CHILDHOOD DISEASE MAPPING IN KADUNA STATE USING GEOGRAPHIC INFORMATION SYSTEMS

BY

Yetunde Adedoyin ARIGBEDE

M.SC/SCIEN/12667/2007-08

A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN GEOGRAPHY

DEPARTMENT OF GEOGRAPHY

FACULTY OF SCIENCE

AHMADU BELLO UNIVERSITY, ZARIA.

OCTOBER 2012

DECLARATION

I declare that this study entitled **CHILDHOOD DISEASE MAPPING USING GEOGRAPHIC INFORMATION SYSTEMS IN KADUNA STATE** has been undertaken by me in the department of Geography under the supervision of Prof. M Mamman and Dr. J G Laah. I submit that this work has not been previously presented in any form for a thesis. All relevant materials used have been duly acknowledged.

....

ARIGBEDE YETUNDE ADEDOYIN **DATE**

CERTIFICATION

This thesis entitled **CHILDHOOD DISEASE MAPPING USING GEOGRAPHIC INFORMATION SYSTEMS IN KADUNA STATE** meets the regulations governing the award of the Degree of Masters of Science (M.Sc) in Geography of the Ahmadu Bello University, and is approved for its contribution to knowledge and literacy presentation.

....

Prof.M Mamman Date

Chairman, Supervisory committee

....

Dr. J. G. Laah Date

Member, Supervisory committee

....

Dr. Jaro Musa Date

Head of Department

....

Prof A A Joshua Date

Dean, Postgraduate School

DEDICATION

This project is dedicated to **The Almighty God**, who keeps keeping me and mine.

ACKNOWLEDGEMENT

My dedicated and conscientious supervisors, Prof. M. Mamman and Dr. J. G. Laah; you did a wonderful job guiding me through this research work; I appreciate your efforts; it is nice being your protégé. As you water, may you be watered. To my colleagues and staff of Geography Department, thank you for the immense encouragement and support; may you all climb the ladder of success with ease.

I would like to thank my loving husband, Mr. O.O.Arigbede for being a pillar of support; a true-blue indeed. May God keep keeping you for me, amen. My angels, Busola and Toduroti, thank you for 'managing', when mummy was busy with research. My parents, Prof and Prof (Mrs) Adeyanju and Chief and Chief (Mrs) Arigbede; who can ask for better parents? Thank you for always being there. My siblings- I appreciate the gentle nudge for accomplishment.

To the staff of hospitals (Paediatric hospital, Banzazzau, Zaria, St Louis Hospital, Zonkwa, Dana clinic, Mando) that tirelessly helped with provision of data, I appreciate your effort.

My friends and individuals too many to mention, who have in one way or another helped to bring this research work to a completion, may you receive your reward from my God in full measure, amen.

ABSTRACT

This study was carried out to map the spatial variation of disease prevalence and their attendant causes among children in Igabi, Zaria and Zangon Kataf LGAs of Kaduna State. The objectives were to characterise the main types of childhood diseases in Kaduna State, analyse and map the spatial pattern of childhood diseases in the study area, identify the factors responsible for the spatial variation of childhood diseases in the study area and determine sex differentials in childhood disease prevalence. The data used included information from hospital records and field survey, which comprised of 477 questionnaires. Qualitative data from in depth interviews and Focus Group discussions were also used. Satellite imageries were georeferenced and digitised. The data for disease prevalence was aggregated within the GIS environment to produce the disease maps. Chi square analysis was used to determine the relationship between economic and sociodemographic characteristics of mothers, and disease prevalence in children. The main diseases that were found among children in the study area included Malaria (59.3%), Diarrhoea (20.3%), VPD (6.0%), pneumonia (4.7%) and others (9.7%). The incidences of these diseases varied between the three LGAs under study, with Igabi being prevalent in Malaria and VPD, Zaria in Diarrhoea, and Zangon Kataf in Pneumonia. Some socioeconomic and demographic characteristics of the mothers of the sick children had influence on the occurrence of sickness in the children. Some of these are educational attainment ($p=0.029$), marital status ($p=0.010$), attendance of antenatal clinics ($p=0.001$), and place of birth ($p=0.013$). The utilisation of mosquito nets is found to have an influence over incidence of malaria in children over the study period,(0.001) The method of excrement disposal(0.025) and source of drinking water($p=0.007$) also had an effect on occurrence of diarrhoea in children. Exposure to pollution from unclean energy for cooking had an influence on pneumonia prevalence ($p=0.007$). Of all these sick children, the general hospital was the most common choice of their mothers in search of treatment. There were also more sickly female children (57%) than male (43%). The health of the female children may not have been treated carefully (probably due to son preference). To help manage disease prevalence, recommendations include: better sanitation conditions, adequate nutrition of children and practice of disease preventive measures such as- timely vaccinations, utilisation of mosquito nets, and improved hygiene should be practiced by mothers. Education of mothers to at least secondary level is also of great importance to aid better care of children. The conclusion is that mapping childhood diseases present a better way of understanding variation in diseases and provide location-specific management measures.

TABLE OF CONTENTS

CHAPTER FIVE: PREVALENCE OF CHILDHOOD DISEASES

CHAPTER SIX: FACTORS INFLUENCING CHILD DISEASES

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER ONE

1.1 INTRODUCTION:

According to UNICEF (United Nations Children's Fund (2009)), 9.2 million children under age five died worldwide in 2007 alone, and an estimated two-thirds of childhood deaths are preventable with existing tools and interventions such as the use of vaccines. Childhood is defined as the period of life between birth and puberty (The free dictionary.com). Within this study, childhood refers to children between the ages of 0-5 years. The first five years of life are the most crucial to the physical and intellectual development of children and can determine their potential to learn and thrive in their lifetime (POLICY, 2002). Sadly, childhood mortality and morbidity rates still remain high, especially in Third World countries. Most children suffer from a variety of diseases during their childhood years, some of which lead to the death of the child. Previous studies have shown that under-five mortality rate (U5MR) was 205 and 197 per 1,000 live births in 2003 and 2004 respectively. (PATHS (Partnership for Transforming Health Systems, 2008); WHO (World Health Organisation, 2006).

Childhood disease is thus an unpleasant condition that affects children, with the potential of temporarily or permanently maiming them, or leading to their ultimately death. WHO (2008) gave a clear report on the main diseases that are rampant and cause fatalities among children to include malaria (24%), pneumonia (20%), diarrhoea (16%), measles (6%) and HIV/AIDS (5%), with underlying malnutrition contributing to about 60% of the deaths. The trends in childhood mortality in Nigeria seem to have been on the increase over the years from the year 2000, with

the rate being at 184 deaths per thousand, rising to 201 deaths per thousand in 2006 (WHO,2008).

This high morbidity and mortality rate of children could affect, negatively, Nigeria's chances of attaining the Millennium Development Goals (MDG). WHO and UNICEF (2010) reveal that about three thousand children die of malaria every day in Nigeria. Reversing the spread of malaria is crucial for the survival, health and development of children especially in Nigeria.

According to WHO (2010), 4 million under-fives die each year from three preventable causes: diarrhoea, malaria or pneumonia. In placing these diseases in categories according to their prevalence among children worldwide, the highest ranking diseases affecting children include Acute Respiratory Infections (ARI), diarrhoea, malaria and vaccine preventable diseases (WHO, 2008).

Pneumonia is the number one killer of children under age five, as one child dies from pneumonia every 15 seconds, 5,500 children every day, two million children every year (UNICEF and WHO, 2006). Most of these children are dying in poor countries and many of the same countries are in danger of failing to meet the MDG child survival goal. Pneumonia is considered to be more deadly than malaria and diarrhoea, and is one of the fastest killers among children (Johnson, 2010). A severe attack of the disease could kill a child in just four hours.

In Nigeria, malaria caused 24% deaths in children below the age of 5 in the year 2000 (WHO, 2006). It is reported to claim the life of one child, every 30 seconds (RBM, 2009). The disease thus kills an unacceptable number of African children each year, and blights the life of many

millions more. High levels of malaria endemicity, parasite resistance to affordable drugs, and inadequate access to treatment facilities help make malaria a prominent killer of children, accounting for an estimated 25%–30% of mortality in children under five, or an estimated 300,000 deaths each year (George *et al*, 2004). What these figures indicate is that malaria still kills more people than HIV/AIDS. Yet, this is a disease that can be eradicated by eradicating mosquitoes. African scientists are said to have been working to develop a malaria vaccine. According to George *et al* (2004), vaccines may have helped in the prevention of polio, tuberculosis, and tetanus, but, in the case of malaria, it would have been better and cheaper to kill mosquitoes than seek malaria vaccines.

About 4 billion cases of diarrhoea are reported each year and results in the deaths of 1.7 million people, most of who are children under the age of five UNICEF (2010). According to UNICEF (2010), diarrhoea causes as many as 17% of the deaths of those under the age of five. This is largely a result of unsafe water and poor hygiene.

Vaccine-preventable diseases (VPD) are responsible for severe rates of morbidity and mortality in Africa (Omer *et al*, 2009). Despite the availability of appropriate vaccines for routine use on infants, vaccine-preventable diseases are highly endemic throughout sub-Saharan Africa (Attai, 2010). In Nigeria, over one million children die annually from preventable diseases, making the country one of the least successful of African countries in achieving improvements in child survival during the past four decades (Ngowu *et al*, 2008). These deaths occur because simple and cost-effective services such as vaccinations are not made available to these children who depend on them for survival.

Existing vaccines alone can prevent an estimated 25% of under-five deaths, as researchers such as Eke *et al* (2001) predict that the utilization of existing tools and interventions around the world could save more than 6 million young lives every year.

In a bid to achieve mans desire to exist with minimal effect of diseases, various attempts have been made to find better ways of managing illnesses that have proved difficult or impossible to eradicate. One of such efforts at coping with the prevalence of diseases is in studying the aetiology of various diseases, their mode of transmission, and the best conditions within which they thrive. Armed with the knowledge of the epidemiology of these diseases, the spatial distribution of these diseases can be mapped, using GIS techniques which will reveal regions with higher prevalence and populations with higher susceptibility to the diseases.

Murni *et al* (2007) carried out a study in North Malaysia, the aim of which was to map child malnutrition and relate its spatial incidence to environmental degradation. The results showed that majority of the malnourished children were living in the flood-prone areas, and also in areas where the soil has high moisture content. These areas were not able to produce the needed agricultural products to satisfy the nutritional needs of children. They also explained that the high incidence of child malnourishment and consequently morbidity in Malaysia is the high poverty level, due to low productivity of the soil for agricultural purposes. Disease mapping is an activity widely used to identify patterns of geographical variation in diseases and to develop new ideas about the causation factors of disease (Olsen, 2006). Disease mapping involves the analysis of geo-referenced disease incidence data, and is applicable to areas such as resource allocation, cluster alarm analysis, and ecological studies.

The striking advantages of Geographic Information Systems (GIS) for disease mapping process are the considerably simplified generation of maps as well as a broader variety in terms of determining areal units and spatial querying (Thomas,2004). GIS is a tool for linking and visualizing geographically referenced data from different sources. It consists of topological and attribute databases together with procedures and techniques for data collection, up-dating, query, spatial analysis and modelling (Burroughs & McDonnell, 1998). With GIS, it is possible to link together the data of research interest and background variables (all forms of geographically referenced information), such as census, socio-economic and environmental data on the population, according to map coordinates (Rytkönen, 2004*)*. With the present state of childhood disease incidence in Kaduna State, manifesting most commonly in diseases such as malaria, diarrhoea, respiratory tract infections and vaccine preventable diseases,(Partnership For Transforming Health Systems(PATHS, 2008)), it is important to attempt to map disease prevalence and pattern of occurrence within children in the population, using GIS techniques, in an effort to reveal graphically the spatial variation in the occurrence of these diseases and their possible causes, to all stakeholders.

The disease situation in Kaduna State among children has been undesirably high, usually resulting in fatalities. In 2003, the infant mortality rate (IMR) was 115 per 1,000 live births; under-five mortality rate (U5MR) was 205 per 1,000 live births (PATHS, 2008). Some of the causes of ill-health and death in children within the State are communicable diseases such malaria, diarrhoeal diseases, respiratory tract infections and childhood vaccine preventable diseases. Poverty, poor hygiene and high illiteracy levels may be contributors to the deplorable

disease situation of children in the state. Most of the conspicuous childhood diseases are communicable, and about 41% of the population in the State is poor (World Bank, 2006).

There have been some researches on the use of Geographic Information Systems (GIS) in the studies of spatial patterns of disease spread, such as those reviewed by Cromley (2003), on the geography of diseases. He highlighted the relationships between pathological factors, and their geographical environment, and explicitly appraised the advantages of GIS in describing the sources and distribution of disease agents, identifying regions in time and space where people may be exposed to environmental and biological agents, and mapping and analyzing spatial and temporal patterns in health outcomes.

Similarly, Armstrong (2002) studied the rampant spread of HIV in Kenya, and observed that the spread varied from one geographic region to another. The data was analysed in a GIS environment, and the results were attributed to the cultural, social and economic variations in the respective regions. The findings enabled him to put different interventionary programmes in place in the respective regions to combat the spread of the scourge.

The focus of this study is thus to examine the nature of childhood diseases in Kaduna State, and to map the spatial distribution of diseases using GIS.

1.2 STATEMENT OF THE RESEARCH PROBLEM

In spite of the large number of available data, and the several studies carried out on childhood diseases, there still remains a lot to be done, in order to control the spread of disease among children under the age of five. Although the most common diseases among children in Kaduna State have been identified, (WHO, 2010; PATHS ,2008), the spatial distribution of the

prevalence of Malaria, Pneumonia, vaccine preventable diseases and diarrhoea have not been highlighted, thus making it necessary for a research of this nature to be carried out.

Kaduna State, which is situated in Nigeria's North West geopolitical zone, has the highest under-five mortality rate of the six geopolitical zones in the country (Rosamund, 2010). This zone also accommodates the highest child population of 0-4years, with figures at 19.90% of the total population, higher than the national average of 16.09%. With the present state of childhood diseases in Kaduna State, there are various prevailing factors that may serve to make this situation thrive. Poverty is one factor. Kaduna state is said to have about 41% of its population poor (World Bank, 2006). Poverty is associated with lower health status and increased vulnerability; the poor are far more likely to experience environmental and social conditions that contribute to poor health and an increase in risk of illness and death (PATHS, 2008).

According to POLICY (2002), child survival in Nigeria is threatened by nutritional deficiencies and illnesses, particularly malaria, diarrhoea, acute respiratory infections (ARI), and vaccine preventable diseases (VPD), which account for the majority of morbidity and mortality cases in childhood. Despite the fact that the major childhood diseases have been identified and modern technology to combat them have been developed, children from African countries (Nigeria inclusive) still die in large numbers from the attacks of these diseases. This is partly due to the inadequate understanding of the ecology of some of these diseases, such that vaccines and drugs are disproportionately deployed to different areas with varied incidence.

The poor attitude of some adults to the vaccination/immunisation of children is quite high in the State. According to Buhari (2010), the State had the fourth highest cases of the polio virus with 49 in 2008 alone. The sanitation situation of Kaduna State also leaves a lot to be desired. With the fact that environmental sanitation is not practiced and the garbage clearing and disposal system in not organised, the problem of indiscriminate waste disposal serves as a breeding ground for vectors of diseases.

Just a little over half of the adult population in Kaduna State is literate. In 2008, about 55.4% of the adults were educated, lower than the national average of 66.0% literacy (NBS, 2009). There are also more educated men than women in Kaduna State, with a gender gap of 13.98% between men and women (NPC, 2006). The facts and observed figures in Kaduna State reveal an interestingly observable gender disparity in educational attainment among other factors. Could this be one of the reasons for which childhood diseases thrive in the state?

Various other scholars have carried out studies on the prevalence of diseases among the young in the population. Eke *et al* (2001) studied the causes of mortality among children in Port-Harcourt. The data used were from hospital records of the University of Port-Harcourt Teaching Hospital, from January to December, 2000. There were about 98 deaths (5.1%) out of a total of 1777 admissions between January to December 2000. The result of the research shows that most of the diseases that eventually led to the death of the child were actually preventable. They adduced reasons for the high disease prevalence to be as a result of people's beliefs and attitudes concerning childcare and behavioural practices. The study however, was just limited to the children admitted in the University Teaching Hospital in Port-Harcourt. This study however

intends to utilise not just information from hospital records, but also from questionnaires, in-depth interviews and Focus Group Discussions (FGDs).

Kandala *et al* (2008) studied childhood diseases in Nigeria as a whole, placing emphasis on the spatial risk factors associated with the scourge. This was a large scale study, using data from the Demographic Health Survey of years 1999 and 2003 to map the prevalence of childhood diseases. The results showed a higher prevalence of childhood fever, cough, and diarrhoea, in the northern and eastern states, while the occurrence was lower in the southern and western states. The study also showed that children with more educated mothers, from more affluent homes and resident in urban areas suffered a lower incidence of diseases. Despite the findings of the study, it fails to capture the intricate details that could be found in a micro scale research, such as some of the social and cultural practices that may encourage disease prevalence among children.

This study is focused on the mapping of childhood diseases in Kaduna State, using remote sensing and GIS techniques. To the knowledge of the researcher, no attempt has been made to map childhood diseases in Kaduna State using remote sensing and GIS techniques, hence the need of the proposed study. This research intends to address the following research questions:

i. What are the dominant childhood diseases in Kaduna state?
ii. What is the spatial pattern of occurrence of main childhood diseases within the study area?
iii. What are the factors responsible for the prevalence of childhood diseases?
iv. What are the implications of the spatial pattern of the occurrence of childhood diseases on healthcare policy in Kaduna State?

v. Are there gender variations in the nature and incidence of childhood diseases in Kaduna State?

1.3 AIM AND OBJECTIVES

The aim of this research is to determine the spatial variation in the prevalence of childhood diseases, using GIS techniques in Kaduna State, towards reducing the incidence of childhood diseases in the State. The aim of this study would be met through the following specific objectives; they are to

I. characterise the main types of childhood diseases in Kaduna State
II. analyse and map the spatial pattern of Childhood diseases in the study area
III. identify the factors responsible for the spatial variation of Childhood diseases in the study area
IV. determine sex differentials in childhood disease prevalence

1.4 HYPOTHESIS

H_0= Economic and Socio-demographic factors do not influence the prevalence of child disease.

H_1= Economic and Socio-demographic factors influence the prevalence of child disease.

1.5 JUSTIFICATION FOR THE STUDY

This study is focused on mapping childhood diseases in Kaduna state. Based on available records, the rate of child morbidity in Nigeria is deplorably high. This study is important in Kaduna state, as there had been an unacceptably high mortality rate and burden of disease profile recorded in the state (PATHS, 2006). This research would reveal areas of high morbidity among children, due to certain diseases, thereby helping to provide a strategy for effective allocation of

health funds in the state. It would also show the effects of the physical and socio-cultural environment on the health of the child.

GIS techniques have proved to have better advantages over conventional methods with regards to mapping diseases. The advantages include cost effectiveness (in relation to conventional methods), and pictorial or graphical presentations, which allow individuals to relate better to the study. It is expected that eventually, public health officials would be provided with the information needed to detect and manage disease outbreaks, by enhancing decision making at all levels. On a general note, the advantages of this study would be to generate data to enrich the general body of knowledge. Epidemiologists would benefit from the data generated from this study for the purpose of research.

1.6 SCOPE OF THE STUDY

Due to limited time and funds, this study cuts across 3 out of the 23 Local Government Areas (LGA's) in Kaduna State, one LGA each from the three senatorial districts to ensure geographic spread. Zaria (Kaduna North), Igabi (Kaduna central) and Zangon-Kataf (Kaduna south) have been chosen. 3 out of 23 LGA's represent over 13% of the total LGA's, which is scientifically representative.

Since this study is on child morbidity, the respondents are basically mothers of children not older than 5 years of age. The information gathered is analysed within a GIS environment, to enable the production of the disease map.

Due to the many diseases that affect children, this study is only limited to the most prominent diseases, so as to ensure in depth research of these diseases.

Temporally, the data for the research is collected within the span of one year.

1.7 METHODOLOGY

1.7.1 Introduction

This includes the types and sources of data used for the research, sampling techniques and data analysis.

1.7.2 Types and Sources of Data

- A reconnaissance survey was carried out by the researcher, for the purpose of getting the researcher acquainted with the study area, to get first hand, and other relevant information to enrich the study.
- Ground truthing was also carried out, to verify the features on ground, as noticed in the satellite imagery.
- A primary source of data included a satellite imagery of Kaduna State, with an attempt to generate data on the physical features existing in the study area. This was obtained from NARSDA (National Research and Space Development Agency), Abuja.
- Structured questionnaires were administered to mothers of children under the age of 5 years, who were willing to give out information. Hospitals and clinics and homes were visited to administer these questionnaires to willing mothers, and also medical personnel, so as to gather information on the health of children in the study area.

  The questionnaire was designed in English language; in the process of administration though, respondents that do not understand the language were communicated with in the local dialect. The questionnaire was close ended, soliciting for the following basic information:

  - Basic demographic data of mother and child (age, sex, number of children, etc),

- Information on educational level and socioeconomic status of the mother and household within which the child develops,
- Information on sanitation and access to healthcare services of the child,
- Information on the health of the child.

In depth interviews were carried out with some mothers to support information obtained form the questionnaires. Medical practitioners were also interviewed to obtain their opinion on childhood diseases in Kaduna State. Three Focus Group Discussions (FGD's) were carried out, to obtain attitudinal data and information on culture, myths and other sensitive issues relevant to the research, which the questionnaire may not have captured. These FGD's were carried out, one in each LGA, comprising of 10 women between the ages 15-45 years in each session. Research assistants assisted in this respect.

Other relevant information on child morbidity, were obtained from Hospital medical records, journals, articles, conference papers, theses, National Population Commission documents, books and relevant literature. Significant websites were also visited. The information from health records would basically be to support the findings from the field.

1.7.3 Sampling Design

Kaduna state has a population of 6,066,562 (NPC, 2006). It comprises of twenty three (23) local government areas, grouped into three senatorial districts. Three local government areas were selected for the study. The selections of these three LGA's were based on the following criteria:

i. Their location in each of the senatorial districts. One was chosen from each of the three senatorial districts, to ensure adequate spatial coverage of the study.

ii. The LGA with the highest population of females in each of the senatorial districts in Kaduna State.

Based on the criteria stated above, the following Local Government Areas were chosen for study

1. Zaria
2. Igabi
3. Zangon-Kataf

Table 1.1: Distribution of LGAs in the Senatorial Zones and their Female Population in Kaduna State.

NORTH (Zone 1)		**CENTRAL (zone 2)**		**SOUTH (Zone 3)**	
LGA	**POPN**	**LGA**	**POPN**	**LGA**	**POPN**
Ikara	99,125	Birnin-gwari	127,662	Jaba	78,558
Kubau	139,176	Chikun	184,839	Jema'a	137,478
Kudan	67,252	Giwa	146,776	Kachia	124,944
Lere	169,344	Igabi	213,339	Kagarko	118,017
Makarfi	73,282	Kaduna north	177,500	Kaura	86,061
Sabongari	142,247	Kaduna south	197,762	Kauru	110,157
Soba	146,028	Kajuru	55,304	Sanga	75,003
Zaria	196,090			Zangon-Kataf	157,121
8		**7**		**8**	

Source: Adapted from NPC (2006)

The number of copies of the questionnaire administered is based on the population size. The total female population in the selected LGA's amount to 556,550, of which 0.1% of this population is used as sample for the distribution of questionnaires. This percentage is adequate, as it surpasses

the required sample size prescribed by research advisors (2006), for the administration of questionnaires within a population. The total number of copies of the questionnaire to be administered is 556, distributed among the mothers and caretakers of children under five years of age in the selected LGA's.

Table 1. 2: Distribution of Female Population in the selected LGA's, and questionnaire administration.

Selected LGA	Population of females	No of questionnaires administered per LGA.(0.1% of population)
Zaria	196,090	196
Igabi	213,339	213
Zangon-Kataf	157,121	157
Total	**556,550**	**556**

Source: Adapted from NPC (2006)

The systematic random sampling is employed to select the wards from each LGA, for the administration of questionnaires, since the study area is quite large. Each of the wards in the selected Local Government Areas is arranged alphabetically, and every other third ward is selected as samples for questionnaire administration.

Table 1.3: Wards in Igabi LGA

1. Afaka	6. Kerewa	11.Turunku
2. Birni Yero	7. Kwarau	12.Zangon Aya
3. Gadan Gaya	8. Riga Chikun	
4. Gwaraji	9. Rigasa	
5. Igabi	10. S/ Birnin	

Source: Adapted from NPC (2006)

Table 1.4: Wards in Zangon Kataf LGA

1.Gidan Jatau	6. Ung. Gaiya	11. Zonzon
2.Gora	7.Ung.Rimi	
3.Kamuru Ikulu	8.Zaman Dabo	
4.Kamanton	9.Zango Urban	
5.Madakiya	10. Zonkwa	

Source: Adapted from NPC (2006)

Table 1.5: Wards in Zaria LGA

1.Angwan Fatika	6. Kaura Limanccin	11.Tudunwada
2.Angwan Juma	7.Kufena	12.Tukurtukur
3. Dembo	8.Kwarebai A	13.Wuciciri
4. Dutsen Abba	9.Kwarbai B	
5. Gyallesu	10.Kona	

Source: Adapted from NPC (2006)

Based on the above tables therefore, the selected wards are:

Igabi LGA: Gadan Gaya, Kerewa, Rigasa, Zangon Aya.

Zangon Kataf LGA: Kamuru Ikulu, Ung.Gaiya, Zango Urban.

Zaria LGA: Dembo, Kaura Limanccin, Kwarebai B, Tukurtukur.

The questionnaires were distributed in hospitals to mothers. They were also distributed in homes using the systematic random sampling method. Every 5^{th} house was selected for questionnaire administration.

1.7.4 Data Analysis

Data collected from the respondents through questionnaire and interviews, were analysed, using both descriptive and inferential statistics. The descriptive statistical analysis was adopted for the summarization of data, tables and percentages. The pie chart and bar graphs were also be used for the presentation of findings.

For the inferential statistics, in analysing the case of the relationship between childhood disease prevalence and causative factors, the chi square analysis is used. This reveals the statistical influence of some of the socioeconomic factors on incidence of child disease, using the SPSS 12 statistical package.

The GIS analysis includes the digitization of the maps of the study area, and using GPS(Global Positioning system) to locate the exact position of the study area on the maps, which is also known as georeferencing, using the Arcview3.2 software package. The physical conditions of Kaduna State remain fairly uniform, hence the assumption of physical uniformity in the study area. The health status of the children were documented in the GIS environment, and aggregated to produce maps.

Apart from the maps, the GIS results are also presented in the form of tables.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter examines issues related to the occurrence of childhood diseases, their causes, the involvement of GIS to the mapping of childhood diseases and health policy implications of childhood diseases.

2.2 THE CONCEPT OF DISEASE MAPPING

Disease mapping has been defined as the estimation and presentation of summary measures of health outcomes (WHO, 2003). Disease mapping dates has a long history of over 200 years. The idea of disease mapping can be attributed to the works of Dr. John Snow who studied the outbreak of cholera in 1854 in London that claimed the lives of hundreds of thousands of people (Leo, 2010). His map of cholera deaths in relation to London's water pumps was one of the first, and perhaps the most celebrated, disease map in the world. With the help of his famous map, Snow was not only able to track the source of the most terrible outbreak of cholera which ever occurred in London, but was also able to convince authorities to take action against the disease (Ross, 2003). For his persistent efforts to determine how cholera was spread and for the statistical mapping methods he initiated, John Snow is widely considered to be the father of [modern] epidemiology. (Fredrichs, 2005).

In the last forty years there have been enormous innovations in mapping techniques to analyze spatial patterns. A good example of such innovations is the use of Geographic Information Systems (GIS) in the analysis of spatial pattern of phenomenon. These innovations have been

found to be particularly significant in light of the challenges presented by modern diseases such as cancer and AIDS, and very importantly too, in reducing child mortality due to diseases (Johnson, 2010).

Of particular interest however , is finding out more about the use of GIS as a technique for mapping childhood diseases that have been responsible for the death of many children in the world generally, and Africa in particular, so as to reduce the incidence of child mortality due to diseases.

2.3 CHILDHOOD DISEASES

Children, due to their fragile nature, have been found to be more susceptible to a host of diseases, and may die due to these attacks if not managed properly and timely (WHO, 2006). In a bid to achieve the desired level of existence without diseases, various attempts have been made to find better ways of managing diseases that have proved difficult or impossible to eradicate. One of such efforts at coping with the prevalence of diseases is in studying the aetiology of various diseases, their mode of transmission, and the best conditions within which they thrive. According to WHO (2010), four million children under the age of five die each year from three preventable causes: diarrhoea, malaria or pneumonia. In placing these diseases in categories according to their prevalence among children worldwide, the highest ranking diseases affecting children include Acute Respiratory Infections (ARI), diarrhoea, malaria and vaccine preventable diseases (WHO, 2008). Some of these are examined further.

2.3.1 Pneumonia

Pneumonia is a form of acute respiratory infection that affects the lungs. The lungs are made up of small sacs called alveoli, which is filled with air when a healthy person breathes. When an individual has pneumonia, the alveoli are filled with pus and fluid, which makes breathing painful and limits oxygen intake. It is triggered when germs are inhaled into the lungs, usually after a bout of cold or flu. This situation makes it difficult for the lungs to fight infection, thus susceptibility to pneumonia. Pneumonia affects children and adults everywhere, but is most prevalent in sub-Saharan Africa, of which Nigeria is located.

Pneumonia is the number one killer of children under age five, and kills an estimated 1.6 million children every year accounting for 18% of all deaths of children under five years old worldwide (Leo, 2010). According to UNICEF and WHO (2006), one child dies from pneumonia every 15 seconds, 5,500 children every day, two million children every year. Most of these children are dying in poor countries, many of which are in danger of failing to meet the Millennium Development Goal (MDG) on child survival. Pneumonia is considered to be more deadly than malaria and diarrhoea, and is one of the fastest killers among children indeed as reported by Johnson (2010); a severe attack of the disease could kill a child in just four hours.

The symptoms of pneumonia include: rapid or difficult breathing, cough, fever, chills, loss of appetite and wheezing. When pneumonia becomes severe, children may experience lower chest wall in drawing, where their chests move in or retract during inhalation (in a healthy person, the chest expands during inhalation). Infants may be unable to feed or drink and may also experience unconsciousness, hypothermia and convulsions. Leo (2010) describes some environmental factors such as poverty, illiteracy, poor living conditions, design of houses, overcrowding,

personal hygiene, exposure to polluted air, and some underlying medical conditions such as measles, increases a child's susceptibility to pneumonia. Medical practitioners have discovered a vaccine against pneumonia, called the PVC 13, and encourage its administration to all children under five years old, to prevent infection. Early detection of the ailment however, has been found to drastically reduce the mortality rate, particularly among children.

A study was carried out in Kenya by Yazoume *et al, (*2009), assessing the seasonal pattern of occurrence of pneumonia in children under five years old. Data was collected from a total of 17,787 under-five children, over a period from January 1, 2003 to December 31, 2005. Out of this number, four hundred and thirty six deaths were observed. Poisson regression was used to analyse the data, and it was discovered that pneumonia was the leading cause of death contributing 25.7% of the total deaths. The study provided evidence that pneumonia-related mortality among under-fives in Nairobi's slums was higher from April to June corresponding to the rainy season and the beginning of the cold season. The study however was focused only on pneumonia, whereas there are a host of diseases that affect children under the age of five.

Deribew, *et al* (2007) attempted to uncover the determinants of under-five mortality in a few communities in Ethiopia. This research was conducted from December 12 to 27, 2005. Data was collected by trained enumerators, using structured questionnaires. Causes of death were determined using the expert algorithm based on verbal autopsy data. The findings of their research showed that the major cause of death in under-five children was pneumonia among other diseases. Among many variables, vaccination status, maternal education, practice and perception of mothers on severity of children's diseases and benefits of some modern treatment were the best predictor of under-five mortality.

In spite of the seriousness of the diseases of pneumonia and the speed to which it can terminate the life of a child, many caregivers, especially mothers still can not recognize the signs of this deadly disease. Galvez *et al* (2002) studied the knowledge and recognition of Peruvian mothers to pneumonia in children under five years old. Five hundred and one mothers were selected randomly in Peru between June and August 2000. The data collected was analysed using SPSS software and descriptive statistics was used to summarise the data. It was discovered that about 84% of mothers claimed they knew about the disease, but over 20% could not adequately describe the symptoms that accompany the disease and about 30% did not have the correct knowledge about the cause of the disease. This goes on to show that a good number of mothers are not knowledgeable about such a disease.

Due to the general deficiency in the knowledge of the widespread occurrence of pneumonia and its symptoms in children, many children end up in critical health, others dead. A factor that also aids in masking the existence of pneumonia in children is the frequent overlap of the disease with fever. In Nigeria, most fevers are assumed and treated as malaria (Ukwaja *et al*, 2010). In their research, Ukwaja and Olufemi (2011) studied the prevalence of overlap of fever and pneumonia in Abeokuta, Ogun State. Interviews were carried out randomly in 420 homes of children less than five years old in the district. It was discovered that about 413 children had been sick with cough over the last two weeks, and also complained of symptoms of fever and difficult fast breathing. Of this figure, 27% received antimalarials alone and 60% were treated with antibiotics for the pneumonia. The study revealed that a large percentage of children have both

malaria and pneumonia symptoms overlapping, with most cases being mismanaged as malaria alone.

2.3.2 Malaria

Over 40% of the world's children live in malaria-endemic countries. Each year, approximately 300 to 500 million malaria infections lead to over one million deaths, of which over 75% occur in African children under the age of 5 years. The rapid spread of resistance to antimalarial drugs, coupled with widespread poverty, weak health infrastructure, and, in some countries, civil unrest, means that mortality from malaria in Africa continues to rise (UNICEF, 2010).

In Nigeria, malaria caused 24% deaths in children below the age of 5 in the year 2000 (WHO, 2006). It is reported to claim the life of one child, every 30 seconds (RBM, 2009). The disease thus kills an unacceptable number of African children each year, and blights the life of many millions more. High levels of malaria endemicity and inadequate access to treatment facilities help make malaria a prominent killer of children, accounting for an estimated 25%–30% of mortality in children under five, or an estimated 300,000 deaths each year in Nigeria (George *et. al*, 2004). What these figures indicate is that malaria still kills more people than HIV/AIDS. Yet, this is a disease that can be eradicated by eradicating mosquitoes. African scientists are said to have been working to develop a malaria vaccine. According to George, *et. al* (2004), vaccines may have helped in the prevention of polio, tuberculosis, and tetanus, but, in the case of malaria, it would have been better and cheaper to kill mosquitoes than seek malaria vaccines.

Munthali (2005) undertook a study on the management of Malaria in Under-Five Children in a Rural Malawian Village. He carried out in depth interviews with the mothers of children under five years old that reside in the village, and discovered that there were factors that caused delays in the proper treatment of malaria in children. Some of these factors included distance to health centres, unavailability of medication and medical personnel in health centres, superstitious beliefs and drug abuse, such as the use of antipyretics on the event of fever occurrence. Unfortunately, malaria deteriorates very fast and can kill in a couple of hours. The longer the delay, the higher the risk of death, especially in children. The child is taken to the hospital usually when traditional and self medication has failed and the health of the child is in a critical state.

Olasehinde *et al* (2010) carried out studies to determine the prevalence of malaria parasite infection among children in Ota, Southwestern Nigeria between April and December 2008. Structured Questionnaires were distributed among 267 parents and caregivers of children to ascertain the age, sex, drugs or insecticides used in prevention or management of malaria and the state of health of the subjects. Overall, 215 (80.5%) of the 267 children investigated were found to have malaria infection. Age group (0-5years) had the highest frequency rate of 84.7%. Children of illiterates from suburb villages had the highest mean parasite density of 850 with 78.1% prevalence rate. 20% of the children were given local herbs and 22% used orthodox medicine as prophylaxis. Only 18% used insecticide treated mosquito nets while 24% of the parents spray insecticides to prevent mosquito bites.

Various beliefs trail the occurrence of malaria in children. One of such beliefs is that under nutrition is a triggering factor of the disease in children. Deribrew *et al* (2010) in his community

based study in Ethiopia, attempted to correlate the occurrence of malaria in children under five years old with under nutrition in children. . A total of 2410 under-five children were included for anthropometric measurement and blood investigation for the diagnosis of malaria, between February to March 2009.The nutritional status of children was determined using the International Reference Population defined by the U.S National Centre for Health Statistics (NCHS). Data were entered into computer, and analyzed using SPSS-12 software. The statistical tests showed that there is no correlation between under nutrition and the occurrence of malaria in children.

2.3.3 Diarrhoea

According to UNICEF (2010), diarrhoea is the second largest killer of children, causing as many as 17% of the deaths of those under the age of five. This is largely a result of unsafe water and poor hygiene. About 4 billion cases of diarrhoea are thus reported each year and results in the deaths of 1.7 million people, most of who are children under the age of five (UNICEF, 2010). Diarrhoea is defined as having loose or watery stools at least three times per day, or more frequently than normal for an individual (UNICEF/WHO, 2009). Though most episodes of childhood diarrhoea are mild, acute cases can lead to significant fluid loss and dehydration, which may result in death or other severe consequences if fluids are not replaced at the first sign of diarrhoea. About 46% of deaths due to diarrhoea occur in Africa alone, and Nigeria happens to record mortality cases due to diarrhoea, at a staggering figure of 151,700 annually (UNICEF/WHO,2009).

Children with poor nutritional status and overall health, as well as those exposed to poor environmental conditions, are more susceptible to severe diarrhoea and dehydration than healthy children. Children are also at greater risk than adults of life-threatening dehydration since water

constitutes a greater proportion of children's bodyweight. Young children use more water over the course of a day given their higher metabolic rates, and their kidneys are less able to conserve water compared to older children and adults.

Reducing childhood diarrhoea requires interventions to make children healthier and less likely to develop infections that lead to diarrhoea; clean environments that are less likely to transmit disease; and the support of communities and caregivers in consistently reinforcing healthy behaviours and practices over time.

El Samani *et al* (1989) studied on the predictors of diarrhoea in children under five in Sudan. They collected data on 445 children under the age of 5 and categorised them according to their weight for age. A strong association between malnutrition and diarrhoea was observed. It was also discovered that undernourished children had close to twice the risk of diarrhoea of well nourished children. The study also revealed that the risk of diarrhoea was higher in female children, probably due to the preference of male children. The risk of diarrhoea also decreased with older and more educated mothers.

Gascon *et al* (2000) studied the prevalence of diarrhoea in children under five years old in Ifakara, Tanzania. Data was collected on a total of 103 children suffering from acute diarrhoea, with watery stool presentation at least 24 hours to the time information was collected. Conditional logistic regression was used to evaluate how the risk of having a case of disease varied for different risk factors and pathogens. The analysis was performed using Stata statistical software, and the results showed that the larger the number of siblings, the higher the risk of diarrhoeal infection. Also, lesser distance to water source, open latrines and children below six months that were not exclusively breast fed were associated with a higher risk of diarrhoea.

Girma *et al,* (2008) studied the environmental determinant of diarrhoea infection among under five children in Western Ethiopia. A community based study was conducted, and data was collected randomly between October 15 and November 26 from four hundred and seven mothers/caregivers of children less than five years of age. Structured and pre-tested questionnaire, were used for data collection, and the information was entered into a computer, edited and analyzed using SPSS for windows version. The results showed that a number of risk factors including distance from drinking water sources, availability & ownership of the latrine, refuse disposal, the presence of faeces around the pit-hole and presence or absence of pit-hole cover & faeces seen in the compound was significantly associated with under-five childhood diarrheal morbidity.

Some cases of diarrhoea are prolonged, with the child continuously passing loose and watery stool for a period over seven days. Many children in this critical state end up adding to mortality figures if not managed with utmost care. Ekanem *et al* (1994) studied the risk factors involved in diarrhoea in children. A semi urban area in Lagos was chosen for the study, and data was collected from a total of 628 children, over a period of about three and half months. Within this period, 20 of these children came down with acute and prolonged diarrhoea. After analysis, the results showed that a significantly high risk of prolonged diarrhoea was found among children who were fed maize pap as the main diet. Children who were fed food purchased from food vendors were also significant sufferers of prolonged and persistent diarrhoea, with frequent exposure to the illness, exacerbated by low energy and low nutrient meals like pap.

In his research, Oni (1996) studied how socioeconomic conditions and feeding practices affect the occurrence of diarrhoea in children under five years of age. Seven hundred and seventy one

children were involved in the study in Ilorin, Kwara state. Questionnaires were administered to the caregivers of these children and the information collected was analysed using SPSS software. Using logistic regression, the results showed that children living in homes with out kitchen facilities, of higher birth order, feeding on semisolid food and with illiterate mothers were at higher risk of diarrhoea infection.

2.3.4 Vaccine Preventable Diseases

Vaccine-preventable diseases (VPD) are responsible for severe rates of morbidity and mortality in Africa (Omer *et al*, 2009). In Sub Saharan Africa, in spite of the availability of appropriate vaccines for routine use on infants, vaccine-preventable diseases are highly endemic throughout sub-Saharan Africa (Attai, 2010). The commonest VPD's include Poliomyelitis, Measles, Diphtheria, Tuberculosis, Yellow fever, meningitis, tetanus and Hepatitis.

Immunization is the process of conferring increased resistance to an infectious disease by a means other than experiencing the natural infection (Awodele *et al,* 2010). Childhood immunization is an act of inducing immunity to a child by applying a vaccine that almost guarantees protection from many major diseases (UNICEF, 2010a). These vaccinations can be administered either as injectibles, or orally as mouth drop. In Nigeria, over two million deaths are delayed through immunization each year (WHO, 2003). In spite of the effort to get children immunised in Nigeria, over one million children still die annually from preventable diseases, making the country one of the least successful of African countries in achieving improvements in child survival during the past four decades (Ngowu, *et al*, 2008).

There are many factors that contribute to the status of unimmunised children in Nigeria. Previous studies have shown that uptake of vaccination services is dependent not only on provision of

these services but also on other factors such as knowledge of mothers (Awodele *et al,* 2010), misinformation of parents (Buhari, 2010); availability of trained health workers (Kabir, 2007), availability of safe needles and syringes and a host of other reasons, such as inadequate monitoring and supervision, inadequate immunization centres and sessions. An effort to address these factors is of great importance in order to improve vaccine utilization, increase the number of immunised children and subsequent protection of the children against childhood infectious diseases, thus giving a better chance of a child to survive to adulthood.

A lot of effort has been put in place by the Nigerian health sector to publicize the importance of immunisation to the health of children, but a quite a number of mothers still lack the education on the individual vaccines and their functions. Awodele` *et al* (2010) studied the attitude towards childhood immunisation among mothers in Lagos state. He carried out a descriptive cross-sectional study involved 274 mothers attending antenatal clinics in LUTH from April-June 2009. The outcome of his study showed that almost all (93.8%) the respondents were aware of immunization and that immunization could prevent childhood illness (98.1%). However, some of the respondents (28.8%) felt immunization will make their children brilliant, while only 8.6% knew that polio vaccine should be given four (4) times. There were significant relationships between age of respondents, ethnicity, level of education, occupation and attitude to immunization. Although majority of the mothers were aware of the existence of immunization services, their knowledge of immunization schedule of vaccine preventable diseases is poor.

In the same vein, kapoor and Vyas(2010) carried out a cross sectional descriptive study on the awareness and knowledge of mothers of under five children regarding immunization in Ahmedabad, India. 100 mothers of under 5 children were studied from March 2009 to May 2009.

The research revealed that about 80% of the mothers had no knowledge about vitamin A and diphtheria, and 60% no knowledge of measles. Only 15% knew about hepatitis B.

Antai (2009) assessed the role of mother's religious affiliation in child immunization status of surviving children 12 months of age and older in Nigeria, using data from the 2003 Nigeria Demographic and Health Survey (NDHS). Variations in the risks of child immunization in Nigeria were examined using logistic regression analysis. The results indicate that religion plays a major role in the risk of non-immunization.

2.4 VARIATION IN CHILDHOOD DISEASES

Historically, variations in incidence and prevalence of childhood diseases, prominent of which are diarrhoea, cough and fever have been related to household socio-economic factors because it determines the amount of resources (such as food, good sanitation, and health care) that are available to infants and neglected temporal and geographical gradients and other variations in risk, in order to generate hypotheses towards the causation of disease.(Kandala *et al*, 2008) Child mortality has declined remarkably during the last decades, while neonatal disorders, diarrhoea, pneumonia, and malaria as well as being underweight account for most of the child deaths worldwide (Pallapies,2006)

2.5 FACTORS RESPONSIBLE FOR THE VARIATIONS IN CHILDHOOD DISEASES

Childhood disease incidences usually do not occur uniformly across a geographical region. The variations of these diseases over space can be explained by various factors. Some of them

include: childhood malnutrition, poor immunization status, household poverty, food insecurity, maternal illiteracy, poor living conditions (housing, water, and sanitation), and poor home practices for childcare during illnesses. Some of these factors would be elaborated on, in relation to the role they play in promoting the occurrence thriving of childhood diseases.

2.5.1 Maternal literacy: Is very important to the health and survival of children. It largely contributes positively to the health of children and infants. Various studies have shown the importance of maternal literacy to the health and survival of children. For instance, Preidt (2010) showed in his study, that between 1970 and 2009, deaths among children under age 5 dropped from 16 million to 7.8 million a year. Within this same period, the average number of years of education among women aged 25 and older more than doubled; the increase was more than triple for women in poor countries. This increase in the survival of children was attributed to increased levels of education among women of childbearing age.

A review by Bicego and Boerma (1991) showed positive increase in child health by maternal education, as they observed in most countries throughout the world. Evidence collected in 41 countries as part of the World Fertility Survey showed that those children of mothers with no formal education face substantially higher risks of infant death. With the numerous advantages to child survival associated to maternal education, Schultz (1984) in his research enumerates the rewards of children with educated mothers:

> *"Educated mothers have the initiative of practicing simple hygiene, to keep their children healthy. Some of these practices include washing of hands frequently and boiling of drinking water to kill water borne pathogens. Educated mothers also administer medication better, as prescribed, thus reducing the risk of adverse drug effects on*

children. They also usually contribute economically to the child's upkeep, and have fewer and more spaced children, which are better for the health of the child."(Schultz, 1984, p 24)

In a bid to keep up with the culture of maternal education, UNICEF (2O1O) vies in support of educating girls for six years or more. This would drastically and consistently improve their prenatal care, postnatal care and childbirth survival rates. Educated girls and eventually women thus spread good health and sanitation practices to their families and throughout their communities, hence decreasing the mortality rate of children due to diseases.

2.5.2 Poverty: Poverty is known as a circumstance of extreme need, often financial, and is characterised by situations of deficiency, scantiness or insufficiency of necessary or desirable ingredients, qualities or commodities (dictionary.com, 2012). Because of poverty, insufficient household sanitary conditions, and other related factors, mothers might not be able to feed infants with enough clean breast milk so that mixed low quality foods or contaminated water are used instead.

According to POLICY (2002), there is an interrelationship between poverty, ignorance, poor health, malnutrition, and reduced child survival. A child born to a financially deprived and less educated family is at risk of dying prenatally or within the first month of life, since the mother was probably poorly nourished during pregnancy, had little or no Ante-natal Care, and is unlikely to have delivered at a health facility. If the child manages to survive the first month of life, the child is then exposed to increased risks of illnesses, such as malaria and diarrhoea, due to

poor living conditions, limited access to safe water and inadequate sanitation, malnutrition from household food insecurity, or ignorance about good child feeding practices. The mother may need to work to help in supporting the family economically, thus leaving the child quite possibly inadequately cared for. All these factors are further aggravated by limited access to health services due to poor income and low levels of maternal education.

Poverty is also said to affect the mental health of children. According to Strohschein (2006), changes in income are associated with changes in child mental health. If household income improves after early childhood, child mental health improves and conversely, drops in income increase depression and antisocial behaviour.

The poverty level in Nigeria is high, with statistics showing that about 70% of Nigerians live below the poverty line (UNDP,2009), Kaduna state however is said to have about 41% of its population living below the poverty line (World Bank, 2006). A small scale study in Oyo State of Nigeria showed that persons earning less than $1 a day were 9 percent less likely to use Insecticide Treated Nets, (ITNs), less able to perceive malaria as a preventable disease, and less likely to have adequate drug treatment than those with a higher income (Oriade,2006). Poverty is thus a potent cause of child mortality due to diseases.

2.5.3 Poor living conditions:

Numerous data suggest that the health of children are compromised by poor living conditions, which involves a situation whereby children suffer limited access to hygiene, good toilet facilities and clean drinking water. It is estimated that 4 per cent of all deaths and 5.7 per cent of the global burden of disease is caused by poor water, sanitation and hygiene (Pruss *et al*, 2002). Roughly 1.5 million children globally, under the age of five die from poor sanitation and water

each year (UNICEF, 2006). Poor sanitation increases the risk of faecal-oral transmission of diseases and is a major risk factor in exposing children to pathogens and infectious diseases (Silva, 2005). These pathogens and diseases can cause severe diarrhoea that claims up to 2.2 million lives per year worldwide (Pruss *et al*, 2002).

Esrey (1996), collected data from eight countries in Sub-Saharan Africa, Asia/North Africa, and the Americas. These were combined and analyzed using multiple linear regression to test whether incremental improvements in water and sanitation resulted in incremental health effects regarding diarrhoea. The results showed that improvements in sanitation and water supply resulted in less diarrhoea and in healthier children. Benefits from improved water occurred only when sanitation was improved alongside potable water supply. Rheingans *et al* (2006) reviewed epidemiological studies that focused on child health, sanitation and water. They found that excrement disposal plays an important role in child health and cannot be underestimated when comparing it to the benefits of clean water, especially in the instances of high rates of diarrhoea.

Fink *et al* (2010) carried out a research, using data from Demographic Health surveys of 70 low and middle income countries between the periods of 1986 to 2007. The data included complete birth histories and water and sanitation information. They used logistic models to establish the relationship between access to good living conditions, which included water, sanitation, and child health. They discovered that both access to water and sanitation have positive effects on child health. Children in households with access to a high quality water source have risks of diarrhoea and other diseases roughly 10 percent lower than children in households with low quality water access. Their findings also revealed that children in households with access to high

quality sanitation have a 13% lower chance of suffering from diarrhoea and other related diseases.

2.5.4 Cultural practices: various ethnic groups and cultures all over the world, have their own beliefs and practices concerning health and disease. Each society or community has its peculiar way of doing their things and it is known that these practices and beliefs go a long way in influencing the people's perception, attitude and management of diseases and other health related problems. The cultural practices of a people not only affect their health, but also affect all their affairs including health and disease.

There are deeply rooted cultural beliefs and attitudes that sometimes result in practices harmful to the survival of children and women. These include food taboos, gender-related practices such as early marriage and lower levels of education among females, and the attendant risks of maternal morbidity and mortality. Also, the inability of women to exercise their reproductive rights due to culturally based limitations brings about higher levels of maternal, infant, and child mortality. Some cultural factors lead to poor childcare practices in Nigeria; for instance, widespread beliefs about the aetiology of illnesses being attributed to evil spirits and use of traditional medicine as the first line of treatment for illnesses (Feyisetan *et al* 1997). To some extent, infant feeding practices have a cultural bias—in some tribes, colostrum is not fed to newborn babies because it is believed to be dirty and thus breastfeeding is delayed and not sustained. There is also the tendency to withhold protein-rich foods, such as meat, chicken, and eggs, from infants because of the mistaken belief that feeding children those foods may encourage them to steal later on in life (Annan, 2011). The above mentioned and many other cultural practices such as forced feeding are detrimental to the health of children.

Jegede *et al* (2006) explored the culture of forced feeding among the Yoruba community in south western Nigeria. They localised their study to a rural area in Osun state and gathered data about this harmful practice by interviews of the caregivers of young children. It was discovered that the practice still persists despite medical warnings of the negative effects on children such as constipation, chocking and convulsions. The most prominent among the detrimental effects of this practice is the opportunistic infection to the child due to the unhygienic nature of the feeding practice, which leads to diarrhoea.

In other villages such as Ondon in South western Nigeria, the villagers believe diarrhoea in children is a natural part of development due to teething; they therefore don't seek medical attention when a child suffers from the disease. (Onyeabochukwu, 2007). This has led to fatalities in some instances.

2.5.5 Breastfeeding: Breastfeeding, also called nursing, can be an easy and inexpensive way for a mother to feed her child. According to the American Academy of Paediatrics (AAP) Policy Statement on breastfeeding, women who don't have health problems should exclusively breastfeed their infants for at least the first six months of life, and preferably try to breastfeed for the first 12 months of life because of the benefits to both the mother and baby.

Breast milk contains the nutrients, antioxidants, hormones and antibodies needed by a child to survive and develop. Infants who are exclusively breastfed for the first six months of life and continue to be breastfed until two years of age and beyond develop fewer infections and have less severe illnesses than those who are not (UNICEF/WHO, 2009). This protection has been shown to be higher where maternal literacy is higher and where sanitation is worse (Victoria,

1987). Infants who are not breastfed have a six fold greater risk of dying from infectious diseases in the first two months of life, including from diarrhoea, middle ear infections, and certain lung infections (Shriver, 2009). This might be because of malnutrition in early feeding practice while a child's immune system is not sufficiently developed to protect him or her from contamination by bacteria. For example, Woldemicael (2001) attributed the immediate deterioration pattern in a child's health to the fact that most children were weaned during 6–12 months. It is likely that as the child's immune system develops, with the help of breastfeeding, disease prevalence decreased.

During infancy, breastfeeding provides excellent nutrition, immune system stimulus, and growth factors, as well as providing rapid involution of the postpartum uterus and a period of time for maternal calcium storage. Breastfeeding also helps protect infants against chronic diseases such as diabetes and certain cancers (Labbock, 2008). The benefits of breastfeeding infants can thus not be underestimated, with regards to their survival and wellbeing.

Ukegbu *et al* (2011) studied the determinants of breastfeeding patterns among mothers in Anambra State, between September 2006 and June 2007 on 228 nursing mothers. Most mothers (208, 91.2%) had good knowledge of breastfeeding but only 110 mothers (48.2%) initiated breastfeeding immediately (<1 hour) after delivery. The exclusive breastfeeding (EBF) rate fell from 143 (62.7%) at birth to 85 (37.3%) at 24 weeks. EBF was significantly associated with older maternal age, higher parity, delivery at a government facility, a positive family attitude towards EBF, and breastfeeding education from a government health facility. Focus group discussion showed that mothers believed that adequate nutrition and physical, financial and emotional support to them would increase EBF practice.

2.5.6 Fertility behaviour:

Fertility behaviour in this context refers to the fertility decisions carried out by couples due to various reasons which are mostly cultural and social. Fertility behaviour affects the survival of children either positively or otherwise. In many African and Asian countries, the preference of male children over female children is pervasive. Son preference is believed to be the major reason of excess female mortality that is often evident during childhood. Research studies suggest that parents with strong son preference consider their daughters to be less valuable and provide inferior care in terms of food allocation, prevention of diseases and accidents, and treatment of sick children (Paveau *et al*, 1991). A strong preference for sons may also lead to the practice of female feticide or infanticide (Kishwar, 1993). Female children are also prone 2 experience increased mortality because their birth is more likely to be followed after a short interval by the birth of a younger sibling. Mortality risks during childhood have consistently been found to be positively related to short birth intervals (Arnold*, et al* 1996).

Various studies have shown that shorter birth intervals usually result in a higher mortality in children. In his research, Rutstein, (2008) carried out an intensive research using data from 52 Demographic Health Surveys of developing countries. His study was based on the effects of birth interval on child mortality. In his findings, he discovered that the excess risk of mortality is highest for very short intervals (less than 12 months birth to pregnancy). He also stated that if all women would wait at least 24 and 36 months to conceive again, under-five deaths would fall by 13 and 25 percent respectively. In summary, he stated that the impact of avoiding high risk birth intervals (less than 36 months) would be a total of 1,836,000 deaths avoided annually in less developed countries, excluding China (where there is a one child policy). Other studies that have been carried out include Davinzo *et al*, (2004), Pitt (1997), among others. Thus, parents who

want their children to survive and thrive would do well to wait at least 30 months after a birth to conceive another child.

2.5.7 Weather variability: This affects the pattern and trend of disease occurrence in children. Seasonal variations come along with their peculiar effect on the health of individuals, especially children due to their vulnerable state. Abdullahi *et al* (2009) studied the trend of malaria occurrence in Sokoto state, north western Nigeria. About 1,297 blood samples were collected from children by simple random sampling method over a period of about 12 months. Out of these samples, 27.1 % tested positive 2 the parasite in the month of August, which was a record high. This also coincides with the peak in the rainy/wet season. The month of March had the least record of malaria occurrence, which was a total of just 9.2% of the samples collected. At this period, the dry season is just ending and the mosquitoes that can cause malaria too are at their lowest population. This shows that the seasons and their appending weather conditions have their effect in the health of children.

Bandyopadhyay *et al* (2010) studied the Impact of Weather Variation on Child Health in Sub-Saharan Africa. A dataset was constructed using data from the Demographic and Health Surveys (DHSs) from 19 Sub-Saharan African countries between 1992 and 2000 and climate data from the Africa Rainfall and Temperature Evaluation System between 1980 and 2000. The results from the econometric analysis confirm that variation in maximum and minimum temperatures and precipitation in dry seasons significantly affects the prevalence of diarrhoea and ARI. It showed that a 1 degree Celsius increase in the average monthly maximum temperature increases the prevalence of diarrheal disease, on average, by about 1 percentage point. The study finds no significant effect of changes in extreme temperatures on ARI prevalence.

2.6 GIS AND DISEASE MAPPING

Geographic Information Systems (GIS) and related technologies like remote sensing are increasingly used to analyze the geography of disease, specifically the relationships between pathological factors (causative agents, vectors and hosts, people) and their geographical environments(Cromley,2003). A GIS integrates common database Operations, such as query and statistical analysis, with the ability to see how data relates in space and time. The maps produced with a GIS are useful showing places and the event that occur there, like outbreaks of disease. Armed with the knowledge of the epidemiology of these diseases, the spatial distribution of these diseases can be mapped, using GIS techniques which will reveal regions with higher prevalence and populations with higher susceptibility to the diseases.

GIS is very useful for studying the associations between location, disease and environment, particularly because of its ability to carry out spatial analysis, and display maps. It is thus a timely means to be used by epidemiologists in mapping diseases (Clarke *et al*, 1996). GIS is an exceptional tool used to identify spatial patterns and core areas of disease transmission. Disease maps have the ability to distinguish between the low and high risk areas, as well as highlight physical and/or socio-cultural factors that contribute to the causation of the disease (Rytokonen, 2004).

There are various researches that have used GIS to map diseases. Some of them include the research by Kandala *et al* (2008), who mapped the morbidity of children in Nigeria from diarrhoea, cough and fever, using data from Nigeria's Demographic Health Surveys of 1999 and 2003. The purpose was to reveal and explore inequalities in the health of Nigerian children by mapping the spatial distribution of childhood morbidity associated with the incidence of these

diseases using a Bayesan Geoadditive model. The results showed that the morbidity attributable to each of these causes varied, differently, at state level. Place of birth (hospital versus other), type of feeding (breastfed only versus other), parental education, maternal visits to antenatal clinics, household economic status, marital status of mother and place of residence were each significantly associated with the childhood morbidity investigated. Children from urban areas were found to have a significantly lower risk of fever than their rural counterparts.

Gupta (2003) also used GIS in the study of infectious diseases in India. They created a relational database and interpolated the factors of the infectious disease in question, its aetiology, epidemiology and vulnerable group conditions. The results produced a map showing the population at risk of exposure to these diseases. Some other scholars that have used GIS in their study of infectious diseases include, Hartskeeri (2005), Oskam (2007), and Rogers and Randolph (2003).

Substantive studies have been carried out on malaria mapping and control, using the GIS tool. One of such studies is by Srivastava (2009), which was able to generate maps identifying malaria outbreak hotspots in the region over time. With this result, accelerated focused malaria control was carried out to manage the spread of the disease, yielding positive results of malaria cases dropping dramatically from 96,042 in 2007 to 90,829 in 2008. Other projects that have been carried out in this field include that of shiravama *et al* (2009), who studied the use of GIS in the control and monitoring of malaria in Laos. Structured questionnaires were administered in the province from June to July, the rainy season, in 2005. A total of 1,711 villagers from 403 households participated in the survey. After data collection and analysis, the GIS maps produced visually indicated the uneven distribution of intervention coverage and health outcome within

one province. In the distal villages located far from the district hospitals, malaria cases were detected, while the villages with the best access were malaria-free. They highlighted where malaria cases occurred, as well as villages with lower coverage of Insecticide Treated Nets or lower adherence to the intervention.

Abdullahi *et al* (2009*)* also carried out a research in Kano State, mapping the incidence of urinary schistosomiasis between 2005 and 2007. A questionnaire was designed to collect data on Name, Age, Sex, Water supply, Contact and history of haematuria. This was distributed to each of the randomly selected subjects (mostly translated to Hausa) and the responses collected at the same time. One hundred and fifty 150 questionnaires were distributed in each LGA, after which respondents produced a urine sample. A total of 6600 urine samples ware examined for the infection. Of these number 2820(42.7%) were infected. Out of the 44 Local Government Areas of Kano State, where data was collected, the highest prevalence rate of 64.0% was observed in Kura Local Government Area and the least 18.0% was observed in D/Tofa Local Government Area. Males were observed to have a higher prevalence rate (48.0%) than the Females (29.7%). The results were mapped, showing the spatial variation in the occurrence of the disease.

Oyedepo *et al* (2011) mapped the epidemiology of cholera in some parts of Abeokuta, South Western Nigeria, using GIS. The network of water pipelines was digitized from the master plan and the geo-ecological characteristics of the environment were captured from a high resolution (Ikonos) satellite image of the affected communities. Water samples were also collected from various points and their coordinates obtained, to trace the probable contamination of the water. All this layers of information were analysed within the GIS environment. It was found that the

sanitary practices of the indigenes of the area were very poor; there were no proper sewage or waste disposal systems. Heaps of refuse dumps were also a common sight on water pipelines. The study confirmed epidemic water contaminations in the area, especially at points where there were leakages from rust and refuse disposal.

CHAPTER THREE

THE STUDY AREA

3.1 PHYSICAL CHARACTERISTICS

3.1.1 Location

Kaduna State is located in the North of Nigeria, and lies between Latitudes$11^0$34' and 9^0 01' North of the equator and longitude $6^0$11' and $8^0$49' east of the Greenwich meridian as shown on the map in Figure 3.1. The State is divided into three senatorial zones, namely Kaduna North, Central and South and comprise of 23 Local Government Areas with 255 political wards (NPC, 2006). Kaduna State shares its boundary with Katsina State to the North, Niger and Abuja at the West, Plateau State to the South and Kano State to the East.

3.1.2 Relief and Geology

The basement complex forms the central major geological unit of Kaduna State, and the bedrock geology of the State is predominantly metamorphic rocks of the Nigerian Basement Complex consisting of biotite gneisses and older granites. This is principally made up of metamorphic and igneous rocks including banded gneisses and migmatites, with locally extensive areas of meta sedimentary rocks which includes; schist, phyllites, quartzites and marbles with the latter outside the study area. Pegmatite and basic igneous rocks such as amphibolites, diorites and gabbros also occur. (KRB Report; 1978)

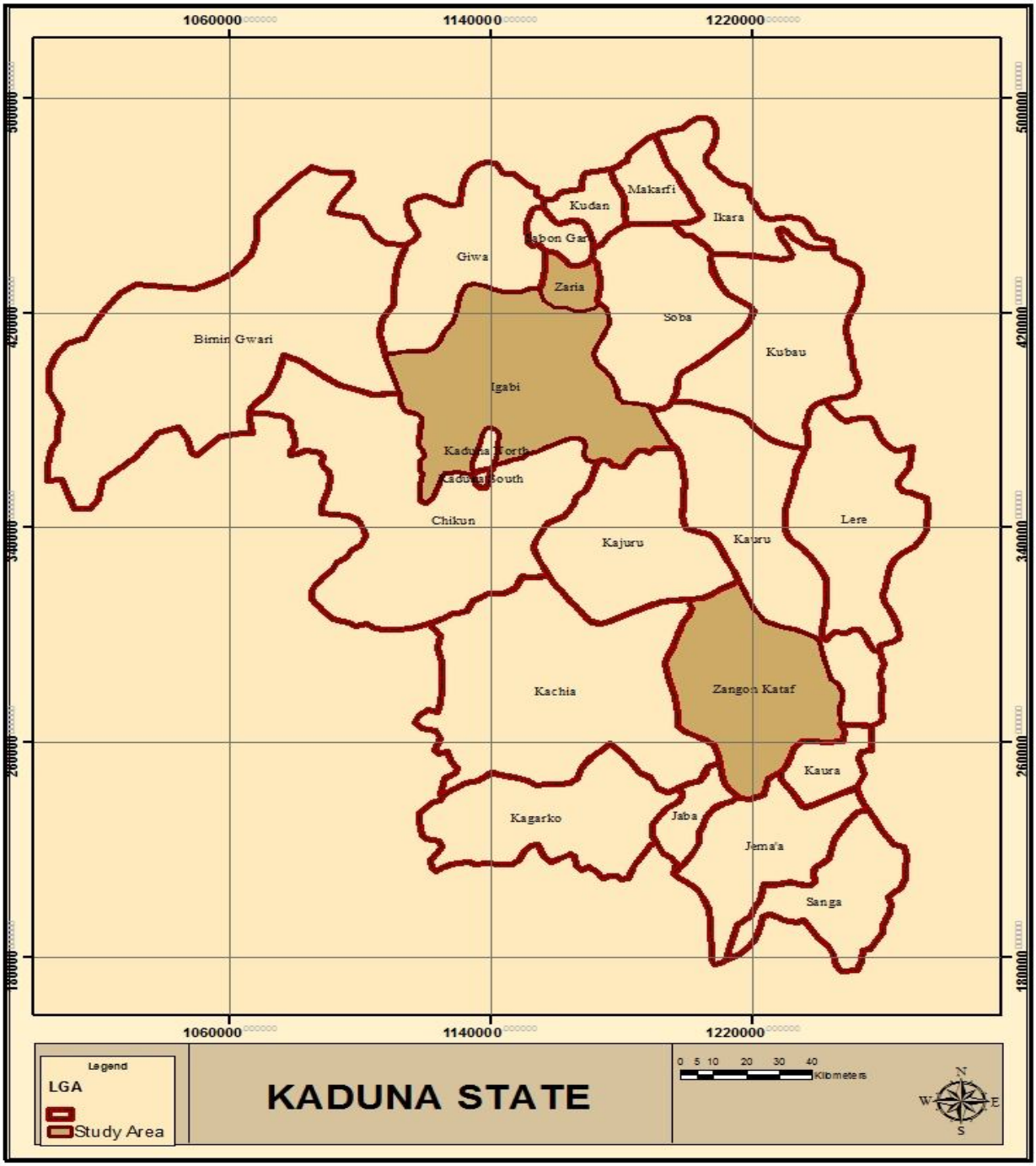


FIG 3.1: KADUNA STATE SHOWING THE STUDY AREAS

Source: Field survey, 2011

In the south-eastern corner, younger granites and bathyliths are evident. Deep chemical weathering and fluvial erosion, influenced by the bioclimatic nature of the environment, have developed the characteristic high undulating plains with subdued interfluves (Mortimore, 1970). In some places, the interfluves are capped by high grade lateritic ironstone especially in the Northwest. However, rocky granitic residuals form inselbergs of varying sizes and shapes, and constitute the main local relief (relative relief is less than 150m) here and there with Kufena, Kagoro hills and Dutsen WaiKudaru Ring complex standing out very prominently. The valleys are shallow but wide, stretching several tens of kilometres into the headwater areas with gentle sloping valley sides; imperceptibly positioning into flat moist to marshy alluviated bottomlands or floodplains, called "fadamas" in Hausa. Although stream valley incisions and dissections of the high plains are evident in several areas, especially in the Zaria region, they are due more to anthropogenic influences and climatic factors than regional geologic instability.

3.1.3 Climate and Hydrology

There are two distinct seasons experienced in Kaduna State: the wet (rainy) season, lasting from April to October, and the dry season (harmattan) lasting from November to March. The seasonality of the weather is pronounced with the cool to hot dry season being longer than the rainy season. These two seasons reflect the influences of tropical continental and equatorial maritime air masses which sweep over the entire country. The rainy season is characterized by thunderstorms which lead to loss of lives and property in severe cases. Again, the spatial and temporal distribution of the rain varies, decreasing from an average of about 1530mm in

Kafanchan-Kagoro areas in the Southeast to about 1015mm in lkara-Makarfi districts in the Northeast.

The dry season is characterized by strong North Easterly winds, which blow cold and dusty from the Sahara desert. The temperature in Kaduna State usually reaches its peak in the month of April, at about 32^0C and drops to its lowest in the hamarttan months dipping to about 16^0C. These seasons have implications on human health (Mamman, 1992). High evaporation during the long dry season poses serious limitations on available water resources especially in Igabi, Giwa, Soba, Makarfi and Ikara Local Government Areas. The relative humidity is above 70% in the rainy season and drops to about 30% or could be as low as 15% in the dry season (Ali, 1989).

The two large river systems, the Kaduna and Gurara that run through the state provide opportunities for good sources of water supply, although many of the tributary streams dry up during the long dry season. Regardless of this trend, the wide alluviated valley bottomlands in many drainage basins such as Galma, Tubo, Karami, Sarkin Pawa and Damari) favour extraction of groundwater of from shallow aquifers. Presently, there are five completed large and medium dams and water intakes at Zaria dam on Galma and Kubanni rivers, Kangimi dam on Karami river, Bimin Gwari dam on Kusheriki river; and Kaduna dam on Kaduna river. Also, one or two boreholes in every LGA have been completed and are now in operation to complement water supply for rural domestic uses.

3.1.4 Soil and vegetation

Generally, the soils and vegetation of Kaduna State are typical redbrown to redyellow tropical ferruginous soils and savannah grassland with scattered trees and woody shrubs. The soils in the

upland areas are rich in red clay and sand but poor in organic matter. However, soils within the "fadama" areas are richer in kaolinitic clay and organic matter. They are very heavy and poorly drained, which are typical characteristics of vertisols.

Generally, the spatial distribution of vegetation is primarily determined by the overall moisture conditions and is therefore more of a reflection of the length of the wet season than the amount of annual rainfall (Mishikir, 1988). The vegetation of the study area is the northern Guinea savanna which consists of tall wood land and long grass savannah species with gallery forest along the main water courses (Hore, 1970). Unfortunately, these characteristics of the vegetative cover is hardly present due to anthropological activities such as poor management practices like wood for fuel, annual cultivation and intensive grazing, and bush burning. Fringe forests ("Kurmi" in Hausa) in some localities, and especially in the southern Local Government Areas of the State, are presently at the mercies of increasing demands for fuel wood in the fast growing towns and urban centres. The shea butter tree (*Viteltaria paradoxa*) locust been (*Parkia biglobosa*), silk cotton (*Ceiba pentadra*), Mango (*Magnfera indica*), and Isobellina doka are the dominant tree species of the study area. They are characterized by an average height of about 6-10cm. In direct response to the decreasing rainfall amount and increasing seasonality, the vegetation densities and height of vegetation in the study area generally decreases north-wards towards the Sudan savannah.

3.2 HISTORICAL DEVELOPMENT OF KADUNA STATE

Established in 1912 by Sir Lord Frederick Lugard, first as a garrison town and then as the regional capital of the then Northern protectorate, Kaduna State is regarded as the political

centre of Northern Nigeria. A great impetus for its growth and status as a nodal town is the construction of the railway in 1913, thus bringing about development and large scale commercial activities. Within two decades of its establishment, it grew from an almost virgin territory of small scattered settlements of the indigenous population, mostly Gbayi, to a town of over 30,000 people (Haruna, nd). The inhabitants of the State comprised mostly of the British colonisers, artisans from other west African British colonies, labourers and traders from the Hausa, Nupe , Kanuri, Fulani and other tribes in the Northern protectorate. It later became a state in 1976, and had its capital as Kaduna.

3.3 THE POPULATION AND PEOPLE OF KADUNA STATE

The State has an estimated population of 6.1 million; 3,090,438 males and 3,023,065 females. The annual rate of increase is 3 %, thus the population figure of Kaduna State is projected to rise steadily over the years to 7,374,292 in 2012 and 8,068,761 in 2015(NPC,2006). Although majority live and depend on the rural areas, about third of the State's population are located in two major urban centres of Kaduna and Zaria. However, except in the North-western quadrant, the rural population concentration is moderate, reaching a high of over 500 persons per sq. km in Kaduna/Zaria and the neighbouring villages; 350 in Jaba, Igabi and Giwa and 200 in Ikara LGAs (PATHS, 2008). Despite the provisional nature of the census results, observations of movements of young able-bodied male labourers in large numbers, from rural villages to towns during the dry season and back to rural agriculture fields during the wet season, suggest a sizeable seasonal labour force migration in the state. However, the seasonal labour migration has no effect on agricultural labour demands in the rural traditional setting. Indeed, some of these seasonal migrants come to town to learn specific trade or acquire special training and eventually go back

to establish in the rural areas as skilled workers such as masons, technicians, tractor drivers, carpenters and motor mechanics. Another major feature of the State's population structure is the near 1:1 male/female ratio, not just for the state as a whole, but even among all the LGAs.

Kaduna State forms a portion of the country's cultural melting pot. Apart from six major ethnic groups found in the State, there are over twenty other ethnic minority groups, each with its language and arts or religion different from the other. Works of art and pottery (e.g. the "Nok Terracotta") are found in the southern parts of the State. Among the major ethnic groups are Kamuku, Gwari, Kadara, in the West, Hausa and Kurama to the North and Northeast. "Nerzit" is now used to describe the Jaba, Kaje, Koro, Kamanton, Kataf, Morwa and Chawai instead of the derogatory term "southern Zaria people." Also, the term "Hausawa" is used to describe the people of Igabi, Ikara, Giwa and Makarfi LGAs, which include a large proportion of rural dwellers that are strictly "Maguzawas." In the North, the Hausa and some immigrants from the southern states practice Islam and majority of the people in the Southern LGAs profess Christianity. The major Muslim festivals are the "Sallah" celebrations of "Id-El-Fitri" and "Id-El-Kabir", while the Christians observe Christmas, New Year and Easter. Two traditional festivals of significance are the "Tuk-Ham" and "Afan" in Jaba and Jama'a LGAs respectively. Prominent among the traditional arts, are leather works, pottery and indigo-pit dyeing with Zaria as the major centre.

3.4 HEALTH FACILITIES AND MEDICAL PRACTITIONERS

Kaduna State has 739 Local Government Health Facilities, 29 Secondary Care Facilities, five Tertiary Hospitals, 656 Private Health Facilities and 2500 registered patent medicine shops. There are also eight academic institutions and four post-basic training programmes for human

resources development within the Healthcare Service (PATHS, 2008). Poor conditions of services including inadequate staff housing have made it extremely difficult to recruit and retain medical staff particularly in rural areas. The supply of drugs at facilities is not consistent. Whilst some essential medicines are out of stock in public hospitals, the health clinics are virtually without any Government-procured drugs. At facility level, providers have different approaches for dealing with the supply issues and how patients are charged as well as which drugs are free (eg malaria in pregnancy) and what are the essential drugs to have in stock. The cost of purchasing drugs and supplies is one of the barriers to access of primary health care by the very poor. Kaduna State Government has made huge investments in the health sector, including the recently launched free treatment programme for pregnant women and children under 5. This policy was designed to increase the attendance at health facilities from 10-15% in 2006 to 40% by the end of 2007, 60-80% by end of 2008 and projected above 90% by 2009. The policy was also designed to be implemented in phases, starting with 1 facility per LGA by the end of 2007, expanding to 2 facilities in each LGA by the end of 2008 (PATHS, 2008).

3.5 EDUCATION

Kaduna State enjoys the leading position in Educational development in the entire region north of the NigerBenue valley, and is known as the center for learning. Prior to the acceptance of formal Western education by the government of the Northern Region, the efforts of Voluntary Agencies (Church Mission Groups) in establishing schools at both primary and secondary levels, gave the present Kaduna State an enviable advantage of early educational infrastructure establishment. It is this early start that accounts for to Kaduna's relatively high level of literacy in the then Northern Region. Secondary schools in the state (Federal and State Government

owned and private/voluntary agencies) have average enrolments of between 300 and 500. Enrolments in some large schools in Zaria and Kaduna urban areas go up to between 2,000 and 4,000 each, respectively. There is a wide is range of tertiary institutions established to produce the high skilled manpower needed by the State. Twelve out of seventeen are located in Zaria and include the Ahmadu Bello University complex, Federal College of Education, Kaduna State Polytechnic, College of Aviation Technology, National Institute for Chemical Research and Technology (all in Zaria); Kaduna State University, Command and Staff College at Jaji, and a Federal Polytechnic, Federal School of Forestry, National Water Resources Institute, and a College of Agriculture and Animal Science in Kaduna.

3.6 ECONOMY

Kaduna is a major commercial city, and is second only to Kano in the North of Nigeria. Almost all the industries in Kaduna State are located in Zaria and Kaduna urban centres. Indeed, the entire heavy manufacturing industrial establishments are concentrated in Kaduna alone. Certainly, the locations are influenced by government policy and probably market. For example, the high concentrations of textile manufacturing industries in Kaduna with just two in Zaria, and none in Soba, Maigana or Saminaka, which are cotton-producing towns, illustrate the strong governmental control. Also, the Federal Government's decisions in the mid 1970s to locate a petroleum refinery and an automobile assembly plant (PAN) in the city further widened its industrial growth base and increased the agglomeration in Makera/Tudun Wada, Kakuri, along Kachia Road. Other major manufacturing industries in the city include Super Phosphate Fertiliser Company Ltd and Petro-Chemical Company Ltd. Again, all these are Federal

Government Parastatals. There are other small to medium scale industries too numerous to list but are very important in providing potable equipment for rural dwellers' use (e.g in old "Panteka" market, construction of metal doors, windows and frames, boxes, grinding stones, huller machines, kitchen wares, ox-plough blade, planters, shellers, etc. may be found). Certainly, there is need to encourage location of other industries outside Kaduna urban center in the future.

3.7 ROADS AND TRANSPORTATION

Kaduna State is served with 2,820km stretch of trunk "A" Federal, wellsurfaced roads radiating from Kaduna City in five cardinal directions westwards to Tegina, northward to Kano, eastwards to Jos, south and southeastwards to the Federal Capital Territory. The State Government has also constructed good tarred surface roads comparable to the trunk "A" totalling 1,200km; and several other road development projects are still going on. Again, in order to open up the large rural areas, the former Federal Government Agency, DFRRI, constructed feeder roads to specific project locations. For example, the road linking Rigachikun to Sabon Bimin and Gumel to Jere in Igabi and Kachia LGAs respectively, are good feeder roads. Several other stretches have been constructed in Zango Kataf and Jama'a LGAs in order to gain access to the state's rural agriculture lands. Apart from motor roads, the railways also aid in interstate shuttle. These transportation networks are assets to the State Government for movement of goods, raw materials and services. The development in air travel within Nigeria has also linked the State to every corner of the country, thus Kaduna State has a standard airport. This is welcome progress bringing the State closer to foreign investors. Indeed, business in any part of Kaduna State from any part of the federation can be reached within an hour or two, using

one out of the numerous airways that offer their services. Also, a telecommunication system connects Kaduna State with all other states and the outside world. Nigeria Telecommunications Corporation (NITEL) provides twenty four hours automatic telephone exchange services; in addition to telephone services there are a host of mobile telecommucation operators offering their services in the State.

3.8 TOURISM AND RECREATION

Although the present state of tourism in Kaduna does not reflect the state's long history and its rich cultural developments, there are several tourist attractions in different parts. For example, the famous Zaria city walls, the Emir's legendary insignia and the palace drums are all in the Old city. During Muslim festivals, like those mentioned above, minidurbar "Hawan Doushe", is normally staged in the open field in front of the palace. The origin of Nigeria's famous Nok terracota and its rich cultural heritage in Jaba LGA and the annual traditional festival of "Tuk Itamo" in Nok Village and Kwoi respectively; and the "Afan" festival among the peoples in Jama'a, Sanga and Kaura LGAs are held during Christmas and Easter and attract other Nigerians and foreigners, in large numbers. Wildlife parks and games are very limited in the State, but there are some good spots of natural history and recreational sites, such as the Kagoro hills bathylith and the Matsirga falls in the Jama'a LGA.

CHAPTER FOUR

DEMOGRAPHIC AND SOCIO ECONOMIC CHARACTERISTICS OF RESPONDENTS

4.1 INTRODUCTION

This chapter focuses on the demographic and socioeconomic features of respondents. Some of these characteristics include: age, religion, ethnicity, educational qualification, occupation, income, marital status, type of marital union, desired and actual number of children and reasons for more children. Other issues are attendance of antenatal clinic, location of last birth, child diseases and treatment, breastfeeding status, nutritional status, source of potable water and method of excrement disposal, usage of mosquito nets and vaccination status of child. The influence of these factors on the prevalence of childhood diseases is examined.

4.2 AGE GROUP OF RESPONDENTS

The age of a mother is very relevant to issues bordering around fertility and particularly the wellbeing of a child. Various studies have shown a strong relationship between maternal age and the health of a child. One of such studies was by Rothenberg and Varga (1981), which showed that children of younger mothers were more susceptible to diseases and accidents of all sorts, compared to children of older women. Table 4.1 shows the distribution of respondents by their age groups.

Table 4.1: Distribution of Respondents by Age Groups

Variables	Igabi LGA		Zaria LGA		Zangon-Kataf LGA		Total LGA's	
Age Group	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
16-20	41	20.5	2	1.6	3	2.0	46	9.6
21-25	79	39.5	17	13.2	22	14.9	118	24.7
26-30	37	18.5	37	28.7	44	29.8	118	24.7
31-35	24	12.0	46	35.7	40	27.0	110	23.1
36-40	15	7.5	19	14.7	29	19.6	63	13.2
41-45	4	2.0	5	3.9	7	4.7	16	3.4
>45	0	0	3	2.3	3	2.0	6	1.3
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field Survey, 2012

On a general note across the three Local Government Areas (LGAs), women within the age range 21-25 and 26-30 years are the most populous groups, totalling a percentage of 49.4. This figure is followed closely by the age group 31-35years, accounting for 23.1% of the respondents. The age range of women within group 36-40years represents 13.2%. The younger women within ages 16-20years form 9.6%, the older women within age group 41-45 form 3.4% and women above 45 years of age represent 1.3 %.

In terms of spatial variation, the age group with the highest proportion of respondents in Igabi LGA is 21-25 years, accounting for 39.5% of the respondents. In Zaria however, the most

populous age group is 31-35, equivalent to 46%. In contrast to Igabi and Zaria, Zangon kataf has the highest proportion of women in age group 26-30years, representing 29.8%. In this study, women within the combined age group 21-35 represent over 72.5% of the respondents. This implies that this age range represents the peak of women reproduction.

4.3 RELIGION AND ETHNICITY OF RESPONDENTS

Individuals are strongly shaped by their religious and cultural affiliations which affect their perception of life and the way it is lived. These affect women at all levels, hence their attitude to child diseases. With reference to Table 4.2, the respondents that are Muslims in Igabi constitute 64.5%, while the Christians are about 35.5%. In Zaria however, the Christian respondents are about 46.5%, while about 53.5% are Muslims. The fairly large representation of Christian respondents can be explained because the data were collected not only from homes, but also from health institutions. Also, many of the respondents are immigrants into Zaria LGA for educational reasons. Zangonkataf comprised predominantly of Christians, amounting to 95.3%; on the other hand, Muslims account for only 4.7%. The very high percentage of Christians in the locality shows that it is a predominantly Christian region, and the Zangon Kataf riots (1993) made a large number of Muslims to emigrate out of the area.

Across the three LGA's, Christians comprise about 57%, while the Muslim population is 43%. The predominant ethnic groups on the average in the study area are the Northern minority(Southern Kaduna) and the Hausa/Fulani, which each constitute 43.2% of the respondents. Next are the Yoruba and Igbo, each constituting 9.4%. The southern minority (Niger/delta, South-South) form 8.0% and other ethnic groups collectively represent about 4.8%.

In the individual LGA's however, Hausa/Fulani is the predominant ethnic group in Igabi LGA with about 59% respondents. This is followed by the Northern minority (29%).

Table 4.2 Distribution of Respondents by Religion and Ethnicity

Variables	Igabi LGA		Zaria LGA		Zangon-kataf LGA		Total LGA's	
Religion	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
Islam	129	64.5	69	53.5	7	4.7	205	43.0
Christianity	71	35.5	60	46.5	141	95.3	272	57.0
Total	**200**	**100.0**	**129**	**100.0**	**148**	**100.0**	**477**	**100.0**
Ethnicity								
Hausa/Fulani	118	59.0	40	31.0	5	3.4	163	34.2
Igbo	11	5.5	14	10.9	20	13.5	45	9.4
Yoruba	10	5.0	27	20.9	8	5.4	45	9.4
Northern Minority	53	26.5	29	22.5	81	54.7	163	34.2
Southern Minority	5	2.5	10	7.8	23	15.5	38	8.0
Others	3	1.5	9	7.0	11	7.4	23	4.8
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field survey, 2012

In Zaria LGA, the Hausa/Fulani form the predominant ethnic group (31%), followed by the Northern minority (22.5%). In Zangonkataf on the other hand, the northern minority are more, comprising 54.7%. This is not surprising since most of the women found in the locality are indigenous. The next most populous ethnic group in Zangon kataf LGA is the southern minority (15.5%).

4.4 EDUCATIONAL QUALIFICATION OF RESPONDENTS

The influence of education in shaping the health behaviour of an individual can not be underestimated. Table 4.3 reveals that generally, the highest educational level attained is the tertiary level, with 34.8% of the respondents. Those with secondary education are 33.1%, while 14.3% had attained primary education. About 14% had only Quranic education, while 1.7% had no form of formal education. In Igabi LGA however, the most common educational attainment is the secondary school level with 40.5%, while about 10% had attained tertiary education.

The situation in Zaria LGA is quite different; as high as 61.2% of the respondents have tertiary education, and only 2.3% have no form of education. The high educational levels in Zaria LGA can be explained by the numerous educational institutions in the area. In Zangonkataf LGA, about 45.3% have attained tertiary education, while secondary school constitutes 35.8%.

Education of men who are supposedly the heads is also important in the household. The general trend in educational attainment of husbands of the respondents reveals that 46.8% of the fathers have attained tertiary education, 29.8% secondary, while 10.7% have primary education. Those with Quranic education are only 6.7% while those with no formal of education constitute 1.3%.

Table 4.3 Distribution of Respondents by Highest Educational Qualification

6Variables	IGABI		ZARIA		ZANGON-KATAF		TOTAL	
Mothers Educational Qualification	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
No Formal	2	1.0	3	2.3	3	2.0	8	1.7
Quranic	60	30.0	7	5.4	0	0.0	67	14.0
Primary	37	18.5	9	7.0	22	14.9	68	14.3
Secondary	81	40.5	24	18.6	53	35.8	158	33.1
Tertiary	20	10.0	79	61.2	67	45.3	166	34.8
Others	0	0.0	7	5.4	3	2.0	10	2.1
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**
Husbands Educational Qualification								
No response	3	1.5	0	0.0	2	0.0	5	1.0
No Formal	2	1.0	2	1.6	2	1.4	6	1.3
Quranic	29	14.5	3	2.3	0	0.0	32	6.7
Primary	31	15.5	3	2.3	17	11.5	51	10.7
Secondary	87	43.5	13	10.1	42	28.4	142	29.8
Tertiary	48	24.0	93	72.1	82	55.4	223	46.8
Others	0	0.0	15	11.6	3	2.0	18	3.8
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field survey, 2012

At the individual LGAs, the highest educational attainment by the fathers in Igabi is the secondary school (43.5%), and tertiary level (24.0%). Zaria LGA has a very high percentage of fathers with tertiary education (72.1%), and the secondary school (10.1%). In Zangonkataf LGA, paternal tertiary educational level is 55.4%, while secondary school is 28.4%. Generally, the figures show that the fathers are more educated than the mothers thus buttressing the 2006 census report which states that more men are educated than women, with a gender gap of 13.98% (NPC, 2006).

4.5 OCCUPATION OF RESPONDENTS

As shown in Table 4.4, the most common occupation engaged in is the civil/public service by 28.5% of the respondents. Next are the fulltime house wives which are about 26.6% of the respondents. Those involved in Business/ trading are 30.2%, while Students constitute 7.3%. Industrial operatives form 2.1% and other forms of occupation are represented by 1.9%.

In Igabi LGA, 44.5% of the respondents are full time housewives, while 32 % are involved in one form of petty trading or another. On the other hand, Zaria LGA has 48.8% of the respondents engaged in civil/public service. A combined figure of about 33.4% of the women also engage in petty trading and fulltime house keeping. Zangonkataf also has a high percentage of the respondents as civil servants (35.8%), followed by petty trading (30.4%). About 12.2% are full time housewives, while 11.5% are students.

Table 4.4 Distribution of Respondents by Occupation

Variables	IGABI		ZARIA		ZANGON-KATAF		TOTAL	
Occupation	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
No response	12	6.0	0	0.0	0	0.0	12	2.5
Farming	1	0.5	1	0.8	2	1.4	4	0.8
Civil/Public servant	20	10.0	63	48.8	53	35.8	136	28.5
Business/petty trading	69	34.5	23	17.9	52	35.1	144	30.2
Full time house wife	89	44.5	20	15.5	18	12.2	127	26.6
Industrial operative/ Casual worker	5	2.5	1	0.8	4	2.7	10	2.1
Student	0	0.0	18	14.0	17	11.5	35	7.3
Others	4	2.0	3	2.3	2	1.4	9	1.9
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field Survey, 2012

4.6 MONTHLY INCOME OF RESPONDENTS

The earnings of a woman could help in the support of a home, and the care of children. With reference to Table 4.5, about, 5.9% of the respondents did not give information with regards to their earnings, while 25.4% earn N20,000, which is more than the current minimum wage of N18,000. Respondents that have a monthly income of less than N5,000 constitute 30.6% and about 20.1% earn between N5001-N10000. A total of 12.4% earn N10,001-N15000 while 5.7% earn N15001-N20,000.

In Igabi LGA, 41.5% of the respondents earn less than N5000, while 6.5% earn more than the minimum wage of N18,000. About 47.3% in Zaria LGA earn above N20,000, while 12.4% earn less than N5000 per month. In Zangonkataf, about 31.8% earn less than N5000 per month, and the same percentage of 31.8 earn above N20,000 monthly.

In summary, majority of the respondents (30.6%) earned less than ₦5,000.

4.5 Monthly Income

Variables	Igabi LGA		Zaria LGA		Zangon- Kataf LGA		Total LGA's	
Income (₦)	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
No response	18	9.0	0	0	10	6.8	28	5.9
< 5,000	83	41.5	16	12.4	47	31.8	146	30.6
5,001 -10,000	44	22.0	26	20.2	26	17.6	96	20.1
10,00- 15,000	28	14.0	19	14.7	12	8.1	59	12.4
15,00-20,000	14	7.0	7	5.4	6	4.1	27	5.7
> 20,000	13	6.5	61	47.3	47	31.8	121	25.4
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field survey, 2012

4.6 Distribution of Respondents by Marital Status and Type of Marital Union

Variables	Igabi LGA		Zaria LGA		Zangon Kataf LGA		Total LGA's	
Marital status	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
Never married	0	0.0	0	0.0	3	2.0	3	0.6
Married	197	98.5	126	97.7	129	87.2	452	94.8
Divorce	1	.5	0	0	0	0	1	0.2
Separated	1	.5	1	0.8	0	0	2	0.4
Widow	1	.5	2	1.6	16	10.8	19	4.0
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**
Type of Marital union								
Monogamy	127	64.5	95	75.2	108	83.7	330	73.0
Polygamy	70	35.5	31	24.8	21	16.3	122	27.0
Total	**197**	**100**	**126**	**100**	**129**	**100**	**452**	**100**

Source: Field survey, 2012

4.7 MARITAL UNION

With regards to Table 4.6, 94.8% of the respondents are married; 4.0% are widowed and 0.6% never married. On a general note, there is no substantial spatial variation in the marital statuses of the respondents in the individual LGA's. The locality with the least percentage of married women is Zangon Kataf (87.2%), with more widows(10.8%). This remains so because many of the widows do not remarry, unlike localities that are predominantly Muslim like Zangon Kataf.

For the married respondents, monogamous union is the most predominant (73.0%), while 27.0% are in polygamous union. The relatively higher percentage of polygamous unions in Igabi (35.5%) and Zaria (24.8%) LGAs can be attributed to the fact that Islam is predominantly practiced and permits a man to have up to four wives, of which many of the men take advantage of.

4.8 ACTUAL AND DESIRED NUMBER OF CHILDREN

Most of the respondents nursed a desire for the number of children they preferred, which is different from (usually more than) the actual number of children they have. Table 4.7 shows that 42.1% of the respondents have between 3 and 4 children, whereas 33.5% prefer to have that number of children. Respondents that actually have either 1 or 2 children totalled 36.3%, whereas only 13% were satisfied with that number. The percentage of women that actually have 5-6 children is 15.8%, although more respondents preferred that number, bringing the percentage up to 29.8%. Those that have 7 children or more are about 5.6%, whereas as much as 22.2% of the respondents prefer to have that number of children.

4.7 Distribution of Respondents by Actual and Preferred Number of Children

Variables	Igabi LGA		Zaria LGA		Zangon-Kataf LGA		Total LGA's	
Number of children	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
No response	1	0.5	0	0	0	0	1	0.1
1-2	83	41.5	53	41.1	39	26.3	175	36.3
3-4	78	39.0	63	48.9	57	38.5	198	42.1
5-6	25	12.5	12	9.4	38	25.7	75	15.8
7 above	13	6.5	1	0.8	14	9.6	28	5.6
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**
Preferred Number of Children								
No response	4	2.0	3	2.4	0	0.0	7	1.5
1-2	20	10.1	25	19.4	17	11.7	62	13.0
3-4	46	22.6	46	35.6	68	45.6	160	33.5
5-6	66	33.4	40	31.0	36	24.5	142	29.8
7 above	64	31.9	15	11.6	27	18.2	106	22.2
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field Survey, 2012

4.9 DESIRE FOR MORE CHILDREN AND ASSOCIATED REASONS

With reference to Table 4.8, respondents that wanted more children, there were various reasons for this desire. One of them is the desire of having a male child, which made 18.0% of the respondents willing to give birth to more children. The respondents that wanted more children because they wanted female children were 15.9%. Having more children was understood as a way of expressing high social prestige by some respondents, hence the desire of 10.5% of them to have more children. For those that wanted to have more children for reasons of security in old age amounted to 9.9%. Those that wanted more children for other reasons not mentioned were 14.7%.

Among the three LGA's however, the respondents in both Igabi and Zaria had a higher desire for male children than female children as expressed in percentages; 22.5% male: 15.5% female and 20.2%:14.0% respectively. On the contrary, the respondents in Zangonkataf had a desire for more female children than male as expressed in the percentages 18.2%:10.1%. This can be explained by the fact that compared to sons, daughters get married earlier and produce grandchildren for eager grandmothers. Another reason is perhaps the cultural satisfaction of the parents when giving out their daughters in marriage. Also, many mothers like female children because it is believed that even when they have been married off, they still remember to care for the aged by taking care of them and sending remittances for their upkeep, unlike the male children who get married and most times are beclouded by the responsibilities of their immediate family.

Table 4.8 Distribution of Respondents by Reasons for Desire of more Children

Variables	Igabi LGA		Zaria LGA		Zangon-Kataf LGA		Total LGA's	
Reason for desire for more children	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
No response	35	17.5	52	40.3	61	41.2	148	31.0
Need a male child	45	22.5	26	20.2	15	10.1	86	18.0
Need a female child	31	15.5	18	14.0	27	18.2	76	15.9
Social prestige	17	8.5	11	8.5	22	14.9	50	10.5
Old age Security	32	16.0	4	3.1	11	7.4	47	9.9
Others	40	20.0	18	14.0	12	8.1	70	14.7
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field survey, 2012

Table 4.9 Distribution of Respondents by Antenatal Attendance and Location of Birth

Variables	Igabi LGA		Zaria LGA		Zangon Kataf LGA		Total LGA's	
Attendance of Antenatal Clinic	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
Yes	167	83.5	121	93.8	142	95.9	430	91.1
No	33	16.5	8	6.2	6	4.1	47	8.9
Total	**200**	**100.0**	**129**	**100.0**	**148**	**100.0**	**477**	**100.0**
Location of \last birth								
Hospital	103	51.5	114	88.4	126	85.1	343	71.9
Home	94	47.0	13	10.1	20	13.5	127	26.6
Spiritual home	2	1.0	0	0	2	1.4	4	0.8
Others	1	.5	2	1.6	0	0	3	0.6
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field survey, 2012

4.10 ANTENATAL ATTENDANCE AND PLACE OF BIRTH.

Antenatal clinic attendance during pregnancy goes a long way to impact on the health and wellbeing of the child after birth. With reference to Table 4.9, Majority (91.1%) of the respondents attended antenatal clinics during their last pregnancy, while only 8.9% did not. Reasons for not attending these clinics basically bordered around inadequate finance and doubts on the importance of such an exercise.

> *It is difficult to consider attending antenatal clinics; where is the money?*
> Jamila, In Depth Interview, Zaria LGA.

Based on the findings, the two most predominant locations of giving birth are the hospital (71.9%) and the home (26.6%). Only 0.8% and 0.6% gave birth in spiritual homes and in other locations (such as in transit to birth location) respectively. In Igabi LGA, the practice of giving birth at home is quite high (47.0%). The percentage of home birth is not as high in Zaria (10.0%), but slightly higher in Zangonkataf (20.0%). Although it is best to give birth in the hospital, the number of births at home is considerably high mainly due to cultural reasons. It is believed that a 'healthy woman' should be able to have a baby in the house and not in the hospital. Also, during the Focus Group Discussions, some of the women in Igabi LGA complained about the neglect suffered during labour in the hospitals that was why giving birth in the house was preferred.

> *The nurses are very harsh; I laboured for hours and suffered neglect and insults by the nurses for making too much of noise and 'not cooperating' during the labour*

of my first child. I have been giving birth at home since then. Mrs Sambo, Igabi LGA.

Some women also for religious reasons would not want a male attendant assisting with their labour, as their husbands are the only males allowed to see their nakedness hence they invite female traditional attendants to help with their birth at home. In the words of a participant:

My husband is the only man allowed to see my nakedness; the only way this is possible when having a child is to give birth at home. Malama Zainab, Igabi LGA.

4.11 BREASTFEEDING STATUS

Breastfeeding is important in the health of a child. According to UNICEF/WHO (2009), infants who are exclusively breastfed for the first six months of life and continue to be breastfed until two years of age and beyond develop fewer infections and have less severe illnesses than those who are not. Exclusive breast feeding is said to be the feeding of a child with only breast milk from birth to 6 months of age. About 71.1% of respondents claimed to practice exclusive breastfeeding for their children while 28.4% did not (Table 4.10).

There were various reasons for not practicing exclusive breastfeeding. Top on the list is the excuse of inconvenience; 12.5% of the mothers did not find exclusively feeding a child with breast milk alone very convenient, and hence did not practice it. Many of the respondents in this category are working mothers. For cultural reasons, 6.0% of the respondents did not practice exclusive breastfeeding. In a personal interview with one of the respondents, she said it was

forbidden to give a child milk alone without even water, as it was like punishment for the child. She likened this practice to an adult eating without having a drink of water.

> *A baby must be given water to be okay. Our mothers gave us water from birth, we will give our children too.* Halima Isah, Zangon Kataf.

A doctor in Zaria also spoke about some women who believe that the colostrum of the breast milk is 'dirty' and should be discarded. On the contrary, this is a very potent part of the milk that helps in boosting the immunity of the child against diseases.

> *We (medical practitioners) try to educate mothers against the culture of expressing out colostrum after birth of a child. In contrast to what they have been taught at home, it is not dirty, but the most nutritious part of the milk.* Dr Ogundipe, Zaria.

Exclusive breastfeeding is supposed to last for six months, after which it is recommended that the child should be introduced gradually to the family diet. The category of women that did not practice exclusive breastfeeding due to 'other' reasons amounted to 4.3%. These reasons included health reasons such as the mother being HIV positive, inability of the mother to produce milk and rejection of mother's milk by child.

Table 4.10 Distribution of Respondents by Exclusive Breastfeeding Status and Reasons for Non Adherence

Variables	Igabi LGA		Zaria LGA		Zangon Kataf LGA		Total LGAs	
Practice of exclusive breastfeeding	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
No response	1	0.5	0	0	2	1.4	3	0.6
Yes	152	76.0	84	65.1	107	72.3	343	71.1
No	47	23.5	45	34.9	39	26.4	131	28.4
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**
Reasons for Non Practice								
Child older than 6 months	2	1.0	14	10.9	6	4.1	22	5.3
Culturally wrong	1	.5	13	10.1	11	7.4	25	6.0
No time/ inconvenient	36	18.0	13	10.1	14	9.4	63	12.5
Others	9	5.0	5	3.8	6	4.1	21	4.3
Total	**47**	**100**	**45**	**100**	**39**	**100**	**131**	**100**

Source: Field Survey, 2012

4.12 NUTRITION

Children are required to eat balanced diets to aid in the overall development and wellbeing of the child. It is important to note however that it is not the quantity and frequency of feeding that has overall importance; the quality of the meal is also very vital. Under nutrition is said to be the underlying cause of more than 50% cases of morbidity and mortality in children under 5 years of age (Deribrew *et al*, 2010). With reference to Table 4.11, 47.8% of the respondents feed their children four times daily, while 28.7% feed their children three times daily. An average of 3.1% of the respondents feed their children twice daily, while 18.2% feed on demand or have no general daily feeding pattern.

To augment the routine meals which are mainly carbohydrate in content, vegetables, protein and fruits are usually added to balance up the diet. The frequencies to which these nutritional supplements are added to meals vary from one respondent to another as illustrated in Table 4.11. Across the three LGA's, majority of the respondents (57.2%) balance up the meals of their children with protein, fruits and vegetables. This figure is quite impressive as mothers struggle to prevent malnutrition. The next category of respondents are those who only give nutritional supplements to their children occasionally. About 27.3% of the respondents fall into this category. Respondents that nutritionally augment the meals of their children weekly are 15.1%. The result of this survey show there is still room for improvement, as previous records have it that Kaduna State is an abode of an unacceptably high amount of undernourished children (Ojofeitimi,nd)

Table 4.11 Distribution of Respondents by Nutritional Status

Variables	Igabi LGA		Zaria LGA		Zangon kataf LGA		Total LGA	
Number of meals daily	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
No response	2	1.0	0	0	10	6.7	12	2.1
2	5	2.5	3	2.3	7	4.7	15	3.1
3	62	31.0	25	19.4	50	33.3	137	28.7
4	87	43.5	71	55.9	70	46.7	228	47.8
Others	44	22.0	30	23.3	13	8.7	87	18.2
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**
Consumption of Protein, Vegetables, Fruits								
None	0	0	3	2.3	14	9.3	15	3.1
Daily	88	44.0	107	82.9	78	52.0	273	57.2
Weekly	45	22.5	7	5.4	20	13.3	72	15.1
Monthly	4	2.0	0	0.0	0	0.0	4	0.8
Occasionally	63	31.5	12	9.3	38	25.7	113	27.3
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field Survey, 2012

CHAPTER FIVE

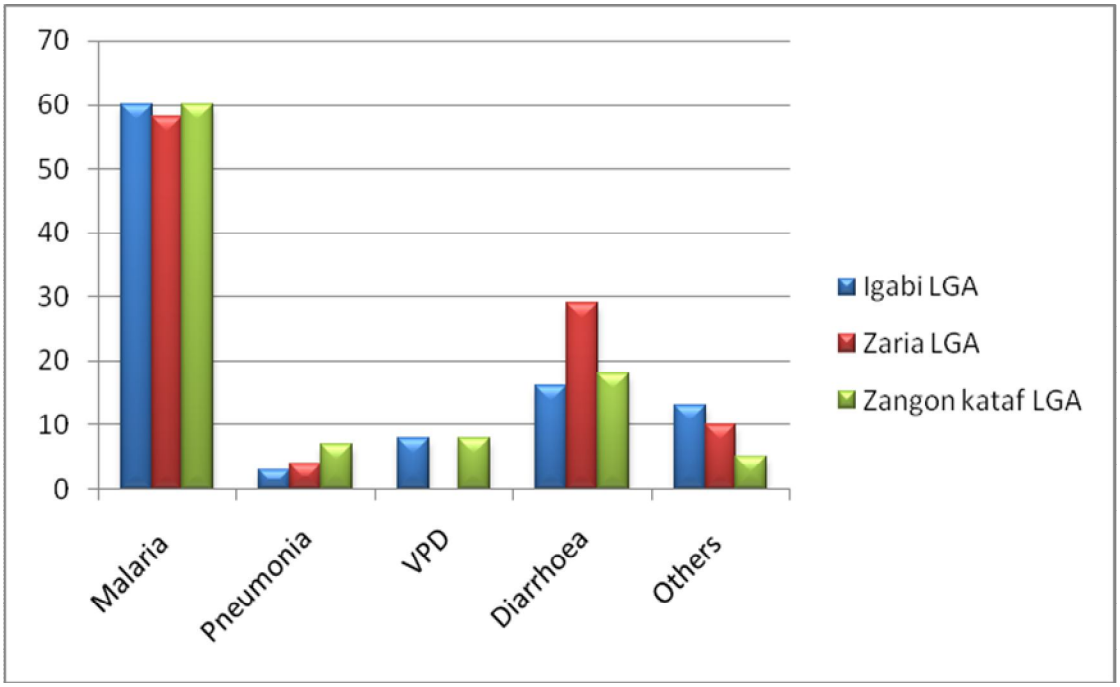
PREVALENCE OF CHILDHOOD DISEASES

5.1 INTRODUCTION

The prevalence and spatial variation of childhood diseases were studied in three Local Government Areas of Kaduna State, namely Zaria, Igabi and Zangon Kataf.

5.2 CHILDHOOD DISEASES

As observed from the field, the main types of childhood diseases that occur in Kaduna State include malaria, diarrhoea, Vaccine Preventable Diseases(VPD) and pneumonia. The occurrence and magnitude of these diseases vary in space (Figure 5.1).



Source:Field Survey,2012

Fig 5.1 Childhood diseases, Kaduna State

Across the three LGAs, malaria is the predominant cause of sickness among children under five years of age. This accounts for an average of 59.3% of all disease prevalence. Next is diarrhoea, affecting an average of 20.3% of children. Vaccine Preventable Diseases and pneumonia account for an average of 6.0% and 3.7% incidence of illness respectively. Other causes of morbidity among children as claimed by 10.7% of the respondents are accidents, sickle cell anaemia, typhoid fever, heart disease, and other rather uncommon diseases.

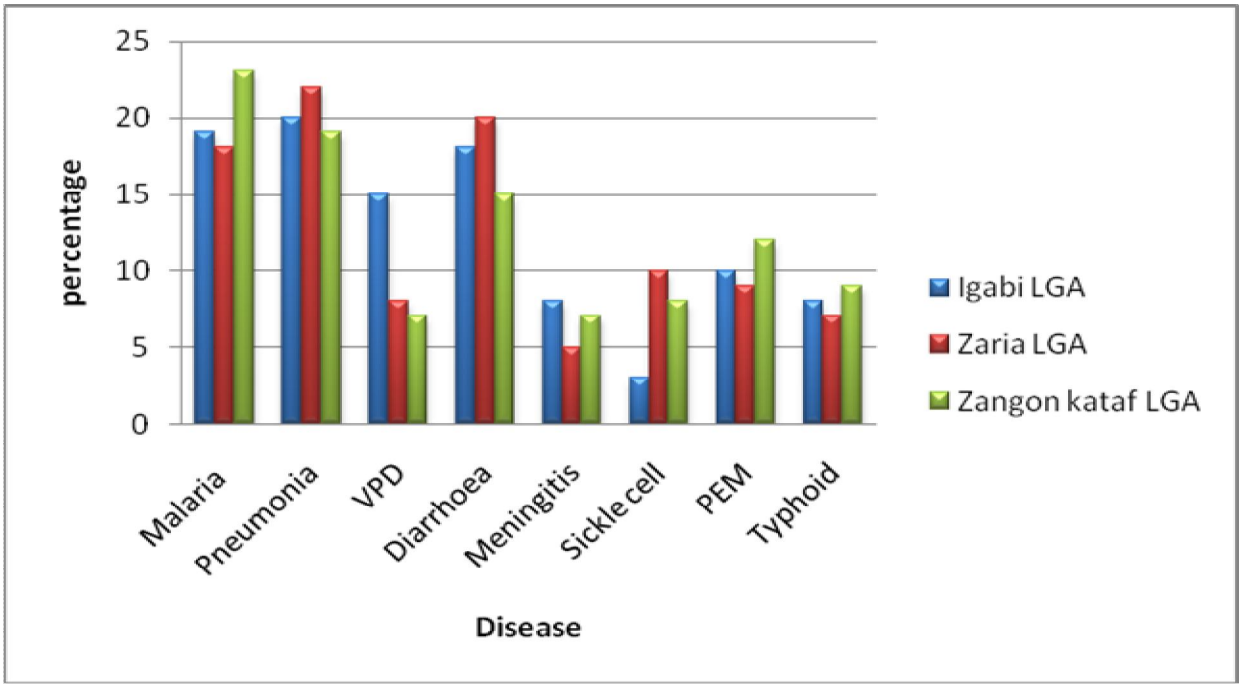


Fig 5.2 Childhood diseases, Kaduna State

Source: Medical records, 2012

The hospital records provide additional insight into the information gathered from the field survey. With reference to Figure 5.2, the main childhood diseases according t hospital records and their average prevalence include: Malaria(20%), Pneumonia(20.3%), VPD(10%) and diarrhoea(17.6%), which are within the scope of this research. Other common childhood

diseases according to hospital records include sickle cell anaemia(7%), Protein Energy Malnutrition(PEM)(10.3%), Typhoid fever(8%) and meningitis(6.7%). In contrast to the field survey, there are many more cases of pneumonia in the hspital records. This can be explained by the fact that many mothers usually associate the symptoms of Pneumonia with Malaria Fever. It is in the Hospital that the children are actually diagnosed as suffering from pneumonia. Another reason could be that most of the hospitals which the hospital records were collected were the major hospitals in the localities, hence the most serious cases of child disease were referred there. There are also fewer cases of malaria from hospital records compared to the field survey, because many cases of malaria are managed at home by mothers; only serious cases are usually reported in the hospital. PEM and typhoid fever are food associated diseases. Children suffering from PEM are deficient in protein in their diets, which usually manifest in nutritional diseases such as Kwashiokor and Marasmus. Typhoid fever on the other hand is associated with consumption of contaminated food and/ or water. Meningitis is usually seasonal, and is associated with hot weather particularly in houses with inadequate ventilation. The nature of the traditional northern/muslim buildings, which have very small windows create an enabling environment for meningitis to effectively thrive. Sickle cell anaemia which is a genetic disease also affects a number of children, who experience attacks at any exposure to fatigue or unhealthy situations.

5.2.1 Childhood Diseases in Igabi LGA

Spatial analysis of disease occurrence reveals disparity at the LGA level. In Igabi LGA, information from the field survey indicates that malaria is the prevalent illness affecting children, causing 59.7% of morbidity. The hospital records however, reveal malaria cases at just about

20%. The ability of mothers to manage malaria at home can be a reason attributed to this disparity. According to the field survey,the next most common disease is diarrhoea (16.1%). This figure is not very different from the hospital records which, of which diarrhoea affects 18% of children. VPD affect 8.1% from the field survey, whereas 15% from the hospital records. Pneumonia has the least morbidity in the field with a percentage of 3.2, however, hospital records indicate 20% affected by the disease. The reasons are as stated earlier. About 12.9% morbidity is attributed to other forms of illnesses in the field survey, such as sickle cell anaemia and various forms of accidents of children. These diseases are disaggregated in the hospital records, with 8% being affected by meningitis, 3% by sickle cell anaemia 10% by PEM and 8% by typhoid respectively.

5.2.2 Childhood Diseases in Zaria LGA

From the field survey, the most prevalent disease among children in Zaria LGA is also Malaria, affecting 57.5% of children. Hospital records however indicate 18% of children being affected by the disease. Diarrhoea with 28.8% of burdens of ill health among children according to the field survey, is represented by 20% in the hospital records. Interestingly, there are no cases of VPD in the LGA according to the field survey, but hospital records indicate an 8% prevalence of the disease. Pneumonia affects 3.8% in the field survey, and 22% by hospital records. This significant difference is so especially in Zaria because hospital records were collected from hospitals that were mainly referral facilities, thus specializing in serious cases. Other causes of ill health from the field survey accounts for 10.0% morbidity, whereas hospital records show 10% being affected by Sickle cell alone, 5% meningitis, 9% PEM and 7% typhoid fever.

5.2.3 Childhood Diseases in Zangon Kataf LGA

In Zango Kataf, the malaria results are not very dissimilar to the other LGAs according to the field survey; it is cause of 60.4% of ill health. Hospital records however, indicate a 23% prevalence of the disease. The field survey reports diarrhoea (18.8%) as the next most common disease affecting children, whereas the hospital records reveal 15% of children being affected by the disease. VPD affects 8.3% in the field, while hospital records show a 7% incidence. Pneumonia accounts for 7.3% burden of diseases in the field and 19% from hospital records. Meningitis, sickle cell anaemia, PEM, and typhoid all account for 7%, 8%, 12% and 9% of illnesses in Zangon Kataf respectively.

5.3 CHILD MORTALITY IN KADUNA STATE

Among the children that suffered illnesses of various kinds, some cases resulted in death. Out of the 477 respondents in the field survey, 27.7% claimed to have lost their children and or wards to diseases. Figure 5.3 gives a graphical presentation of mortality records from the field survey.

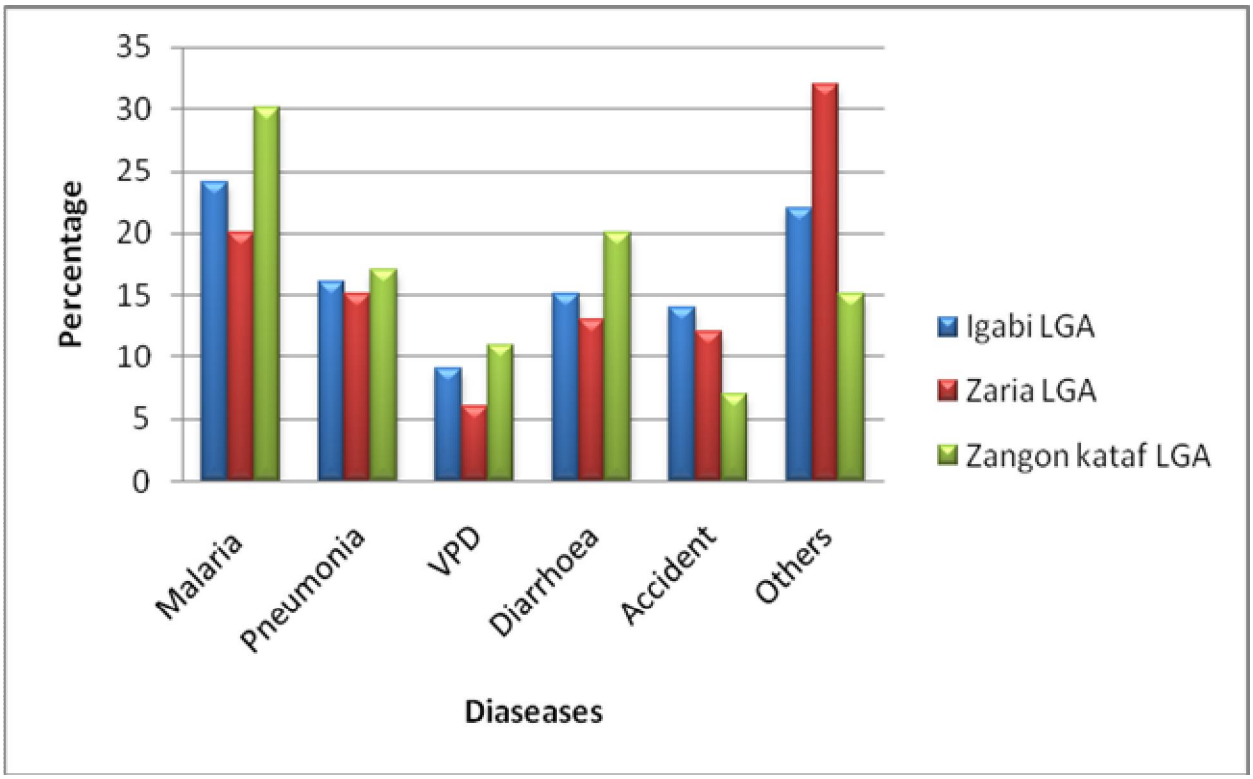


Fig 5.3 Causes of Child Mortality in Kaduna State

Source: Field Survey, 2012

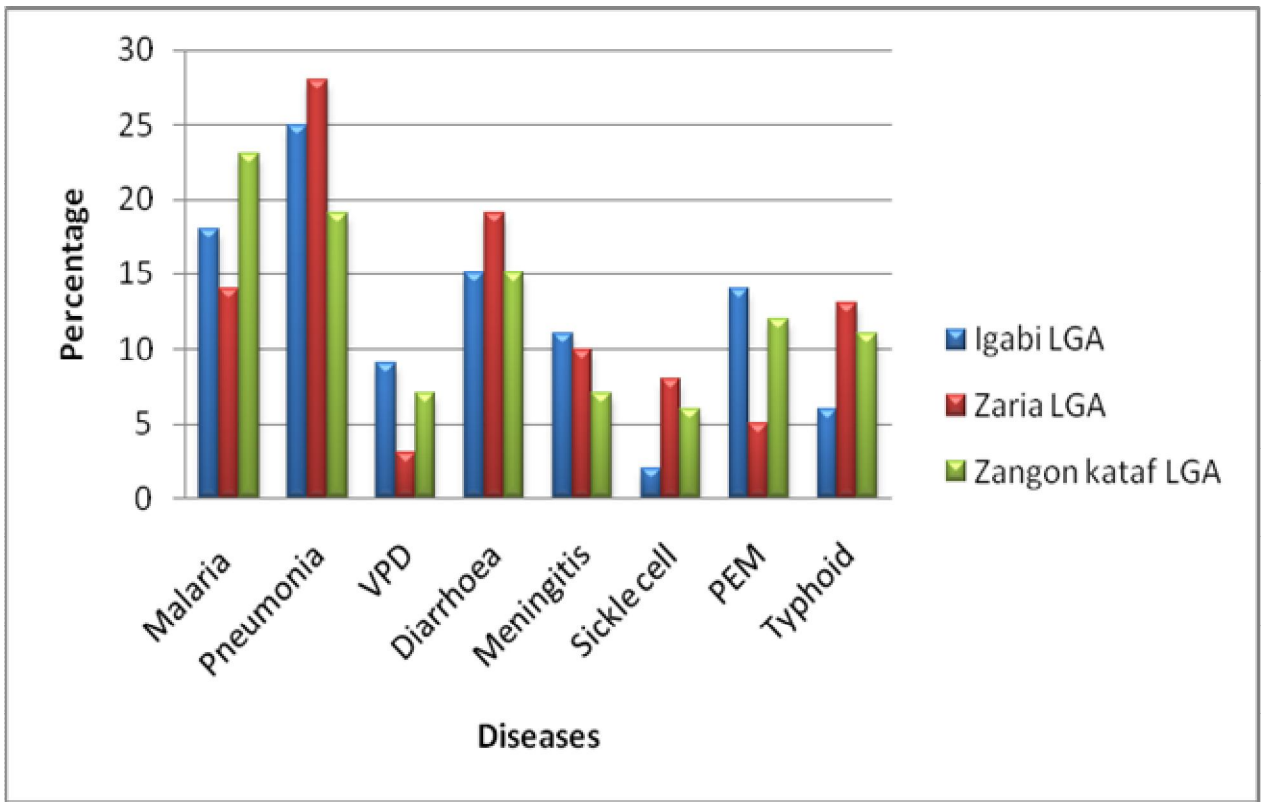


Figure 5.4: Causes of Child Mortality in Kaduna State

Source: Medical records, 2012

Figure 5.4 provides complementary insight into the main causes of mortality among children who had sought medical attention from health facilities as obtained from hospital records. Comparatively, the causes of death show disparities from one LGA to another, based on field and hospital records. The cases of mortality are reviewed by their causes subsequently

Malaria: according to the field survey, malaria caused 24%, 20% and 30% deaths in Igabi, Zaria and Zangon Kataf LGAs. The hospital records however show 18%, 14% and 23% malaria mortality

Pneumonia: was the cause of death of 16%, 15% and 17% of children in Igabi, Zaria and Zangon Kataf LGAs (Field Survey, 2012). The hospital records however showed a 25%, 28% and 19% cases of mortality in Igabi, Zaria and Zangon Kataf LGAs. The high rate of mortality from

pneumonia as indicated in the hospital records is not surprising because it has been established by Johnson (2010) as the fastest killer of children. However, the difference observed in this study (from the questionnaire survey) perhaps is due to the inability of many mothers to recognise or rather distinguish the symptoms of pneumonia hence, the high body temperature is usually mistaken for malaria fever. With the typical character of pneumonia that kills very fast, a child could be dead in four hours if adequate treatment is not administered on time, which is usually the case. Another reason for this disparity could be the fact that the hospitals usually have higher cases of death records compared to individual perceptions.

Diarrhoea: According to the field survey, diarrhoea was the cause of death of 15%, 13% and 20% children in Igabi, Zaria and Zangon Kataf LGAs in that order. The hospital records however show that 15%, 19% and 14% deaths were caused by diarrhoea in Igabi, Zaria and Zangon Kataf LGAs respectively. The disparities within the LGAs from the field and hospital records are not very significant.

VPD: Results from the field survey showed that 9%, 6% and 11% of mortality cases in Igabi, Zaria and Zangon Kataf were caused by VPD. The figures from the hospital records on the other hand, signify 9%, 3% and 8% of child deaths in Igabi, Zaria and Zangon Kataf are due to VPD. The mortality due to VPD are generally low, both from field and hospital records.

Accidents: Only the field survey captured data on child death due to accidents which included causes from automobile crashes, falls, burns, poisoning and a host of other reasons. The results showed that 14%, 12% and 7% of the deaths in Igabi, Zaria and Zangon Kataf LGAs were due to accidents.

PEM: The hospital records indicate that child deaths that were caused by PEM were 14%, 5% and 12% in Igabi, Zaria and Zangon Kataf LGAs respectively. PEM, which manifests in form of Marasmus and Kwashiorkor, is a consequence of poor nutrition, from diets lacking in protein. Poor nutrition is known to be the underlying cause of many cases of mortality and morbidity in children (WHO, 2008). Many mothers also do not recognise this ailment till it reaches a chronic level which results in mortality particularly because it weakens the immune system.

Typhoid fever: Is reported to have caused 6%, 13% and 11% of the cases of mortality in Igabi, Zaria and Zangon Kataf LGAs, based on hospital records. Typhoid fever is another disease usually mistaken for malaria fever among the poorly knowledgeable mothers. It is mostly caused by consumption of faecal-contaminated food and water, which introduce infection to the body system of the child.

Meningitis: Is a disease that more commonly affects children under 5 years of age, which affects the membranes covering the brain and spinal cord. The medical records show that it caused the death of 11%, 10% and 7% of children in Igabi, Zaria and Zangon Kataf LGAs respectively

Sickle cell anaemia: Is a genetic disease that affects the blood cells that lead to episodes of crisis on event of exposure to fatigue or sickness. It caused the death of 2%, 8% and 6% of children in Igabi, Zaria and Zangon Kataf LGAs respectively (medical records, 2012).

Others: apart from the five major causes of childhood death covered in the field survey, other causes of death claimed lives of 22%,32% and 15% of children in Igabi, Zaria and Zangon Kataf LGAs.

5.4 SPATIAL VARIATION IN MAIN CHILDHOOD DISEASES AND THEIR INFLUENCING FACTORS.

The research on the aetiologies of these diseases is based on social, cultural and environmental factors.

5.4.1 Malaria

Among the three LGAs, Igabi has the highest percentage (41.6%) of malaria occurrence, which is followed by Zangon Kataf with 32.58% and Zaria (25.84%). This can be seen in Fig 5.5, showing the malaria endemic regions, graduating from low to high as depicted by lighter to darker colours respectively on the maps.

The high incidence of malaria in Igabi can be attributed to the extremely low usage of mosquito nets for the children(Table 5.1). The anopheles mosquito is most active at night; hence children that sleep under mosquito nets are better protected from their bites.

In sub-saharan Africa, malaria is a disease ravaging both the young and old. As the saying goes, 'prevention is better than cure'; in a bid to prevent the disease, the use of mosquito nets have proved to be very effective. Both government and non-governmental bodies have tried to launch campaigns encouraging the use of mosquito nets especially for pregnant women and children under the age of five years old. Table 5.1 reveals that 29.3% of the respondents utilize mosquito nets for their children. The remaining 68.9% don't use mosquito nets for various reasons.

Table 5.1 Status of Utilization of Mosquito Nets

Variables	Igabi LGA		Zaria LGA		Zangon Kataf LGA		Total LGA	
Use of Mosquito Nets	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
No response	1	0.5	1	0.8	6	4.1	8	1.8
No	119	59.5	88	68.2	117	79.1	324	68.9
Yes	80	40.0	40	31.0	25	16.9	145	29.3
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**
Reasons for Non Usage								
Not convenient	21	17.5	11	12.5	33	28.0	62	19.3
Not available	72	61.2	42	47.5	56	48.0	169	52.2
Don't see the need	23	18.8	26	30.0	23	20.0	76	23.0
Others	3	2.5	9	10.0	5	4.0	17	5.5
Total	**119**	**100**	**88**	**100**	**117**	**100**	**324**	**100**

Source: Field Survey, 2012

The main reason for non usage of mosquito nets is non availability, the reason given by 52.2% of the respondents. The next most common reason for non utilisation of nets is that 23.0% do not see the need. To this group, the benefits of utilisation of nets are obviously not evident to them. The next group constitutes 19.3% of the net non users and their reason is that using the mosquito net is not convenient for them. During a personal interview, one respondent in Zaria LGA complained about the chemicals used in treating some of the nets as giving a burning sensation to the skin even after washing, hence the disuse of the mosquito nets. Some others complained about the choking sensation when under the treated net thus they discontinue usage.

> *The mosquito nets leave a burning sensation on the skin after lying in it for just a few minutes. The chemicals used to treat them are too strong, making it impossible for me to use it.* (Bunmi , Student. Zaria).

The responses from the administered questionnaire and field observations reveal that there are also more cases of stagnant water in the residential surroundings of the respondents in Igabi LGA, which encourage the breeding of mosquitoes, and could have also been responsible for the high prevalence of malaria in the locality.

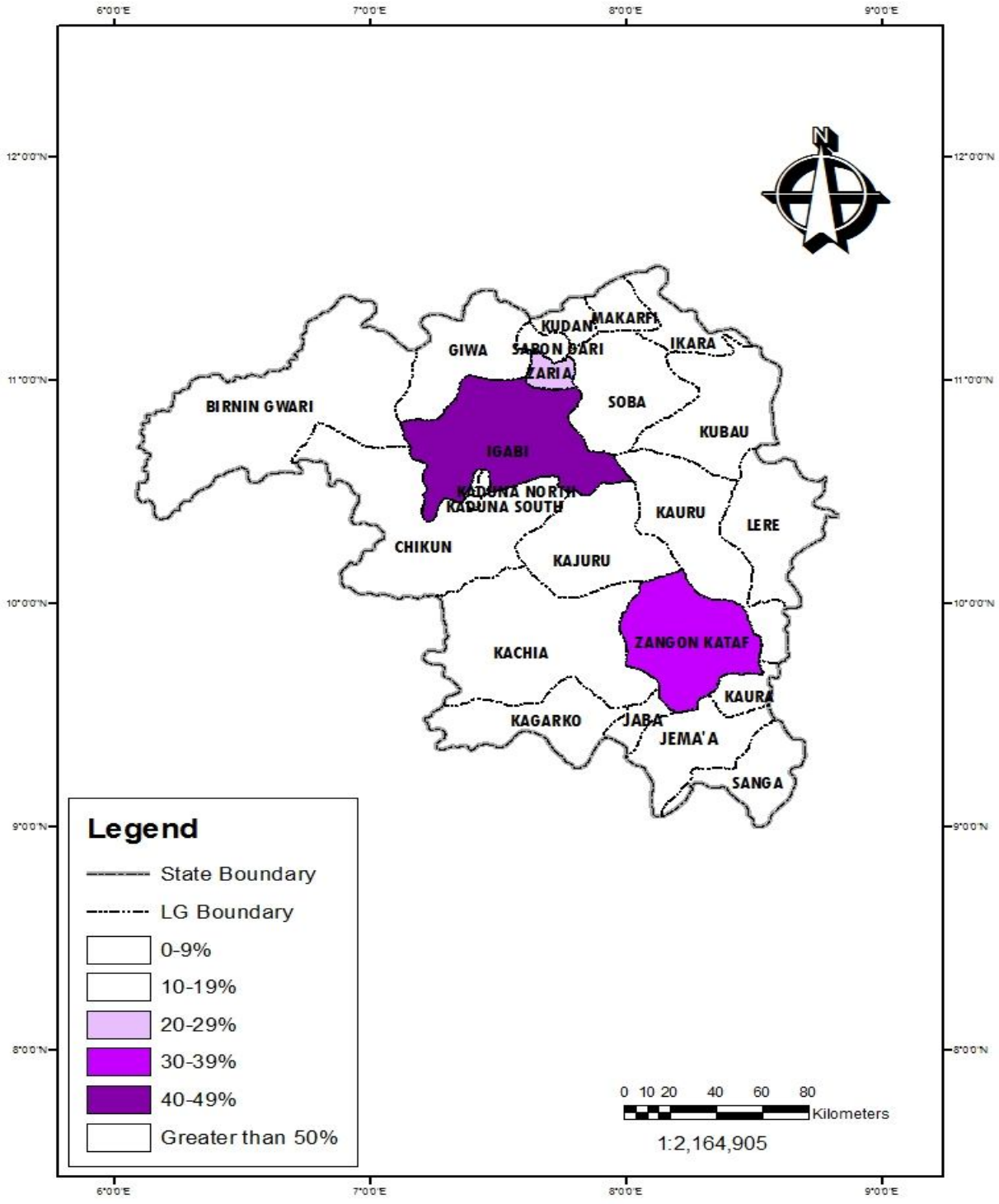


Fig 5.5 Map of Kaduna State, showing Malaria Prevalence in the Study LGAs

Source: Field Survey, 2012

5.4.2 Pneumonia

Zangon Kataf had the highest record of pneumonia incidence with about half of all cases (50%) occurring in the LGA (Fig 5.6). This is followed by Igabi (30%), and Zaria with (20%) of incidence. The data reveals an usually low incidence of pneumonia in the three LGAs. This finding differs slightly from past researches which identified pneumonia as the number one killer of children (WHO/UNICEF, 2006). The contradiction is perhaps because pneumonia is a disease that is usually mistaken for malaria fever. Besides, it is instructive that the map is an outcome of questionnaire survey whereas hospital records and macro-scale sentinel surveys are in most cases the sources of reports for multinational agencies which usually preclude local variations.

Nonetheless, a prominent symptom of pneumonia is high body temperature; when a child exhibits this symptom, most mothers assume it to be malaria, and administer treatment for the latter (Ukwaja, 2010). By the time the child does not respond to treatment, and is taken to the hospital, many cases end up as mortality figures due to the fast rate at which pneumonia kills its victims (Johnson,2010). This may probably be the underlying reason for the low occurrence of pneumonia among the sick children in Kaduna State. It could be said that the majority of the cases of pneumonia in Zangon Kataf may be attributed to the high usage of firewood and cow dung for cooking. Akanbi *et al* (2009) in their research have indeed found that the persistent exposure of children to biomass smoke, particularly from cooking fuel, makes this the most important risk factor for pneumonia infection. The field survey showed that a comparably higher percentage of the women in Zangon Kataf use firewood and cow dung to cook meals, compared to Zaria and Igabi LGAs(Table 5.2). This pollution is a potent source of pneumonia infection in

children. The incidence of pneumonia in Igabi LGA however, is expected to be lower than Zaria LGA, considering the higher socioeconomic status of the mothers in the latter.

Table 5.2 Distribution of Respondents by Types of Cooking Fuel

Variables	Igabi LGA		Zaria LGA		Zangon Kataf LGA		Total LGA's	
Fuel for Cooking	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
Gas	7	3.5	15	11.6	10	6.7	32	6.8
Stove	44	22.0	35	27.1	39	26.3	118	24.8
Firewood	77	38.5	47	36.4	68	45.9	192	40.3
Cow dung	51	25.5	20	15.5	23	15.5	94	19.7
Others	20	10.0	12	9.4	8	5.4	40	8.4
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field Survey, 2012

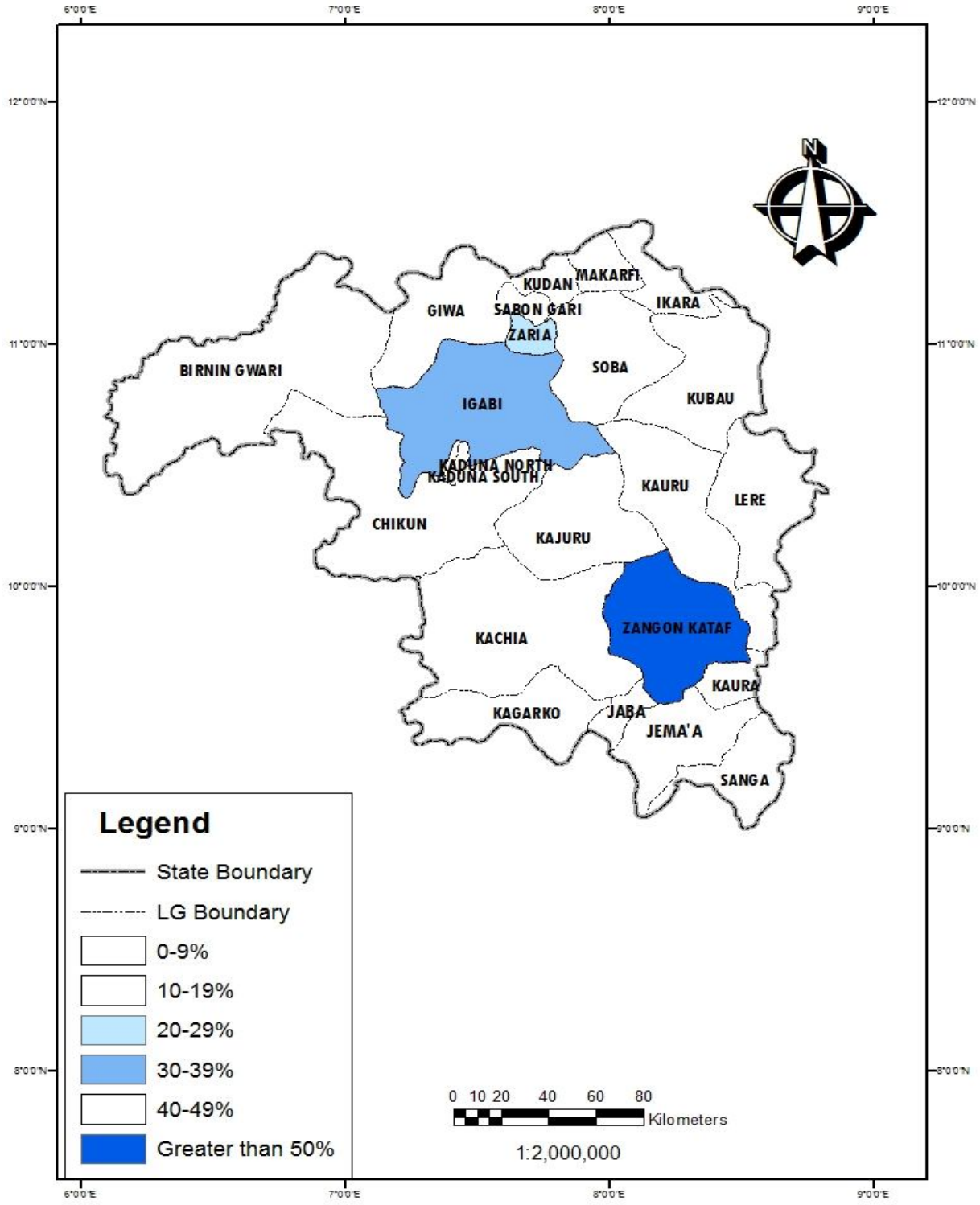


Fig 5.6 Map of Kaduna state showing pneumonia prevalence in the Study area

Source: Field Survey, 2012

5.4.3 Diarrhoea

Overall, diarrhoea is the second major disease after malaria in the study area. With reference to Figure 5.7, the children in Zaria LGA suffered the highest prevalence of diarrhoea (40.1%). Igabi accounts for a total of 32.78% of diarrhoea cases, while the least number of cases are found in Zangon Kataf LGA at 29.51%. Reports from various studies show that, lack of excreta disposal facility, the presence of excreta within the residential yard, lack of latrines and absence of refuse disposal pit are associated with higher diarrhoea morbidity (Getaneh *et al*,1997; Root,2001).

Source of drinking water is also linked to the prevalence of diarrhoea. The main sources of drinking water in the study area generally are pipe borne water, well and borehole. The highest number of respondents that patronised water vendors for drinking water is found in Zaria LGA. This may be a reason why the prevalence of diarrhoea is high in Zaria LGA. Feeding practices such as the feeding of infants with semisolid cereal pap has also been linked to diarrhoea in children (Ekanem *et al*, 1994). This is the case in Zaria LGA, as a good number of the respondents are civil/public servants, hence the inability to exclusively breastfeed their infants, thus augmenting feeding with cereal pap.

An average human body is made up of 75% of water (answers.com, 2012). The importance of safe water consumption can not be underestimated in the development of a child. Many diseases are related to consumption of unsafe water, of which diarrhoea is inclusive.

Table 5.3 Distribution of Respondents by Sources of Drinking Water and Excrement Disposal

Variables	Igabi LGA		Zaria LGA		Zangon kataf LGA		Total LGA	
Source of Drinking Water	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
No response	0	0	0	0	4	2.7	4	0.9
Pipeborne	53	26.5	49	38.0	58	39.2	160	34.5
Tanker/water vendor	6	3.0	15	11.6	2	1.4	23	5.3
Well	112	56.0	9	7.0	49	33.1	155	32.0
Borehole	25	12.5	51	39.5	32	21.6	108	24.5
River/stream	1	0.5	1	0.8	1	0.7	3	0.7
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**
Excrement Disposal								
No response	0	0	0	0	4	2.7	4	0.9
Water closet	44	22.0	86	66.7	63	42.6	193	40.5
Pit latrine	145	72.5	39	30.2	68	45.9	252	52.8
Bucket/ pan	0	0.0	1	0.8	2	1.4	3	0.6
Public toilet	8	4.0	2	1.6	6	4.1	16	3.4
Bush/field	3	1.5	1	0.8	3	2.0	7	1.5
Others	0	0.0	0	0.0	2	1.4	2	0.4
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field Survey, 2012

Table 5.3 shows the different sources of drinking water in the study area. On the average, 34.5% of the respondents get their potable water from the tap. This statistic is followed closely by the supply of potable water from the well (32.0%). Boreholes as a source of potable water is fast gaining popularity(24.5%) as it seems to be more reliable in terms of safety and supply, while only 0.7% sourced their drinking water from rivers and streams.

The method of excrement disposal affects the health of individuals especially children in many ways. On the average, of all the methods of waste disposal in the study area, 47.0% use the pit latrine. This figure is followed closely by the water closet at 46.3%. The open field/bush serve 1.9% of the respondents, while 0.7% use the bucket/pan. Lastly, the public toilet is utilised by 3.3%. In all three LGAs, the main method of excrement disposal is the pit latrine and the water closet. Interestingly however, while majority(74.4%) of the respondents in Zaria LGA utilize the water closet system, Zangon Kataf has 42.6% usage and Igabi only 22% usage. This spatial difference could be due to the status of each of the LGA's with regards to their urban settings. Zaria LGA being the most urbanize followed by Zangon Kataf LGA and lastly Igabi LGA.

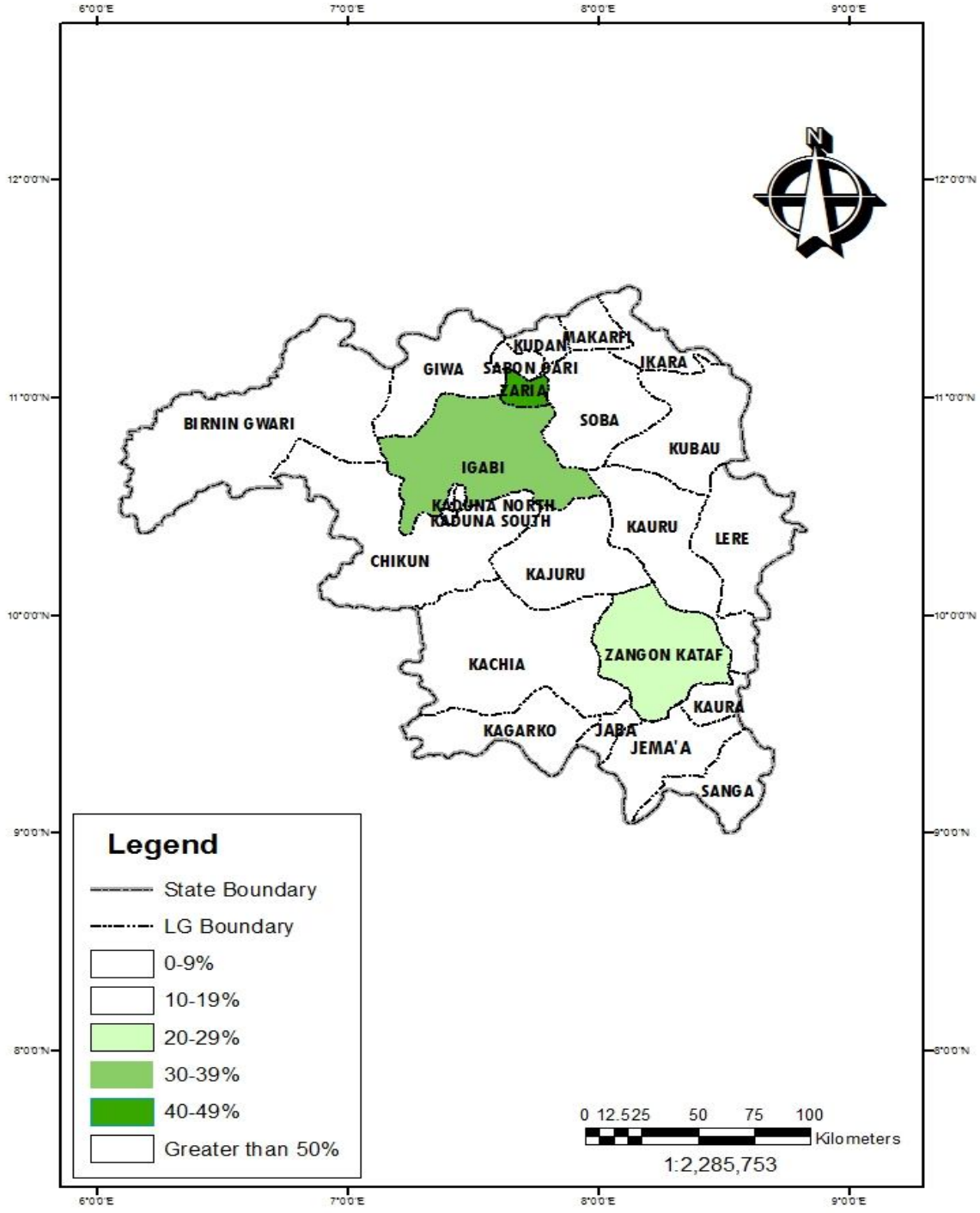

6°0'0"E
7°0'0"E
8°0'0"E
9°0'0"E
12°0'0"N
11°0'0"N
10°0'0"N
9°0'0"N
8°0'0"N
N
KUDAN
MAKARFI
GIWA
SABON GARI
IKARA
ZARIA
BIRNIN GWARI
SOBA
KUBAU
IGABI
KADUNA NORTH
KADUNA SOUTH
KAURU
LERE
CHIKUN
KAJURU
ZANGON KATAF
KACHIA
KAURA
KAGARKO
JABA
JEMA'A
SANGA
Legend
State Boundary
LG Boundary
0-9%
10-19%
20-29%
30-39%
40-49%
Greater than 50%
0 12.525 50 75 100
Kilometers
1:2,285,753

Fig 5.7 Map of Kaduna State Showing Diarrhoea Prevalence in the Study LGAs

Source: Field Survey, 2012

5.4.4 Vaccine Preventable Diseases (VPD)

Vaccine Preventable Diseases are diseases that can be averted by immunisation. These diseases are recorded in only two LGAs (Figure 5.8). Igabi had the highest prevalence, at 55.6%, while Zangon Kataf had 44.4%. The total cases of VPD are just 18. This may be an indication that the efforts of both government and Non-Governmental Organisations (NGOs) in increasing the awareness on immunization are yielding positive results. Apart from this, intensive sensitisation by health workers on the vaccination status of children and maternal education have also been closely associated with scheduled vaccination of children. The better educated a woman is, the more likely she would make sure her children are vaccinated. Zaria LGA had no record of VPD, Igabi had the highest record, while Zangon Kataf followed.

With regards to the educational levels of the respondents, (Table 4.3) Zaria had the respondents with the highest education followed by Zangon Kataf, and then Igabi. These findings are similar to that of Odusanya *et al*, (2008), who related female education as having a strong positive influence on vaccination status of children. Mothers who are better educated are said to have their children completely vaccinated, and on schedule.

Vaccination against childhood killer diseases that are preventable by immunisation has helped to save the life of a host of children, especially in developing countries. The efforts of the government of Nigeria to eradicate Vaccine Preventable Diseases (VPD) through campaigns and free administration to children from birth to five years of age has shown positive results over the years, as there have been fewer cases of mortality due to vaccine preventable diseases. With

reference to table 5.4, a percentage (94.2%) of children had been vaccinated against VPD. Only 4.1% reported not to have their children vaccinated. Zaria LGA has the highest figure of vaccinated children (98.4%). This is followed by Igabi (94.5%) and lastly Zangon Kataf (89.9%).

Some respondents (35.2%) that did not ensure that their children were vaccinated had religious/cultural reasons for non immunisation. For example, in some Northern states, children were denied vaccination because the decision makers thought it was a trick by the Europeans to cause sterility among the northerners in an attempt to curb their population growth

Table 5.4 Vaccination Status

Variables	Igabi LGA		Zaria LGA		Zangon Kataf LGA		Total LGA	
Vaccination status	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
No response	2	1.0	0	0	6	4.1	8	1.7
Yes	189	94.5	127	98.4	133	89.9	449	94.2
No	9	4.5	2	1.6	9	6.1	20	4.1
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**
Reasons for Non Vaccination								
Not available	2	22.2	0	0	2	22.2	4	14.8
Ignorant of the programme	0	0	0	0	2	22.2	2	7.4
Religious/cultural reasons	2	22.2	1	50.0	3	33.3	6	35.2
No reason	1	11.1	1	50.0	2	22.2	4	27.8
Others	4	44.4	0	0	0	0	4	14.8
Total	**9**	**100**	**2**	**100**	**9**	**100**	**20**	**100**

Source: Field Survey, 2012

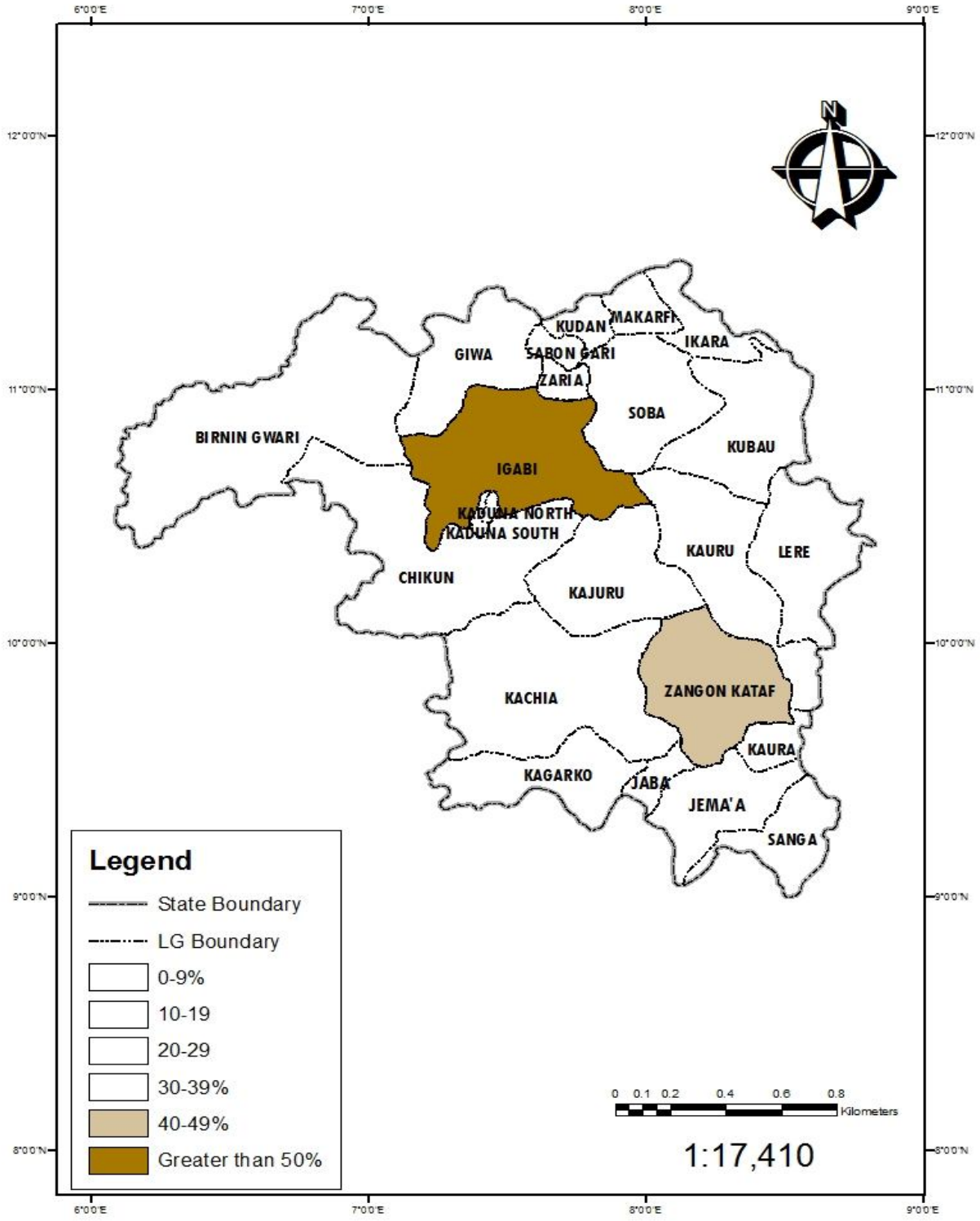


Fig 5.8: Map of Kaduna State Showing Prevalence of VPD in the Study LGAs

Source: Field Survey, 2012

5.5 SEX DIFFERENTIALS

The disparity between the incidence of disease in male and female children is discussed in this section. The difference could indeed, be a pointer to some underlying factors responsible for the incidence of disease in children.

5.5.1 Sex Differentials in Child Disease in Zaria LGA

Figure 5.9 reveals that there are more sick female children compared to male children in Zaria LGA. With regards to the child sufferers of pneumonia in Zaria, there are unexplainably no recorded cases of male children, but all the affected children were female. Diarrhoea affected 53% of female children and 47% of male children. There are no cases of Vaccine Preventable Diseases.

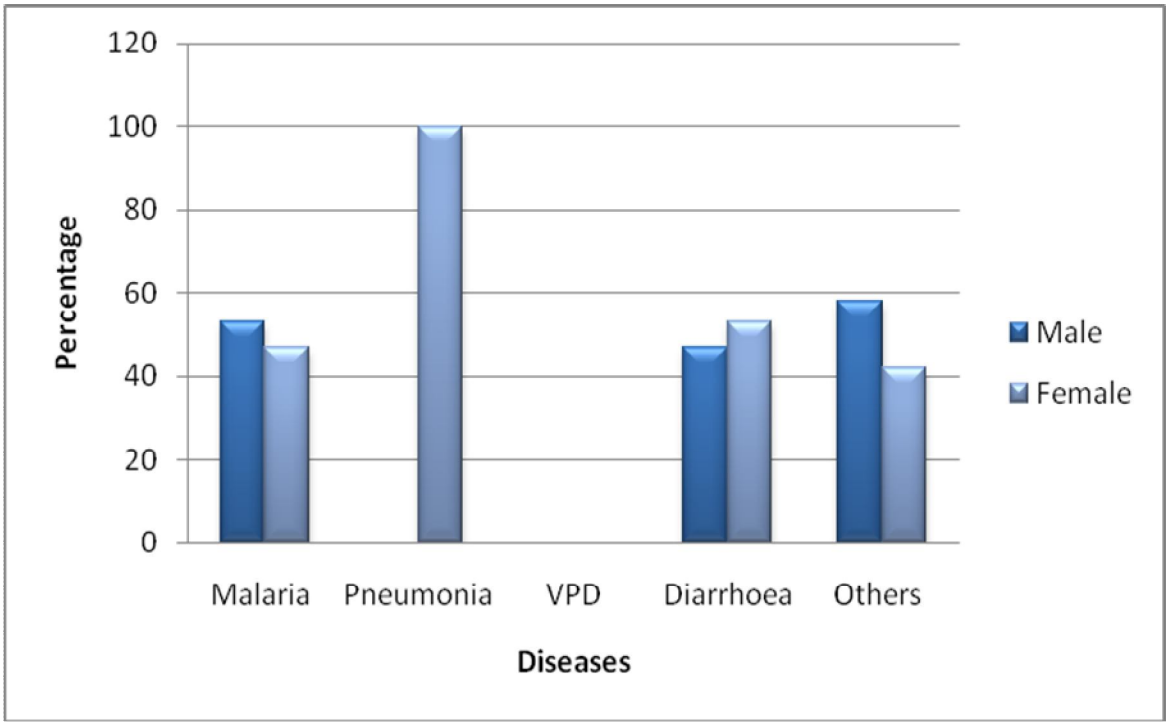


Figure 5.9: Sex differentials in Child Disease Prevalence, Zaria LGA

Source: Field Survey, 2012

There are slightly more male children (53%) suffering from malaria than female children (47%). Other forms of illness had more male casualties than female with 58% male sufferers as compared to 42% female sufferers.

5.5.2 Sex Differentials in Child Disease prevalence in Igabi LGA

There are more female children (55%) affected by malaria than males (45%)(Figure 5.10). Pneumonia also affects more females than males, with a statistic of 67% to 33% respectively. The male children that suffer from diarrhoea are 37%, as compared to 63% females.

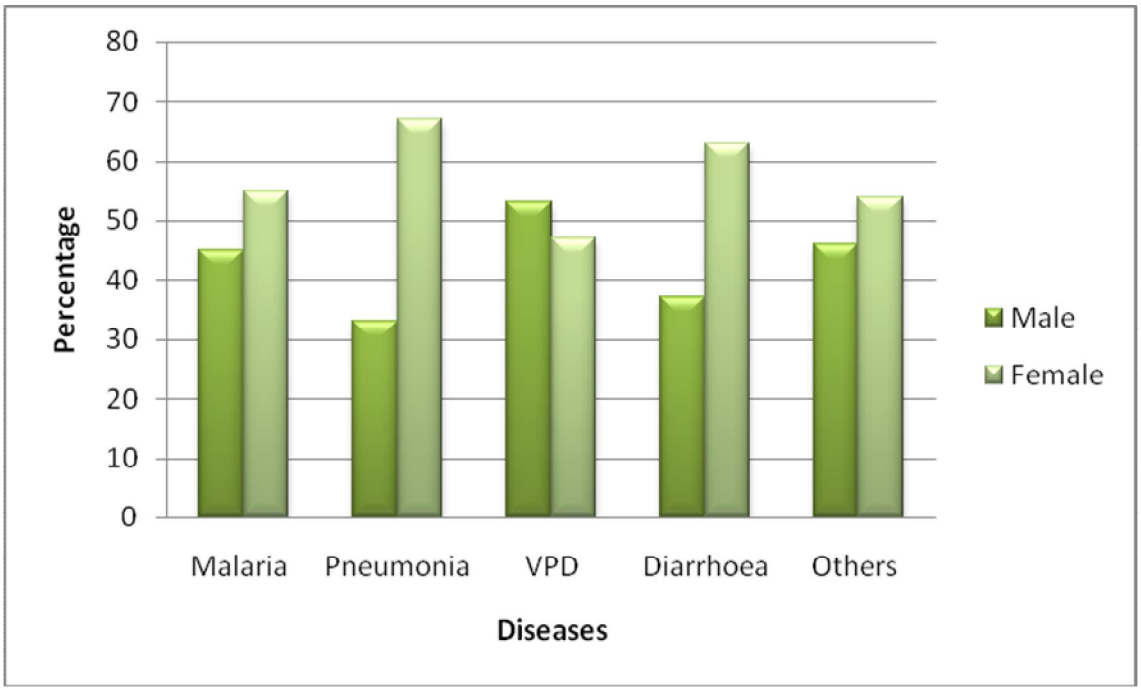


Figure 5.10: Sex Differentials in Child Disease Prevalence, Igabi LGA

Source: Field Survey, 2012

Of all the childhood diseases under study in Igabi LGA, Vaccine Preventable Diseases affects more of male children (53%) than female children (47%). These results indicate that there might be preference of male children in this LGA, as most of the cases of morbidity occur in female children (see Table 4.7).

5.5.3 Sex Differentials in Child Disease Prevalence in Zangon Kataf LGA

In Zangon Kataf, most of the child diseases affect both male and female children almost equally (Figure 5.11). Reported cases of Pneumonia, Vaccine Preventable Diseases and other sources of ill health were within 50 % rate among female and male children.

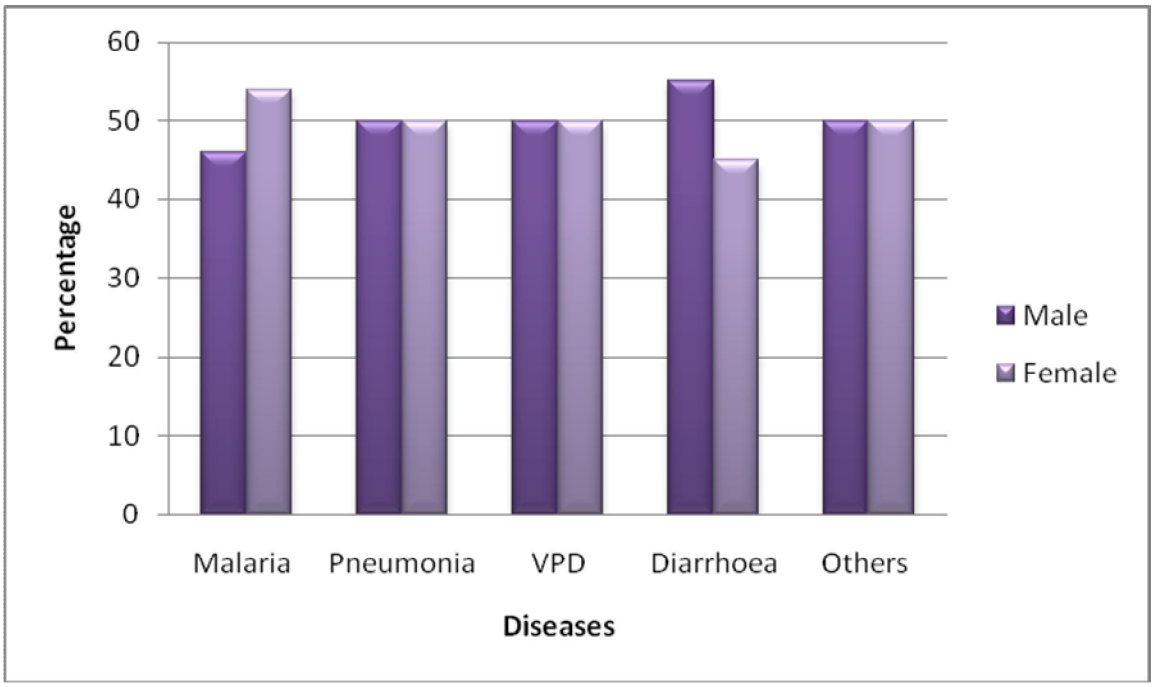


Figure 5.10: Sex Differentials in Child Disease Prevalence, Zangon Kataf LGA

Source: Field Survey, 2012

Malaria affects more female children at 54% and less male children at 46 %. Diarrhoea on the other hand has a greater number of male sufferers at 55% compared to 45% females. Zangon Kataf has more respondents that prefer female children, than male children for various reasons ranging from enrichment during wedding ceremonies, to perceived security at old age. This preference for female children does not seem to have adversely affected the care the male children receive which perhaps point to religious and other socio-economic dispositions of parents to give equal attention to their children. Figure 5.11 indicates a fairly equal incidence of diseases to both male and female children.

As indicated in Table 5.5, a summary of sex differentials in disease incidence, show that there are more sick female (58.5%) than male children (41.5%).

Table 5.5 Spatial Variation in Gender Differentials in Disease Prevalence across Igabi, Zaria and Zangon Kataf LGAs

LGAs	Igabi		Zaria		Zangon Kataf		Total	
Diseases	**Male(%)**	**Female(%)**	**Male(%)**	**Female(%)**	**Male(%)**	**Female(%)**	**Male(%)**	**Female(%)**
Malaria	45.0	55.0	53.0	47.0	46.0	54.0	48.0	52.0
Diarrhoea	37.0	63.0	47.0	53.0	55.0	45.0	48.3	51.7
VPD	53.0	47.0	0.0	0.0	50.0	50.0	51.5	48.5
Pneumonia	33.0	67.0	0.0	100.0	50.0	50.0	27.7	72.3
Others	46.0	54.0	58.0	42.0	50.0	50.0	54.3	45.7
Total	**42.8**	**57.2**	**31.6**	**68.4**	**50.2**	**49.8**	**41.5**	**58.5**

Source: Field Survey, 2012

5.6 CHILD DISEASE AND TREATMENT

The incidence of ill health in children is more frequent in some than others. Regardless of gender, the ability to manage diseases as they occur is very important. Table 5.6 shows the occurrence of diseases and how they are managed.

On the average, about 62.3% of mothers claimed that their children had fallen ill within the previous 12 months. Out of this percentage, about 28.9% visited the general hospital for medical attention. This is followed by the visit to the teaching hospital, by 11.5%. The pharmacy/chemist is the choice of treatment for 9.6% of the respondents, while 5.2% go to the dispensaries. The primary healthcare clinic treats 6.7% of the respondents, while 0.6% adopts self medication. Unfortunately the practice of self medication is on the rise, (Alexander, 2010) hence, the higher percentages of respondents going over to get medication from the pharmacy than primary healthcare clinics for treatment. The primary healthcare clinics have been put in place by the government to attend to the basic health needs of individuals, but the relatively low patronage of the clinics within the study area signifies a problem. The women during the Focus Group Discussions in Igabi and Zaria LGAs complained that the primary health clinics are poorly staffed and lack basic medication hence the choice of other venues for treatment.

An excerpt of the response of a mother (Mercy), in Zaria LGA is perhaps emphatic. According to her

> *...since the establishment of the primary health clinic in our area, I have never seen a doctor on seat, only nurses are sometimes present and the drugs are not available to patients.*

Apart from drug and medical personnel, absence of bed space to accommodate sickly children may be associated factors for the low patronage of primary health care centres.

In Igabi and Zangon Kataf LGAs, about 37.5% and 27.3% of respondents take their children to the general hospital for treatment respectively. In Zaria LGA however, the teaching hospital has the highest patronage (20.2%). Interestingly, only Zaria and Igabi LGA have records of mothers taking their children to spiritual/herbal homes for treatment (2.9%). This is a pointer to increase in the rate of unorthodox medical practices in Nigerian urban centres. Alternative medicines are now becoming health-seeking options for many people and parents extend this to their children too.

Table 5.6 Distribution of Respondents by Health Status and Location of Treatment

Variables	Igabi LGA		Zaria LGA		Zangon kataf LGA		Total LGA	
Sick over last 12 months	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**	**Number of Respondents**	**%**
No response	0	0	0	0	0	0.0	0	0.0
Yes	124	62.0	79	61.2	96	64.9	300	62.9
No	76	38.0	50	38.8	52	35.1	177	37.1
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**
Place of Treatment								
No Response	76	38.0	50	38.8	52	35.1	177	37.1
Teaching/specialist hospital	7	3.5	26	20.2	22	14.7	55	11.5
General Hospital	75	37.5	21	16.3	41	27.3	138	28.9
Primary Hospital	15	7.5	4	3.1	13	8.7	32	6.7
Clinic/Dispensary	9	4.5	8	6.2	8	5.3	25	5.2
Chemist/Pharmacy	18	9.0	17	13.2	11	7.3	46	9.6
Herbal/spiritual home	0	0	3	2.3	0	0.0	3	0.6
Others	0	0.0	0	0.0	1	0.7	1	0.2
Total	**200**	**100**	**129**	**100**	**148**	**100**	**477**	**100**

Source: Field Survey, 2012

CHAPTER SIX

FACTORS INFLUENCING CHILD DISEASES

6.1. Mothers' age and Child Disease

The relationship between the age of mothers and prevalence of child disease in all LGAs is presented in Table 6.1a and Table 6.1b.

Table 6.1a Mothers' Age and Prevalence of Child Disease

Age groups	Total LGAs		
	Prevalence of disease		
	Yes (%)	No (%)	Row total (%)
<16	0(0.0)	0(0.0)	0(0.0)
16-20	26(56.5)	20(43.5)	46(100.0)
21-25	82(69.5)	36(30.5)	118(100.0)
26-30	70(59.3)	48(40.7)	118(100.0)
31-35	69(62.7)	41(37.3)	110(100.0)
36-40	42(66.7)	21(33.3)	63(100.0)
41-45	10(62.5)	6(37.5)	16(100.0)
>45	1(16.7)	5(83.3)	6(100.0)
Column total	300(62.9)	177(37.1)	477(100.0)
Calculated X^2 value = 9.527 Degree of freedom= 6 P- value= 0.146 Remark= Not significant			

Source: Field Survey, 2012

The Chi squared analysis shows the relationship between age of mothers and health of children. About 72.5% of the respondents were between ages 21-35. A greater number of respondents had more children that had been sick (62.9%), compared to 37.1% whose children have not reported illness. No particular trend is observed between the age of mothers and the prevalence of child disease. This is perhaps due to the fact that more of the respondents are not very young mothers.

This finding is similar to that of Rothenberg and Varga (1981), which linked disease prevalence in children to mothers of younger ages.

Table 6.1b Spatial Comparison of Mothers' Age and Prevalence of Child Disease

Igabi LGA				
Variables	**Observed X^2 value**	**Degree of freedom**	**P- value**	**Remark**
Age of mother and child disease	3.386	5	0.641	Not significant
Zaria LGA				
Age of mother and child disease	16.641	6	0.011	Significant
Zangon-Kataf LGA				
Age of mother and child disease	13.596	6	0.034	Significant

Source: Field Survey, 2012

The results for all the LGAs indicate a statistically non-significant relationship between the ages of mothers and the prevalence of disease among their children, with a Chi squared value of 9.527, a P value of 0.146, degree of freedom at 6 and significance level at 0.05. The null hypothesis that a woman's age has no influence on the health of her child is thus accepted. At the individual LGA level, there are disparities. From Table 6.1b, the Chi-squared results in Igabi LGA (X^2 value=3.386, df=5, p= 0.641) correspond with that of the overall result as not significant. Zaria LGA and Zangon Kataf LGA however show a significant relationship, with the results from Zaria LGA showing(X^2 value=16.641, df=6, p=0.011), and Zangon Kataf showing(X^2 value=13.596, df=6, p=0.034). Maternal age in Zaria and Zangon Kataf LGAs therefore influence the prevalence of diseases in children.

6.2 Religion and Prevalence of Child Diseases

Table 6.2a indicates that 58% of Muslim women have had sick children within the past 1 year, while 42% have had healthy children. On the other hand, 66.5% of Christian women have had sick children within the year, whereas 33.5% have had healthy children.

The results of the analysis for all LGAs indicate a non significant relationship between religion and prevalence of child disease (X^2 value = 3.615 df= 1 P- value= 0.057), hence the acceptance of the null hypothesis.

Table 6.2a Religion and Prevalence of Child Diseases

Religious affiliations	**Total**		
	Prevalence of disease		
	Yes (%)	**No (%)**	**Row total (%)**
Islam	119(58.0)	86(42.0)	205(100)
Christianity	181(66.5)	91(33.5)	272(100)
Column total	300(62.9)	177(37.1)	477(100)
Calculated X^2 value = 3.615 Degree of freedom= 1 P- value= 0.057 Remark= not significant			

Source: Field Survey, 2012

With reference to Table 6.2b, the Chi squared results in two LGAs (Zaria and Zangon Kataf), indicate a statistically insignificant relationship; Zaria shows (X^2 value = 0.073 df= 1 P- value= 0.787), while Zangon Kataf shows a value of X^2 value = 1.561 df= 1 P- value= 0.211). On the other hand, Igabi LGA had the following result (X^2 value = 5.902, df= 1, P- value= 0.015).

Table 6.2b Spatial Comparison of Religion and Prevalence of Child Diseases

Igabi LGA				
Variables	**Observed X^2 value**	**Degree of Freedom**	**P- value**	**Remark**
Religion and child disease	5.902	1	0.015	Significant
Zaria LGA				
Religion	0.073	1	0.787	Not significant

and child disease				
Zangon-Kataf LGA				
Religion and child disease	1.561	1	0.211	Not significant

Source: Field survey, 2012

This showed a statistically significant relationship between religion and incidence of child diseases, thus leading to the rejection of the null hypothesis in Igabi LGA, and the acceptance of the null hypothesis in both Zaria and Zangon Kataf LGAs.

6.3 Ethnicity and Prevalence of Child Diseases

As depicted in Table 6.3a, the study area is characterised by a mix of various ethnic groups. Across the three LGA's, the northern minority ethnic groups reported the highest prevalence of child diseases at 71.2%. The Hausa/ Fulani respondents had 58.3% of reported sick children over the year. Out of the 45 Igbo respondents(9.4%), 31(68.9%) reported ill health in their children; the Yoruba, southern minority and others had 53.3%, 52.6% and 60.9% prevalence of ill heath among their children. The Chi-squared tests indicates a result that is statistically non significant(X^2 value = 10.475, df= 5 P- value= 0.063).

Table 6.3a Ethnic Group and Prevalence of Child Disease

Ethnic groups	**Total**		
	Prevalence of disease		
	Yes(%)	**No(%)**	**Row total(%)**
Hausa /Fulani	95(58.3%)	68(41.7)	163(100.0)
Igbo	31(68.9)	14(31.1)	45(100.0)
Yoruba	24(53.3)	21(46.7)	45(100.0)
Northern Minority	116(71.2)	47(28.8)	163(100.0)
Southern Minority	20(52.6)	18(47.4)	38(100.0)

Others	14(60.9)	9(39.1)	23(100.0)
Column total	300(62.9)	177(37.1)	477(100.0)
Calculated X^2 value = 10.475 Degree of freedom= 5 P- value= 0.063 Remark= Not significant			

Source: Field Survey, 2012

Table 6.3b Spatial comparison of ethnic group and prevalence of child disease

Igabi LGA				
Variables	**Observed X^2 value**	**Degree of freedom**	**P- value**	**Remark**
Ethnic group and child disease	9.774	5	0.082	Not significant
Zaria LGA				
Ethnic group and child disease	4.002	5	0.549	Not significant
Zangon-Kataf LGA				
Ethnic group and child disease	6.117	5	0.295	Not significant

Source: Field Survey, 2012

Within the individual LGAs, the Chi-squared results in Table 6.3b show similarity with the results in Table 6.3a. Igabi LGA indicates a statistically non significant result (X^2 value = 9.774 df= 5 P- value= 0.082). The Chi squared result for Zaria LGA shows(X^2 value = 4.002 df= 5 P- value= 0.549), and Zangon Kataf LGA(X^2 value = 6.117 df= 5 P- value= 0.295). All these results did not reveal any association between ethnicity and prevalence of childhood diseases, hence the acceptance of the null hypothesis stating that there is no relationship between ethnicity and prevalence of childhood diseases.

6.4 Educational level and Prevalence of Child Disease

Table 6.4a shows that respondents with no form of education had 75% prevalence of child diseases. Mothers that had attained secondary school education had 71.5% sick children, while those with Quranic, primary and tertiary levels of education had 58.2%, 67.6% and 53.6% occurrences of child disease respectively.

Table 6.4a Mothers' Educational Qualification and Prevalence of Child Diseases

Educational qualification	**Total**		
	Prevalence of disease		
	Yes (%)	**No(%)**	**Row total (%)**
None	6(75.0)	2(25.0)	8(100.0)
Quranic	39(58.2)	28(41.8)	67(100.0)
Primary	46(67.6)	22(32.4)	68(100.0)
Secondary	113(71.5)	45(28.5)	158(100.0)
Tertiary	89(53.6)	77(46.4)	166(100.0)
Others	7(70.0)	3(30.0)	10(100.0)
Column total	300(62.9)	177(37.1)	477(100.0)
Calculated X^2 value = 12.419 Degree of freedom= 5 P- value= 0.029 Remark= Significant			

Source: Field Survey, 2012

The Chi-squared analysis reveals a calculated value of 12.419 at 5 degrees of freedom and a P-value of 0.029, indicating a statistically significant relationship between mother's educational level and child disease. This result leads to the rejection of the null hypothesis.

Table 6.4b Mothers' Educational Qualification and Spatial Prevalence of Child Diseases

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Mothers educational level and child disease	3.963	4	0.411	Not significant

Zaria LGA				
Mothers educational level and child disease	26.813	5	0.001	Significant
Zangon-Kataf LGA				
Mothers educational level and child disease	0.729	4	0.948	Not significant

Source: Field Survey, 2012

Within the LGAs, there is a variation in the Chi-squared results. Both Igabi and Zangon Kataf LGA indicate a result that is statistically non significant (X^2 value = 3.963, df= 4, P- value= 0.411 and X^2 value = 0.729, df= 4, P- value= 0.948 respectively). The results in Zaria however, show a statistically significant relationship between maternal education and prevalence of child disease(X^2 value = 26.813, df= 5, P- value= 0.001). The detailed Chi squared results of Zaria LGA show that all the respondents with secondary educational level and lower, had 100% prevalence of child disease. The influence of maternal education on child health has reported by Cleland and Ginneken, (1988) is the ability to decrease the cases of morbidity in children by 7-9% by every one year increment in mother's education. These findings corroborate with a number of past researches which indicate a relationship between maternal education and child health such as that of Amfani-joe (2011); Gwarzo *et al*, (1997) among others.

Table 6.4a shows an increase in prevalence of child disease in educational levels below tertiary. The critical educational level for mothers to significantly reduce child disease therefore is Secondary education, since it is the closest to tertiary education, and more women have opportunities to have a secondary than a tertiary education. By this time also, mothers are able to adequately read and write, and are capable of making basic decisions that will affect the health of their children positively.

Table 6.5a Fathers Educational Qualification and Prevalence of Childhood Diseases

Educational qualification	Total		
	Prevalence of disease		
	Yes (%)	No(%)	Row total (%)
No response	1(20.0)	4(80.0)	5(100.0)
None	4(66.7)	2(33.3)	6(100.0)
Quranic	17(53.1)	15(46.9)	32(100.0)
Primary	39(76.5)	12(23.5)	51(100.0)
Secondary	101(71.1)	41(28.9)	142(100.0)
Tertiary	127(57.0)	96(43.0)	223(100.0)
Others	11(61.1)	7(38.9)	18(100.0)
Column total	300(62.9)	177(37.1)	477(100.0)
Calculated X^2 value = 12.921 Degree of freedom= 5 P- value= 0.024 Remark= Significant			

Source: Field Survey, 2012

With reference to Table 6.5a, 66.7% of the husbands whose wives had sick children had no form of education. About 71.1% of the fathers with ill children had secondary education, while 57% of these fathers had attained tertiary educational level. The Chi squared analysis reveals a calculated value of 12.921, with 5 degrees of freedom and a P value of 0.024. This reveals a statistically significant relationship between paternal educational attainment and prevalence of child disease.

The spatial variation within the three LGAs shows a statistically non significant relationship between paternal education and incidence of child disease in Igabi and Zangon Kataf, (**Igabi LGA**- X^2 value = 5.811, df= 4, P- value= 0.214;**Zangonkataf LGA**- X^2 value = 8.782, df= 4, P- value= 0.067) and a statistically significant relationship in Zaria LGA(**Zaria LGA**- X^2 value = 11.235, df= 5, P- value=0.047).

Table 6.5b Spatial Variation in Fathers' Educational Qualification and Prevalence of Childhood Diseases

Igabi LGA				
Variables	**Observed X^2 value**	**Degree of freedom**	**P- value**	**Remark**
Fathers' educational level and child disease	5.811	4	0.214	Not significant
Zaria LGA				
Fathers' educational level and child disease	11.235	5	0.047	Significant
Zangon-Kataf LGA				
Fathers' educational level and child disease	8.782	4	0.067	Not significant

Source: Field Survey, 2012

6.5 Occupation of Mothers and Prevalence of Child Disease

Table 6.6a, shows that all the women farmers and industrial workers reported their children sick. The business/petty traders, full time house wives and civil/public servants had 63.0%, 66.9% and 59.6% in that order of their children sick. The students had 54.3% sick children. The results of the Chi-squared analysis show a calculated value of 12.847, with 7 degrees of freedom. The resultant p-value is 0.076, which indicates a statistically non significant relationship between maternal occupational status and child disease.

Table 6.6a Mothers' Occupation and Prevalence of Child Disease

Occupation	Total		
	Prevalence of disease		
	Yes (%)	No(%)	Row total (%)
No response	9(75.0)	3(25.0)	12(100.0)
Farming	4(100.0)	0(0.0)	4(100.0)
Civil/public servant	81(59.6)	55(40.4)	136(100.0)
Business/petty trading	86(63.0)	58(36.8)	144(100.0)
Student	19(54.3)	16(45.7)	35(100.0)
Full time house wife	85(66.9)	42(33.1)	127(100.0)
Industrial/casual worker	10(100.0)	0(0.0)	10(100.0)
Others	6(66.7)	3(33.3)	9(100.0)
Column total	300(62.9)	177(37.1)	477(100.0)
Calculated X^2 value = 12.847 Degree of freedom= 7 P- value= 0.076 Remark= Not significant			

Source: field survey, 2012

Table 6.6b Spatial Comparison of Mothers' Occupation and Incidence of Child Disease

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Mothers' occupation and child disease	9.089	6	0.169	Not significant
Zaria LGA				
Mothers' occupation and child disease	12.914	7	0.074	Not significant
Zangon-Kataf LGA				
Mothers' occupation and child disease	9.165	7	0.241	Not significant

Source: Field Survey, 2012

Within the individual LGA's the chiquare results also show a statistically non significant relationship between maternal occupation and incidence of child disease, as observed in Table 6.6b. This result therefore leads to the acceptance of the null hypothesis which that there is no relationship between maternal occupation and child disease.

6.6 Marital status and prevalence of childhood diseases

Table 6.7a, reveals that out of a total of 477 respondents, 452(94%) are married. Out of this figure, 64.6% claimed that their children suffered ill health. The respondents that had children out of wedlock had 66.7% prevalence of childhood diseases whereas the widowed had 26.3% event of child disease. The analysis by Chi squared tests results shows a value of 13.313, at 4 degrees of freedom and a p-value of 0.010. This reveals a statistically significant relationship, hence the rejection of the null hypothesis.

Table 6.7a Marital Status and Prevalence of Childhood Diseases

Marital status	Total		
	Prevalence of disease		
	Yes (%)	No(%)	Row total (%)
Never married	2(66.7)	1(33.3)	3(100.0)
Married	292(64.6)	160(35.4)	452(100.0)
Divorced	0(0.0)	1(100.0)	1(100.0)
Separated	1(50.0)	1(50.0)	2(100.0)
Widow	5(26.3)	14(73.7)	19(100.0)
Column total	300(62.9)	177(37.1)	477(100.0)
Calculated X^2 value = 13.313 Degree of freedom= 4 P- value= 0.010 Remark= Significant			

Source: Field Survey, 2012

There is a spatial variation in the Chi-squared results (Table 6.7b). Both Igabi and Zaria indicate a statistically non significant relationship between marital status and childhood diseases (X^2 value = 4.969, df= 3, P- value= 0.174 and X^2 value = 0.740, df= 2, P- value= 0.691 respectively). The results lead to the acceptance of the null hypothesis, that there is no relationship between marital status and prevalence of child disease in Igabi and Zaria LGA. In Zangon Kataf LGA however, the Chi-squared tests reveal a statistically significant relationship with a Chi-squared value of 12.522, at 2 degrees of freedom and a P value of 0.002. This thus indicates that the marital status of a woman influences the prevalence of child disease in Zangon Kataf, hence the rejection of

the null hypothesis. This could be because Zangon Kataf LGA have the least percentage of married respondents (87.2%) among the three LGAs.

Table 6.7b Spatial Comparison in Marital status and Prevalence of Childhood Diseases

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Marital status and child disease	4.969	3	0.174	Not significant
Zaria LGA				
Marital status and child disease	0.740	2	0.691	Not significant
Zangon-Kataf LGA				
Marital status and child disease	12.522	2	0.002	Significant

Source: Field Survey, 2012

6.7 Number of Children born and Prevalence of Child Disease

Table 6.8a, shows the respondents that had 1-2 children had a 66% prevalence of child disease. Those with 3-4 children and 7-8 children had about 60% incidence of child disease. The mothers with 5-6 children had a 58.7% of child illnesses, while those with more than 8 children claimed to have 77.8% of child disease. The Chi squared analysis reveals a calculated value of 2.682 at 4 degrees of freedom and a p value of 0.612, thus indicating a statistically non significant relationship between the number of children a woman has and the prevalence of child disease. This leads to the acceptance of the null hypothesis that no relationship exists between the number of children a woman has and the health of the children.

Table 6.8a Number of Children and Prevalence of Child Disease

Number of children born	Total		
	Prevalence of disease		
	Yes(%)	**No(%)**	**Row total (%)**
No response	1(100.0)	0(0.0)	1(100.0)
1-2	115(66.1)	59(33.9)	174(100.0)
3-4	120(60.0)	78(39.4)	198(100.0)
5-6	44(58.7)	31(41.3)	75(100.0)
7-8	12(60.0)	8(40.0)	20(100.0)
>8	7(77.8)	2(22.2)	9(100.0)
Column total	299(62.9)	178(37.4)	477(100.0)
Calculated X^2 value = 2.682, Degree of freedom= 4, P- value= 0.612, Remark= Not significant			

Source: Field Survey, 2012

Table 6.8b Spatial Variation in Number of Children and Prevalence of Child Disease

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Number of children and child disease	4.415	4	0.353	Not significant
Zaria LGA				
Number of children and child disease	1.733	3	0.630	Not significant
Zangon-Kataf LGA				
Number of children and child disease	0.734	4	0.947	Not significant

Source: Field survey, 2012

Table 6.8b presents the Chi squared analysis in Igabi, Zaria and Zangon Kataf LGAs. The results show a statistically non significant relationship(X^2 value = 4.415, df= 4, p value= 0.353; X^2 value = 1.733, df= 3, P- value= 0.630 and X^2 value = 0.734, df= 4, P- value= 0.947 respectively). The

null hypothesis is thus accepted for the three LGAs, indicating no relationship between the number of children a woman has, and the prevalence of disease in children.

6.8 Antenatal attendance and prevalence of child disease

Antenatal visits are encouraged to help monitor maternal and foetal health. Table 6.9a reveals that 65.8% of respondents attended antenatal clinics and eventually have prevalence of child disease, whereas 34% attended antenatal clinics and have healthy children. The Chi squared test shows a calculated value of 18.284 at 1 degree of freedom and a P value of 0.001. This indicates a statistically significant relationship; hence antenatal attendance has as positive effect on prevalence of child disease. The null hypothesis is thus rejected in this case. Similar results were reported by Kandala *et al* (1997), who worked on the spatial risk factors for childhood morbidity in Nigeria, using demographic health records. They found antenatal visits to significantly reduce child disease (P=0.001).

Table 6.9a Attendance of Antenatal Clinics and Prevalence of Child Disease

Attendance of antenatal clinics	**Total**		
	Prevalence of disease		
	Yes	**No**	**Row total**
Yes	283(65.8)	147(34.2)	430(100.0)
No	16(34.0)	31(66.0)	47(100.0)
Column total	300(62.9)	177(37.1)	477(100.0)
Calculated X^2 value = 18.284 Degree of freedom= 1 P- value= 0.001 Remark= Significant			

Source: Field Survey,2012

Within the individual LGAs, there is a spatial variation in the results of test of significance. Table 6.9b, shows the chi square results in Zaria LGA and Zangon Kataf LGAs. There is no statistically significant relationship between attendance of antenatal clinics by mothers, and

prevalence of child disease (calculated X^2 value = 0.006; Degree of freedom= 1; P- value= 0.940 and Calculated X^2 value = 2.728; Degree of freedom= 1; P- value= 0.099). The null hypothesis is therefore accepted for these two LGAs.

On the other hand in Igabi LGA, the Chi squared results reveal a calculated value of 20.230 at 1 degree of freedom and a P value of 0.001. Since the chi-square results indicate a statistically significant relationship between attendance at antenatal clinics and prevalence of child disease, the null hypothesis is thus rejected.

Table 6.9b Spatial Disparity in Attendance of Antenatal Clinics and Prevalence of Child Disease

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Attendance of antenatal and child disease	20.230	1	0.001	Significant
Zaria LGA				
Attendance of antenatal and child disease	0.006	1	0.940	Not significant
Zangon-Kataf LGA				
Attendance of antenatal and child disease	2.728	1	0.099	Not significant

Source: field survey,2012

6.9 Place of Birth and Prevalence of Child Disease

Table 6.10a, reveals that 65% of respondents who had hospital births and 57% of mothers who had home births, had prevalence of child disease. The respondents that had their births in spiritual homes had 75% prevalence of child disease. The results of the chi square tests on a general note showed that there is a statistically significant relationship between birth location and

prevalence of child disease (calculated X^2 value = 10.845; Degree of freedom= 3; P- value= 0.013). The null hypothesis is thus rejected.

Table 6.10a Place of Birth and Prevalence of Child Disease

Birth location	**Total**		
	Prevalence of disease		
	Yes (%)	**No(%)**	**Row total (%)**
Hospital	223(65.0)	120(35.0)	343(100.0)
House	73(57.5)	45(42.5)	127(100.0)
Spiritual home	3(75.0)	1(25.0)	4(100.0)
Others	0(0.0)	3(100.0)	3(100.0)
Column total	300(62.9)	177(37.1)	477(100.0)
Calculated X^2 value = 10.845 Degree of freedom= 3 P- value= 0.013 Remark= Significant			

Source: Field Survey, 2012

Table 6.10b Spatial Variation in Place of Birth and Prevalence of Child Disease

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Birth location and child disease	11.640	3	0.009	Significant
Zaria LGA				
Birth location and child disease	6.274	2	0.043	Significant
Zangon-Kataf LGA				
Birth location and child disease	1.419	2	0.492	Not significant

Source: Field Survey, 2012

Table 6.10b, shows that within the three LGAs, the Chi squared results vary spatially. Zangon Kataf LGA shows a result of statistically non significant relationship between birth location and prevalence of child disease (Calculated X^2 value = 1.419; Degree of freedom= 2; P- value= 0.492). The results differ in Igabi and Zaria LGAs were dissimilar. The Chi squared test outcome shows a statistical significance between birth location and prevalence of child disease

(**Igabi LGA**- Calculated X^2 value = 11.640; Degree of freedom= 3; P- value= 0.009; **Zaria LGA**- Calculated X^2 value = 6.274; Degree of freedom= 2; P- value= 0.043). This shows that there is a considerable influence of birth location on prevalence of child disease. The findings of Idris *et al* (2006) and Sychareun *et al* (2009), in their research also agree with this result. They carried out a research in Zaria, on the determinants of place of delivery among women, and found out that most of the women that give birth at home have their children at a higher risk of disease and subsequently death in severe cases. Clean delivery practices are vital to safeguard the health of mothers and newborns from infections. Severe infections, which are often associated with unhygienic delivery practices and unsafe water and poor sanitation, accounted for 36 per cent of neonatal deaths in 2000(UNICEF, 2009).

6.10 Nutrition and Prevalence of Child Disease

Table 6.11a Nutrition and Disease Prevalence.

		Total	
		Prevalence of disease	
Nutritional augmentation (fruits,meat &vegetables)	**Yes (%)**	**No (%)**	**Row Total(%)**
Daily	158(57.9)	115(42.1)	273(100)
Weekly	51(70.8)	21(29.2)	72(100)
Monthly	2(50.0)	2(50.0)	4(100)
Occasionally	77(68.1)	36(31.9)	113(100)
Total	288(62.3)	174(37.7)	462(100)
Calculated X^2 value = 6.409 Degree of freedom= 3 P- value= 0.093 Remark= Not significant			

Source: Field Survey, 2012

Table 6.11a reveals that about 58% of children that had a daily intake of fruits, meat and vegetables had suffered disease prevalence, whereas 42% did not fall ill. The Chi squared results indicate a statistically non significant relationship between nutrition and prevalence of child disease (Calculated X^2 value = 6.409, Degree of freedom= 3, P- value= 0.093). This may be an indication of other sources of nutrition apart from meat, fish, fruits and vegetables. An in depth interview with a nutritionist revealed the following:

> *Many children do not get the nutrition they need for growth and development, hence we advise mothers to feed their children with local but highly nutritious foods such as acha, kuka and beans* Dr Remi, ABUTH.

Table 6.11b Spatial Variation in Nutrition and Disease Prevalence.

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Nutrition and disease incidence	1.552	3	0.670	Not significant
Zaria LGA				
Nutrition and disease incidence	4.731	2	0.094	Not significant
Zangon-Kataf LGA				
Nutrition and disease incidence	3.555	2	0.169	Not significant

Source: Field Survey, 2012

Table 6.11b show the Chi squared results within the LGAs, which indicate a statistically non significant relationship between nutrition and prevalence of child disease;(**Igabi LGA**- X^2 value = 1.552, Degree of freedom= 3, P- value= 0.670; **Zaria LGA**- X^2 value = 4.731, Degree of freedom= 2, P- value= 0.094; **Zangon Kataf LGA**- X^2 value = 6.409, Degree of freedom= 3, P- value= 0.093) hence the acceptance of the null hypothesis.

6.2 SPECIFIC CHILD DISEASE AND INFLUENCING FACTORS

For the diseases recorded among children in the study area, there are underlying factors which may be responsible for their occurrence. Some of these factors may exacerbate the exposure of the child to certain illnesses. This section briefly analyse some specific diseases and probable attendant factors that may be contributory to the event of ill health.

6.2.1 Utilisation of Mosquito Nets and Prevalence of Malaria Fever.

Table 6.12a Prevalence of Malaria and Utilisation of Mosquito Nets

Prevalence of Malaria	**Total**		
	Utilisation of Mosquito Nets		
	No (%)	**Yes(%)**	**Row total (%)**
No response	0(0.0)	2(100.0)	2(100.0)
Yes	123(69.9)	53(30.1)	176(100.0)
Column total	123(69.1)	55(30.9)	178(100.0)
Calculated X^2 value = 44.31; Degree of freedom= 1; P- value= 0.001; Remark= Significant			

Source: Field Survey,2012

Table 6.12a shows that about 69% of children that had malaria do not sleep under mosquito nets, while about 31% of the children who suffered the disease sleep under mosquito nets. The Chi squared results show a statistically significant association between utilisation of mosquito nets and prevalence of malaria (Calculated X^2 value = 44.31; Degree of freedom= 1; P- value= 0.001; Remark= Significant).

Within the LGAs Table 6.12b indicates that the results in all three LGAs agree that there is a statistical significance between utilisation of mosquito nets and prevalence of malaria.

Table 6.12b Spatial Variation in Incidence of Malaria and Utilisation of Mosquito Nets

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Sleeping under mosquito net and Malaria	31.52	1	0.001	Significant
Zaria LGA				
Sleeping under mosquito net and Malaria	12.50	1	0.001	Significant
Zangon-Kataf LGA				
Sleeping under mosquito net and Malaria	4.40	1	0.001	Significant

Source: Field Survey,2012

Igabi LGA is significant with a calculated chi square value of 31.52, 1 degree of freedom and a P- value of 0.001. For Zaria LGA, the calculated chisquare value is 12.50, with 1 Degree of freedom, and a P- value of 0.001. Also in Zangon Kataf LGA, the calculated chi square value is 4.40, with 1 degree of freedom and P- value of 0.001. As stated earlier, the results in all the LGAs indicate a statistically significant relationship between malaria and utilisation of mosquito nets.

6.2.2 Excrement Disposal and Prevalence of Diarrhoea

Table 6.13a shows that about 59% of the respondents' children who have suffered diarrhoea utilise the pit latrine; 3.3% use the bucket/pan. The chi square result reveals a calculated value of 9.319, with 3 degrees of freedom and a P value of 0.025 to indicate a statistically significant relationship between method of excrement disposal and in prevalence of diarrhoea in children.

Table 6.13a Excrement Disposal and Prevalence of Diarrhoea

Prevalence of diarrhoea	Total				
	Excrement disposal				
	Water closet (%)	**Pit latrine (%)**	**Bucket/pan (%)**	**Public toilet (%)**	**Row total (%)**
Yes	22(36.1)	36(59.0)	2(3.3)	1(1.6)	61(100.0)
No					
Column total	22(36.1)	36(59.0)	2(3.3)	1(1.6)	61(100.0)
Calculated X^2 value = 9.319; Degree of freedom= 3; P- value= 0.025; Remark= Significant					

Source: Field Survey, 2012

Table 6.13b Spatial Variation in Excrement Disposal and Prevalence of Diarrhoea

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Excrement disposal and Diarrhoea incidence	0.75	3	0.001	Significant
Zaria LGA				
Excrement disposal and Diarrhoea incidence	0.26	4	0.001	Significant
Zangon-Kataf LGA				
Excrement disposal and Diarrhoea incidence	66.7	5	0.070	Not significant

Source: Field Survey,2012

Table 6.13b, reveals no difference within the individual LGAs. Result for Igabi LGA and Zaria LGAs is not different from that of the overall result (Igabi LGA- Calculated X^2 value = 0.75; Degree of freedom= 3; P- value= 0.001; Remark= Significant. Zaria LGA - Calculated X^2 value = 0.26; Degree of freedom= 4; P- value= 0.001; Remark= Significant). The result in Zangon

Kataf however shows a non significant relationship, hence showing that in the locality, the method of excrement disposal has no influence on diarrhoea prevalence in children (Zangon Kataf-Calculated X^2 value = 66.7; Degree of freedom= 5; P- value= 0.070; Remark= Not significant).

6.2.3 Source of Drinking Water and Prevalence of Diarrhoea

Table 6.14a show that all of the respondents whose source of drinking water was pipe borne, had children with diarrhoea.

Table 6.14a Source of Drinking Water and Prevalence of Diarrhoea

Prevalence of diarrhoea	**Total**					
	Drinking water					
	Pipe borne	**Tanker/ Vendor**	**Well**	**Borehole**	**Others**	**Row total**
Yes	23(100.0)	2(50.0)	16(84.2)	8(57.1)	1(100.0)	50(100.0)
No	0(0.0)	2(50.0)	3(15.8)	6(42.9)	0(0.0)	11(100.0)
Column total	23(37.7)	4(6.6)	19(31.2)	14(22.9)	1(1.6)	61(100.0)
Calculated X^2 value = 13.947; Degree of freedom= 4; P- value= 0.007; Remark= Significant						

Source: Field Survey,2012

Those that drink water from the well had an 84% prevalence of diarrhoea. The Chi squared tests indicate a statistically significant association between drinking water and prevalence of diarrhoea in children(X^2 value = 13.947; Degree of freedom= 4; P- value= 0.007).

Table 6.14b Spatial Variation in Source of Drinking Water and Prevalence of Diarrhoea

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Drinking water and diarrhoea prevalence	11.640	3	0.009	Significant
Zaria LGA				
Drinking water and diarrhoea prevalence	13.313	4	0.010	Significant
Zangon-Kataf LGA				
Drinking water and diarrhoea prevalence	3.555	2	0.069	Not significant

Source: Field Survey,2012

The spatial variation in the Chi square results across the three LGAs indicate a statistically significant relationship in Igabi and Zaria LGAs, (**Igabi LGA**- Calculated X^2 value = 11.640; Degree of freedom= 3; P- value= 0.009; **Zaria LGA** - Calculated X^2 value = 13.313; Degree of freedom= 4; P- value= 0.010) and a non significant relationship in Zangon kataf LGA (**Zangon Kataf LGA**- Calculated X^2 value = 0.75; Degree of freedom= 3; P- value= 0.001)

6.2.4 Cooking Energy and Prevalence of Pneumonia

Table 6.15a shows that about 57% and 35.7% of the respondents that use firewood and cow dung as cooking fuel, had children with pneumonia. The chi square tests show a statistically

significant relationship between types of fuel for cooking and prevalence of pneumonia (X^2 value = 13.947; Degree of freedom= 4; P- value= 0.007).

Table 6.15a Cooking Energy and Prevalence of Pneumonia

Prevalence of pneumonia	**Total**					
	Fuel for cooking					
	Gas(%)	**Stove (%)**	**Firewood (%)**	**Cow dung(%)**	**Others(%)**	**Row total(%)**
Yes	0(0.0)	1(7.14)	8(57.1)	5(35.7)	0(0.0)	14(100.0)
Column total	0(0.0)	1(7.14)	8(57.1)	5(35.7)	0(0.0)	14(100.0)
Calculated X^2 value = 13.947; Degree of freedom= 4; P- value= 0.007; Remark= Significant						

Source: Field Survey,2012

Apart from exposing children to cold temperatures, inhaling smoke and soot from unclean sources of energy (such as cow dung and firewood) for cooking puts children at risk of pneumonia. Gordon and Graham (2007); Zar (2006); Shabir *et al*(2005) in their studies also found that biomass smoke, especially when let into the house, is a potent source of pneumonia infection in children.

Table 6.15b Spatial Variation in Energy for Cooking and Prevalence of Pneumonia

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Cooking fuel and pneumonia prevalence	13.313	4	0.010	Significant
Zaria LGA				
Cooking fuel and pneumonia prevalence	3.555	2	0.069	Not significant

Zangon-Kataf LGA				
Cooking fuel and pneumonia prevalence	11.640	3	0.009	Significant

Source: Field Survey,2012

The Chi squared results in Table 6.15b show a statistically significant relationship between source of cooking fuel and pneumonia infection in children in Zaria and Zangon Kataf LGAs. (**Igabi LGA**- X^2 value = 13.313, Degree of freedom= 4, P- value= 0.010; **Zangon Kataf LGA**- X^2 value = 11.640, Degree of freedom= 3, P- value= 0.009) and a statistically non significant relationship in Igabi LGA. ;(**Zaria LGA**- X^2 value = 3.555, Degree of freedom= 2, P- value= 0.069). The statistically significant relationship in Zangon Kataf is expected, since it had the highest cases of pneumonia documented on the field.

6.2.5 Vaccination Status and Prevalence of VPD

Table 6.16a Vaccination Status and Prevalence of VPD

Prevalence of VPD	**Total**		
	Vaccination status		
	Yes (%)	**No(%)**	**Row total (%)**
Yes	2(10.0)	18(90.0)	20(100)
Column total	2(10.0)	18(90.0)	20(100)
Calculated X^2 value = 44.31; Degree of freedom= 1; P- value= 0.001; Remark= Significant			

Source: Field Survey,2012

The Chi squared results in Table 6.16a show a statistically significant relationship between vaccination status and prevalence of VPD (Calculated X^2 value = 44.31; Degree of freedom= 1;

P- value= 0.001; Remark= Significant). A total of 20 children were reported not to have been vaccinated; these children were eventually reported to suffer VPD.

Table 6.16b Spatial Variation in Vaccination Status and Prevalence of VPD

Igabi LGA				
Variables	Observed X^2 value	Degree of freedom	P- value	Remark
Vaccination status and incidence of VPD	6.274	2	0.043	Significant
Zangon-Kataf LGA				
Vaccination status and incidence of VPD	9.811	2	0.007	Significant

Source: Field Survey,2012

Within the two LGAs that reportedly had children suffering from VPD, both of them showed a result of significant influence of vaccination on prevalence of VPD (**Igabi**- Calculated X^2 value = 0.04; Degree of freedom= 1; P- value= 0.001; Remark= Significant. **Zangon Kataf**- Calculated X^2 value = 0.03; Degree of freedom= 1; P- value= 0.001; Remark= Significant).

CHAPTER SEVEN

7.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

7.1 Summary

The aim of this research is to determine the spatial variation in the prevalence of childhood diseases, using GIS techniques in Kaduna State. Three LGAs were selected for the study, one from each senatorial district in the State; these included Igabi, Zaria and Zangonkataf LGAs. Data and information for the research was obtained using Satellite images, structured questionnaires, focus group discussions, and in-depth interviews. The main types of childhood diseases in Kaduna State were characterised, the spatial pattern of these diseases were mapped. The reasons for these spatial variations between the LGAs were examined and the gender differentials in the incidence of these diseases were determined.

7.2 Main findings

The main diseases that were found among children in the study area included Malaria, Diarrhoea, VPD and pneumonia. The incidences of these diseases varied between the three LGAs under study. There were also disparities between the results from the hospital medical records and field survey over some of the diseases, which were mainly attributed to the perception to child disease of the respondents in the field, and the type of hospitals the medical records were collected from. The spatial variations of these diseases were successfully mapped, though some socioeconomic and demographic characteristics of the mothers of the sick children had influence on the occurrence of sickness in the children. The environment within which the child is developing

also affected the health of some of the children. These characteristics and practices are enumerated subsequently:

The respondents, which are basically women with children 0-5 years old, fall within the average fertility range of 15-49years old. Majority of the respondents (72.5%) are within the age groups 21-35, which is within the reproductive age bracket. Only two religions were documented in the study area (Christianity and Islam), with 57% of the respondents being Christian and 47% being Muslims. The most common ethnic groups were the Hausa/Fulani and the Northern minority, which both each had a percentage of 34.2 respondents. The marital union is highly revered in the study area, thus 94.8% of the respondents were married, and only a total of 0.6% to the respondents were separated or divorced. Of those that were married, about 72% were in a monogamous union, while 27% practiced polygamy.

Tertiary education is the most common educational attainment among the respondents in Zaria and Zangon Kataf LGAs; in Igabi LGA however, secondary school education is the most common. This level of educational attainment is reflected in the occupational nature of the respondents, as civil/public servants are the most common means of livelihood engaged in by the respondents. There are also a good number of petty traders and full time house wives. The study also revealed that on the average, more of the husbands (46.8%) of the respondents had attained tertiary education, compared to their wives (34.8%). The income of the respondents indicated 30.6% earning less than ₦ 5,000, while 25.4% make more than ₦ 20,000 monthly.

About 68.8% of the respondents desired to have more children, though 42.1% of the respondents already had between 3 and 4 children. For those who were interested, the desire for more children was mostly driven by the need of a male child. There was a preponderance of

respondents attending antenatal clinics while pregnant, choosing the hospital as the birth location of choice, practicing exclusive breastfeeding for children younger than six months, daily consumption of balanced diets by the older children and correct acceptance of vaccination when due, all in an attempt to safeguard the health of the children.

Over the study period however, 62.9% of the children of the respondents were sick. Malaria was the most common form of affliction among the children (59.3%). Diarrhoea also affected 20.3% of the sick children. VPD, Pneumonia and other forms of illnesses affected 6.0%, 4.7% and 9.7% respectively. Of all these sick children, the general hospital was the most common choice of their mothers in search of treatment.

The investigation into the living conditions of the respondents revealed that almost 70% of their children do not sleep under mosquito nets at night. The most common excuse for non utilisation of mosquito nets is unavailability. The predominant sources of potable water available to the children were the well, borehole and tap. Excrement was mainly disposed trough the means of pit latrine and water closet system.

The relationship between the age of mothers and incidence of child disease is established in the study, as the chi square analysis showed a significant relationship in Zaria and Zangon Kataf LGAs. It was also discovered that events of child disease occurred regardless of religious and ethnic affiliations. Mothers' education however, has influence on child disease incidence. The chi square analysis revealed a statistically significant relationship between the educational qualification of mothers and disease incidence in their children. The respondents with higher educational qualification had less sick children, as compared with those with primary school,

Quranic and no education at all, who had more sickly children. The research also revealed a statistically significant relationship between fathers' educational qualification and child health.

There were more sickly female children (57%) than male (43%). The health of the female children may not have been treated carefully, hence the higher percentage of disease incidence in them.

The utilisation of mosquito nets is found to have an influence over incidence of malaria in children over the study period, as revealed by a statistically significant chi square result. The use of mosquito nets in the study is quite low (30%), leaving the children susceptible to the attack of malaria fever.

The method of excrement disposal and source of drinking water also had an effect on occurrence of diarrhoea in children. The pit latrine which was the most common method of excrement disposal among diarrhoea sufferers proved to have a good influence on incidence of diarrhoea on children in the study area. Zangon Kataf LGA had the highest incidence of pneumonia in the study area. Information gathered revealed the utilisation of unclean forms of energy for cooking, such as fuel wood and cow dung. The exposure of the children smoke from cooking and cold weather could account for the most cases of pneumonia in Zangon Kataf.

7.3 Conclusion

The findings of this research reveal that Economic and Socio-demographic factors influence the prevalence of child disease in Kaduna State, as indicated by statistically significant chi square relationships. Due to the fact that the major caregivers of children are their mothers, pertinent to incidence and management of diseases in children therefore, is the social status of mothers.

Mothers with better social standing due to education, income and sound health are usually more equipped to take better care of children.

This study also reveals that the incidences of child disease vary spatially over the study area. Of the child diseases studied, Malaria was the most prevalent in all LGAs, but being endemic in Igabi LGA, followed by diarrhoea, with its prevalence in Zaria LGA. Children suffering from VPD were found in Igabi and Zangon Kataf alone, with the most cases found in Igabi LGA. Pneumonia child sufferers were found in all LGAs but were prevalent in Zangon Kataf LGA. Other forms of sickness affecting children outside the jurisdiction of the study such as accidents, genetic and chronic diseases were prevalent in Igabi LGA.

The spatial variation in the prevalence of child diseases within the study area is evident, and is shown in the maps and charts produced. These maps are a relevant tool to aid Government interventions in better management of child diseases where they occur, and prevention in places possible.

7.4 Recommendations

The study findings reveal some vital issues which need to be addressed to manage the problem of child morbidity in Kaduna State. The Millennium Development Goal (MDG) number 4 is directly relevant to child health. It aims to reduce by two thirds, between 1990 and 2015, the under-five mortality rate. For Nigeria to meet this MDG, certain policies have to be put in place. Some suggestions as to how to tackle the crisis of child disease are enumerated.

- The use of GIS in mapping diseases has proven to be very relevant; hence it is recommended that this tool is taken advantage of by the Government in mapping and

monitoring diseases in children. Map presentations are easy to interpret; therefore it can serve as a potent tool in policy implementation and effective allocation of health funds to appropriate health sectors where funds are better needed. Government and non governmental organisations that are health oriented should therefore encourage the utilisation of mapping applications by investing more in training and acquisition of the technology to solve health problems.

- The gender gap existing in education between men and women should seek to be closed up by the government. Priority should be given to the education of girls, who will become mothers tomorrow. Better education of girls to at least the secondary school level, would translate to a delay in marriage, which would in turn reduce their fecundity. The fewer children a woman has, the better she would be able to manage them, hence reducing the occurrence of disease among them. The education importance of educating girls can not be overemphasized, as educated females would have an enlightened mind, hence would be able to make informed decisions with regards to the health of children such as proper hygiene, good nutritional practices and appropriate vaccinations and medical attention when needed.

- Women that are illiterate or semi literate should be empowered by relevant governmental and non governmental organisations in skill acquisition, so that they can earn a reasonable income, which can help to support in raising the children and providing them with the necessities they need to develop properly.

- Sensitisation on the adverse effects of absenteeism from antenatal clinics, giving birth in other locations apart from the hospital, and poor vaccination on the health of children

should be better carried out by health workers to mothers. This would reduce the overall incidences of child disease.

- Better attention should be paid to the feeding routine of children, particularly those younger than 6 months of age. More emphasis should be placed on the WHO/UNICEF guidelines on exclusive breastfeeding for 6 months after birth. Organisations should grant maternity leave of at least 4 months for working mothers, and make adequate arrangements for nursing mothers to be able to breastfeed their babies at work. Mothers should also be educated on how to enrich the nutritious content of the meals of their children through affordable and local food which is readily available.

- Governmental and non governmental organisations working to reduce malaria infections in children should intensify efforts at making mosquito nets available as unavailability of nets was the most common excuse for its non utilisation in the study.

- Mothers should be sensitised on the symptoms of the main childhood diseases, especially pneumonia, by the Ministry of heath, in conjunction with health workers. This would aid early recognition of the diseases, in order to avoid fatalities.

7.5 Further research

The following are recommended for further research

- Prediction and forecasting of child disease incidence

- Environmental influence on spatial incidence of child disease

REFERENCES

Abdullahi, K., Abubakar, U., Adamu, T., Daneji, A.I., Aliyu,R.U, Jiya,N, Ibraheem, T.O, Nata'ala,S.U(2009) Malaria in Sokoto, North Western Nigeria. *African Journal of Biotechnology* Vol. 8 (24), pp. 7101-7105, Academic Journals

Abdullahi, M.K, Bassey , S.E and Oyeyi, T. A(2009) Comprehensive mapping of urinary Schistosomiasis Using GIS in Kano State, Nigeria. *Bayero Journal of Pure and Applied Sciences,* 2(1): 41 - 46

Acho.O. (2005). Poor healthcare system: *Nigeria's moral indifference.* Retrieved from www.motherland .com

Akanbi, M.O.,Ukoli,C.O., Erhabor,G.E., Akanbi,F.O., and S B Gordon, S.B(2009). The burden of respiratory disease in Nigeria. *African Journal of Respiratory Medicine.* Review article

Alexander, C (2010) Rising self medication incidence worries experts, *Business day news. Businessdayonline*.com. Retrieved 7th August, 2012

Ali, A E(1989) Assessment of trend and periodicity characteristics of river Kaduna(1947-1964) *Unpublished Bsc dissertation* , Geography department, ABU Zaria.

Amfani-Joe, C.E(2011) Impact Assessment of Education in Home Economics on the Behavioral Patterns of the Nigerian Educated Working Housewives, Kaduna State, Nigeria. *PAT journal; 7 (2): 10-19 ISSN: 0794-5213*

Annan, R (2011) African food taboos. *World Public Health Nutrition Association,* http://www.wphna.org/2011-apr-col-reggie.htm.

Anne R. Pebley and Sajeda Amin,(1991) The impact of a public-health intervention on sex differentials in childhood mortality in rural Punjab, India , Health Transition Review, 1 (2) (1991), pp. 143-169

Answers.com (2012) www.answers.com

Antai.D (2009) Faith and child survival: The role of religion in childhood immunisation in Nigeria. *Journal of Biosocial Science* , 41 : pp 57-76

Armstrong, K.I. (2002) *The Use of GIS in Mapping, Analysis and Evaluation of HIV/AIDS Occurrence Patterns.* FIG XXII International Congress, Washington, D.C. USA, April 19-26 2002.

Arnold, F., Choe, M.K.,and Roy T.K. (1996) Son Preference, the Family-Building Process and Child Mortality in India, *East –West center working papers, population series* no. 85.

Attai, D. (2010) Migration and child immunization in Nigeria: individual- and community-level contexts. *BMC Public Health, Public Health* http://www.biomedcentral.com/1471-2458/10/116. Retrieved on 05 06 2010,

Awodele, O., Oreagba I., Akinyede A., Awodele D. and Dolapo D (2010). The knowledge and attitude towards childhood immunization among mothers attending antenatal clinic in Lagos University Teaching Hospital, Nigeria. www.ajol/info/43905. Downloaded from ajol on 29th March,2011.

A rnold F, Choe M K, and. Roy T. K (1996)Son Preference, the Family-Building Process and Child Mortality in *India Population Series* No. 85, August 1996

Bandyopadhyay,S., Kanji,S., and Wang,L.(2010) The Impact of Weather Variation on Child Health in Sub-Saharan Africa. *World Bank working papers no 5*.

Bicego, G.T. and Boerma, J.T (1991) Maternal education and child mortality. www.demog.berkeley.edu

Buhari, R. (2010) Nigeria: Still On the Fight Against Polio. *This day, Nigeria*. Retrieved on 27/09/2010, from http://allafrica.com/stories/200904150158.html

Burroughs, P., McDonnell, R. (1998) Principles of Geographical Information Systems. : Oxford University Press, New York.

Clarke,K.C., McLafferty, S.L, Tempalski,B.J. (1996) Perspectives on epidemiology and Geographic Information Systems: A review and discussion of future directions. *Emerging infectious diseases* vol 2, APRIL-JUNE 1996

Cleland, J.G., Ginneken Jerome K (1988) Maternal education and child survival in developing countries: The search for pathways of influence . *Social Science & Medicine, Volume 27, Issue 12*, 1988, Pages 1357–1368

Cromley, E.K. (2003) GIS and disease*, Annual. Review of Public Health 2003*. 24:7–24 Downloaded from arjournals.annualreviews.org by OARE on 07/30/10.

DaVinzo J, Abdur, R., Rahman,M (2004) The effects of birth spacing on infant and child mortality, pregnancy outcomes and maternal morbidity and mortality in matleb, Bangladesh. Retrieved from http://m.rand.org/pubs/working-papers/WR198.html

Deribew A, Fasil T, Belaineh G (2007) Determinants of under-five mortality in Gilgel Gibe Field Research Center, Southwest Ethiopia. *Ethiop.J.Health Dev.* 2007;21(2):117-124

Deribew, A., Alemseged,F., Tessema, F, Lelisa Sena,L, Zewdie Birhanu, Z., Zeynudin, A., Sudhakar, M., Abdo,N., Deribe,K., and Biadgilign, S.,(2010) Malaria and Under-Nutrition: A Community Based Study Among Under-Five Children at Risk of Malaria, South- West Ethiopia. PLoS ONE 5(5): e10775. doi:10.1371/journal.pone.0010775

Ekanem, E.E.,Adedeji,O.T.,and Akintoye, C.O.,(1994) Environmental and behavioural risk factors for prolonged diarrhoea in Nigerian children. *Journal for diarrhoeal disease resources,* Mar;12(1):19-24.

Eke, F.U., Frank-Briggs A.,and Ottor J. (2001) Childhood Mortality In Port Harcourt, Nigeria. from *Anil Aggrawal's Internet Journal of Forensic Medicine andToxicology, 2001; Vol. 2, No. 2.* Retrieved on 28 06 2010,

Esrey, S.A. (1996) 'Water, Waste, and Well-being: A Multicountry Study', *American Journal of Epidemiology* 143: 608-23

El Samani F Z, Willet W C, Ware J H(1989) predictors of simple diarrhoea in children under five years – a study of Sudanese rural community, *Social Science and Medicine* ;29(9): 1065-70

Feyisetan, B.J, Asa S,and Ebigbola J.A.(1997) Mothers' management of childhood diseases in Yorubaland: the influence of cultural beliefs.*Health Transit Review*;7(2):221-34.

Fink., G., Gunther.I, and Hill.K (2010). Water, Sanitation and Child Health – Evidence from the Demographic and Health Surveys 1986 – 2007. *Department of Global Health and Population, Harvard School of Public Health.* 665 Huntington Avenue, Building I, Boston, MA 02115.

Fredrichs,R.(2005) Father of modern epidemiology. Retrieved from http://www.ph.ucla.edu/epi/snow/fatherofepidemiology_part2.html#TWO accessed 12 04 2011

Galvez. M, Modeste N, Lee JW, Betancourt H, and Wilkins R L (2002) Peruvian mothers' knowledge and recognition of pneumonia in children under 5 years of age. http://aiias.academia.edu/CesarGalvez/Papers/355937/

Gascón,J., Vargas,M.,Schellenberg,D., Urassa,H.,Kahigwa,E, Aponte, J.J.,Mshinda,H., and Vila.J (2000) Diarrhoea in Children under 5 Years of Age. Study from Ifakara, Tanzania.

George, G., Akinpelumi,A., Madueke, L., Plowman, B., Fapohunda, B., Tawfik, Y., Holmes, R., Owor, J., Gilpin, U., Clarence, C., and Lennox, B. (2004). *Improving Management of Childhood Malaria in Nigeria and Uganda by Improving Practices of Patent Medicine Vendors.* Arlington, Va.: BASICS II for the United StatesAgency for Development Control *J. Clin. Microbiol.* 2000, 38(12):4459.

Getanch T, Assefa A, and Taddesse Z. Diarrhoea morbidity in urban area of South-west Ethiopia. *East Afr Med J,* 1997; 74(8): 491-494.

Girma R, Wondwossen B, Bishaw D, Tefera B(2008) Environmental determinants of diarrhoea among under-five children in nekemte town, western ethiopia. *Ethiopia Journal of Health Science*. Vol. 18, No. 2

Gordon,S and Graham,S(2007) Epidemiology of Respiratory Disease in Malawi @add affiliation.

Gupta (2003) Decentralized Delivery of Primary Health Services in Nigeria. Survey Evidence from the States of Lagos and Kogi Africa Region *Human Development Working Paper Series*

Hartskeeri R A. (2005) Studying Haemo fevers in Indonesia, *Royal Tropical Institute*

Healthcare, www.motherlandnigeria.com/health.html

Hore, P.N(1970) 'Weather and climate' in Zaria and its regions. Moretimore(ed) *Occassional paper No 4*. Department of Geography, ABU Zaria

Idris, S.H, Gwarzo,U.M.D., and Shehu, A.U (2006) Determinants of place of delivery among women in a semiurban settlement in Zaria, Northern Nigeria, *annals of African Medicine, Vol 5, No 2 pp68-72*

Jegede, A.S., Ajala,A.S., Adejumo, O.P., and Osunwole, S.O.,(2006). Forced Feeding Practice in Yoruba Community of Southwestern Nigeria: Evidence from Ethnographic Research. *Anthropologist*, 8(3): 171-179 (2006)

Johnson, K., (2010) Crossriver tackles pneumonia. Retrieved on 14-07-2010, from The Nationonline.net.

Kabir, M. (2007) Knowledge, Perception and Beliefs About Childhood Immunisation and Attitude Towards Uptake of Poliomyelitis Immunization in North. Retrieved on 20-08-2010 from http://www.comminit.com/en/node/223216/292

Kandala N.B, Ji, C., Stallard,N., Stranges,S., and Cappuccio, F.P.(2008) Morbidity from diarrhoea, cough and fever among young children in Nigeria. *Annals of Tropical Medicine & Parasitology,* Vol. 102, No. 5, 427–445

Kapoor,R., Vyas, S. (2010) Awareness and knowledge of mothers of under five children regarding immunization in Ahmedabad. *Journal of Indian Association of preventive and social medicine.* Volume 1 Issue 1 Pages| 12-15

Kishwar, A (1993) 'Abortion of female fetuses: Is legislation the answer?' *Reproductive Health Matters,* No.2,, pp. 113-115

KRB REPORT,(1978) Zaria and its regions. Occassional paper No 4. Department of Geology, ABU Zaria Kaduna river Basin Report(1978). Vol iii

Labbock, M. (2008) Transdisciplinary breastfeeding support: creating program and policy synergy across the reproductive continuum. *International breastfeeding journal.* Vol 3/1/16

Leo, R (2010) Pneumonia: Why children need to be vaccinated. Downloaded on 20 01 2010 from dailytrust.dailytrust.com/index.php.

Longman (2000) *Dictionary of contemporary English*, London

Mamman, M (1992) An analysis of fertility differentials in Kaduna metropolis. Unpublished P.hd thesis, Ahmadu Bello University, Zaria.

Mamman, M. (1996). Gender Bias: Roadblock to Sustainable Development, In Oruwari, Y., (ed), Women Development and the Nigerian Environment, Ibadan, *Vantage Publishers,* Pp. 17-23.

Makemba AM, Winch PJ, Makame VM, Mehl GL, Premji Z, Minjas JN, Shiff CJ(1996): Treatment practices for degedege, a locally recognized febrile illness, and implications for strategies to decrease mortality from severe malaria in Bagamoyo District, Tanzania. Trop Med Int Health 1996, 1:305-313.

Mishikir, C I(1998) Some streamflow characteristics of the Kaduna river. Unpublished BSc dissertation, Department of Geography, ABU Zaria

Mortimore, (1970) Geology of Zaria in: Zaria and its regions. *Occassional paper No 4.* Department of Geology, ABU Zaria Kaduna river Basin Report(1978). Vol iii

Munthali, A.C(2005) Managing Malaria in Under-Five Children in a Rural Malawian Village *Nordic Journal of African Studies 14(2): 127–146 (2005)*

Murni, S.U., Syahrul, H.B., Aflah, A., Aniza,r A., Nasarudin, N.M., Othman, M., Zabidi-Hussin, A.M.H.(2007), *Risk mapping of malnutrition distribution using Remote sensing and Geoinformation system (GIS) in Tunpat*, North of Kelantan, Malaysia.

National Population Commission (2009), *Population and housing census of the Federal republic of Nigeria*. Kaduna State priority tables. VOL 1.

National Population Commission (2009), *Nigerian Demographic and health survey*. Abuja.

Ngowu, R., Larson, J.S., and Kim, M.S. (2008*) Reducing child mortality in Nigeria: A case study of immunization and systemic factors. Soc Sci Med* 2008, 67:161-164.

Ojofeitimi, E O(nd). Malnutrition and approaches to improving the nutritional status of children in low income settings. http://netacad.oauife.edu.ng

Olasehinde,GI, Ajayi,A.A., , Taiwo,S.O., Adekeye,B.T., and Adeyeba OA(2010). Prevention and management of Falciparum malaria among infants and children in ota, South west Nigeria. *African Journal of clinical and experimental microbiology* 11(3): 159-163

Olsen, F.S., Martuzzi,M., and Paul, E., (2006) *Cluster analysis and disease mapping--why, when, and how? A step by step guide.* BMJ 1996;313:863-866.

Omer, S.B., Salmon, D.A., Orenstein, W.A., DeHart, P., and Halsey, N(2009).: Vaccine Refusal, Mandatory Immunization, and the Risks of Vaccine-Preventable Diseases. *N Engl J Med* 2009 ,360:1981-8.

Oni, G.A(1996) Infant feeding practices, socioeconomic conditions and diarrhoeal disease in a traditional area of urban Ilorin, Nigeria. *East African medical journal.* 73(5):283-8

Onyeabochukwu,D.A(2007) Cultural practices and health; the Nigerian experience. Medikka-*Journal of the University of Nigeria Medical Students*. http://medikkajournal.com/culturalpractices.htm

Oriade Study,2006 http://www.nigerianmuse.com/20080729204222zg/health/the-collapse-of-primary-health-care-guardian-editorial

Oskam, L (2007) Determining leprosy transmission patterns Royal Tropical Institute, www.cdc.com, downloaded on 23-11-2011.

Oyedepo J. A., Shittu O. B., Popoola T.O. S., Adeofun C.O. and Ogunshola E. O(2011). Rapid Epidemiological Mapping of Cholera in Some Parts of Abeokuta Metropolis: A GIS-Supported Post-Epidemic Assessment. Proceedings of the Environmental Management Conference, Federal University of Agriculture, Abeokuta, Nigeria, 2011

.

PATHS, Partnership For Transforming Health Systems (2008) *Final programme report, supporting Kaduna's health reform agenda*. Kaduna.

Paveau, V., Koenig M.A. and Wojtyniak, B.(1991) 'Excess female deaths among rural Bangladeshi children: An examination of cause specific mortality and morbidity', *International Journal ofEpidemiology,* 20 (3) , pp. 729-735

Pitt, M (1997) Estimating the determinants of child health when fertility and mortality are selective. *The journal of human resources*, Vol 32, no 1, 129-158.

POLICY Project/Nigeria. (2002). Child Survival in Nigeria, Situation, Response, and Prospects: Key Issues. Abuja.

Preidt, R. (2010). More Maternal Education Saves Children's Lives. *The Lancet, news release*, Sept.16,2010. Retrieved on 11- 11-11, from http://www.businessweek.com/lifestyle/content/healthday/643233.html

Pruss, A., D. Kay, L. Fewtrell and J. Bartram (2002) 'Estimating the Burden of Disease from Water, Sanitation and Hygiene', *Environmental Health Perspectives* 110.(5): 537-42

Rheingans, R., R. Dreibelbis and M.C. Freeman (2006) 'Beyond the Millennium Development Goals: Public Health Challenges in Water and Sanitation', *Global Public Health* 1.1: 31-48

Rogers, D., and , Randolph, S.(2003). Studying the global distribution of infectious diseases using GIS and Remote sensing. *Nature reviews mocribiology*1, 231-237

Root GPM(2001). Sanitation, community environment and childhood diarrhea in rural Zimbabwe. *J Health Popul Nutr*, 2001; 19(2): 73-8

.

Rosamund M. Akuse,Edwin E. Eseigbe, Abubakar Ahmed, and William R. Brieger(2010*) Patent Medicine Sellers: How Can They Help Control Childhood Malaria?* Retrieved from OARE on 08/28/ 2010.

Ross,Z, (2003). Mapping Disease: Deciphering Geographic Patterns From Cholera to Breast Cancer. *The ribbon,* Volume 8 • Number 1.1-16

Rothenberg, P.B and VargaP E (1981) The relationship between age of mother and child health. *American journal of public health* 71(8):810-7

Rutstein,S.O (2008) Further Evidence of the Effects of Preceding Birth Intervals on Neonatal, Infant, and Under-Five-Years Mortality and Nutritional Status in Developing Countries: Evidence from the Demographic and Health Surveys. *Demographic Health survey working paper, no. 41*

Rytkonen, M.(2004) "not all maps are equal: GIS and spatial analysis in epidemiology". *International journal of circumpolar health* 63:1,11

Schultz(1984) Social interactions and contemporary fertilitytransitions," *Population and Development Review* 22 (4): 639-682.

Shabir A. Madhi and Keith P. Klugman(2005) Acute Respiratory Infections, www.ncbi.nlm.nih.gov/books/NBK2283

Shiravama,Y., Phompida,S., and Shibuva,K (2009). GIS maps and malaria control monitoring: intervention coverage and health outcome in distal villages of Khammouane province, Laos. *Malaria journal.* Retrieved from www.malariajournal.com/content/8/1/217.

Shriver,E, K. (2009)) Breastfeeding.National institute for child health and human development. Retreived from http://www.nichd.nih.gov/health/topics/breastfeeding.cfm on 23rd Jan 2011.

Silva, P. (2005) Environmental Factors and Children's Malnutrition in Ethiopia, *Working Paper 3498, World Bank Policy Research,* Washington DC: World Bank

Srivastava, A. (2009) Malaria management in India using GIS. doi: http www.sciencecentric.com

Strohschein, L (2006)). Long-term Poverty Affects Mental Health Of Children. *ScienceDaily.* Retrieved May 23, 2011, from http://www.sciencedaily.com /releases/2006/02/060206171449.htm

Sychareun, V; Phengsavanh, A; Hansana, V; somphet, V;and Menorah, S. (2009). Cultural beliefs and traditional rituals about child birth practices in Lao PDR. Kuala Lumpur, Malaysia The Asian-Pacific Resource & Research Centre for Women (ARROW).

The Research advisors (2006). www.research-advisor.com/tools/samplesize.htm.

Thomas, S (2004) Using Geographic Information Systems to Define Healthcare Access in an Urban Community Health Center Network Bureau of Primary Care website, http://bhpr.hrsa.gov/shortage/muaguide.htm, accessed 4/30/10

Ukwaja, K.N, and O A Olufemi (2010) *Home management of acute respiratory infections in a Nigerian district* African Journal of Respiratory Medicine sept 2010 www.africanjournalofrespiratorymedicine.com

Ukwaja, K.N, Aina,O.B, and Talabi, A.A(2011) Clinical overlap between malaria and pneumonia: can malaria rapid diagnostic test play a role? *J Infect Dev Ctries* 2011; 5(3):199-203

Ukegbu, A U, Ukegbu, P O Onyeonoro, U U and Ubajaka, C F(2011) Determinants of breastfeeding patterns among mothers in Anambra State, Nigeria *South African Journal of Child Health,* Vol 5, No 4 :1-15

UNDP (2009). Achieving Growth with Equity *Human Development Report Nigeria 2008 – 2009* (Abuja: United Nations Development Programme).

United Nations Children's Fund (2006) 'Progress for Children: A Report Card on Water and Sanitation Number 5', www.unicef.org/progressforchildren/2006n5/index.html (accessed 2 July 2008)

United Nations Children's Fund & World Health Organisation (2006) *Pneumonia: The forgotten killer of children*. www.who.org

United Nations Children's Fund World Health Organisation (2009) Diarrhoea : Why children are still dying and what can be done. www.unicef.org/health/index-51412.html. downloaded on 2nd february, 2011.

United Nations Children's Fund (2009) The state of the worlds children 2009.www.unicef.org

UNICEF, (2010), *Safe water saves children's lives,* UNICEF media center, Nigeria. http://www.unicef.org/nigeria/media_4122.html . Retrieved 04 08 2010.

United Nations Children's Fund (2010). Immunisation. Retrieved on 25 07 2010, from www.UNICEF.com

Victora, C.G.,(1987) 'Evidence for the Protection of Breastfeeding Against Infant Deaths from Infectious Diseases in Brazil', The Lancet, vol. 2, no. 8554,1987, pp. 319-322.

World Health Organization (2003): Immunization, vaccines and biologicals. http://www.who.int/immunization/en/

World Health Organisation (2006) Country Health System Fact Sheet 2006 Nigeria. www.who.org

World Health Organisation (2008), Millenium development goals. www.who.org

World Health Organisation (2010) State of the world's children, 2010. www.who.org

World Health Organisation & United Nations Children's Fund, (2010) Nigeria malaria report. www.who.org

Woldermicael G, (2001). Diarrhoeal morbidity among young children in Eritrea: environmental and socioeconomic determinants. *J Health Popul Nutr 19:* 83–90.

World Bank (2006) Nigeria Poverty Assessment, Washington DC: The World Bank Group, Africa Region Human Development III.

Yazoume Y, Eliya Z, Maurice M, Benedict O, Jacques E and Catherine K(2009) Seasonal Pattern of Pneumonia Mortality among Under-Five Children in Nairobi's Informal Settlements http://www.ajtmh.org/content/81/5/770.

Zar H J (2006) Respiratory disease burden in children in the western cape of south Africa, school of child and adolescent health, capetown.

APPENDIX I

QUESTIONNAIRE ON MAIN CHILDHOOD DISEASES, KADUNA STATE

DEPARTMENT OF GEOGRAPHY, AHMADU BELLO UNIVERSITY, ZARIA

Dear respondent,

The purpose of this questionnaire is to obtain information that affect child health in Kaduna State. Your answers will be confidential and strictly for academic use. I sincerely request your cooperation in completing this questionnaire. Please tick the appropriate option.

QC ☐

Location code ☐

SECTION A: DEMOGRAPHIC AND SOCIOECONOMIC INFORMATION

1. What is your age? .....

2. What is your ethnic group?

   a. Hausa/Fulani ( ) b. Igbo ( ) c.Yoruba ( ) d.Northern minority ( )

   e. Southern minority ( ) f. Others (specify).....

3. What is your religion?

   a. Islam ( ) b.christianity ( ) c.Traditional ( ) d.Pagan ( ) e.Others (specify).....

4. Place of residence (a) Urban( ) (b) Rural ( )

5. What is your highest educational qualification?

   a. None( ) b. Quranic( ) c. Primary( ) d. Secondary( ) e. Tertiary( ) e. Others(specify).....

6. Are you gainfully employed? A. Yes( ) b. No( )

7. Type of occupation

   a. Farming( ) b. Civil/public servant( ) c.Business professional/ trading( ) d. Student( ) e. full time house wife( ) f. Industrial operative/ casual worker g.others(specify).....

8. What is your monthly income? (a) <5000( ) b. 5001-10000( ) c. 10001-15000( ) d. 15001-20000( ) e. >20000( )

9. What is your marital status?

a. Never married( ) b.Married( ) c.Divorce( ) d.Separated( ) e. Widow( )

10. Type of marital union

a. monogamy( ) b.polygamy( ) c. Others(specify).....

11. What is your husband's ethnic group?

a. Hausa/Fulani ( ) b. Igbo ( ) c.Yoruba ( ) d.Northern minority ( )

e. Southern minority ( ) f. Others (specify).....

12. What is your husband's religion?

a. Islam ( ) b.Christianity ( ) c.Traditional ( ) d.Pagan ( ) e.Others (specify)...

13. What is your husband's highest qualification?

a. None( ) b. Quaranic( ) c. Primary( ) d. Secondary( ) e. Tertiary( )
e. Others(specify).....

14. Is your husband employed?

a. Yes ( ) b. No ( )

15. What is your husband's occupation?

a. farming( ) b. Civil/public servant( )c. Business professional( ) d.student( ) e.full time house wife( ) f. Petty trading( ) g. Industrial operative/ casual worker h.others(specify).....

16. Income of husband? ? (a) <5000( ) b. 5001-10000( ) c. 10001-15000( ) d. 15001-20000( ) e. >20000( )

17. Children ever born.....

18. Number of children surviving.....

19. Do you intend to have more children? a. Yes ( ) b. No ( )

20. If yes, why? A. need a male child ( ) b. Need a female child ( ) c. For social prestige ( ) d. Need more hands in farm work ( ) e. Others (specify).....

21. Have you lost any child/children? a. Yes ( ) b. No ( )

22. If yes, what was the cause of death?

    a. diarrhoea( ) b. Malaria ( ) c. Accident( ) d. Pneumonia( ) e.Vaccine preventable diseases( ) f. Others (specify).....

23. What is your preferred number of children?.....

SECTION B: INFORMATION ON THE HEALTH OF THE CHILD

24. How many of your children are between ages 0-5 years? A. none ( ) b.1-2( ) c.3-4( ) d. 4-5( )

25. What is the sex of the children? a.male ..... b.female.....

26. Did you attend antenatal clinics during the pregnancy of your last child? a. yes( ) b.no( )

27. Where did you have your last birth? a. hospital ( ) b. House ( ) c. Spiritual home( )

    d. Others (specify).....

28. Has the child been sick over the last 12 months? a. yes( ) b. no( )

29. If yes, what was the cause of the sickness? a. malaria( ) b. pneumonia( ) c.diarrhoea( ) preventable diseases( ) e. Others (specify).....

30. Where did you go for treatment? a. teaching/specialist hospital( ) b. General hospital( ) c.primary hospital( ) d. Clinic/dispensary( ) e. Chemist/pharmacy( ) f. Herbal( ) g.spiritualhome( ) h.None of the above( ) i. Others(specify).....

31. What is the age of the preceding child? .....

32. Is the child breast fed? a. yes( ) b. no( )

33. Did you practice exclusive breastfeeding? a. yes( ) b.no( )

34. If no, why? a. It is culturally wrong( ) b. It is not convenient( ) c. Others(specify).....

35. How many times does the child eat daily? a.1 ( ) b. 2( ) c.3 ( ) d.4 ( ) e.Others(specify).....

36. How often does your child eat meat, fish, vegetables and fruits a. daily( ) b. Weekly( ) c. Monthly( ) d. Occasionally( )

SECTION C: INFORMATION ON THE LIVING CONDITIONS OF THE RESPONDENT

37. What type of accommodation do you live in? A. one/two room apartment( ) b. Compound house( ) c. Two/three bedroom flat d. Duplex( ) e. Hostel( ) f. Others(specify).....

38. Ownership of accommodation a. self owned( ) b. Official( ) c. Family house( ) d. Rented( ) e. Squatting( ) f. Others(specify).....

39. How many people reside in each room? .....

40. What is your source of drinking water? a. pipeborne( ) b. Tanker/water vendor( ) c. well( )d. Bore hole( ) e. Rain water( ) f. River/stream( ) g.others(specify).....

41. How is sewage disposed of from the house? a. water closet ( ) b. Pit latrine( ) c.bucket/pan( ) d.public toilet( ) e. Bush/field( ) f. Others(specify).....

42. What is the surrounding of the house like? a. long grasses ( ) b.short (weeded grasses)( ) c.trees( ) d. Water logged( ) e. Others(specify).....

43. Do the children sleep under mosquito nets? a.yes( ) b. No( )

44. If no, why? a. it is not convenient( ) b.it is not available( ) c. Don't see the need( ) d. Others(specify).....

45. How often do you wash your hands? a. before feeeding( ) b. After feeding( ) c.After using the toilet( ) d. All of the above( ) e.none of the above( )

46. Have your children been vaccinated against childhood diseases? a. yes( ) b.no( )

47. If no, why? a. not available( ) b. Don't know about the programme( ) c. Religious/cultural reasons( ) d. No reason( ) e. Others(specify).....

48. What is your source of energy for cooking meals? a. cow dung( ) b. Fire wood( ) c. Kerosine stove( ) d. Gas cooker( ) e. Electricity( ) f. Others(specify).....

APPENDIX II

QUESTIONNIARE ON MAIN CHILDHOOD DISEASES, KADUNA STATE

DEPARTMENT OF GEOGRAPHY, AHMADU BELLO UNIVERSITY, ZARIA

Dear respondent,

The purpose of this questionnaire is to obtain information that affect child health in Kaduna State. Your answers will be confidential and strictly for academic use. I sincerely request your cooperation in completing this questionnaire. Please tick the appropriate option.

SECTION A: CHARACTERISTICS OF HEALTH PERSONNEL

1. What is your age?
   a. Below 20years ( )
   b. 20-29 years ( )
   c. 30-39years ( )
   d. 40-49years ( )
   e. 50-59years ( )
   f. 60 and above ( )

2. Position in the hospital
   a. Doctor(surgeon) ( )
   b. paediatrician ( )
   c. Matron ( )
   d. Midwife ( )
   e. Nurse ( )

3. Years of experience
   a. below 2 years ( )
   b. 3-7 years ( )
   c. 8-15 years ( )
   d. 16- 25 years ( )
   e. 26 and above ( )

SECTION B (CHILD HEALTH)

4. Children of what age are more vulnerable to sickness.....

5. What is the most common disease ravaging children in this area?

   a. malaria( ) b. Diarrhoea( ) c. Pneumonia( ) d. Vaccine preventable diseases( )
   e.Others(specify).....

6. What are the causes of the disease (selected above)?.....

7. Are these children brought promptly to the hospital for treatment? A.yes( ) b.no( )

8. If no above, what is the excuse? A. financial challenges( ) b. Far distance( ) c. Earlier use of traditional medicine( ) d. Others(specify).....

9. Do these children receive adequate care when brought to the hospital. A. yes( ) b. No( )

10. If no, what are the reasons? A. inadequate staff( ) b. Inadequate medication( )
    c. Others(specify).....

11. What preventive measures have been put in place to ensure child health?

    a. vaccinations( ) b. Mother education( ) c.sensitisation and advocacy( )
    d. Others(specify).....

12. From experience, which children are more vulnerable to diseases(pls tick)

    a. from poor parents( )

    b. from uneducated mothers( )

    c. from very large households( )

    d. from homes with birth intervals less than 2 yrs( )

    e. from unhygienic homes( )

    f. others(specify).....

APPENDIX III

FOCUS GROUP DISCUSSION/ INDEPTH INTERVIEW GUIDE

Good morning, my name is Yetunde Arigbede. I am a student of Geography Department, Ahmadu Bello University, Zaria. The aim of this discussion is to obtain information for my research work, which is to map child diseases in Kaduna State. Your cooperation and contribution are highly coveted. Thank you.

A-Respondents

1. What do you think about the topic we have gathered here to discuss, which is the mapping of child diseases in Kaduna State? (*Seek to know each individuals' perception of child disease)*
2. What are the most common diseases that affect children (*probe to understand the reason for each individuals answer*).
3. How do you know your child is sick? (*take note of the most common symptoms mentioned*).
4. What do you do on the event of child sickness?(*seek to know the reasons for the responses)*
5. How do you know a child is suffering from Malaria fever?
6. Do your children sleep under mosquito nets? (*Seek to know the reasons why some don't use*)
7. What are the measures you exercise to prevent malaria fever in your children?

8. Can you recognise the symptoms of a child suffering from pneumonia?
9. What energy source do you use to cook?(*probe to know the locations of cooking*)
10. What knowledge of vaccinations do you have?
11. Have your children been vaccinated?
12. If no why(*probe to know reasons*)

B- Health practitioners

1. What in your opinion are the most dominant diseases among children?
2. Which children are more susceptible to diseases?(*channel answers with regards to hygiene and socioeconomic environment of the child*)
3. How are these diseases managed by the health practitioners?(*take note of medical loopholes*)
4. How receptive are mothers to efforts of sensitisation and advocacy?
5. What best advice do you have for mothers in preventing diseases in their children?