves peaks in the period of February to May (Beniston,2002).

2.5 DIARRHEA

A manual on management of acute diarrhoeal (1983) defined diarrhoea as the passage of three or more watering stools in a day. Diarrhoea simply means a change in the consistency of the stools to being abnormally loose or fluid measure in the frequency of stools to more than is normal for the age of the person (Akinbobola And Omotosho, 2004). Diarrhoea is the passing of increased amounts (more than 300g in 24 hours) of loose stools. It is often caused by a virus or bacteria and can be acute (short term) or chronic (long term) lasting more than two to three weeks.

According to Rutherford (2002), most people are affected by diarrhoea at some time in their lives. It is often accompanied by stomach pains, feeling sick and vomiting. It is usually due to consumption of drinking water contaminated with bacteria under cooked meal and eggs or inadequate Kitchen hygience in other words on infection. Globally, seven children die of diarrhoea every minute, mainly due to poor quality

drinking water and malnutrition, which still affect the majority of the world population.

Diarrhoea is caused by bacteria of the genus Shigella; the terminal portion of the small intestine may be involved in particularly severe infections. Bacillary dysentery has a long history. It has always been associated with conditions of overcrowding and poor sanitation, and has always been a major feature in military campaigns, for instance in the Gallipoli campaign of World War I where it was a main cause of illness and death and the Middle East campaign of world War II. It is prevalent throughout the developing countries particularly in the tropics, but it also occurs epidemically in temperate climates as in the water-borne Montrose outbreak in Scotland reported in 1968. Mental hospitals and institutions for children are particularly prone to outbreaks.(Critchfield 1960).In temperate climates the incidence was formerly highest in late summer and early autumn, but the periodicity has changed in Britain where the peak has recently tended to occur in winter or spring. In the tropics and subtropics the peak is expected during or after the period of heavy rains, when houseflies are more abundant.(Critchfield,1960)

Dysentery bacilli are expected in the faces of patients in the acute stage of the disease, and in those of patients whose intestinal lesions have not completely healed. Infection takes place through the mouth, and many of the ingested bacilli are probably destroyed by the gastric juice; large numbers may be required for experimental infection conjectured that the decreased incidence of St. Fleneri in Britain is due to the fact that the large closes needed for infection do not occur where may be able to infect with a small close, persisting where personal hygience is poor (Malek,1999).In hot countries bacillary dysentery tends to breakout during the early summers, but as the heat increases the sun may sterilize exposed human faeces and kill fly maggots

and the disease may decline. In temperate countries some dysentery tends to be most prevalent in winter.

There is abundant circumstantial evidence that house flies (Muscadomestica), where they are numerous, are important carriers of Shigellae from the faeces of infected persons (especially in the acute stages of the disease) to other people, perhaps largely by contaminating food. Shigellare have been isolated from the intestines of flies and from flies crushed in fluid media. The infection, however, seems to be conveyed mainly on the feet of flies, though also probably via their vomit and faeces.(Akinbobola and Omotosho,2004).

A part from flies, Shigellae are probably transferred from infective material to other people, or to food (blanemange, pies, watercress, cheese, etc) by direct contact of unwashed fingers sailed with faeces. This is important, especially in children playing together, but also in the tropics where the mothers generally feed their young children by hand after weaning. Acute diarrhoeal disease is a very common cause of illness in infants in the tropics.

Water can be the vehicle of infection, and many outbreaks of this kind have been reported, for instance in Java. Some have been explosive outbreaks associated with hepatitis, which has occurred in waves following the dysentery after a delay of days or more usually weeks and thus reflecting the different incubation periods of the two diseases. Sometimes the sanitary control of the water-supply breaks down, for instance when wells are contaminated from nearby cesspools, or when chlorination fails.

Carriers of Shigellae are either convalescent patience who remain infective for short periods, usually a week or two, or chronic carrier (a minority). Who may be infective

for severed months excreting Shigellae intermittently Carriers of the shigabacillis tend to persist much longer than carriers of the floxner group, and the shiga carriers tend to be ill, with chronic dysentery and relapses.

2.5.1 Symptoms of Diarrhoea

The symptoms of diarrhoea includes inability to drink liquids because of vomiting, dehydration excreting small amounts of dark urine, blood in the motion, pus in the motions, drowsiness dry mucus membrane and thirst, increase amount of loose stools, Nausea, vomiting and cold sweats, abdominal pain, abdominal cramps, distension.In developing countries of the world, infectious diarrhoea kills about 4 million people per year. In the United States, it is estimated that children younger than 5 years of age experience more than 20 episodes of diarrhoea (disease each year) with about 400 deaths per year attributed to such episode.(Trop, 1963)

According to a recent WHO estimate, every child under 5 years of age in the developing world suffers from an average, two to three episodes of diarrhoea a year, in the first 2 years of life as many as 20 per 1,000 may die from acute diarrhoea (ORT) for nurses and other health workers (1986) stated that: Acute diarrhoea occurs throughout the world but it is a very serious problem in developing countries. Globally, it affects millions of children every year, and many of these die. It is a leading cause of death among children below the age of 5 years.

Diarrhoea is the most common affliction of travellers to developing countries occurring in 20% to 50% of those travelling to destinations in tropics and subtropical area of Latin American, Africa, and Southern Asia. Even within the developed world, severe or temporary sewage system failures of flooding may contaminate water supplies and diarrhoea illness may result.

Diarrhoea is most common as breast feeding comes to an end and continues for at least 3 months after its Cessation. In the Village of Imesi, Nigeria this was the time of greatest nutritional risk and many children developed diarrhoea.

The study has also shown that while diarrhoea is just as frequent during the early weaning period, when the child is still being breast fed, it is the alter period, when breast feeding has just stopped, that mortality is so high. In their report they stated that diarrhoeal disease in young children has been and continues to be the scourged of tropical of tropical land in the temperate zone and in more technically developed countries. Irrespective of climate it is more prevalent in the lower economic strata where poverty goes hand in hand with ignorance overcrowding poor hygiene, limited food supply and inadequately unsafe often unclean drinking water (Luper and prudence 2009).

2.6 MEASLES

Measles, not just another viral exanthema is a highly communicable disease predominantly of the pre-school and early school-age children (2-5 years). It is one of the six killer diseases of childhood caused by a paramyxovirus commonly seen in the tropics. It is characterized by fever, cough, coryza, and conjunctivitis. In other words, measles is also called rubella, and is a highly contagious respiratory infection that is caused by a virus. It causes a total – body skin rash and flu-like symptoms, including a fever, cough, and runny nose.

The measles virus is from the family parmyxovirus which normally grows, in the cell that lines the back of the throat and lungs. Measles is a human disease and is not known to occur in animals. When the virus is breathing into the respiratory tract of an uninfected individual, it passes through the cells of the tiny bronchioles into the blood

stream; the virus enters into the lymphatic system and begins to multiply or about 10-14 days (incubation period)(Duke, 2003).

2.6.1 Symptoms of Measles

Since measles is caused by a virus, there is no specific medical treatment and the virus has to run its course. But a child who is infected should be sure to receive plenty of fluid and rest, and be kept from spreading the infection to others (Healthscout, 2010). Severe measles is more likely among poorly nourished young children, especially those with insufficient vitamin A, or whose immune systems have been weakened by HIV/AIDS or other diseases.

Most measles-related deaths are caused by complications associated with the disease. Complications are more common in children under the age of five, or adults over the age of 20. The most serious complications include blindness, encephalitis (an infection that causes brain swelling) severe diarrhoea and related dehydration, ear infection or severe respiratory infections such as pneumonia. As high as 10% of measles cases result in death among populations with high levels of malnutrition and a lack of adequate health care (Coleman, 2010).

Unvaccinated young children are at highest risk of measles and its complications, including death. Any non-immune person (who has not been vaccinated or previously recovered from the disease) can become infected. In 2008, about 83% of the world's children received one dose of measles vaccine by their first birthday through routine health services-up from 72% in 2000. Two doses of the vaccine are recommended to ensure immunity, as about 15% of vaccinated children fail to develop immunity from the first dose.

The extensiveness of the disease at any time depends upon the number of susceptible persons in a community. Children who are malnourished are mostly, susceptible to the disease. Young infants between 4 and 6 months are vulnerable to measles because of reduced maternal anti bodies in women with immunosuppressive disease (Coleman, 2010). The disease kills an average of one out of every ten afflicted children in rural areas where treatment possibilities are very few or even non-existent. Though as simple as the disease may look and despite that it is preventable, it is one of the diseases with high mortality rate in children (Rey, 1970). Most deaths are caused by complications of the viral infection. There is increased mortality rate in infants below the age of nine (9) months who are too young to have been vaccinated against the disease since rates of sero-conversion are low. Measles is a handicap for the future of the community since it wipes out or disables a large proportion of its children; therefore it calls for intervention in order to enhance or promote the future of the community. (Rey,1970).

Despite the advent of measles vaccine, the illness remains one of the most severe infectious diseases of the developing world. Over two Million children die of measles each year. The greatest mortality rate is seen in the poor regions of the world where access to basic health care services such as clinics, vaccines etc are limited (Coleman, 2010).

The disease kills an average of one out of every ten infected children especially in the tropics. Most deaths are caused by complications of the viral infection such as when it is super imposed by other bacterial infections such as streploredpneumonea or when it suppresses the immunity of the individual. Between 1992 – 1997, the West Africa sub-region reported the highest measles morbidity (121 measles cases per100,000 inhabitants) while significant, reduction in reported measles incidence and mortality

was observed in South Africa sub-region (Coleman 2010). While the African nations are still battling with the disease, the Asian and European Countries have long ago eliminated it to almost an in-existing rate. In China, the average annual measles incidence decreased from 9.0 to 5.7 cases per 100,000 population and mortality rate falls from less than 0.3-0.1 death per million population as at 2000 (Coleman, 2010).

Most of the studies like on association between climatic variation and disease incidence could not account for the complex web of factors that influence diseases and thus may not be reliable indicators of future change. Most of the studies only used a single parameter of climate i e. temperature and correlate it with a single disease. There is no study to the best of my knowledge that correlates several climatic elements with common diseases especially in the study area. This is one of the concerns of this study. Though issues on climate and diseases in Nigerian are much discussed as mentioned earlier, this work is however to the best of my knowledge the pioneer work in Kafanchan .This is the gap that this study has filled.

CHAPTER THREE

THE STUDY AREA AND METHODOLOGY

3.1 THE STUDY AREA

As a result of the 1976 Local Government reforms,Jema'a division (Jema"a federation) became a Local Government council of its own, which comprises eleven(11) districts, namely; ,FadanKarshi, Nok, Ayu, Kwoi, Ankung, kagoma, Nimzam, Godogodo and Gwantu,Bedde,Takau. By 1997 certain districts were carved out leaving Jema'a Ungwanfari, Gwadogwado and Kagoma, to form today's Jema'a Local Government with its headquarter at Kafanchan. Kafanchan is located in Jema'a Local Government Area it is found between latitudes 9 10'and 9 30'N and longitude 8 00' and 8 30'E(fig3.1).The Local Government is bounded in the East by Kagoro in Kaura Local Government Area, in the North by Zonkwa and UngwaRimi District of Zangon-Kataf Local Government Area and in the South by Nassarawa State and in the South East by Sanga Local Government Area respectively. The study area has witnessed a tremendous growth in population in the last 30 years (Ishaya and Abaje, 2008).

It has a population of 278,735 (FRN, 2006). With annual growth rate of about 3% in the state (FRN, 2006), the 2009 projected population was about 308,581 people. Presently, it has twelve wards namely: Jagindi, Godogodo, Atuku, Gidan – Waya, Maigizo, Kaninkon, Kagoma, Asso, Kafanchan 'A', Kafanchan 'B', Bedde and Takau (Ishaya and Abaje, 2008).

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3.1.1 Location of Kafanchan

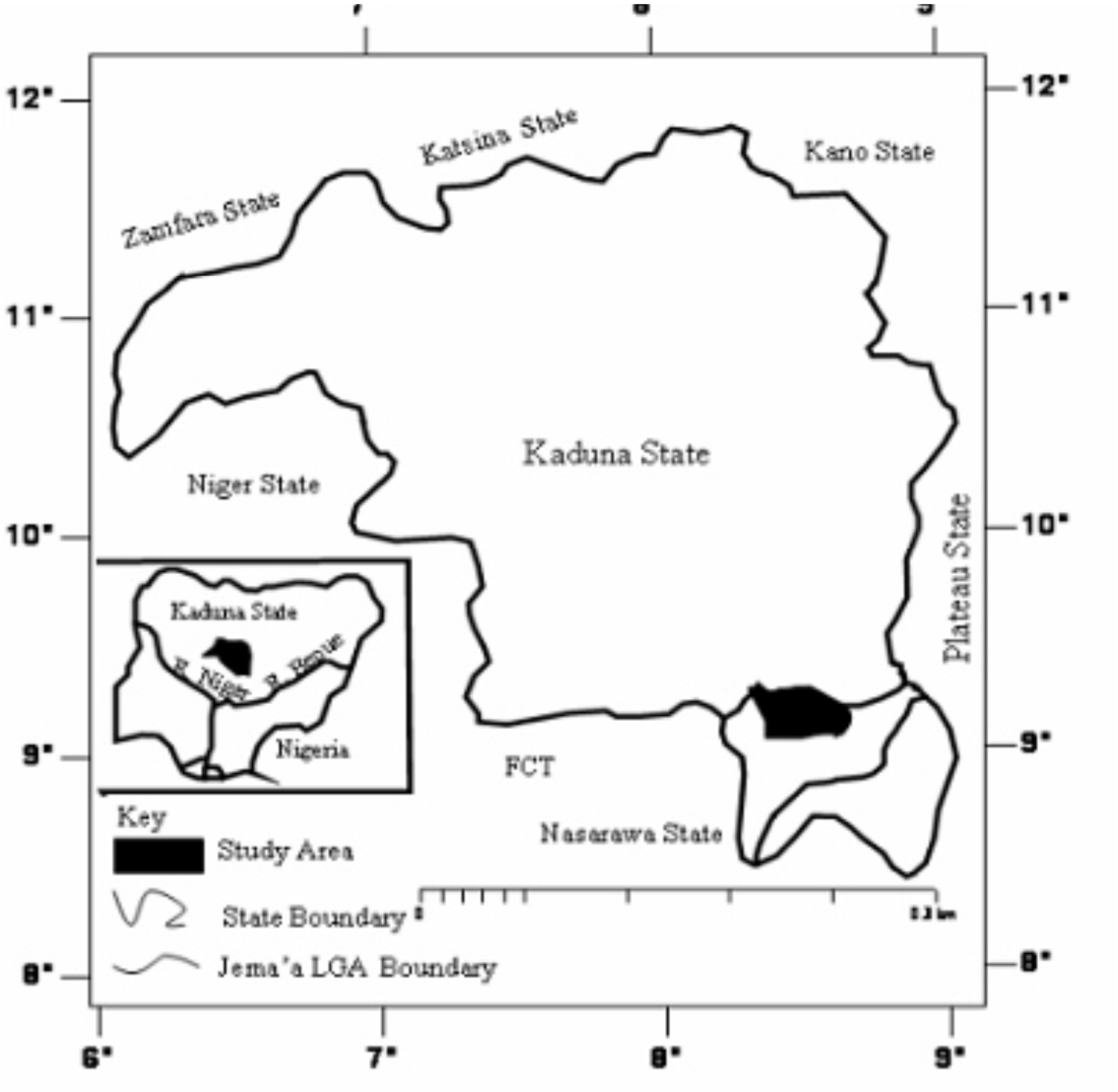
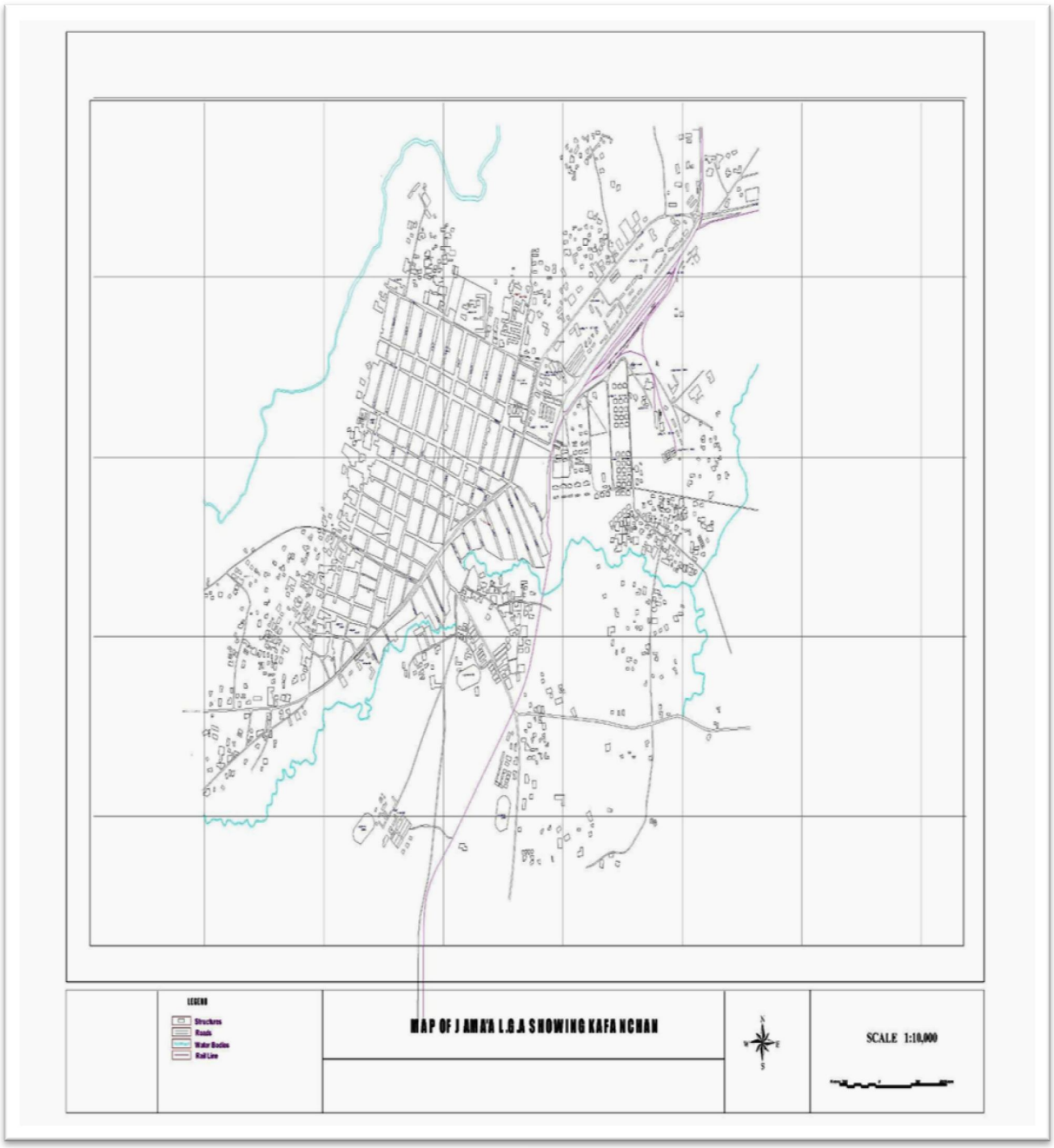


FIGURE1 KADUNA SHOWING THE STUDY AREA



MAP OF KAFANCHAN (THE STUDY AREA)

3.1.2 Climate and Weather

The area is designated Koppen's Aw climate with two distinct seasons: a wet season and a dry season. Rainfall occurs between the months of April to October with a peak in August. The mean annual rainfall is about 1400mm and the mean monthly temperature is 30^{o}C, while the relative humidity is about 69%. The orographic effects of the Jos Plateaux and Kagoro Hills have positive influence on weather. The main type of soil is the ferruginous tropical soil which is related to the climate, vegetation, lithology and the topography of the area. The relief is relatively flat and undulating and it influences the drainage pattern of the area (Abaje *et al, 2009*). The location of the study area around 9 14^{1}N and 8 15^{1}E made it to have an almost central location in the country. The implication of this is that they are far removed from the direct influence of the sea and at the same time not directly influenced by the harsh-semi-desert climatic conditions of the northernmost fringes of the country.

Like any other part of the country, the climate of these rural communities is directly under the influence of two dominant air masses; namely; the tropical maritime(mt) or South-west Trade wind which blows across the Atlantic ocean and the Tropical Continental (mt) or Northeast Trade wind which blows across the Sahara desert. By the characteristics of these air masses, each of them exerts its own influence on the climate of this area. The South-west Trade wind for instance, brings rain to the study area, while the North-east Trade exerts its desiccating effect and hence the cold harmattan during the dry season. As stated earlier the orographic effect of Kagoro hill and Jos plateau exert influence on the climate of the area. In fact the study area lies on the windward side of these highlands, the implication of which is the annual quantity of rainfall is most likely to be positively influenced. From the fore-going, it can be

inferred that three factors influence the climate of these communities; these factors are;

a) The North-east Trade wind
b) The South-west Trade wind and
c) Relief

Based on zonation of the country into climatic belts, it is clearly seen that this area is in tropical Hinterland, thus two principal seasons stand out distinctively: wet and dry seasons. The rainy or wet season starts in April and gradually builds up to an annually quantity of between 1000 -2000mm. The rainy season starts to cease in late October, this means that the area has nearly six (6) effective months of rain. However, with the proximity of the study area to the Jos Plateau, the annual quantity of rain and the duration of the rainy season could be slightly more than the figures stated above.

During the dry season, when the whole country is under the influence of the Northeast Trade wind starting from November through the month of March, the areas are completely dry. In fact starting from December through February, the area is under the influence of a severely strong dry wind (harmattan) and with additional influence of the high Plateau of Jos. This means that it descends with devastating speed. This strong dry wind desiccates the vegetation as early as December and hence if there is any unfortunate fire outbreak, the bushes will be consumed within a short period of time (Abaje et al 2009).

3.1.3 Vegetation

The flora of any place is particularly determined by annual quantity of rainfall and soil type. In view of this, the vegetation of the area with an annual rainfall of about 1000-1400mm is typical Guinea Savannah. This comprises of Savannah woodlands, shrub Savannah and parkland. Burning, cultivation, grazing fire-wood gathering and hewing down of trees for the purposes of building and other constructions has immensely reduced the natural vegetation to grasses of about 1.5-2m in height. The few trees are scattered here and there with common species such as: the local beans trees, Shea-butter tree among others. Although the area is within the northern boundary of the Southern Guinea Savannah, the major types of vegetation recognizable in Nigeria namely forest and savannah are found within the area. Forest is here defined as a type of vegetation consisting predominantly of woody plants and from which grasses are virtually absent. On the other hand, savannah is defined as vegetation in which perennial mesophytic grasses of at least 80mm high with flat basal and caulin leaves play on important part. Although most of the grasses form tussocks, isolated from one another when fully grown form a more or less continuous layer dominating any lower stratum.

Patches of woodland are found towards the valley bottom with some oil palm trees growing along the stream banks in this area The vegetation is generally largely secondary in nature due to cultivation, burning, grazing, firewood gathering, and cutting for building. Trees like silk, cotton, mahogany, locust, sheabutter, tamarind and farm palm are usually found along the river banks. Other species like the isoberlin jadoka and copaiba grow widely and are at times found to dominate the vegetation of some localities. This vegetation cover serves as a source area for hunting, timber, roof grass, firewood and fruit gathering.

3.1.4 Geology and Drainage

The area is generally a plain. It is lowest in the south and southwest with a height of 180m rising steadily north and Northeastward to about 450m along the Northern angle of the area sometimes reaching 600m in the extreme northeast as one is approaching the Jos plateau. The relief inwardly influences the drainage pattern. Most of the area lies within the Mada, Okawa, and Gurara River System. The Okawa and Mada systems flow into River Benue, while the Gurara flows into the river Niger.

Natural resources such as relief, soil, vegetation, minerals among others, of any area are to a large extent determined by the geological setting of such area. Geologically, the area is endowed with basement complex underlies the recent alluvial deposits at the top. Basement complex rocks (igneous and metamorphic) are predominantly granite, although gneiss, migmatites, schist and quartzite are also present. The geology of Kafanchan area has been variously investigated in the past by a number of scholars. Igneous and metamorphic rocks underlay the Jema'a region predominantly. These belong mainly to Precambrian to lower palaezoic basement complex. These are however Jurisic intrusion of younger granites. There is also occurrence of late tertiary to quaternary, volcanic lava, which are found mostly within the region (Adamu, 2003).

3.1.5 Soil

The soil forming factors are parent materials; topography, biotic factors and time have all played significant roles in the soil development in the area. The parent material mostly granite, gneiss and volcanic lava of the Jos plateau have been weathered to give rise to large quantities of gravelly quarz-rich soils of this area. In some areas,

lateritic, iron pan can be found. One interesting feature of the soil of this area is that even though lateritic and sticky, they are fertile (Adamu, 2003).

In addition to this quartz-rich and laterite soils, there are the clayey and the sandy clay soil found along the banks of the River. The soils here are quite fertile and hence had been put into cultivation of various crops. Three main soil types are found over the study area, the sandy gravels of the hill slopes, the sandy loam of the upland areas of the plain and the deposits of the fadamas on river valleys. Fadamas which are fairly rich in nutrients and have good to excessive water supply that persist in the dry season are of special importance to the people. Many parts of it are used for cultivation of high moisture demanding crops like rice, coco-yams, cassava, sugarcane and vegetables.

Sandy loamy soil is more widespread and forms the main soil type of the upland though it is also found on hillsides and valleys where slope conditions are more favourable. The three reasons for developing the UIML:

- Historical motivation or raising the abstraction.
- Managing the family of interfaces.
- Avoiding market risks when developing applications for new appliances.

This soil has a well defined soil profile with the zonal divisions showing more clearly as one approaches the dark grey variety. The soil is relatively rich in humus content, fined grained and usually well drained. It is more wide spread than any of the other soil type and supports a wider variety of crops grown (Adamu, 2003).

3.1.6 Economic Activities

Like most of the Nigerian farmers the natives of Kafanchan are mostly subsistence farmers. Agriculture is the oldest and remains the most important single occupation of the area. There are basically two systems of arable cropping in the area. Rain fed arable cropping is the dominant system, the oldest and has the largest hectarage arable copping is labour intensive system in its present system, this form of cultivation is still done most entirely by hand and there is little use of manure or fertilizer. There are no drought animals and little mechanical cultivation. The major crops are sorghum, Millet, Cassava, Maize and yam. Others are acha, cocoyam and rice.

The second system of arable cropping is flood land agriculture. This is limited of the seasonally flooded bottomlands. The most common crops in these wet bottom lands are bambara nut, rice, maize, cabbage, spinach, oranges cassava, groundnut, beans, sweet potatoes sugar cane, banana and vegetables. Almost all the crops grown here are for subsistence uses except for cotton and peanut. However surpluses, particularly yams, sorghum and acha are sold in local market or to traders from outside the area. Sorghum, yam, millet and maize are grown by almost all the ethnic groups but acha is grown particularly by the Jaba, kagoma, Kagoro and Bajju ethnic groups.

Since the area is tsetse fly infested there are no settled animals production systems in that the Fulani herdsmen move across the area South from the North in the dry season and move back north at the beginning of the rain. This system is supplemented by the domestication of sheep, goats and Pigs by the indigenes. Sheep and goats are kept in houses and roam about freely especially during the dry season. The nomadic pastoralist Fulani burn the grass to stimulate new growth for stock to graze.

3.1.7 Population

Population is one of the foremost variables in any study that has something to do with health particularly in relationship with weather. The size, growth, density distribution and other occupations of the people, in addition to its culture are some determinants of the level of the health of such people. Jemma'a Local Government with an area of 3,756l km^2 had a population of 140,625 people in 1963 an estimated population of 238,020 in 1980 and a population of 270,838 in 1991, with a 2.5 percentage growth rate and a density of 99 persons per square kilometer.

The study area has continued to witness a tremendous growth in population it has a population of 278,735 from the population census conducted in 2006 with annual growth rate of 3% in the state (FRN, 2006). The 2009 projected population is 308,581 people. Presently, it has twelve wards namely; Jagindi, Godogodo, Auku, Gidan-waya, ,Maigizo, Kaninkon, Kagoma, Asso, Kafanchan 'A' Kafanchan 'B' Bedde and Takau (Ishaya and Abaje, 2008).

DISTRICT	1963	1980	1991
Kafancahan	40,243	63,841	75,850
Fadankagoma	40,052	62,390	1,233
UngwanFari	29,758	52,439	59,415
Godogodo	30,629	59.350	64,340
Grand Total	140,675	238,020	270,838

Source: 1963, 1991 Federal Republic of Nigeria Provisional Population Census.

Most of the people of Jema'a (70-80%) are engaged in agricultural production. This is as a result of the conducive atmospheric cool temperature, adequate rainfall and abundant farmland spread all over the area. Jema'a people are active and involve in intensive agricultural practices. Though some are engaged in other economic activities like weaving, black smiting, lumbering, hunting, mining, pot making, but they also participate actively in agriculture, which is the mainstay of the economy farming is predominant because the water resources potentials of Jama'a has not been developed to the fullest to attract large scale production.

3.2 METHODOLOGY

Temperature data (minimum and maximum), rainfall and relative humidity of 10 years (1999 to 2008) for Kafanchan was collected from State Water Board of the same area because it is only in the Water Board that comprehensive data can be gotten in the study area. While Medical records of common diseases such as malaria, measles, typhoid, cholera ,pneumonia, cough, diarrhoea and Meningitis were obtained from the following Hospitals:

General Hospital Kafanchan,

New Era Hospital, Funtua street, and

Kowa hospital Jagindi Street

(These Hospitals have records of common diseases up to 10 years).

3.2.1. Types and Sources of data

This research was based mostly on secondary data i.e. Hospital records, information on common diseases available were collected from the hospital records. Information

was also collected from other sources such as books, journals, newspapers, maps and other relevant statistics records.

3.2.2. Collection of Climatic data

The climatic data used for this research were collected from Water Board in Kafanchan by selecting from their records the three weather elements required for this work which are: Rainfall, temperature and relative humidity. A ten year record (1999-2008) for monthly rainfall, temperature, and Relative Humidity was taken.

3.2.3 Collection of Medical Data

The medical records were obtained from the following hospitals;

- General Hospital Kafanchan,
- New Era Hospital and
- Kowa Hospital

All the above hospitals are in Kafanchan. The choice of these hospitals was based on the fact that each of the above named Hospitals has existed for 10 years and has the records of patients treated between 1999-2008; therefore these records were collected by taking the frequency of occurrence of each of these diseases monthly for the period of time in question.

3.3 PRESENTATION OF DATA AND ANALYSIS

3.3.1 Presentation of Data

This was done using descriptive statistics. All the data collected were presented in a tabular form. The mean temperature for each month and mean relative humidity for

each month were calculated and presented in a tabular form. Also, the relationship between each disease and the climatic variables were presented.

3.3.2 Data Analysis

The data were analysed using correlation analysis which is used to measure the degree of relationship that exist between two variables of interest and Stepwise and Enter method of Regression Analysis and ANOVA analysis of variance was used to find out if there is significant different between the occurrence of diseases among the various seasons. These statistics were used to assess relationship between weather (rainfall, temperature and relative humidity) of Kafanchan and the occurrence of the common diseases and their seasonality.

The Product Moment Correlation Coefficient was used. The formula is given as:

$$r = \frac{n\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2]\,[n\Sigma y^2}}$$

Where

r =Product Moment Correlation Coefficient /x and y values of the two variables.

n=number of occurrences/frequency of occurrence

Σx=sum of x

Σy=sum of y

Σy^2=sum of y^2

Σxy=sum of xy

Σx^2=sum of x^2

The Regression Equation is stated as follows

$D = a + b_1 x_1 + b_2 x_2 + b_3 x_3$

X_1 = Rainfall

X_2 = Humidity

X_3 = Temperature

D = Diseases

a_1 = Constant

b_1= Coefficient of rainfall

b_2 = " " Humidity

b_3 = " " Temperature

CHAPTER FOUR:

RESULTS AND DISCUSSION

4.0 INTRODUCTION

This research titled "The influence of weather elements on the occurrence of some common diseases in Kafanchan Kaduna state" sampled three different hospitals using purposive sampling technique based on the duration of their existence if up to10years. The data on climatic elements were collected from the Water Board for period of 10 years. Based on the two hypotheses given, the analysis was done and the following results were obtained.

4.1 DATA ON TEMPERATURE, RAINFALL, AND RELATIVE HUMIDITY

The climatic data collected (table 4.2.1 and appendix 4.1), shows that temperature varies widely. The range is high between the month of November and February and lower around July/August. The mean temperature is lower in December/January. Relative humidity which increases as the rain increases reached its peak in August after which it started decreasing again. The relative humidity is lower around February/March when the weather is usually hot and dry. The rainfall is also observed to be seasonal with onset in April, its climax is usually around July/August as the rain increases and it is usually at its peak in August, after which it started to decrease. The presence of highlands in Kagoro near Kafanchan produces orographic rainfall which is usually very high.

Table 4.2.1 **Monthly Descriptive Statistics of Climatic and Diseases Variables**

JANUARY

Variable	Mean	Standard Deviation	N
Rainfall	2.3040	7.28589	10
Humidity	34.5000	4.47834	10
Temperature	23.9500	0.79757	10
Malaria	35.0500	29.87216	10
Measles	2.5833	2.37171	10
Typhoid	30.3500	24.02165	10
Cholera	0.4000	0.62460	10
Pneumonia	14.75000	7.77033	10
Cough	23.5833	16.44468	10
Diarrhoea	34.4000	18.15149	10
Meningitis	3.2667	3.13404	10
FEBRUARY			
Variable	**Mean**	**Standard Deviation**	**N**
Rainfall	0.6400	2.02386	10
Humidity	35.8000	5.14350	10
Temperature	25.2000	1.76698	10
Malaria	33.1333	17.7949	10
Measles	7.0667	12.48387	10
Typhoid	34.1000	14.22313	10
Cholera	0.4333	0.52234	10
Pneumonia	13.6000	11.76708	10
Cough	142.8333	382.44765	10
Diarrhea	32.7667	26.23966	10
Meningitis	6.5667	8.50860	10
MARCH			
Variable	**Mean**	**Standard Deviation**	**N**
Rainfall	15.1250	18.34723	10
Humidity	44.7000	3.63012	10
Temperature	27.5500	1.48043	10
Malaria	45.1333	49.68250	10
Measles	6.8333	8.77883	10
Typhoid	42.3333	16.27996	10
Cholera	0.5000	0.75768	10
Pneumonia	16.3000	8.58286	10
Cough	22.7333	11.916117	10
Diarrhea	38.8667	22.97834	10
Meningitis	5.6000	4.56990	10
APRIL			
Variable	**Mean**	**Standard Deviation**	**N**
Rainfall	122.7180	49.85617	10
Humidity	58.3500	8.24638	10
Temperature	27.7800	1.09321	10

Malaria	52.4667	74.22076	10
Measles	3.7000	4.46786	10
Typhoid	46.2000	14.99811	10
Cholera	0.1667	0.36004	10
Pneumonia	29.7000	43.32491	10
Cough	21.1000	9.06772	10
Diarrhea	46.2333	19.73907	10
Meningitis	5.2667	3.64742	10
MAY			
Varible	**Mean**	**Standard Deviation**	**N**
Rainfall	191.3440	73.08120	10
Humidity	72.2000	3.59938	10
Temperature	26.2000	1.27366	10
Malaria	60.6333	63.98504	10
Measles	3.6667	5.55778	10
Typhoid	47.9333	15.14685	10
Cholera	0.3000	0.67495	10
Pneumonia	21.3667	13.42878	10
Cough	22.9667	10.15005	10
Diarrhea	48.5333	27.82050	10
Meningitis	4.0333	3.02847	10
JUNE			
Varible	**Mean**	**Standard Deviation**	**N**
Rainfall	248.0360	46.35817	10
Humidity	78.0000	4.61880	10
Temperature	25.0000	1.08012	10
Malaria	65.333	68.43178	10
Measles	4.2333	6.36939	10
Typhoid	44.7667	19.63749	10
Cholera	2.0333	5.75090	10
Pneumonia	26.1000	13.39896	10
Cough	32.1667	27.63217	10
Diarrhea	58.4333	28.42447	10
Meningitis	3.1667	4.24337	10
JULY			
Variable	**Mean**	**Standard Deviation**	**N**
Rainfall	291.3960	84.63515	10
Humidity	80.6500	1.85667	10
Temperature	23.7000	0.82327	10
Malaria	62.4000	42.97194	10
Measles	2.7667	2.824228	10
Typhoid	56.1000	19.96481	10
Cholera	1.9333	8.81615	10
Pneumonia	24.8000	14.04332	10
Cough	23.5000	10.15102	10
Diarrhea	44.4667	26.81035	10
Meningitis	2.6000	3.14191	10

AUGUST			
Variable	**Mean**	**Standard Deviation**	**N**
Rainfall	379.1860	57.35292	10
Humidity	80.4500	5.62460	10
Temperature	23.3000	0.63246	10
Malaria	78.5500	69.72326	10
Measles	2.1667	2.49568	10
Typhoid	63.2167	22.19944	10
Cholera	0.7667	1.79883	10
Pneumonia	2646333	14.79777	10
Cough	26.5000	10.59146	10
Diarrhea	59.5167	30.94165	10
Meningitis	2.5500	3.12897	10
SEPTEMBER			
Variable	**Mean**	**Standard Deviation**	**N**
Rainfall	1492.8980	2751.04809	10
Humidity	78.9500	5.06869	10
Temperature	23.85000	0.70907	10
Malaria	74.5000	83.51022	10
Measles	3.9667	9.36957	10
Typhoid	52.8000	16.88538	10
Cholera	2.8667	20.92686	10
Pneumonia	28.0833	14.79777	10
Cough	30.7167	17.49533	10
Diarrhea	55.4833	33.02379	10
Meningitis	0.8500	1.40205	10
OCTOBER			
Variable	**Mean**	**Standard Deviation**	**N**
Rainfall	132.6020	81.36355	10
Humidity	66.7000	8.48594	10
Temperature	24.4500	0.72457	10
Malaria	70.9000	70.74368	10
Measles	0.4333	81.36355	10
Typhoid	42.0667	15.62982	10
Cholera	-	-	-
Pneumonia	23.1667	16.46414	10
Cough	20.5667	11.52566	10
Diarrhea	54.5667	21.90386	10
Meningitis	1.0333	1.61360	10
NOVEMBER			
Variable	**Mean**	**Standard Deviation**	**N**
Rainfall	3.3300	6.67800	10
Humidity	41.3000	7.68910	10
Temperature	24.0500	1.30064	10
Malaria	51.8000	63.60414	10
Measles	0.2000	0.32203	10
Typhoid	30.4667	22.47424	10
Cholera	0.0333	0.10541	10

Pneumonia	21.6333	11.64861	10
Cough	17.1500	13.34131	10
Diarrhea	39.8167	23.17066	10
Meningitis	1.0500	1.74634	10
DECEMBER			
Varible	**Mean**	**Standard Deviation**	**N**
Rainfall	0.0000	0.000000	10
Humidity	31.5000	6.67915	10
Temperature	23.1000	6.67915	10
Malaria	59.2667	107.64939	10
Measles	0.1000	0.16102	10
Typhoid	33.5000	26.81130	10
Cholera	0.0333	0.10541	10
Pneumonia	28.4333	31.92354	10
Cough	19.5667	23.68729	10
Diarrhea	57.4000	59.01868	10
Meningitis	23.1000	1.12546	10

4.2.2 Data on the Diseases

From the medical record collected from the various hospitals in Kafanchan and from the various means of diseases shown in table 4.2.1, malaria has the highest frequency of occurrence among other diseases recorded. In General Hospital Kafanchan appendix 4.2.1, the occurrence of all these common diseases was established. Cases of malaria, typhoid, and diarrhea were recorded almost throughout the months of the year. Measles, meningitis showed a seasonal pattern of occurrence while cholera occurred once in many years as an outbreak. Cough and Pneumonia also showed some level of consistency throughout the years, but their frequencies are not as much as other diseases.

4.3.MONTHLY STEPWISE AND ENTER METHOD REGRESSION ANALYSIS

Table 4.3a JANUARY

DISEASES	a	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	Number
Malaria (enter method)	424.899 (0.270)	0.240 (0.884)	3.612 (0.223)	-21.457 (0.228)	0.910 (0.490)
Malaria (Stepwise Method)	-	-	-	-	-
Measles (enter method)	41.805 (0.202)	0.071 (0.608)	0.136 (0.562)	-1.840 (0.217)	0.636 (0.619
Measles (Stepwise Method)	-	-	-	-	-
Typhoid (enter method)	429.692 (0.186)	0.800 (0.559)	2.007 (0.394)	-19.642 (0.186)	0.780 (0.547)
Typhoid (Stepwise Method)	-	-	-	-	-
Cholera (enter method)	-3.156 (0.713)	-0.017 (0.667)	-0.048 (0.468)	0.081 (0.836)	0.335 (0.801)
Cholera (Stepwise Method)	-	-	-	-	-
Pneumonia (enter method)	65.377 (0.610)	0.151 (0.760)	0.520 (0.538)	-2.502 (0.620)	0.195 (0.896)
Pneumonia (Stepwise Method)	-	-	-	-	-
Cough (enter method)	287.616 (0.196)	0.809 (0.397)	0.188 (0.459)	-12.814 (0.205)	0.765 (0.554)
Cough (Stepwise Method)	-	-	-	-	-
Diarrhea (enter Method)	291.448 (0.233)	1.129 (0.297)	1.033 (0.559)	-12.329 (0.265)	0.722 (0.574)
Diarrhea (Stepwise Method)	-	-	-	-	-
Meningitis (enter Method)	64.749 (0.115)	0.059 (0.738)	0.127 0.657)	-2.797 (0.137)	1.082 (0.425)
Meningitis (Stepwise Method)	-	-	-	-	-

From table 4.3a there is no significant relationship between rainfall and malaria (0.884), Measles (0.608), Typhoid (0.559), Cholera (0.667) Pneumonia (0.760), Cough (0.397), Diarrhea (0.297) Meningitis (0.115). There is also no significant relationship between relative humidity and Malaria (0.223), Measles (0.562), Typhoid (0.394), Cholera (0.468) Pneumonia (0.538) Cough (0.459), Diarrhea (0.559), Meningitis (0.657). This is because the calculated sig (2-tailed) of these diseases are greater than 0.05 confident level. There is also no significant relationship between temperature and Malaria (0.228), Measles (0.217), Typhoid (0.186) Cholera (0.836), Pneumonia (0.620), Cough (0.205), Diarrhea (0.265), Meningitis (0.137). This is due to the same reason as mentioned above. The enter regression method also shows that none of the aggregated weather elements influence any diseases in January. The stepwise regression analysis method did not indicate any climatic variable that is mostly responsible for the occurrence of any of the diseases.

Table 4.3b FEBRUARY

DISEASES	a	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	Number
Malaria (enter method)	-98.830 (0.509)	-1.799 (0.708)	0.385 (0.795)	-3.108 (0.566)	0.151 (0.962)
Malaria (Stepwise Method)	-	-	-	-	-
Measles (enter method)	-16.328 (0.876)	-0.062 (0.985)	-0.274 (0.794)	1.319 (0.729)	0.125 (0.942)
Measles (Stepwise Method)	-	-	-	-	-
Typhoid (enter method)	168.087 (0.141)	-3.234 (0.354)	0.203 (0.845)	-5.524 (0.176)	0.802 (0.536)
Typhoid (Stepwise Method)	-	-	-	-	-
Cholera (enter method)	-6.817 (0.062)	-0.069 (0.500)	-0.047 (0.164)	-0.219 (0.090)	2.187 (0.190)
Cholera (Stepwise Method)	-	-	-	-	-
Pneumonia (enter method)	108.251 (0.249)	-3.326 (0.273)	-0.213 (0.811)	-3.369 (0.316)	0.617 (0.629)
Pneumonia (Stepwise Method)	-	-	-	-	-
Cough (enter method)	- 2548.891 (0.406)	-1.600 (0.987)	-26.563 (0.388)	69.111 (0.000)*	0.461 (0.720)
Cough (Stepwise Method)	29.697 (0.185)	-	-	-31.625 (0.004)*	-32.725 (0.004)*
Diarrhea (enter Method)	205.097 (0.352)	-3.601 (0.605)	-0.947 (0.659)	-5.402 (0.492)	0.270 (0.845)
Diarrhea (Stepwise Method)	-	-	-	-	-
Meningitis (enter Method)	7.208 (0.919)	0.103 (0.964)	-0.333 (0.644)	-0.466 (0.863)	0.108 (0.952)
Meningitis (Stepwise Method)	-	-	-	-	-

A careful study of table 4.3b shows that there is no significant relationship between rainfall and Malaria (0.708), Measles (0.985), Typhoid (0.354), Cholera (0.500), Pneumonia (0.273), Cough (0.987), Diarrhea (0.605) Meningitis (0.964). This is

because the calculated Sig (2-tailed) of these diseases is greater than 0.05 confident levels. It also shows no significant relationship between humidity and Malaria (0.795), Measles (0.794), Typhoid (0.845), Cholera (0.164) Pneumonia (0.811), Cough (0.388), Diarrhea (0.659), Meningitis (0.644). This is because the calculated Sig (2-tailed) of these diseases is greater than 0.05 level of confidence. There is no significant relationship between temperature and Malaria (0.566), Measles (0.729), Typhoid (0.176), Cholera (0.090), Pneumonia (0.316) Diarrhea (0.492), Meningitis (0.863). This is because the calculated Sig (2-tailed) of these diseases is greater than 0.05 level of significance. There is a significant inverse relationship between temperature and Cough (0.001). The stepwise and the enter method of regression indicates that there is an inverse relationship between temperature and Cough.

Table 4.3c MARCH

DISEASES	a	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	F
Malaria (enter method)	-290.831 (0.363)	-1.379 (0.209)	-9.251 (0.144)	-23.174 (0.112)	1.463 (0.316)
Malaria (Stepwise Method)	-	-	-	-	-
Measles (enter method)	-32.476 (0.591)	-0.173 (0.396)	-1.552 (0.195)	-3.354 (0.213)	0.886 (0.500)
Measles (Stepwise Method)	-	-	-	-	-
Typhoid (enter method)	-2.477 (0.978)	-4.187 (0.041)	-2.233 (0.845)	-5.201 (0.205)	2.229 (0.177)
Typhoid (Stepwise Method)	-	-	-	-	-
Cholera (enter method)	0.297 (0.960)	-0.011 (0.572)	-0.058 (0.603)	-0.117 (0.642)	0.159 (0.920)
Cholera (Stepwise Method)	-	-	-	-	-
Pneumonia (enter method)	-49.482 (0.480)	-0.003 (0.989)	-0.167 (0.896)	-0.936 (0.747)	0.086 (0.965)
Pneumonia (Stepwise Method)	-	-	-	-	-
Cough (enter method)	-177.552 (0.026)	-0.087 (0.678)	-0.882 (0.462)	-7.002 (0.033)	2.800 (0.131)
Cough (Stepwise Method)	-	-	-	-	-
Diarrhea (enter Method)	-56.384 (0.745)	-0.336 (0.563	-3.044 (0.362)	-5.390 (0.469)	0.354.456 (0.788)
Diarrhea (Stepwise Method)	-	-	-	-	-
Meningitis (enter Method)	-22.738 (0.388)	-0.076 (0.386)	0.716 (0.167)	-0.174 (0.871)	2.278 (0.180)
Meningitis (Stepwise Method)	-31.826 (0.065)	-31.826 (0.065)	-	0.837 (0.003)*	6.346 (0.003)*

The detail of table 4.3c reveals that there is no significant relationship between rainfall and Malaria (0.209), Measles (0.396), Typhoid (0.041) Cholera (0.572) ,

Pneumonia (0.989), Cough (0.678)) Diarrhea (0.563), Meningitis (0.286). This is because the calculated Sig. (2-tailed) of these diseases is greater than 0.05 level of confidence. There is also no significant relationship between relative humidity and Malaria (0.144), Measles (0.195), Typhoid (0.845), Cholera (0.603), Pneumonia (0.896), Cough (0.462), Diarrhae (0.362), Meningitis (0.167). This is because the calculated Sig. (2-tailed) of these diseases is greater than 0.05 level of confidence. There is also no significant relationship between temperature and Malaria (0.112), Measles (0.213), typhoid (0.205),Cholera (0.642),pneumonia (0.747),Diarrhea (0.469), Meningitis (0.871). The enter regression method shows that there is significant negative correlation between Cough (0.033) and temperature, while the stepwise regression method indicates that there is significant relationship between temperature and Meningitis (0.003).

Table 4.3d APRIL

DISEASES	a	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	F
Malaria (enter method)	-1216.045 (0.104)	0.227 (0.660)	-0.714 (0.812)	-41.387 (0.097)	1.694 (0.267)
Malaria (Stepwise Method)	1278.254 (0.0653)	-	-	44.125 (0.042)*	5.85 (0.042)*
Measles (enter method)	-17.676 (0.653)	-0.053 (0.117)	-0.131 (0.468)	1.277 (0.002)*	1.882 (0.003)*
Measles (Stepwise Method)	172.62 (0.789)	-	-	0.887 (0.004)*	10.785 (0.004)*
Typhoid (enter method)	188.107 (0.209)	0.123 (0.278)	0.023 (0.970)	-5.699 (0.244)	1.424 (0.325)
Typhoid (Stepwise Method)	-	-	-	-	-
Cholera (enter method)	-4.046 (0.311)	0.002 (0.511)	-0.003 (0.850)	-0.150 (0.262)	0.624 (0.625)
Cholera (Stepwise Method)	-	-	-	-	-
Pneumonia (enter method)	496.242 (0.301)	-0.410 (0.270)	-1.618 (0.446)	-11.585 (0.454)	0.652 (0.610)
Pneumonia (Stepwise Method)	-	-	-	-	-
Cough (enter method)	186.264 (0.041)	0.091 (0.150)	0.009 (0.979)	5.563 (0.057)	2.354 (0.171)
Cough (Stepwise Method)	-	-	-	-	-
Diarrhea (enter Method)	397.583 (0.068)	-0.115 (0.436)	-0.716 (0.410	-10.636 (0.122)	1.310 (0.355)
Diarrhea (Stepwise Method)	-	-	-	-	-
Meningitis (enter Method)	-35.306 (-0.908)	0.009 (0.783)	0.019 (0.916)	1.383 (0.324)	0.387 (0.767)
Meningitis (Stepwise Method)	-	-	-	-	-

From table 4.3d there is no significant relationship between rainfall and Malaria

(0.660), Measles (0.117), Typhoid (0.278) Cholera (0.511), Pneumonia (0.270), Cough (0.150), Diarrhea (0.436), Meningitis (0.783) and between humidity and Malaria 0.812), Measles (0.468), Typhoid (0.970), Cholera (0.850), Pneumonia (0.446),Cough(0.979),Diarrhea(0.410),Meningitis(0.916) and between temperature and Malaria (0.097), Measles (0.042), Typhoid (0.244), Pneumonia (0.454), Cough (0.059), Diarrhea (0.122), Meningitis (0.324). This is because the calculated Sig. (2-tailed) of these diseases is greater than 0.05 confidence level. However, there is significant relationship between temperature and Malaria (0.042), Measles (0.004) in the stepwise regression method and the enter method shows that there is significant relationship with Measles (0.002) for the contribution of all the climatic elements on Measles, while the stepwise regression method shows that temperature (0.004) is mostly responsible for the occurrence of Measles.

Table 4.3e MAY

DISEASES	a	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	Number
Malaria (enter method)	1014.712 (0.161)	-0.247 (0.525)	-3.278 (0.658)	-25.579 (0.315)	0.779 (0.547)
Malaria (Stepwise Method)	-	-	-	-	-
Measles (enter method)	-115.100 (0.018)	0.032 (0.171)	-0.029 (0.944)	4.379 (0.016)*	4.674 (0.052)
Measles (Stepwise Method)	-83,368 (0.013)	-	-	3.322 (0.011)*	11.029 (0.011)*
Typhoid (enter method)	311.130 (0.019)*)	0.024 (0.684)	-2.800 (0.041)*	-2.506 (0.511)`	4.590 (0.054)
Typhoid (Stepwise Method)	137.275 (0.002)	-	5.427 (0.006)*	-	13.479 (0.006)*
Cholera (enter method)	-4.439 (0.530)	0.004 (0.346)	-0.074 (0.355)	0.356 (0.196)	0.811 (0.533)
Cholera (Stepwise Method)	-	-	-	-	-
Pneumonia (enter method)	-206.836 (0.078)	0.048 (0.430)	-0.935 (0.421)	-4.850 (0.0226)	3.176 (0.106)
Pneumonia (Stepwise Method)	221.575 (0.011)*	-	-	-7.642 (0.018)*	0.8852 (0.018)*
Cough (enter method)	-14.054 (0.886)	0.094 (0.133)	-0.471 (0.668)	2.022 (0.581)	1.174 (0.395)
Cough (Stepwise Method)	-	-	-	-	-
Diarrhea (enter Method)	326.993 (0.199)	0.054 (0.694)	-6.080 (0.052)	5.733 (0.517)	2.136 (0.197)
Diarrhea (Stepwise Method)	434.343 (0.016)	-	5.344 (0.027)*	-	7.325 (0.027)*
Meningitis (enter Method)	54.961 (0.071)	-0.024 (0.143)	-0.434 (0.170)	-0 .570 (0.560)	1.985 (0.218)
Meningitis (Stepwise Method)	-	-	-	-	-

Table 4.3e indicates that there is no significant relationship between rainfall and Malaria (0.525), Measles (0.171), Typhoid (0.684), Cholera (0.346), Pneumonia (0.430), Cough (0.133), Diarrhea (0.694), Meningitis (0.143) for the enter regression method. This is because the calculated Sig. (2-tailed) of these diseases is greater than 0.05 degree of freedom. The enter regression method also indicates that there is no significant relationship between humidity and Malaria (0.658), Measles (0.944), Cholera (0.355), Pneumonia (0.421), Cough (0.668), Diarrhea (0.052), Meningitis (0.170). The stepwise regression method also indicates that there is significant relationship between humidity and Diarrhea (0.027)*, Typhoid (0.006)*. This is because the calculated value (2-tailed) is less than 0.05 of the confidence level. There is no significant relationship between temperature and Malaria (0.315), Typhoid (0.511), Cholera (0.196), Pneumonia (0.0226), Cough (0.581), Diarrhea (0.517), Meningitis (0.560) in the enter method. This is because the calculated value (2-tailed) is greater than 0.05 confidence level. The enter regression method indicates a significant relationship between temperature and Measles (0.016)* and the stepwise regression method indicates significant relationships between temperature and Measles (0.011)*, Pneumonia (0.018)*. The stepwise regression method indicates that temperature influence measles (0.011)* while humidity influence Diarrhea (0.027) and Typoid(0.006) This is because the calculated values (2-tailed) for these diseases are less than 0.05 level of confidence.

Table 4.3f JUNE

DISEASES	a	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	Number
Malaria (enter method)	1030.336 (0.388)	-1.458 (0.365)	-23.698 (0.065)	-55.174 (0.965)	2.754 (0.135)
Malaria (Stepwise Method)	882.631 (0.016)	-	10.470 (0.022)*	-	7.982 (0.022)*
Measles (enter method)	0.315 (0.996)	0.042 (0.484)	-0.007 (0.993)	0.599 (0.852)	0.296 (0.827)
Measles (Stepwise Method)	-	-	-	-	-
Typhoid (enter method)	95.169 (0.557)	0.147 (0.296)	-3.482 (0.065)	7.389 (0.328)	2.290 (0.178)
Typhoid (Stepwise Method)	-	-	-	-	-
Cholera (enter method)	42.184 (0.521)	-0.031 (0.572)	-0.288 (0.657)	-0.480 (0.891)	0.243 (0.864)
Cholera (Stepwise Method)	-	-	-	-	-
Pneumonia (enter method)	114.987 (0.411)	-0.154 (0.207)	-0.491 (0.718)	-0.492 (0.936)	0.760 (0.556)
Pneumonia (Stepwise Method)	-	-	-	-	-
Cough (enter method)	-423.480 (0.097)	-0.277 (0.177)	-3.791 (0.128)	-1.075 (0.916)	2.274 (0.180)
Cough (Stepwise Method)	-	-	-	-	-
Diarrhea (enter Method)	112.477 (0.507)	-0.170 (0.253)	6.200 (0.008)*	18.864 (0.040)*	6.261 (0.028)*
Diarrhea (Stepwise Method)	-	-	-	-	-
Meningitis (enter Method)	-10.225 (0.728)	0.062 (0.39)	-0.627 (0.066)	1.243 (0.191)	3.934 (0.072)
Meningitis (Stepwise Method)	-	-	-	-	-

From table 4.3f, the enter method of regression indicates that there is no significant relationship between rainfall and Malaria (0.365), Measles (0.483), Typhoid (0.296), Cholera (0.572), Pneumonia (0.207), Cough (0.177), Diarrhea (0.253), Meningitis (0.39). This is because the calculated values (2-tailed) for these diseases are greater than 0.05 level of confidence. The enter method of regression indicates that there is no significant relationship between relative humidity and Malaria (0.065), Measles (0.993), Typhoid (0.065), Cholera (0.657), Pneumonia (0.718), Cough (0.128), Meningitis (0.066). This is because the calculated value (2-tailed) for these diseases are greater than 0.05 level of confidence. There is significant relationship between relative humidity and Malaria (0.022)* in stepwise method, and between relative humidity and Diarrhea (0.008)*in enter method. The enter method also indicates that there is no significant relationship between temperature and Malaria (0.965), Measles (0.852),Typhoid (0.328),Cholera(0.891) Pneumonia (0.936), Cough (0.916) , Meningitis (0.191). This is because the calculated value (2-tailed) for these diseases are greater than 0.05 level of confidence. The enter method also indicates a relationship between temperature and Diarrhea (0.040)*. This because the calculated value (2-tailed) Sig is less than the 0.05 level of tolerance. The stepwise method shows that humidity mostly determines malaria (0.022) while the enter method shows all the climatic variables contribute to the outbreak of Diarrhea (0.028)*.

Table 4.3g JULY

DISEASES	A	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	Number
Malaria (enter method)	1765.533 (0.022)	0.017 (0.907)	-9.042 (0.149)	-41.308 (0.031)	4.101 (0.067)
Malaria (Stepwise Method)	954.582 (954.582)	-	-	37.645 (0.019)*	8.672 (0.019)*
Measles (enter method)	5.973 (0.930)	-0.005 (0.773)	-0.124 (0.842)	0.347 (0.842)	0.043 (0.987)
Measles (Stepwise Method)	-	-	-	-	-
Typhoid (enter method)	814.283 (0.032)	0.125 (0.139)	-3.728 (0.232)	-20.847 (0.033)*	2.994 (0.117)
Typhoid (Stepwise Method)	-	-	-	-	-
Cholera (enter method)	-65.932 (0.446)	0.011 (0.613)	0.677 (0.414)	0.426 (0.844)	0.415 (0.749)
Cholera (Stepwise Method)	-	-	-	-	-
Pneumonia (enter method)	422.210 (0.154)	0.066 (0.349)	-1.613 (0.538)	-12.086 (0.119)	1.189 (0.390)
Pneumonia (Stepwise Method)	-	-	-	-	-
Cough (enter method)	230.087 (0.295)	0.054 (0.325)	-0.509 (0.799)	-7.646 (0.189)	0.776 (0.549)
Cough (Stepwise Method)	-	-	-	-	-
Diarrhea (enter Method)	1044.283 (0.068)	0.078 (0.531)	-7.721 (0.136)	-16.873 (0.212)	1.521 (0.302)
Diarrhea (Stepwise Method)	-	-	-	-	-
Meningitis (enter Method)	91.117 (0.146)	0.007 (0.638)	-1.067 (0.087)	-0.188 (0.898)	1.586 (0.288)
Meningitis (Stepwise Method)	-90.724 (0.039)	-	-1.093 (0.044)*	-	5.720 (0.044)*

The outcome of table 4.3g using enter method indicates that there is no significant relationship between rainfall and Malaria (0.907), Measless (0.773), Typhoid (0.139), Cholera(0.613), Pneumonia (0.349), Cough (0.325), Diarrhea (0.531), Meningitis (0.638). This is because the calculated values (2-tailed) for all the elements are greater than 0.05 level of confidence. Using the enter method of regression there is no significant relationship between humidity and Malaria (0.149), Measles (0.842), Typhoid (0.232), Cholera (0.414), Pneumonia (0.538), Cough (0.799), Diarrhea (0.138), Meningitis (0.087). This is because the calculated values are greater than the 0.05 level of confidence. However, there is a negative relationship between Meningitis (0.044)* and humidity in the month of July the Stepwise results indicates that Malaria (0.019) *is influenced by temperature in July and Meningitis (0.044)* is influenced by humidity .in thesame July

Table 4.3h AUGUST

DISEASES	A	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	Number
Malaria (enter method)	-1426.672 (0.147)	-0.285 (0.461)	3.371 (0.399)	-64.859 (0.095)	1.838 (0.241)
Malaria (Stepwise Method)	-	-	-	-	-
Measles (enter method)	28.578 (0.511)	-0.001 (0.966)	-0.022 (0.904)	-1.044 (0.529)	0.150 (0.962)
Measles (Stepwise Method)	-	-	-	-	-
Typhoid (enter method)	515.001 (0.156)	0.033 (0.814)	-0.344 (0.811)	-18.740 (0.174)	0.823 (0.527)
Typhoid (Stepwise Method)	-	-	-	-	-
Cholera (enter method)	-6.305 (0.833)	-0.007 (0.583)	0.099 (0.458)	0.078 (0.946)	0.283 (0.836)
Cholera (Stepwise Method)	413.78 (0.976)	-	13.84 (0.001)*	-	25.789 (0.001)*
Pneumonia (enter method)	-277.678 (0.253)	0.011 (0.911)	0.071 (0.943)	-11.197 (0.231)	0.620 (0.627)
Pneumonia (Stepwise Method)	-	-	-	-	-
Cough (enter method)	400.315 (0.004)	0.006 (0.873)	-0.471 (0.259)	-14.518 (0.05)*	6.573 (0.025)*
Cough (Stepwise Method)	354.426 (0.001)	-	-	14.74 (0.002)*	19.239 (0.002)*
Diarrhea (enter Method)	-597.499 (0.249)	0.055 (0.792)	-0.028 (0.989)	-22.104 (0.262)	0.531 (0.678)
Diarrhea (Stepwise Method)	-	-	-	-	-
Meningitis (enter Method)	-30.658 (0.537)	-0.013 (0.537)	0.239 (0.285)	0.813 (0.666)	6.580 (0.649)
Meningitis (Stepwise Method)	-	-	-	-	-

Table 3.3b using enter method of regression results indicates that there is no significant relationship between rainfall and Malaria (0.461) , Measles (0.966), Typhoid (0.814), Cholera (0.583), Pneumonia (0.911), Cough (0.873), Diarrhea(0.792), Meningitis (0.537). This is because the calculated values for these diseases are greater than the 0.05 level of confidence. The enter method equally indicates that there is no significant relationship between humidity and malaria (0.399), Measles (0.904), Typhoid (0.811), Cholera (0.458), Pneumonia (0.943). Cough (0.259), Diarrhea (0.989), Meningitis (0.285). This is because the calculated values are greater than 0.05 confidence level. There is no significant relationship between temperature and Malaria (0.095), Measles (0.529), Typhoid (0.174), Cholera (0.946), Pneumonia (0.231), Diarrhea (0.262), Meningitis (0.666). This is because the calculated values are greater than 0.05 confident levels. In the enter method, there is negative significant relationship between temperature and Cough (0.05) *and (0.002)* for the stepwise method and Cholera stepwise for humidity is (0.001)* which are all less than 0.05 confident level. Therefore, humidity (0.001)* is responsible for the occurrence of Cholera and all the climatic elements are responsible for the occurrence of Cough (0.002)*.

Table 4.3i SEPTEMBER

DISEASES	a	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	Number
Malaria (enter method)	1418.797 (0.167)	0.002 (0.893)	11.026 (0.147)	26.001 (0.534)	1.807 (0.246)
Malaria (Stepwise Method)	-762.688 (0.063)	-	10.604 (0.045)*	-	5.658 (0.045)*
Measles (enter method)	-59.109 (0.482)	0.004 (0.019)*	1.899 (0.017)*	-3.869 (0.306)	4.249 (0.062)
Measles (Stepwise Method)	-	-	-	-	-
Typhoid (enter method)	-232.209 (0.157)	-0.003 (0.186)	-1.355 (0.250)	7.695 (0.267)	4.141 (0.066)
Typhoid (Stepwise Method)	-139.398 (0.060)	-	2.434 (0.016)*	-	-9.168 (0.016)*
Cholera (enter method)	12.000 (0.8866)	0.001 (0.317)	0.675 (0.296)	-2.695 (0.472)	0.521 (0.683)
Cholera (Stepwise Method)	-	-	-	-	-
Pneumonia (enter method)	-313.274 (0.217)	-0.001 (0.861)	2.473 (0.189)	6.165 (0.558)	1.764 (0.254)
Pneumonia (Stepwise Method)	-186.499 (0.064)	-	2.718 (0.034)*	-	6.119 (0.038)*
Cough (enter method)	-223.226 (0.299)	0.002 (0.557)	2.666 (0.115)	1.445 (0.849)	1.519 (0.303)
Cough (Stepwise Method)	-	-	-	-	-
Diarrhea (enter Method)	412.247 (0.272)	-0.004 (0.467)	3.088 (0.264)	9.628 (0.543)	2.165 (0.193)
Diarrhea (Stepwise Method)	-294.663 (0.058)	-	4.435 (0.030)*	-	2.628 (0.030)*
Meningitis (enter Method)	-23.871 (0.228)	2.069 (0.938)	0.109 (0.437)	0.675 (0.419)	0.763 (0.555)
Meningitis (Stepwise Method)	-	-	-	-	-

The outcome of the enter regression method in the month of September (Table4.3i) portrays that there is no significant relationship between rainfall and Malaria (0.893), Typhoid (0.186), Cholera (0.317), Pneumonia (0.861), Cough (0.557) Diarrhea (0.467), Meningitis (0.938). This is because the calculated values for these diseases are greater than the 0.05 confident levels. Measle also shows significant relationship with rainfall (0.019)* and humidity (0.017)* because their values are all less than 0.05 confident level. There is no significant relationship between humidity and Malaria (0.147), Typhoid (0.250), Cholera (0.296), Pneumonia (0.189), Cough (0.115), Diarrhea (0.264), Meningitis (0.437). This is because the calculated values for all these diseases are greater than the 0.05 confident level. The enter method shows that there is a significant relationship between humidity and Measles (0.017)* and the stepwise method indicates that there is significant relationship between humidity and Malaria (0.045)*, Typhoid (0.016)*, Pneumonia (0.034)*, Diarrhea (0.030)*. This is because the calculated values for all these diseases are less than 0.05 confident level. The enter method indicates that there is no significant relationship between temperature and Malaria (0.534), Measles (0.306), Typhoid (0.267), Cholera (0.472), Pneumonia (0.558), Cough (0.849), Diarrhea (0.543), Meningitis (0.419). This is because all the calculated values for these diseases are greater than 0.05 confident level. The outcome of the stepwise regression therefore indicates that humidity is responsible for Malaria (0.045)*, Typhoid (0.016)*, Pneumonia (0.034)*, and Diarrhea (0.030)**.**

Table 4.3j OCTOBER

DISEASES	a	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	Number
Malaria (enter method)	661.673 (0.500)	0.086 (0.812)	5.663 (0.153)	-40.076 (0.390)	0.972 (0.465)
Malaria (Stepwise Method)	-	-	-	-	-
Measles (enter method)	-8.301 (0.388)	-0.002 (0.580)	-0.023 (0.517)	0.431 ((0. 342)	0.359 (0.785)
Measles (Stepwise Method)	-	-	-	-	-
Typhoid (enter method)	345.546 (0.043)*	-0.030 (0.576)	1.314 (0.041)*	-15.836 (0.046)*	4.769 (0.050)*
Typhoid (Stepwise Method)	-	-	-	-	-
Cholera (enter method)	-	-	-	-	-
Cholera (Stepwise Method)	-	-	-	-	-
Pneumonia (enter method)	-26.357 (0.920)	0.048 (0.629)	0.248 (0.802)	1.091 (0.929)	0.17 (0.912)
Pneumonia (Stepwise Method)	-	-	-	-	-
Cough (enter method)	-46.902 (0.801)	-0.035 (0.619)	-0.029 (0.967)	-3.026 (0.729)	0.120 (0.945)
Cough (Stepwise Method)	-	-	-	-	-
Diarrhea (enter Method)	484.427 (0.140)	0.048 (0.670)	1.304 (0.269)	-21.398 (0.160)	0.987 (0.460)
Diarrhea (Stepwise Method)	-	-	-	-	-
Meningitis (enter Method)	-0.613 (0.980)	-0.007 (0.454)	-0.077 (0.406)	-0.181 (0.872)	0.483 (0.768)
Meningitis (Stepwise Method)	-	-	-	-	-

The enter method results of table 4.3j shows that there is no relationship between rainfall and Malaria (0.812) and , Measles (0.580), Typhoid (0.576), Pneumonia (0.629), Cough (0.619), Diarrhea (0.670), Meningitis (0.454). This is because the calculated values of these diseases are higher than the confident value of 0.05. The enter method results equally shows that there is no relationship between relative humidity and Malaria (0.153), Measles (0.517), Pneumonia (0.802), Cough (0.967), Diarrhea (0.269), Meningitis (0.406). This is because the calculated value of these diseases is greater than 0.05 confident level. The enter method also shows that there is significant relationship between humidity and Typhoid (0.041)*. This is because the calculated value of Typhoid is less than the 0.05 confident level.

Moreso, the enter method equally indicates that there is no significant relationship between temperature and Malaria (0.390), Measles (0.342), Pneumonia (0.929),Cough (0.729), Diarrhea (0.160), Meningitis (0.872). This is because the calculated values of these diseases are greater than the 0.05 confident levels. The enter method equally shows that all the variables contribute to the occurrence of Typhoid (0.050).

Table 4.3k NOVEMBER

DISEASES	a	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	Number
Malaria (enter method)	36.440 (0.937)	-1.944 (0.605)	3.227 (0.322)	-4.633 (0.806)	0.627 (0.624)
Malaria (Stepwise Method)	-	-	-	-	-
Measles (enter method)	0.573 (0.741)	-0.018 (0.223)	-0.029 (0.039)*	0.085 ((0. 254)	2.848 (0.127)
Measles (Stepwise Method)	1.294 (0.027)	-	0.026 (0.050)*	-	5.340 (0.050)*
Typhoid (enter method)	125.041 (0.404)	-1.082 (0.371)	0.970 (0.342)	-5.448 (0.374)	1.327 (0.350)
Typhoid (Stepwise Method)	-	-	-	-	-
Cholera (enter method)	0.328 (0.360)	0.014 (0.002)*	-0.004 (0.163)	-0.008 (0.572)	10.990 (0.008)
Cholera (Stepwise Method)	-0.013 (0.524)	0.014 (0.001)*	-	-	26.676 (0.001)*
Pneumonia (enter method)	15.465 (0.851)	-0.834 (0.236)	0.253 (0.651)	-0.063 (0.985)	0. 967 (0.539)
Pneumonia (Stepwise Method)	-	-	-	-	-
Cough (enter method)	-74.644 (0.420)	0.482 (0.513)	0.814 (0.211)	2.486 (0.505)	1.060 (0.433)
Cough (Stepwise Method)	-	-	-	-	-
Diarrhea (enter Method)	117.675 (0.467)	-1.225 (0.354)	0.792 (0.468)	-4.427 (0.500)	0.987 (0.460)
Diarrhea (Stepwise Method)	-	-	-	-	-
Meningitis (enter Method)	2.950 (0.816)	0.032 (0.757)	0.108 (0.235)	-0.269 (0.606)	0.656 (0.608)
Meningitis (Stepwise Method)	-	-	-	-	-

The outcome of enter method for table 4.3k shows that there is no significant relationship between rainfall and Malaria (0.605), Measles (0.223), Typhoid (0.371), Pneumonia (0.236), Cough (0.513), Diarrhea (0.354), Meningitis (0.757). This is because the calculated value for these diseases is greater than 0.05 confident level. The enter regression method also shows that there is no significant relationship between humidity and Malaria (0.322), Measles (0.039), Typhoid (0.342), Cholera (0.163), Pneumonia (0.651), Cough (0.211), Diarrhea (0.468), Meningitis (0.235). This is because their calculated values are greater than 0.05 confident level. There is no relationship between temperature and Malaria (0.806), Measles (0.254), Typhoid (0.374), Cholera (0.572), Pneumonia (0.985), Cough (0.505), Diarrhea (0.500) and Meningitis (0.606). This is because the calculated values for these diseases are greater than 0.05 confident level. The stepwise regression method indicates that humidity is responsible for the occurrence of Measles (0.05)*, and rainfall is responsible for the occurrence of Cholera (0.001)*.

Table 4.3l DECEMBER

DISEASES	a	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	Number
Malaria (enter method)	-387.829 (0.609)	-	7.903 (0.210)	8.578 (0.808)	1.410 (0.306)
Malaria (Stepwise Method)	-	-	-	-	-
Measles (enter method)	-2.344 (0.026)	-	0.002 (0.782)	0.103 ((0. 034)*	4.771 (0.049)*
Measles (Stepwise Method)	-2.399 (0.014)	-	-	0.108 (0.011)*	10.685 (0.011)*
Typhoid (enter method)	-80.593 (0.621)	-	2.642 (0.069)	1.336 (0.860)	3.089 (0.109)
Typhoid (Stepwise Method)	-52.841 (0.151)	-		2.741 (0.030)*	6.988 (0.030)*
Cholera (enter method)	0.624 (0.043)	-	-0.005 (0.616)	0.018 (0.0401)*	0.920 (0.442
Cholera (Stepwise Method)	-	-	-	-	-)
Pneumonia (enter method)	-31.609 (0.894)	-	2.084 (0.288)	-0.243 (0.983)	0. 805 (0.485)
Pneumonia (Stepwise Method)	-	-	-	-	-
Cough (enter method)	-23.020 (0.897)	-	1.531 (0.294)	-0.244 (0.977)	0.779 (0.495
Cough (Stepwise Method)	-	-	-	-	-
Diarrhea (enter Method)	-180.380 (0.631)	-	5.486 (0.095)	2.813 (0.872)	2.509 (0.151)
Diarrhea (Stepwise Method)	-121.963 (0.151)	-		5.694 (0.044)*	5.681 (0.044)*
Meningitis (enter Method)	-9.255 (0.480)	-	0.109 (0.303)	0.336 (0.581	1.322 (0.326)
Meningitis (Stepwise Method)	-	-	-	-	-

The results of enter method of regression from table 4.31 indicate that there is no significant relationship between humidity and Malaria (0.210), Measles (0.782), Typhoid (0.069), Cholera (0.616), Pneumonia (0.288),Cough(0.294), Diarrhea (0.095), Meningitis (0.303). This is because the calculated values for these diseases are greater than 0.05 confident level. There is no significant relationship between temperature and Malaria (0.808), Typhoid (0.860), Pneumonia (0.983), Cough (0.977), Diarrhea (0.872), Meningitis (0.581). This is because the calculated values for all these diseases are greater than 0.05. The stepwise regression indicates that temperature is responsible for Measles (0.011)*, Typhoid (0.030)* and Diarrhea (0.044)*.

Table 4.4 CORRELATION OF THE OVERALL CLIMATIC VARIABLES WITH THE OVERALL DISEASES DATA FROM 1999 TO 2008 (SUMMARY)

DISEASE	MEANS	RAINFALL		RELATIVE HUMIDITY		TEMPERATURE	
		Correlation Index (r)	Correlation Sig	Correlation Index (r)	Correlation Index Sig	Correlation Index (r)	Correlation Index Sig
Malaria	58.19 SD15.55	0.849	0.000*	0.947	0.000*	-.095	0.385
Measles	3.39 SD 2.47	0.019	0.476	0.018	0.477	0.580	0.024*
Typhoid	45.51 SD11.79	0.925	0.000*	0.903	0.000*	-0.016	0.048
Cholera	0.84 SD 1.10	0.716	0.004*	0.653	0.011*	-0.178	1.178
Pneumonia	23.57 SD 5.71	0.719	0.004*	0.726	0.004*	0.13	0.484
Cough	35.62 SD 38.69	-0.229	0.237	-0.269	0.199	0.023	0.408
Diarrhea	49.23 SD 9.35	0.761	0.002*	0.825	0.000*	-0.112	0.364
Meningitis	9.353 SD2.02	-0.248	0.219	-0.254	0.213	0.745	0.03*

From the table 4.4 Malaria shows strong relationship with rainfall (0.849) and relative humidity (r=0.947) and the calculated values for both rainfall and relative humidity with malaria is 0.000< 0.05 confident level. Temperature however, shows a negative correlation with Malaria (r=-0.095) and the calculated sig (one-tailed) of 0.385 >0.05 level of tolerance. Measles shows a very weak relationship with rainfall (r=0.019) and with Relative humidity (0.018). It is however, moderately related with temperature (r=0.058) and its correlation sig (one-tailed) is 0.024< 0.05 level of tolerance. From the results of the correlation, Typhoid has a significant relationship with rainfall and relative humidity. This is because their correlation sign (one-tailed) is less than 0.05 confident level, while temperature (r=-0.016) is negatively related with Typhoid but it is significant because its correlation sig. 0.048* is less than 0.05 confidence level.

There is significant relationship between Cholera with rainfall and humidity. This is because the correlation sig (0.004)* for Cholera, and 0.011* for relative humidity are both less than 0.05 confident level while temperature is negatively related with

Cholera (r=-0.178) and correlation sig (0.178) is greater than the 0.05 level of confidence.

Pneumonia shows significant relationship with rainfall and relative humidity. i.e the correlation sig (one – tailed) is 0.004 *for rainfall and 0.004 *for relative humidity, both are less than 0.05 confident level. Pneumonia is not significantly related with temperature this is because the correlation index (0.13) is very low and the correlation sig (one – tailed) 0.484 is greater than the 0.05 confidence level.

From the results of the correlation between Cough with the elements of weather, Cough is found not to be significantly related with rainfall and relative humidity. This is because the calculated correlation sig (0.237) for rainfall and 0.199 for humidity are both greater than 0.05 confident level and -0.269 for rainfall and -0.269 for humidity are lower. A careful study of table 4.4 shows that Rainfall and relative humidity are significantly related with Diarrhea. This is because the correlation sign (0.002)* for rainfall and 0.000*for relative humidity are both lower than 0.05 level of tolerance, while temperature is not significantly related with Diarrhea because correlation sig (one – tailed) 0.364 is greater than 0.05 level of tolerance.

Meningitis shows a significant relationship with temperature (r=0.745) and 0.03* correlation sig (one-tailed) is less than 0.05 level of tolerance. Rainfall and relative humidity are not significantly related with Meningitis. This is because the correlation sig (one – tailed) 0.219 for rainfall and 0.213 for relative humidity are greater than 0.05 level of tolerance.

The results of the PPMC correlation indicates that Malaria, Typhoid, Cholera, Pneumonia and Diarrhea show strong significant relationship with rainfall and relative humidity while Measles, Cough and Meningitis do not show significant relationship with these two weather variables.

The result of the PPMC correlation in table 4.4 indicates that temperature is significantly related with Measles and Meningitis only. Temperature does not show significant relationship with, Cough and Pneumonia. However, it indicates a negative correlation with Malaria, Typhoid, Cholera and Diarrhea.

Table 4.4.1. The Overall Analysis of Climatic Variables with the Overall Diseases Data from 1999 to 2008 Using Stepwise and Enter Method of Regression

DISEASES	A	$b_1 x_1$	$b_2 x_2$	$b_3 X_3$	Number
Malaria (enter method)	20.573 (0.423)	-0.065 (0.080)	1.232 (0.001)*	-0.965 (0.385)	36.129 (0.000)*
Malaria (Stepwise Method)	14.765 (0.013)	-	0.741 (0.000)*	-	86.887 (0.000)*
Measles (enter method)	-21.936 (0.085)	0.017 (0.296)	-0.116 (0.351)	1.183 (0.039)*	2.017 (0.190)
Measles (Stepwise Method)	-19.758 (0.084)	-	-	0.931 (0.049)*	5.059 (0.049)*
Typhoid (enter method)	-5.903 (0.801)	0.073 (0.043)*	-0.010 (0.968)	1.614 (0.138)	23.071 (0.000)*
Typhoid (Stepwise Method)	34.417 (0.000)	0.068 (0.000)*			59.030 (0.000)*
Cholera (enter method)	2.389 (0.599)	0.005 (0.374)	-0.005 (0.873)	-0.080 (0.681)	3.017 (0.094)
Cholera (Stepwise Method)	0.063 (0.851)	0.005 (0.009)*	-	-	10.498 (0.009)*
Pneumonia (enter method)	1.839 (0.938)	0.030 (0.548)	0.067 (0.785)	0.590 (0.564)	3.338 (0.077)
Pneumonia (Stepwise Method)	11.332 (0.015)	-	-0.209 (0.008)*	-	11.148 (0.008)*
Cough (enter method)	26.446 (0.906)	0.107 (0.725)	-1.325 (0.583)	2.790 (0.777)	0.264 (0.850)
Cough (Stepwise Method)	-	-	-	-	-
Diarrhea (enter Method)	33.024 (0.314)	-0.021 (0.621)	0.547 (0.131)	0.500 (0.718)	0.005 (0.019)*
Diarrhea (Stepwise Method)	26.465 (0.388)	-	-0.388 (0.001)*	-	21.381 (0.001)*
Meningitis (enter Method)	-20.617 (0.016)	0.015 (0.116)	-0.135 (0.086)	1.176 (0.003)*	6.331 (0.017)*
Meningitis (Stepwise Method)	-21.057 (0.012)	-	-	0.976 (0.005)*	12.481 (0.005)*

Table 4.4.1 shows the summary of the whole results for the ten years record (1999 to 2008) and from the table, it indicates that there is no significant relationship between rainfall and Malaria (0.080), Measles (0.296), Cholera (0.374), Pneumonia (0.548), Cough (0.725), Diarrhea (0621), Meningitis (0.116) This is because the calculated value of all these diseases are greater than 0.05 confident level. The enter method indicates that rainfall has significant relationship with Typhoid (0.043)*. The stepwise regression method shows that there is significant relationship between rainfall and Typhoid(0.000)*, Cholera (0.009)*. The enter method of regression equally indicates that there is no significant relationship between humidity and Measles (0.351), Typhoid (0.968), Cholera (0.873), Pneumonia (0.785), Cough (0.583), Diarrhea (0131), Meningitis (0.086). This is because the calculated values of all these diseases are greater than the 0.05 confident level. The stepwise method of regression shows that there is significant relationship between humidity and Malaria (0.000)*, Pneumonia (0.008)*, Diarrhea (0.001)*. This is because the calculated values of these diseases are less than 0.05 degree of freedom.

More so, the results of enter method is table 4.4.1 still indicates that there is no significant relationship between temperature and Malaria (0.385), Cholera (0.681), Pneumonia (0.564), Cough (0.777), Diarrhea (0.718). This is because the calculated values for these diseases are grater than 0.05 confident level. The enter regression method reveals that there is significant relationship between temperature and Measles (0.039)*, Meningitis (0.003)*. This is because the calculated values for these diseases are less than 0.05 confident levels. The stepwise regression method indicates that there is significant relationship between temperature and Measles (0.049)*, Meningitis (0.005)*. The stepwise regression method shows that climatic variables that is mostly responsible for the occurrence of Malaria (0.000)* is humidity, temperature is responsible for Measles (0.049)*, rainfall is responsible for Typhoid (0.000)*, rainfall

is responsible for Cholera (0.009)*,humidity influences Pneumonia (0.008)*, humidity is responsible for Diarrhea (0.001)*, temperature is responsible for Meningitis (0.005)*. The enter regression method shows that the contribution of all the climatic variables are responsible for Malaria (0.000)*, Typhoid (0.000)*, Diarrhea (0.019)*, Meningitis (0.017)*.

4.5 HYPOTHESES

4.5.1 Hypothesis One

There is no significant relationship between weather elements (rainfall, relative humidity and temperature) and the occurrence of common disease in Kafanchan.

Malaria, Pneumonia and Diarrhoea in the Stepwise Regression Analysis Method (Table 4.4.1) shows that relative humidity is significantly influencing them while Typhoid, Measles, Cholera, Cough and Meningitis are not influenced by relative humidity.

Also Stepwise Regression Analysis indicates that temperature is mostly responsible for Measles and Meningitis while other diseases like Malaria, Typhoid, Cholera, Pneumonia, Cough, Diarrhoea, are not significantly influenced by temperatures. It also portrays that rainfall is responsible for Typhoid and Cholera while others diseases are not depending on rainfall for their occurrences.

Although various diseases are influenced by different weather elements as shown by the stepwise regression analysis result, i.e. humidity has high impact on Malaria, Pneumonia and Diarrhoea, temperature on Measles and Meningitis, rainfall on Typhoid and Cholera. The collective effect of all the weather variables cannot be ignored. Lastly , the enter method of regression, on the other hand, indicates that the aggregate weather elements (rainfall, relative humidity and temperature) have a collective

influence on Malaria, Typhoid, Diarrhea and Meningitis, while Measles, Cholera, Pneumonia and Cough are not significantly influenced by the aggregate weather elements. Base on the foregoing therefore the Null Hypothesis is accepted for Measles, Cholera, Pneumonia, and Cough and rejected for Malaria, Typhoid, Diarrhoea and Meningitis.

4.5.2 Hypothesis Two

There is no significant seasonal variability (differences) in the occurrence of common diseases in the study area

Table 4.6 SEASONAL VARIABILITY OF DISEASES

DISEASE	DRY SEASON	HOT SEASON	RAINY SEASON	WET-SEASON	F
Malaria	44.81a	48.80b	63.28c	71.59c	1.342(0.005)*
Measles	2.48a	5.27b	3.95c	2.33d	1.310(0.001)*
Typhoid	32.10a	44.27b	46.35c	53.56d	8.391(0.000)*
Cholera	0.23a	0.33a	1.17a	1.39a	1.526(0.212)
Pneumonia	19.60a	23.00a	23.73a	25.67a	0.640(0.591)
Cought	50.78a	21.91a	27.57a	25.32a	0.479(0.698)
Diarrhoea	41.10a	42.55b	53.48c	53.51d	1.613(0.001)*
Meningitis	3.20a	5.43b	3.60c	1.75d	4.0519(0.009)*

From Table 4.6 Malaria has the highest occurrence during the wet-season with the mean of 71.59, this is followed by rainy season with 63.28, hot season 48.80 and lastly dry season with the mean of 44.8. It also indicates that there is significant variability in the occurrence of common diseases among the various seasons.

The results of ANOVA analysis from table 4.5 portrays that measles occurs mostly in the Hot season with mean of 5.27, this is followed by rainy season with mean of 3.95, then Dry season with 2.49 and lastly Wet season with mean of 2.33. There is a significant difference among the various seasons as regard to the occurrence of measles.

The result of the ANOVA analysis shows that there is a significant difference regarding the seasonality of Typhoid. The wet season has the highest occurrence (53.56), this is followed by the Rainy season (46.35), Hot season (44.27) and lastly Dry season with 3 2.10 as its mean.

The results of the ANOVA analysis indicate that there is no significant difference among the various seasons, regarding the occurrence of Cholera. Wet season has the highest occurrence of 1.39; this is followed by rainy season with mean of 1.17, hot season (0.33) and lastly dry season with mean of 0.23. Table 4.5 shows that there is no significant difference among seasons as regarding the occurrence of Pneumonia. The Wet season shows the highest occurrence (25.67), rainy season (23.73), hot season (23.00) and lastly Dry season (19.60)

There is no significant difference between the occurrence of Cough among the various seasons. However, Cough occurs mostly in the dry season with the mean of 50.78, rainy season (27.57), wet season (25.32) and then hot season 21.91.

The results of the ANOVA analysis show that there is a significant difference among the various seasons in the occurrence of Diarrhea. The highest occurrence is in the wet-season (53.51), rainy season (53.48), hot season (42.55) and dry season with 41.10. Therefore Diarrhea is usually very common in the wet-season in the study areas. The results of the ANOVA analysis in table 4.5 show that there is a significant difference between the occurrence of Meningitis among the various seasons. The Hot season

shows the highest mean of occurrence (5.43), this is followed by the Rainy season (3.60), Dry season (3.20) and then lastly the wet season (1.75) occurrence. Hence, Meningitis is common within the hot season. Therefore the Null Hypothesis is accepted for Cholera, Pneumonia, and Cough which shows no significant seasonal variability and rejected for Malaria, Measles, Typhoid, Diarrhea and Meningitis which shows significant seasonal variability in their occurrences.

4.7 DISCUSSION

From table 4. 3a, it shows that there is no single disease that is significant with the weather variables in both stepwise or enters method of regression. According to WHO (2001) the temporal and spatial changes in temperature, precipitation and humidity expected to occur under different climatic scenario could affect the biology and ecology of the vectors and intermediate hosts and consequently the risk of disease transmission. During this period, there is always very low temperature, humidity and rainfall. This may be the reason why the common diseases are not very prominent within this month.

In table 4.3b shows an inverse relationship between temperature and Cough in both stepwise and enter method of regression. The implication of this is that whenever temperature increases the rate of the occurrence of Cough reduces. According to Katayama and Momiyama – Sakamoto (1970) countries with smaller seasonal temperature ranges exhibit steeper regression lines in temperature mortality it correlations than do countries with greater temperature ranges. The cold allows the virus it self to be more fit and able, and of course, the biggest issue is that people get together in the cold weather and congregate and sneeze and cough. The fact that other diseases did not show any significant relationship with the climatic variables within the month of February may be due to Laxia (2003) explanation that certain diseases show

a seasonal trend and that variation from year to year in the general character of a particular season is reflected in the degree of severity of the outbreak of certain diseases.

Table 4.3c indicates that Meningitis is significantly related with temperature. The stepwise regression method therefore implies that temperature is the climatic variable that is mostly responsible for Meningitis. Other diseases are not significantly related with the climatic variables due to the reasons explained above. In April, table 4.3d shows that there is a significant inverse relationship between temperature and Malaria. This is supported by Michael (1995) that stated that minimum temperatures for mosquito development is between 8-10^{o}C the minimum temperature for parasites development are between 14-19^{o}C. The optimum temperature for mosquitoes is 25-27^{o}C and, the maximum temperature for both vectors and parasites is 40^{o}C (Michael, 1995). It also shows significant relationship between measles with temperature by April (table 4.3d). It is more common during late dry season to early onset of rainfall (March to June). Relative Humidity is very low because of the high temperature, since it is highly contagious and the measles virus can be active for two hours in the air on infected surface, the disease spreads easily during this period.

In May, (table 4.3e) there is significant relationship between Measles and temperature. The reason is not far fetched from what was explained above. There is also significant relationship between Typhoid and relative humidity. This is due to the fact that high relative humidity appears to increase the chances of microbial or viral infections since a rise in the viscosity or bronchial mucous seems to reduce the ability of the body to fight offending micro-organisms that may enter the body from atmosphere. Pneumonia also shows a negative significant relationship with temperature. This implies that when temperature reduces, the incidence of Pneumonia increases. Diarrhea also shows a

significant relationship with humidity. The reason for occurrence is because humidity may help in proliferation of the pathogen which eventually leads to diarrhea.

Table 4.3f (June) shows that there is a significant relationship between humidity and Malaria. Hence, humidity can be used to predict Malaria. When relative humidity is high, mosquitoes are more active and they act freely but when it is low, they are vulnerable and do not live long (Park, 1997). Diarrhea and temperature also show significant relationship intable 4.3f base on the reasons explained above. Table 4.3g (July) indicates significant relationship between Malaria and temperature and Typhoid and temperature. This is not surprising because Typhoid fever is observed all through the year but more significantly in some months.

In August (table 4.3h), there is a significant relationship between Cholera and humidity. This could be as a result of high rainfall that renders most of the drinking water dirty consequently effectively causes Cholera. Cough also shows significant relationship with temperature.. High rainfall during August may contribute to Cough. Table 4.3I (September) indicates that there are many diseases that are significantly related with the climatic variables. During this period the rainfall is usually high and hence the high humidity; and humidity makes pathogens to grow and spread faster thereby increasing the rate of the occurrence of Malaria. There is also significant relationship between rainfall and Measles, humidity and Measles and the justification is that high rainfall influences high humidity consequently the fast growth of pathogens. The stepwise regression method indicates that humidity is the climatic variable that mostly influences or is responsible for Typhoid, Pneumonia and Diarrhea in the month of September. This follows the same explanations as in above. The month of October (Table 4.3j) indicates that there is significant relationship between relative humidity and Typhoid, temperature and Typhoid. Temperature as earlier said helps in the proliferation of pathogens that lead to the occurrence of Typhoid. The

month of November (table 4.3k) shows that there is a significant relationship between relative humidity and measles as explained earlier. It also portrays a significant relationship between rainfall and Cholera. This may be justified by saying that there is no adequate clean water for drinking in the study area. According to World Health Organization (WHO, 2003) 78 percent of the population in less developed countries is without clean water and 85 percent without adequate faecal waste disposal. The study area is not an exception to this case.

The 4.3l (December) indicates that there is a significant relationship between temperature and Measles in both the enter and stepwise method of regression analysis. The reason for this was earlier explained. The significant relationship between Typhoid and temperature may be as a result of the fact that temperature in the multiplication of pathogen as earlier explained. Temperature also influences Cholera and Diarrhea. From the results of the analysis it is explicit that some diseases are more sensitive to weather elements than others and some are more prominent in some seasons than others.

From the (Table 4.4). The overall correlation of climatic variables with Diseases data, Malaria shows significant relationship with both rainfall and relative humidity. This is because Malaria has a predictable seasonal pattern with maximum prevalence during the rainy season which is of high rainfall and high relative humidity. The high rate of Malaria during the rainy season is not unexpected bearing in mind the fact that during rainy season there are a lot of stagnant water seen within Kafanchan which is a source of breeding places for the anopheles mosquitoes which facilitate Malaria transmission. This is collaborated by Anyanwu (2000) who affirms that Malaria is closely dependent upon the local climate which influences the ecology of mosquitoes. He further states that in the hot humid equatorial areas Anopheles mosquitoes find ideal conditions in

which to lay eggs. Stagnant water surfaces, water collecting in trees, palm leaves and other objects make ideal larval habitats for mosquitoes.

More so, when relative humidity is high, mosquitoes are more active they feed more voraciously but when it is low, they do not live long. Typhoid fever is observed all through the year but more significantly high observations were recorded during the rainy season. This is the reason why there is significant relationship between Typhoid fever with rainfall and relative humidity. The occurrence of Typhoid is higher when relative humidity is higher usually during the rainy season. This can be explained from several perspectives. The town of Kafanchan lacks modern drainage system, hence most of the sources of drinking water such as rivers, wells, streams, ponds among others, are contaminated hence the chances of Typhoid infection. Equally, according to Ayoade (1982), weather has potential to alter the average exposure of condition that is suitable for the vector and diseases pathogens.

Furthermore, both relative humidity and rainfall were found to have significant relationship with Cholera but temperature does not. This is justified by the fact that Kafancahn has no adequate clean water for drinking. Most of the sources of the drinking water may be easily contaminated with Cholera pathogens. This is substantiated by World Health Organization (2003) that 78 percent of the population in less developed countries is without clean water and 85 % without adequate faecal waste disposal. Kafanchan therefore is not an exception to this assertion. Pneumonia is significantly related with rainfall and relative humidity; this is contrary to the findings of Oshaji (2010) who founds out that Pneumonia was not significantly influenced by rainfall and relative humidity. Pneumonia is related to rainfall in Kafanchan possibly due to the fact that the area used to have low temperature as a result of the influence of the surrounding highlands and the thick cloud cover. Although other factors such as

housing condition, socio-economic development and poor nutritional habit which were not investigated by this work may also influence Pneumonia.

The correlation results show that rainfall and relative humidity correlates significantly with Diarrhoea. Diarrhoea occurs through out the year in most seasons when its frequency begins to drop. Relative humidity is higher between July and September because of the amount of rainfall in those months. Relative humidity favours the growth of disease pathogens it is easy for it to be spread during rainy season. Relative humidity and rainfall do not indicate significant relationship with Measles, Cough and Meningitis. This may explain the reason why these three diseases are not very common during the rainy season. It is possible because rainfall and humidity possibly do not encourage the growth and spreading of the pathogens that are responsible for these three diseases.

Of all the diseases, only Measles and Meningitis show significant relationship, with temperature. This is because Meningitis is spread majorly when the temperature is high in the dry season and there is overcrowding. Normally, when the temperature is high relative humidity is very low and there is usually no rainfall, this probably is the reason why Meningitis shows significant relationship with temperature. Other researchers that studied this relationship in Zaria and discovered that high temperature is the only weather element that triggers Meningitis (Osadare 2011, Bukhari 2009, Ogbaji 2006 and Oshaji 2000) give credence to this present findings.

Measles is not common in Kafanchan. It only occurs once in a while. When it occurs, it is mostly common during the dry season to early onset of rainfall (March and June). The disease is very contagious and the virus can be active for two hours in the air on infected surfaces, the disease spreads easily during this period.

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 SUMMARY

The investigation of the influence of weather elements on the occurrence of some common diseases in Kafanchan Jema'a Local Government Area of Kaduna State was conducted using weather records of rainfall, relative humidity and temperature acquired from the Water Board in the same town. The records of common diseases such as Malaria, Measles, Typhoid, Cholera, Pneumonia, Cough, Diarrhoea and Meningitis were collected from three different hospitals such as general Hospital Kafanchan, Kowa Hospital Kafanchan, and Ozumba Hospital all in Kafanchan town. These hospitals were used because they have records of common diseases not less than 10 years.

Two major hypotheses were tested for relationship between the weather elements (rainfall, relative humidity, and temperature) and the occurrence of common diseases and the seasonal variability of the common diseases. From the data of medical records, temperature, rainfall and relative humidity, collected, the monthly mean was obtained for each month. The seasons were grouped into four periods base on Osadare (2011). Dry season ''hamattan'' (November to February), Hot season (March to April), Thunderstorms and Rain season (May to June) Wet season (July to October). Equally, the analysis was first done on monthly basis using Stepwise and Enter methods of Regression Analysis to see if there is significant relationship between any of the common diseases and various elements in the various months. The overall analysis of climatic variables with the overall disease data from 1999 to 2008 was summarised and correlated using Pearson Product Moment Correlation (PPMC) and Stepwise and Enter Regression Statistics Methods to test for presence or absence of significant relationship between the variables.

The results of the research indicated that Although various diseases are influenced by different weather elements as shown by the stepwise regression analysis result, i.e. humidity has high impact on Malaria, Pneumonia and Diarrhoea, temperature on Measles and Meningitis, rainfall on Typhoid and Cholera. The collective or aggregate effect of all the weather variables on the diseases was not ignored The enter method of regression, on the other hand, indicates that the aggregate weather elements (rainfall, relative humidity and temperature) have a collective influence on Malaria, Typhoid, Diarrhea and Meningitis, while Measles, Cholera, Pneumonia and Cough are not significantly influenced by the aggregate weather elements. Base on this outcome the Null Hypothesis was accepted for Measles, Cholera, Pneumonia, and Cough and rejected for Malaria, Typhoid, Diarrhoea and Meningitis. The second Hypothesis states that there is no significant seasonal variability in the occurrences of common diseases in the study area. The Null Hypothesis for this Hypothesis was accepted for Cholera, Pneumonia, and Cough which shows no significant seasonal variability and rejected for Malaria, Measles, Typhoid, Diarrhea and Meningitis which shows significant seasonal variability in their occurrences.In the course of these study the following were observed:

-In the trend of occurrence of common diseases, the drier months have fewer occurrences of these common diseases than the wet Months. This may be attributed to the presence of water which enhance the growth and proliferation of diseases pathogens

-It was also observed by the researcher (personal observation) that many houses were built very close to the major river of Kafanchan. These houses do experience flooding due to high rainfall in the study area that is experienced due to Orographic effects. This flood may contribute to the spread of diseases carriers in the area.

-Inadequate sanitation of the town. There are no strict rules about refuse disposal i.e people dump polythene and other waste materials indiscriminately. These could lead to the multiplication and spread of diseases pathogens.

-The location of the area closer to highlands makes the area to have high rainfall, high relative humidity which were found to influence common diseases. Some of these diseases spread faster mostly during the rainy season while few spread during the dry season.

-Through observation and inquiring, it was noticed that there is only one major Government Hospital in the study area. This shows that there are inadequate Government Health Facilities in the area.

5.2 CONCLUSION

This research being first of its kind (to the best of my knowledge) to investigate the influence of weather elements on common diseases in Kafanchan has discovered many facts. The research discovered the common diseases prevalent in the study through medical records. These include Malaria, Typhoid, Meningitis, Measles, Diarrhea, Cough, Pneumonia and Cholera.

The relationship between common diseases and weather condition was also found to be high. The analysis shows that most of the common diseases found in the study area have significant relationship with all the climatic elements but the correlation strength varies with each disease. On seasonal basis, all the three climatic elements i.e rainfall, temperature and relative humidity were found to influence common diseases based on prevailing season. The Product Moment Correlation Coefficient and Regression were used and the result obtained indicated that Malaria and Typhoid have the highest number of mean of occurrence in all the Months. Measles and Meningitis rarely occur,

but when they occur, it is usually during the hot period. The effect of urban growth in Kafanchan without attendant increase in social amenities and facilities may have led to the increase in the cases of common diseases. Inadequate environmental sanitation, insufficient Health care services, ignorance might have being among other factors that stimulate action of weather as it influences common diseases in Kafanchan town.

The study has shown that relative humidity, rainfall and temperature have a great influence on the occurrence of common diseases in Kafanchan. Some of the diseases show significant relationship with the weather elements while others do not.

5.3 RECOMMENDATION

1) Government need to enlighten the people on the need for adequate environmental sanitation. There should be strict rules against indiscriminate refuse disposal because the common diseases which are influenced by weather elements can be enhanced by poor sanitation.
2) It is important that government and other relevant agencies should take appropriate measures to protect the quality of the water resources by implementing strict rules against indiscriminate dumping of refuse and safeguarding the sources of drinking water in the area so as to improve public health. There should be continuous periodic water quality assessment of the river because of the dynamic nature of human activities taking place in the watershed, for efficient planning and management of our surface water resources.
3) The need to be enlightened about climate change, its effects and the means of mitigating or moderating its impact in order to reduce the influence of weather on common diseases.

4) In Kafanchan, the orographic effects of the various highlands make the area to have higher amount of rainfall compared to surrounding areas of the same location. This implies that the area is prone to flooding. Therefore people should be advised not to build houses close to the river and streams. Furthermore, flood when it occurs causes the spread of diseases. This can be controlled by the construction of good drainage system in Kafanchan town.
5) Government need to build and equip more hospitals with adequate personnel and subsidize services to moderate the effects of common diseases.
6) Urbanization which is obviously taken place in Kafanchan has its own effect. The town is growing without adequate town planning. Government need to plan the town in order to improve the health and sanitation of the residents.

REFERENCES.

Abaje. I.B, Ati.O.F and Ishaya, S. (2009). Nature of Portable Water Supply and Demand in Jema'a Local Government Area of Kaduna State,Nigeria. *Research Journal of Environmental and Earth Sciences 1(1):16-21,2009.ISSN2041-0492.maxwell Scientific Oganization 2009.*

Adamu, J.C. (2003). Water Constraint in the Rural Development of Jema'a Local Government Area, Kaduna State. An Unpublished M.Sc Thesis Department of Geography Ahmadu Bello University, Zaria.

Adebayo,A,A. (2000)."Temperature Variability and Outbreak of Meningitis and Measles in Yola, Nigeria":*Global Journal of pure and Applied sciences ISSN-1118-0579.*

Adefolalu D.O. (1984). On Bioclimatological Aspect of Harmattan Haze in Nigeria. *Arch. Met. Geoph.Biocli. Sci. B33 Pp 387 – 404*

Akinbobola, A. and Omotosho, J.B. (2004)."The Relationship between Meteorological Variables and Some Common Diseases in Some Selected Stations". Department of Meteorology, Federal University of Technology, Akure, Nigeria.

Andrew, G. (2010). Predicting Malaria Epidemics before Its Occurrence in Kenya, Uganda and Tanzania. Naiobi pet publisher,Kenya

Anyawu, D. (2000). The Influence of Greenhouse Effect on the Multiplication and Distribution of Malaria. Longman Plc.

Ayoade, J.O. (1988). Tropical Hydrology and Water Resources.1st Edition. London; Macmillan Publishers.

Ayoade J.O. (1982). Introduction to Climatology for the Tropics.Ibadan Spectrum Books limited Pp 25 – 235

Banzer,M. (2009)."Weather and Our Health." Retrieved on 18rh February 2009 from http://www.bbc.co.uk/weather/

Beniston,M. (2002). Climatic Change: Possible Impact on Human Health: *SWISSMED WKLY 2002,123: 332-337.www.smw.ch.*

Bukhari,T.B. (2009). Temperature and Rainfall Variability and Outbreak of Meningitis and Measles in Zaria L.G.A of Kaduna State, Nigeria. An Unpublished B.Sc Dissertation, Department of Geography, Ahmadu Bello University, Zaria.

Campbell-Lendrum, D. and Corvalan, C. (2009). Climate Change and Developing Cities; Implications for Environmental Health and Equity. Retrieved on 19th February, 2009 from http://www.pubmedcentral.nih.gov/artiderender.Fcgi

Canadian Climate Center Study (1981).

Climate and Health Resources Room (CHRR, 2008)"Climate and Malaria/Meningistis in Africa. Retrieved 27th March, 2009 form http.//www.iridl.ideo.Columbia.Edu/maproom/health/Regional/Africa/malaria .

Coleman,T.(2010).Forecasting Illness: The Weather-Health Connectionth. Retrieved 27th March 2009 from http://www.al-hikmah.org/fore-casting illness.htn.

Critchfield .H.J (1960). General Climatology.London, Prientice – Hall Inc. Pp 395 – 414

Doney,M. (2008). Net Benefits Development Issues41,PP.32.

Driscoll .P. (1971b). Relationship between Meteorological Variables and Mortality Rate. Chicago Manucipal press plc.

Duke . (2003). Environmental Health Principles. Fatcher pub.

Ericsson,C.(2010). How Does Our Cold Weather Affect Our Health?" Retrieved 27th March, 2009 from http://www.usatoday.com/weather/health/whealth.htm.

Fabian, E. and McMorry. (2003). The Impact of Weather on Human Well-being. Chicago Press.

Gagge,A.P. (1979). The Role of Humidity during Warm Discomfort in Indoor Climate: Effects on Human Comfort, Performance and Health in Residential, Commercial and Light Industry Building. Edited by Fanger P.O and Valbjorn,O.Yofit Publishers Washington

Global Health Report(2005).WHO Publication press.

Greer,A; Victoria,N.G .and Fisman, D(2008)."Climate Change and Infection Diseases in North America: The Road Ahead". *CMAJ .March 11,2008.178(6).Canadian Medical Association.*

Gellert. S, Hassan,B.Y. Melen,S. and Hiesgen,G. (1998). Malaria prevalence and outcome in the in-patients of the Padiatrics Department of state Specialist Hospital, Maiduguri, Nigeria. *Journal of Tropical Pediatrics. April 44(2).*

Griffiths,J.F. (1976). Applied Climatology: An introduction 2nd Edition.

Healthscout. (2010)."Measles-Synptoms, Treatment and Prevention. Retrieved March, 27th 2009 from "http://www.Hea;thscout.com/ency/68/732/main.

Hensel, H.(1979).Thermoreception and Human Comfort in INDOOR CLIMATE;Effect on Human Comfort,Performance and Health in Residential,Commercial and Light-industry Building.Edited by Fanger,P.O and Valbjorn,O.Gometed Press,London.

Hoeprich, P.D. (1977). Acute Bacterial Meningitis in Infectious Diseases: A Modern Treatise of Infectious Processes. 2nd Edition; Harper and Row Publisher, Inc.

Hore, P.N. (1979). Weather and Climate. Department of Geography Ahmadu Bello University, Zaria; *Journal of Zaria and Its Regions, vol. 4*.

Ilemona,J.O.(1983). A Prospective Study of Pneumonia in Under-Fives as Seen in A.B.U.T.H, Zaria. An Unpublished M.B.B.S. Dissertation. Department of Community Medicine Ahmadu Bello University, Zaria.

Ishaya.S and Abaje I.B (2008) Indigenous People's Perception on Climate Change And Adaptation Strategies in Jama'a Local Gvernment Area of Kaduna State,

Nigeria.Journal of Geography and Regional Planning Vol.1(8),pp.138-143.Nov.2008.

Kallamullah, M.S. (2002). Study on the Endemicity of Typhoid Fever in Ahmadu Bello University Community, Samaru ,Zaria. An Unpublished M.B.B.S Dissertification, Department of Community Medicine, Ahmadu Bello University, Zaria.

Kalkstein .L.S. (1984). The Influence of Temperature on the Spread and Distribution of Malaria. 2nd Edition; Lisspot publisher inc.

Kalkstein,L.S and Valimont,K.M. (2008). Climate Effect on Human Health. Retrieved June 16th 2009 from http://www.hc-sc.gc.ca/ewh-semt/climat/index-eng.php.

Kaplan, M. (2009). Biometeorology: It May be Weather, not Just in Your Head. Retrieved on 16th June 2009 from http:www.weather.com,arches and pains.

Katayama, K and Sakamoto, M (1970).Temperature and Correlation Model.Zoaninc.

La'ah,J.G.and Zubairu. (2007). Examination of the Trend and Seasonal Variation in the Incidence of Malaria in Gwagwalada, Nigeria. A Paper Presented at the 49th Annual Conference of Association of Nigeria Geographers (ANG) held at University of Abuja, 14th-19th.

Lixia. L.(2003). Impacts of Global Environmental Change on Future Health and Health Care in Tropical Countries. *British Medical Bulletin 1998:54(2):475-488*

Luber and Prudent.(2009)."Climate Change and Human Health. *Transaction of the American Clinical and Climatological Association,Vol.120,2009.*

Malek, E. (1999). The Way Weather Affects Your Health Retrived 12thFebruary, 2010 from http://www.ciesin.columbia.edocs/001-333/001-338html.

Matthew,B.(2005).Weather and Your Health. USATODAY, A Division of Gannett Co.Inc.

Martens, R. and Sandford, N. (1995) .Climate Change and Its Effect on Human Health. David Publisher inc.

Michael,M.C.(1995). Climate Change and Human Population Health. Australia; Liege Press,

Miller,(1977)."Malaria" in Infectious Diseases; A modernTreatise of Infectious Processes.2nd Editon; Herperand Row Publishers, Inc.

My Weather and Health Forecast (2010). Medical meteorology. Retrieved 23rd October, 2011 from http://weatherandhealth.net.

Monath, M. (1993). How Does Climate Influence Diseases. Mainstream publishers Plc.

National Center for Health Statistics (1978) United States of America

Ogbaji,E.C.(2006). Role of Temperature in the Distribution of Malaria: A Case Study of. Zaria and Environs. An Unpublished B.Sc. dissertation, Department of Geography, Ahmadu Bello University, Zaria.

Oshaji,O.B. (2000). Effect of Weather in Distribution of Some Diseases: A Case Study of Zaria. An Unpublished B.Sc Dissertation; Department of Geography, Ahmadu Bello University, Zaria.

Pampana, V. (1969). Climatology and its Relevance Bacruninc.

Park, K. (1997)."Epidemiology of Communicable Diseases" in Park's Textbooks of Preventive and Social Medicine.15th Edition.

Persinger.P. (1975). Our Environment and Our Health. Lisbon publishers.

Ray,V. (1970). Economic Activities in Zaria"in *Journal of Zaria and its Region,Vol4*. Department of Geography Ahmadu Bello University, Zaria.

Russell, T. and Martin, H. (1963). The Influence of Climate on The Diseases in Tropics. publisherinc.

Sawa, R.A. (2007). The Occurrence of Harmattan Dust – Related Health Hazards in the Sahelian Region of Northern Nigeria; *Journal of Environmental Studies, Volume 3, number 4 Pp 27 – 32*

Thomas, C. (2009). Climate Change May Alter Malaria Pattern. The Pennsylvania State University Press

Trop W.(1963) The Burden of Climate on Man. Queen Lister Press

Tong, V. (2002). Ecological Association between Variability and Transmission of Ross River Virus .Diseases in Queensland. Landmarn publishers

WHD (2008) ;World Health Day Report

WHO (2003) Climate Change and Human Health-Risk and Response, France.

WHO (2005) World Malaria Report

WHO (2007) Climate Change and Human Health" http:/www.euro.who.int/mediacentre/PRI.

Wilcocks and Manson-Bahr (1976). Tropical Diseases.Hilltop Press. Retrieved on 5th Augus2010 from http://www.webwire.com 2009 (5/01/2010) and http://www.tulane.edu/malaria (5/08/2010)

APPENDIX

4.1 DATA ON TEMPERATURE,RAINFALL AND RELATIVE HUMIDITY

(FROM 1999 TO 2008)

YEAR 1999

MONTH	RAINFALL 'MM'	RELATIVE HUMIDITY	TEMPERATURE oc		MEAN TEMPERATURE
			MAX	MINI	
JANUARY	2.88	37.5	37	12	24.5
FEBRUARY	19.69	40.5	37	17	27
MARCH	59.52	49	37	18	27.5
APRIL	71.2	56	37	18	27.5
MAY	282.72	77	35	19	27
JUNE	207.36	77	31	19	25
JULY	286.88	79.5	29	18	23.5
AUGUST	499.36	83	29	17	23
SEPTEMBER	349.44	77.5	30	18	24
OCTOBER	349.44	64.5	32	17	24.5
NOVEMBER	-	41.5	34	19	26.5
DECEMBER	-	34	35	10	22.5

YEAR 2000

MONTH	RAINFALL 'MM'	RELATIVE HUMIDITY	TEMPERATURE oc		MEAN TEMPERATURE
			MAX	MINI	
JANUARY	_	38	36	12	24
FEBRUARY	_	41.5	36	15	25.5
MARCH	26.2	38	36	13	24.5
APRIL	110.2	73.5	36	19	27.5
MAY	265.6	68	33	18	25.5
JUNE	276.8	82	30	17	23.5
JULY	177.3	79	30	18	24
AUGUST	403.7	83	28	17	22.5
SEPTEMBER	442.4	83	30	18	24
OCTOBER	130.1	61	32	17	24.5
NOVEMBER	_	27	35	13	24
DECEMBER	_	22	35	12	23.5

YEAR 2001

MONTH	RAINFALL 'MM'	RELATIVE HUMIDITY	TEMPERATURE oc		MEAN TEMPERATURE
			MAX	MINI	
JANUARY	_	27	35	14	24.5
FEBRUARY	_	25	36	16	26
MARCH	_	42.5	38	18	28
APRIL	115.5	64.5	35	20	27.5
MAY	160	76	33	19	26
JUNE	378.2	77	31	18	24.5
JULY	304.8	79.5	30	19	24.5
AUGUST	366.1	83	29	18	23.5
SEPTEMBER	364.8	79.5	30	18	24
OCTOBER	21.8	54.5	33	12	22.5
NOVEMBER	_	34	35	11	23
DECEMBER	_	27	36	13	24.5

YEAR 2002

MONTH	RAINFALL 'MM'	RELATIVE HUMIDITY	TEMPERATURE oc		MEAN TEMPERATURE
			MAX	MINI	
JANUARY	_	33	34	12	23
FEBRUARY	_	32	36	14	25
MARCH	24.8	50	37	18	27.5
APRIL	88.3	69.5	38	18	28
MAY	98.4	68	34	20	27
JUNE	341.8	73.5	31	18	24.5
JULY	412.8	78.5	30	19	24.5
AUGUST	342.7	84	29	18	23.5
SEPTEMBER	256.9	79.5	29	18	23.5
OCTOBER	151.2	77	32	17	24.5
NOVEMBER	3.2	48	33	13	23
DECEMBER	_	40	35	13	24

YEAR 2003

MONTH	RAINFALL 'MM'	RELATIVE HUMIDITY	TEMPERATURE oc		MEAN TEMPERATURE
			MAX	MINI	
JANUARY	_	27.5	35	11	23
FEBRUARY	_	32.5	36	16	26
MARCH	2.7	40.5	37	19	28
APRIL	170.2	56	37	19	28
MAY	83.2	77	35	20	27.5
JUNE	276.8	83.5	30	20	25
JULY	219.5	84	29	19	24
AUGUST	377.4	81.5	29	19	24
SEPTEMBER	378.6	67.5	31	18	24.5
OCTOBER	206.6	60	32	18	25
NOVEMBER	20	32.5	34	15	24.5
DECEMBER	_	23.5	34	10	22

YEAR 2004

MONTH	RAINFALL 'MM'	RELATIVE HUMIDITY	TEMPERATURE oc		MEAN TEMPERATURE
			MAX	MINI	
JANUARY	_	33.5	35	12	23.5
FEBRUARY	_	34.5	37	15	26
MARCH	5	45.5	38	17	27.5
APRIL	121.1	56	38	20	29
MAY	255.7	69.5	34	18	26
JUNE	223.4	74.5	31	18	24.5
JULY	352	79.5	30	18	24
AUGUST	427.8	85	30	17	23.5
SEPTEMBER	144.6	83	30	18	24
OCTOBER	14.2	79	33	17	25
NOVEMBER	10.1	49	35	16	25.5
DECEMBER	_	39	36	13	24.5

YEAR 2005

MONTH	RAINFALL 'MM'	RELATIVE HUMIDITY	TEMPERATURE oc		MEAN TEMPERATURE
			MAX	MINI	
JANUARY	_	38	37	11	24
FEBRUARY	_	40	38	15	26.5
MARCH	13.2	46.5	39	20	29.5
APRIL	67.4	55.5	39	20	29.5
MAY	123.8	74	37	20	28.5
JUNE	240.6	84	35	18	26.5
JULY	328.2	83	30	18	24
AUGUST	311	72	30	18	24
SEPTEMBER	326.6	77	30	18	24
OCTOBER	129.8	64	33	17	25
NOVEMBER	_	44	34	15	24.5
DECEMBER	_	30.5	36	14	25

YEAR 2006

MONTH	RAINFALL 'MM'	RELATIVE HUMIDITY	TEMPERATURE oc		MEAN TEMPERATURE
			MAX	MINI	
JANUARY	23.04	38.5	38	12	25
FEBRUARY	6.4	40	30	14	22
MARCH	4	44.5	37	18	27.5
APRIL	89.6	49	36	17	26.5
MAY	243.84	69.5	31	18	24.5
JUNE	178.4	81	35	16	25.5
JULY	269.44	82	29	16	22.5
AUGUST	356.8	69.5	28	17	22.5
SEPTEMBER	246.88	77	27	17	22
OCTOBER	151.68	63.5	33	16	24.5
NOVEMBER	_	45.5	30	14	22
DECEMBER	_	29	31	12	21.5

YEAR 2007

MONTH	RAINFALL 'MM'	RELATIVE HUMIDITY	TEMPERATURE oc		MEAN TEMPERATURE
			MAX	MINI	
JANUARY	_	39	37	13	25
FEBRUARY	_	37.5	31	13	22
MARCH	15.84	45.5	39	20	29.5
APRIL	219.04	48.5	36	20	28
MAY	225.44	72.5	30	20	25
JUNE	223.2	81	36	18	27
JULY	394.74	81.5	30	18	24
AUGUST	540	77.5	30	18	24
SEPTEMBER	365.92	79	30	18	24
OCTOBER	114.72	65	34	15	24.5
NOVEMBER	_	42	32	15	23.5
DECEMBER	_	29.5	32	13	22.5

YEAR 2008

MONTH	RAINFALL 'MM'	RELATIVE HUMIDITY	TEMPERATURE oc		MEAN TEMPERATURE
			MAX	MINI	
JANUARY	_	33	36	10	23
FEBRUARY	_	34.5	38	14	26
MARCH	_	45	37	15	26
APRIL	150.4	55	34	18	26
MAY	175.04	70.5	33	17	25
JUNE	233.8	69.5	31	17	24
JULY	168.3	80	28	16	22
AUGUST	332.8	86	28	17	22.5
SEPTEMBER	303.6	86.5	31	18	24.5
OCTOBER	112.24	78.5	32	17	24.5
NOVEMBER	_	49.5	32	16	24
DECEMBER	_	40.5	35	13	24

TABLE: 4.2.1 DATA ON COMMON DISEASES FROM GENERAL HOSPITAL KAFANCHAN.
YEAR:1999

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	82	5	4	3	14	14	25	0
February	53	9	46	0	16	39	79	0
March	99	25	78	4	31	35	44	19
April	44	35	35	0	445	46	145	13
May	82	41	65	0	27	66	90	0
June	89	46	65	0	42	70	106	0
July	78	23	70	0	41	73	108	6
August	115	6	95	0	31	49	57	8
September	124	4	104	0	40	49	31	0
October	80	0	60	0	111	47	88	0
November	59	0	29	0	30	19	22	0
December	34	0	25	0	5	20	17	0

YEAR 2000

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	58	5	56	0	30	83	90	4
February	80	5	55	0	0	62	23	6
March	70	5	55	0	64	111	118	4
April	90	5	71	0	50	93	133	7
May	120	0	110	0	46	46	72	0
June	135	0	110	0	113	101	61	5
July	170	14	114	0	82	64	199	11
August	189	12	152	0	90	116	133	0
September	137	91	51	36	68	154	79	0
October	90	0	61	0	76	72	81	0
November	53	0	33	0	45	32	111	0
December	29	0	25	0	65	45	48	0

YEAR: 2001

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	18	3	13	0	17	35	62	0
February	23	7	26	0	25	46	59	4
March	35	5	32	0	20	54	83	9
April	55	0	45	0	27	36	101	0
May	55	0	52	0	16	28	27	9
June	79	4	70	0	23	48	77	3
July	85	7	64	0	27	23	83	0
August	133	23	200	0	57	37	113	29
September	115	0	126	0	70	52	217	0
October	131	0	110	0	29	34	197	0
November	108	0	114	0	75	40	133	0
December	49	0	33	0	16	19	66	0

YEAR: 2002

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	150	22	173	0	82	46	167	29
February	159	29	148	0	34	54	227	38
March	102	19	149	0	34	69	183	38
April	92	13	117	0	29	68	113	16
May	130	23	121	0	56	63	254	29
June	156	0	149	0	71	38	206	43
July	187	0	177	0	113	71	220	26
August	133	0	145	0	128	57	192	17
September	129	0	112	45	107	0	136	0
October	103	0	78	0	36	0	178	9
November	106	0	118	0	25	0	138	16
December	102	0	95	0	55	0	150	9

YEAR:2003

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	4	0	0	0	33	38	54	9
February	35	0	0	0	24	29	12	14
March	9	6	12	5	17	10	0	5
April	6	7	18	0	11	18	8	5
May	15	7	15	0	9	15	10	5
June	10	0	0	0	19	17	30	0
July	17	0	10	0	12	21	5	0
August	18	0	7	0	14	26	4	0
September	15	0	9	0	13	22	9	0
October	38	0	0	0	7	8	23	11
November	20	0	0	0	14	0	28	0
December	10	0	23	0	9	0	16	0

YEAR:2004

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	23	0	15	0	17	24	41	9
February	55	3	32	0	17	22	60	7
March	29	3	35	4	13	33	36	4
April	36	1	26	3	17	33	43	4
May	148	0	126	5	79	80	236	10
June	137	30	142	54	63	64	202	9
July	60	10	93	13	20	54	44	9
August	135	9	107	0	34	75	131	0
September	132	13	135	0	28	97	171	0
October	111	0	109	0	40	68	112	0
November	68	0	18	0	41	72	71	0
December	93	0	70	0	32	34	177	8

YEAR: 2005

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	103	4	29	0	11	12	17	0
February	73	7	74	0	24	3681	0	0
March	91	23	85	0	29	31	46	18
April	64	33	42	0	42	42	140	11
May	102	37	80	0	24	59	101	0
June	109	42	107	0	49	76	159	0
July	98	19	89	36	74	109	4	0
August	18	4	41	0	28	47	57	5
September	16	5	46	0	37	46	32	4
October	60	4	87	0	107	35	100	0
November	27	0	26	0	28	17	26	0
December	33	0	43		4	18	15	0

YEAR: 2006

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	60	7	87	0	37	87	130	3
February	88	3	78	0	0	66	63	4
March	120	0	95	0	81	115	128	2
April	179	4	102	0	59	97	173	5
May	150	00	127	0	116	65	164	0
June	204	0	16	0	145	105	229	3
July	212	10	209	0	102	68	230	9
August	225	11	213	0	95	120	218	0
September	103	00	106	0	46	72	133	0
October	137	0	89	0	0	75	154	0
November	91	0	43	0	43	36	80	0
December	50	0	49	0	65	49	90	0

YEAR:2007

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	118	0	83	0	71	47	86	0
February	101	0	105	0	72	59	123	0
March	114	17	85	0	73	29	200	12
April	106	7	107	0	71	42	155	28
May	133	0	161	0	123	74	121	13
June	100	0	135	0	102	75	135	3
July	159	0	149	0	108	67	151	0
August	236	0	133	0	122	73	262	0
September	237	0	143	0	134	143	265	0
October	348	0	143	0	128	100	221	0
November	200	0	99	0	126	49	130	0
December	215	0	132	0	150	65	273	0

YEAR: 2008

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	301	0	215	0	18	153	142	0
February	180	123	73	0	104	112	195	78
March	523	91	176	0	52	77	174	0
April	760	0	141	0	84	71	183	0
May	684	0	120	0	68	86	166	0
June	732	0	156	0	99	313	292	0
July	452	0	175	2	118	88	148	0
August	496	0	132	0	78	54	226	1
September	572	4	151	0	141	91	227	0
October	731	2	166	0	82	71	189	5
November	432	0	140	0	75	87	178	0
December	360	0	97	0	110	83	208	4

TABLE: 4.2.2 DATA ON COMMON DISEASES FROM NEW ERA HOSPITAL KAFANCHAN.

YEAR: 1999

	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	3	0	2	3	7	14	21	4
February	10	0	11	4	7	27	40	0
March	11	0	15	0	3	24	16	5
April	9	0	6	0	7	28	23	0
May	5	0	3	0	31	50	42	0
June	19	0	14	0	31	29	39	0
July	24	0	16	0	11	35	24	0
August	21	0	17	0	22	30	69	0
September	22	0	15	0	23	66	79	0
October	22	0	18	0	23	18	72	0
November	14	0	10	0	25	18	49	0
December	3	0	2	0	23	6	145	0

YEAR: 2000

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	9	4	5	0	3	6	6	8
February	5	0	3	0	3	5	9	11
March	7	3	7	0	6	12	10	7
April	15	0	19	0	1	5	7	9
May	19	0	20	0	13	3	9	0
June	27	3	23	0	0	0	3	0
July	43	0	30	0	6	0	5	0
August	60	0	51	0	27	4	4	0
September	34	0	43	0	15	7	15	0
October	19	5	25	0	15	12	7	0
November	10	3	6	0	6	4	5	3
December	8	0	4	0	10	1	2	7

YEAR:2001

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	3	0	1	0	3	0	3	3
February	2	0	1	0	0	1	2	2
March	4	0	2	0	0	0	4	4
April	12	0	6	0	6	0	5	2
May	8	0	8	0	0	2	5	3
June	8	0	4	0	0	1	3	2
July	12	0	9	0	2	0	0	2
August	17	0	7	0	3	2	3	0
September	9	0	11	0	4	2	5	0
October	13	0	15	0	0	5	3	0
November	3	0	5	0	0	0	0	0
December	3	0	5	0	0	1	2	0

YEAR:2002

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	9	1	7	0	7	12	9	3
February	5	2	5	0	3	3	8	4
March	6	3	4	0	4	7	5	0
April	8	5	5	0	6	3	11	16
May	19	0	13	0	7	5	9	3
June	24	0	18	0	0	3	17	0
July	42	0	33	0	0	7	7	0
August	59	0	37	0	5	3	11	0
September	64	0	45	0	6	7	10	0
October	52	0	48	0	3	3	15	0
November	26	0	30	0	3	2	15	0
December	16	0	18	0	13	4	5	0

YEAR:2003

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	3	5	5	0	3	8	7	4
February	7	3	3	0	4	6	9	5
March	10	0	7	0	4	7	13	5
April	3	0	1	0	0	5	13	0
May	3	0	4	0	4	4	21	0
June	10	0	5	0	3	3	24	0
July	17	0	9	0	2	3	18	0
August	19	0	13	0	3	9	36	7
September	22	0	21	0	0	7	32	3
October	7	0	4	0	0	4	11	0
November	7	0	5	0	8	5	5	0
December	4	0	5	0	9	5	8	5

YEAR: 2004

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	3	7	1	0	9	9	3	3
February	9	9	5	0	12	13	7	5
March	10	0	5	0	8	12	8	3
April	11	0	7	0	5	6	13	0
May	12	0	10	0	3	15	20	0
June	18	0	13	0	0	0	21	0
July	23	0	13	0	0	0	36	0
August	23	0	19	0	3	12	35	0
September	25	0	18	0	7	10	29	0
October	11	0	7	0	15	8	17	0
November	4	0	3	0	15	26	10	5
December	3	0	3	0	16	20	3	5

YEAR: 2005

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	3	0	2	0	7	9	12	3
February	5	0	5	0	3	10	4	0
March	7	0	4	0	16	12	11	0
April	9	0	10	0	5	13	3	3
May	13	0	18	0	2	5	17	0
June	14	0	14	0	6	4	10	5
July	23	0	15	0	1	4	17	0
August	39	0	9	0	3	13	35	0
September	17	0	34	0	4	29	25	0
October	13	0	10	0	4	15	17	0
November	5	0	11	0	27	33	13	0
December	3	0	5	0	19	18	21	0

YEAR: 2006

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	3	0	5	0	14	7	12	3
February	4	0	4	0	12	5	12	5
March	2	0	0	0	4	4	10	2
April	9	0	6	0	5	7	17	0
May	14	0	11	0	3	2	13	4
June	20	0	12	0	4	5	17	5
July	33	0	18	0	2	3	18	0
August	31	0	23	0	5	5	23	0
September	25	0	16	0	6	5	11	0
October	25	0	21	0	3	10	18	0
November	10	0	8	0	13	15	21	0
December	4	0	3	0	26	25	11	8

YEAR: **2007**

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	7	0	5	0	5	7	10	3
February	5	0	4	0	13	13	10	0
March	11	0	6	0	9	9	13	2
April	11	0	5	0	8	8	17	0
May	20	0	13	0	10	10	14	0
June	15	0	8	0	7	7	94	3
July	18	0	10	0	9	9	7	0
August	20	0	15	0	3	3	4	0
September	17	0	17	0	3	3	7	0
October	21	0	15	0	4	4	4	0
November	13	0	13	0	3	3	5	0
December	7	0	15	0	3	3	3	0

YEAR :2008

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	11	0	7	0	21	14	21	4
February	13	0	15	0	17	17	17	5
March	17	0	16	0	13	21	14	4
April	13	0	19	0	9	11	20	4
May	20	0	18	0	3	11	17	6
June	23	0	17	0	3	5	9	3
July	35	0	28	0	9	3	4	5
August	29	0	13	0	4	20	13	6
September	36	0	25	0	12	8	8	9
October	23	0	13	0	11	23	5	3
November	18	0	12	0	5	4	9	5
December	12	0	6	0	4	12	3	5

YEAR: 1999 TABLE: 4.2.3 DATA ON COMMON DISEASES FROM KOWA HOSPITAL KAFANCHAN.

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	8	1	21	0	5	1	11	0
February	8	0	39	0	2	0	4	0
March	6	0	46	0	1	0	6	3
April	4	1	70	0	0	0	8	7
May	8	1	35	0	0	0	4	0
June	4	1	29	0	0	0	3	0
July	8	0	46	0	1	1	0	0
August	10	0	52	0	2	0	6	0
September	12	0	53	0	0	1	4	0
October	15	1	19	0	0	1	6	0
November	4	1	13	0	0	6	8	0
December	3	0	8	0	1	2	8	0

YEAR: 2000

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	7	1	15	0	5	2	3	0
February	13	1	24	0	4	2	0	0
March	12	0	36	0	3	1	1	0
April	4	1	24	0	0	0	9	7
May	6	0	43	0	0	0	4	0
June	10	0	26	0	0	0	0	3
July	12	0	19	0	0	0	0	0
August	5	0	23	0	0	0	4	0
September	8	0	12	0	1	2	2	0
October	11	0	16	0	1	1	5	0
November	2	0	15	0	0	1	6	0
December	2	0	31	0	0	0	0	0

YEAR:2001

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	6	0	26	0	5	3	10	0
February	7	0	50	0	2	1	5	0
March	6	0	48	0	0	0	13	0
April	4	0	89	0	0	0	10	0
May	9	0	35	0	0	0	4	0
June	7	0	29	0	1	0	1	0
July	7	0	47	0	0	0	0	0
August	7	0	67	0	0	2	0	0
September	14	0	53	0	0	0	0	0
October	13	0	44	0	0	1	3	0
November	7	1	22	0	1	0	14	0
December	1	1	9	0	1	0	8	000

YEAR:2002

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	7	2	12	0	1		8	0
February	15	1	33	0	2	3	5	1
March	12	0	30	0	0	3	2	13
April	6	0	27	0	0	0	8	0
May	9	0	38	0	0	0	12	0
June	13	0	38	1	0	0	0	1
July	12	0	22	1	0	0	3	5
August	12	0	24	2	0	0	1	0
September	12	0	18	4	0	0	0	0
October	12	0	24	0	0	0	0	0
November	9	0	12	0	0	00	1	0
December	11	1	41	0	0	1	3	1

YEAR:2003

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	6	2	24	0	1	1	4	0
February	6	3	44	0	3	2	1	0
March	6	1	56	1	2	1	7	0
April	0	0	82	2	0	0	8	2
May	5	0	41	0	0	0	0	1
June	0	0	26	0	1	1	0	0
July	7	0	45	0	2	2	1	0
August	5	0	52	1	0	0	9	0
September	10	0	52	1	1	0	0	0
October	9	0	24	0	0	0	10	1
November	3	0	9	1	0	0	3	0
December	0	0	10	1	0	0	1	1

YEAR: 2004

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	2	1	15	2	1	0	5	0
February	13	1	24	3	1	0	1	0
March	12	0	36	0	0	0	0	0
April	11	0	42	0	0	0	0	9
May	10	0	42	1	1	0	5	0
June	8	0	8	1	1	0	10	0
July	11	0	21	1	1	0	0	0
August	13	0	20	0	0	0	0	0
September	8	0	15	0	0	0	6	4
October	2	1	14	0	0	0	2	0
November	3	1	18	0	0	0	2	0
December	2	1	32	0	0	0	8	1

YEAR: **2005**

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	4	1	22	2	1	1	7	0
February	4	2	40	3	1	2	2	2
March	4	0	50	0	0	3	9	2
April	0	0	80	0	1	0	6	6
May	5	0	31	0	0	0	0	9
June	0	0	25	0	0	0	0	0
July	7	0	50	0	0	0	1	0
August	5	0	53	0	0	0	10	0
September	8	0	33	0	0	0	0	0
October	9	0	14	0	0	0	9	0
November	4	0	9	0	0	0	10	0
December	0	0	8	0	0	0	5	0

YEAR:**2006**

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	3	1	11	1	1	1	5	0
February	11	1	20	1	1	1	1	4
March	8	1	33	1	0	0	0	1
April	2	0	20	0	0	0	3	5
May	5	0	34	0	0	0	10	11
June	8	0	26	0	0	0	0	0
July	7	0	15	0	1	0	0	0
August	3	0	25	0	1	1	4	0
September	8	0	11	0	1	1	3	1
October	7	0	12	0	0	1		1
November	5	0	12	0	0	0	3	0
December	10	0	32	0	1	1	4	1

YEAR :2007

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	4	1	22	0	0	0	7	0
February	4	1	46	0	0	2	2	2
March	4	2	50	0	1	1	9	2
April	0	0	80	0	0	0	6	6
May	5	0	31	0	0	0	0	9
June	0	0	15	0	0	0	0	0
July	7	0	42	0	0	0	1	0
August	11	0	83	0	0	0	10	0
September	3	0	10	0	0	0	9	0
October	8	0	7	0	0	0	3	0
November	9	0	4	0	0	0	6	0
December	3	0	4	0	0	0	3	0

YEAR :2008

Month	Malaria	Measles	Typhoid	Cholera	Pneumonia	Cough	Diarrhoea	Meningitis
January	7	1	12	1	2	2	9	0
February	7	2	19	2	1	2	0	0
March	6	0	29	0	0	0	4	4
April	3	0	72	0	0	0	14	0
May	7	0	32	0	0	0	4	2
June	3	1	26	0	0	0	1	10
July	8	0	38	0	0	0	0	2
August	13	0	65	0	0	0	3	0
September	9	0	17	0	0	0	4	2
October	9	0	13	0	0	0	4	1
November	2	0	10	0	0	0	9	0
December	1	0	1	0	0	0	3	0