MANAGEMENT OF MALARIA IN CHILDREN UNDER FIVE AMONG NOMADIC FULANI PEOPLE OF ADAMAWA STATE, NORTHEASTERN NIGERIA.

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BEING A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, OF THE FEDERAL UNIVERSITY OF TECHNOLOGY, YOLA, NIGERIA IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF DOCTOR OF PHILOSOPHY (PhD) DEGREE IN APPLIED PARASITOLOGY AND ENTOMOLOGY.

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DECLARATION

I, CHESSED, Godly hereby declare that the research work presented in this thesis is original. It was carried by me under the supervision of Professor O. B. Akogun, in the Department of Biological Sciences, School of Pure and Applied Sciences, Federal University of Technology, Yola, Nigeria. References have been made to other research works and are duly acknowledged. No part of this thesis has been submitted elsewhere for a higher degree of this or any other University.

…….. ……

Signature Date

APPROVAL PAGE

This thesis entitled 'Management of malaria in children under-five among nomadic fulani of northeastern Nigeria', by CHESSED, Godly, meets the regulations governing the award of PhD degree in Applied Entomology and Parasitology, Federal University of Technology, Yola, Nigeria.

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DEDICATION

This work is dedicated to my parents, Rev. and Rev. (Mrs.) Chessed Danpullo; my siblings, Seth, Grace, Benjamin and Goodness.

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ABSTRACT

A study on management of malaria in under-five children among nomadic Fulani of northeastern Nigeria was carried out over a nine year period. Sample population came from 300 households with an under-five child, presumed sick with malaria. Focus group discussions, in-depth interviews, as well as pre-tested structured questionnaires were used in face-to-face interviews to elicit information on health-seeking behaviour from mothers of the under-five children. Blood samples for detection of malaria parasites were taken from the 300 under-five children and the result was crossed matched with mothers' presumptive diagnosis to test for reliability and sensitivity of presumptive diagnosis. Eating fresh corn (37.7%), eating fresh millet/inhaling pollen dust while walking by a millet farm (36.0%), mosquitoes (10.7%), eating fresh groundnut (6.7%), eating wild fruits during the rainy season (2.3%), inhaling smoke from roasting corn (1.7%), staying long under the hot sun (0.3%) and others (4.7%) (i.e. drinking unboiled, fresh cow's milk,) were cited as causes of malaria. Mothers use diarrhea and headache (36.6%), hot body and shivering (30.6%), coughing and crying (7.6%), vomiting and unable to play (2.3%) and joint pain, restlessness, persistent cries and moodiness (2.3%). There was no statistical significant difference between mothers age and symptoms used in diagnosing malaria in children under five to determine that their child had malaria. At onset of symptoms, 109(36.3%) of respondents did not take any action in relation to malaria. If symptoms continued after waiting on the child for between 2-3 days without resolving, 81(27.0%) of mothers resorted to self-treatment. 10% (n=30) of mothers said first line treatment would involve giving the child a cold bath. If symptoms persist, (7.3%) of mothers did not take action as second line of care. Eighty seven mothers (29%) said they would give herbal portions. Less value was put on the utilization of clinics and hospitals

as only a fraction of the 22.7% of mothers gave an indication of their willingness to visit these healthcare facilities. Seventy seven (25.7%) of respondents preferred to consult with a herbalist or traditional healer. Thirty two (10.7%) mothers preferred to seek the advice of the child's father before taking any action, while 4.7% of mothers sought the advice of a neighbour with whom she normally confides in. There was no significant difference between care-seeking (Second line of action) to malaria in under-five children and mothers age-group. Poverty emerged as the most significant determinant of health-seeking behaviour and individuals from poor households, relatively, were nearly two times more likely to practice self-care. There was no link between *diunuqo* (severe malaria) and malaria, and the nomadic Fulani encountered in this study treat the two forms differently. Thick blood smear showed 94% malaria infection. There was a high correlation between reliability of mother's presumptive diagnosis and parasitological technique. This study uncovered marked deficiencies in the level of awareness and practices regarding malaria-related illness among nomadic Fulani. This limited awareness and incomplete approach to malaria treatment can lead to serious complications. Concerted effort is needed to improve the knowledge of the population group about the link between malaria and mosquitoes. Effective antimalarial drugs should also be available where the problem of malaria is rampant.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Introduction

Malaria is the most important parasitic disease in the tropics and remains of highest public health importance (Okeke and Okafor, 2008). About 90% of all malaria deaths in the world today occur in Africa, south of the Sahara (WHO, 2002). An estimated one million people in Africa die from malaria each year and most of these are children under five years old. (WHO, 1999; WHO, 2000; WHO, 2002; Okeke and Okafor, 2008) Malaria had been eliminated or effectively controlled in many parts of the world (WHO, 2008). An eradication program initiated in the 1950s using the insecticide dichlorodiphenyltrichloroethane (DDT) was successful, but by the 1970s cases were already increasing worldwide. Malaria has reappeared in formerly malaria-free areas as a result of the decline in public health systems, malaria epidemics, and imported cases. (Brieger, 2002; Muller, *et al., 2003*). The reason for the resurgence of malaria is the parasite's increasing resistance to chloroquine, the most common drug used for treating the disease. Another reason is the discontinual use of the insecticide DDT due to the fact that it causes cancer (Muller, *et al*., 2003).

Most people survive malaria after an illness of 10-20 days and mortality due to malaria is estimated to be over 1 million deaths each year. The vast majority of deaths occur among poor children in Africa, especially in remote rural areas with poor access to health services (WHO, 1998, WHO, 2002). The WHO (1996) estimates that about 25% of childhood deaths in Africa and half of fever episodes among African children under five years in endemic areas are attributed to malaria. Malaria causes death of approximately

750,000 children under five (the equivalent of almost 3,000 children), and accounts for 10% of the total disease burden measured in disability adjusted life years (Goodman and Mills, 1999). Malaria is also the sixth leading cause of disability among children under five years in the developing world (WHO,2008). Pregnant women are also at high risk; there is a fourfold increase in risk of disease and a twofold increase in death rates. Pregnant mothers who have malaria and are HIV-positive are more likely to transmit the virus to their unborn child (WHO, 1998a).

Malaria has continued to present a considerable risk to most households in Nigeria and is often stated as one of the top ten health problems. Malaria transmission in Nigeria is holoendemic and more than 90% of the population live in areas with stable malaria. It is one of the leading causes of mortality and morbidity among the population, especially among children under five. It is responsible for 25% and 30% of infant mortality and childhood mortality, respectively. It is estimated that malaria accounts for 50% of outpatient consultations and 15% to 31.3% of hospital admissions in Nigeria and for 23% deaths among under-five children years (FMOH, 2005; Okeke and Okafor, 2008). Most of these deaths result from severe and complicated malaria especially in rural areas (Salako, 1994). It is estimated that 92% of childhood deaths occur at home (Greenwood, *et al*,. 1987).

The adverse effects of malaria have put pressure on resources in the provision of medical services and on household income, which for a majority of people in Nigeria is already limited. Over a quarter of a very poor family's income can be absorbed in the cost of malaria treatment. Added to these are the costs of prevention and opportunity cost of labor lost to illness (Afolabi, 2004). It is estimated that malaria reduces the Gross

Domestic Product (GDP) of the Nigerian national income by 1.3% per annum and is projected to reduce economic growth in the year 2000-2001 by nearly 30% (FMOH, 2005).

Despite efforts to combat malaria, the disease has continued to be one of the main killers in Nigeria. Providing effective treatment is no longer enough because malaria parasites are becoming increasingly resistant to drugs.

Consequently, the Ministry of Health has adopted plans to prevent malaria.

It is estimated that 92% of the childhood deaths occur at home (Greenwood, *et al*,.1987), mothers and other care takers are therefore of foremost importance in recognizing mild or severe malaria disease and seeking treatment for their wards. Mothers are often the first to notice if their child is sick, symptomatically diagnose and provide treatment to the child. Accurate and rapid diagnosis of malaria is important not only to guide treatment but also to avoid unnecessary treatment that may foster drug resistance and waste health resources.

Nomadic Fulani constitute the extreme part of the adversely situated populations as a result of their peculiar behavioral patterns such as dispersion, low average population density and mobility, which collectively create specific problems regarding health, social services and education. It is a matter of serious concern to all those seeking the advancement of humanity that in parts of some developing countries people still fall sick and die of diseases, which are easily preventable. When compared to the urban populations, rural communities and nomadic Fulani's, in particular, are greatly underserved, especially in developing countries including Nigeria. The correct knowledge and in-depth information of the Fulani nomadic settlements will afford one

the impetus to plan and intervene using behavioral models to reduce the morbidity and mortality experiences. Very little research has been done in this area in the northeast region which has a large nomadic Fulani population. Thus, it was felt that this study would provide insight into the manner by which Fulani deal with malaria related illness to provide guidance for intervention in the control of malaria.

Community perceptions relating to causation, transmission, prevention and treatment are the main socio-cultural factors that can influence malaria control (Agyepong, 1992). The success of malaria control programmes at present rely heavily on community perceptions and practices in the transmission, treatment and control of the disease. Incorrect beliefs or inappropriate behaviour can interfere with the effectiveness of a control measure, such as vector control or chemotherapy. This is particularly important in tropical areas where malaria control options are limited because of the parasite and vector resistance to antimalaria drugs and insecticides, respectively (WHO, 2008). Studies done on community knowledge and perception on malaria are scarce in Adamawa State. Therefore, the present study was undertaken to assess the knowledge, attitudes and perception of the nomadic Fulani on malaria. The information generated in the current study would help in designing and evaluating malaria control strategies. This study will help in exposing any gap in community education on common diseases in the study area among the rural poor.

1.2 Justification

The behavioral pattern of nomads, coupled with their unique settlement, which is usually sporadic and at the fringes of settler populations has necessitated the construction of

temporary dwelling structures as homestead. Their seasonal migration, oftentimes at short notice, makes them inaccessible to most government services like healthcare and education over the years, contributing to their being disenfranchised. They don't easily trust outsiders and find it difficult to accept or believe in orthodox medicine.

The cohort of under-five children was chosen because of their vulnerability to malaria. Additionally, this group cannot communicate easily and can only show signs and symptoms and are very fragile and die easily from complications. Neither do they have vaccination or prenatal attainment.

1.3 Significance of study

Improving child survival require investment in approaches that empower the rural poor, giving them the tools to recognize the signs and symptoms of malaria and to take prompt and appropriate action, thereby preventing death. Presumptive treatment of malaria has remained the one affordable option for ensuring prompt and effective treatment at community level. This study was done with the intention of developing a strategy to increase access to effective antimalarial treatment close to the home, thereby addressing the failure of the formal health system to deliver effective treatment promptly to those in need. The study could also add to the current knowledge on the management of malaria in under-five children among the nomadic Fulani.

1.4 Aims and objectives of research:

The broad aim of this study is to ascertain the current perceptions of cause and treatment seeking practices of caretakers of children under five among nomadic Fulani in order to identify probable areas of intervention for effective control of malaria.

The specific objectives of the study are:

a. To assess nomadic Fulani attitudes, and perception of malaria infection.

b. To describe signs that nomadic Fulani mothers use in the diagnosis of malaria in under-five children in relation to mothers' age and number of childbirths .

c. To describe care seeking behavior pattern of the nomadic Fulani towards malaria infection

d. To identify factors that influence treatment option of nomadic Fulani in relation to malaria.

e. To compare reliability of mothers presumptive and parasitological diagnosis of malaria in under-five children of nomadic Fulani

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Epidemiology of malaria

Malaria is a unique disease because its roots lie deep within human communities (Heggenbougen, *et al.,* 2003). Malaria is a disease of poverty, since the majority of cases abound among the world's poor (Bell, *et al,.* 2006). It is a major cause of poverty and poverty exacerbates the malaria situation (UNICEF, 2000). When a substantial proportion of a country's population is ill with malaria yearly, sustained economic development is very difficult to achieve. Countries thus compromised cannot easily become trading partners nor are they in the position to decrease their dependence on foreign aid (WHO, 1999). So too is the economic loss, which in Africa alone is estimated at more than $2 billion annually (WHO, 2000). Malaria has slowed economic growth in African countries by 1.3% per year, the compounded effects of which are a gross domestic product level now up to 32% lower than it would have been had malaria been eradicated from Africa in 1960. Malaria is a threat to more than 40% of the world's population, and out of the more than 300 million acute cases each year between 1.1 and 2.7 million people die annually (WHO, 2000). The vast majority of malaria cases (90%) are in sub-Saharan African, where malaria constitutes 10% of the total disease burden. Children under five and pregnant women are most at risk, with *Plasmodium falciparum* being the main cause of severe clinical malaria and death (WHO, 2002). Although effective preventive measures and drugs exist for malaria, transmission and mortality are high in tropical and subtropical countries with inadequate resources and poor health infrastructure (WHO, 2002).

Malaria constitutes nearly 25% of all childhood mortality in Africa (WHO, 2000). Malaria's cost to human and social well-being is enormous. Because of the seriousness of the problem, the World Health Organization (WHO), in consonance with United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP), and the World Bank (WB) have joined forces in worldwide malaria control efforts, with the aim of reducing malaria mortality by 50% by the year 2010 (World Bank, 2001).

Early work on malaria focused on vector control and chemoprophylaxis and was done without reference to the behavior and belief systems of the affected populations. Too often, behavioral involvement in research came as an afterthought. It is a well known fact that neglect of socio-cultural factors contributed significantly to the failure of earlier malaria control efforts. Inadequate investments in communities meant that they could not hold on to preventive programmes, and governments felt they lacked the resources to continue providing the means for vector control. However, the challenge for any malaria control strategy is the effective development, implementation and sustaining of appropriate interventions and only in retrospect has it become clear that failure of malaria eradication was in large part a failure to look at the social and organizational levels. This can be achieved only through a cross-disciplinary approach; integral to which is a socio-behavioral dimension and social science perspective (Dunn, 1979; Wessin, 1986; Brabin, 1990).

A different approach to the malaria control effort was taken in the 1970s, with the malaria scourge being tackled through socio-cultural and behavioral research (Jones and Williams, 2004). Inhorn and Brown (1997) classified this period as the boom time for research, with more anthropological work than ever before on infectious diseases,

because of the growing recognition of the importance of the discipline in the conduct of health research. The early 1990s saw an increase in the number of malaria studies that focused on local terms, perceptions of disease causation, treatment-seeking behavior, prescriber behavior, and preventive measures such as the use of bed nets (Agyepong, 1992; Mwenesi, 1993; Aikins, *et al,.* 1994; Gyapong, 1996; Binka and Adongo, 1997; Haussman-Muela, *et a.,*. 1998).

Studies have shown that most malaria episodes are first treated at home using shop-bought drugs (Foster, 1991; Agyepong, 1992; Snow, *et al.,* 1992; Mwenesi, 1995). Part of the reason for this is poor access to, and the perceived poor performance of the formal health services (Foster, 1995; McCombie, 1996). These treatments are usually incorrect or suboptimal (Agyepong, 1992; Slutsker *e*t *al*, 1994). Since the majority of the children who die from malaria do so within 48 hours of onset of illness, the early use of effective anti-malaria medicines close to the home can help to reduce the burden of the disease in sub-Saharan Africa and minimize the life-threatening consequences of treatment delays (WHO, 2005b).

Improving child survival required investment in approaches that empower the rural poor, giving them the tools to recognize the signs and symptoms of malaria and to take prompt and appropriate action, thereby preventing death. Presumptive treatment of malaria has remained the one affordable option for ensuring prompt and effective treatment at community level (WHO, 2007).

The discovery of the malaria parasite by Laveran in 1880 marked a milestone in the history of medicine, destroying the belief in the role of "telluric" or "mias-matic" factors and establishing the causal link of the parasite to disease (Bruce-Chwatt, 1988). Ross in

India and Grassi in Italy independently described the life cycle of the malaria parasite in birds and humans (Ernesto, 2005).

Anopheline mosquitoes typically breed in stagnant, unpolluted surface waters. Eggs are laid on the water surface among floating vegetation. The larvae float horizontally just under the water surface, breathing air and feeding on small suspended particles. Typically, breeding sites for different species include forest pools, irrigated fields, lakes, and temporary rainwater puddles (Bruce-Chwatt, 1988). Anopheline mosquitoes are mainly associated with rural settings. However, there are a few exceptions where malaria vectors have adapted to city life: on the Indian subcontinent and, to a lesser extent, in some cities in the Middle East and Brazil (Lines, 1994). In India, malaria transmission in towns is often as intense as it is in the surrounding countryside because the local vector, *Anopheles stephensi*, has adapted to breeding in containers, particularly in overhead tanks (Deobhankar and Palkar, 1990). There are similar situations in Africa, but the main reason malaria transmission penetrates to urban centers in Africa is that the local vectors, *Anopheles gambiae* and *Anopheles arabiensis*, are extremely efficient. It is estimated that a single female *Anopheles gambiae* in every six houses is sufficient to maintain transmission in an entire community (Lines, 1994).

There are 120 *Plasmodium species*, of which four are of consequence to humans: *P. falciparum, P. vivax, P. malariae* and *P. ovale*. While there are considerable differences between the species in their pathogenecity and epidemiology, as well as subtle but important differences in appearance, development, and host-parasite relationships, all four species share a common basic life cycle (WHO, 1994). It is *P. falciparum*, however, that causes nearly all of the mortality in cases of malaria infection. Natural transmission

is dependent on a complex interaction between host, vector, parasite, and environment.

Malaria is an infectious disease caused by a one-celled parasite known as *Plasmodium*. The parasite is transmitted to humans by the bite of the female *Anopheles* mosquito (Figure 1). The *Plasmodium* parasite spends its life cycle partly in humans and partly in mosquitoes. Mosquito infected with the malaria parasite bites human (A), passing cells called sporozoites into the bloodstream. Sporozoites travel to the liver (B). Each sporozoite undergoes asexual reproduction, in which its nucleus splits to form two new cells, called merozoites. Merozoites (C) enter the bloodstream and infect red blood cells.

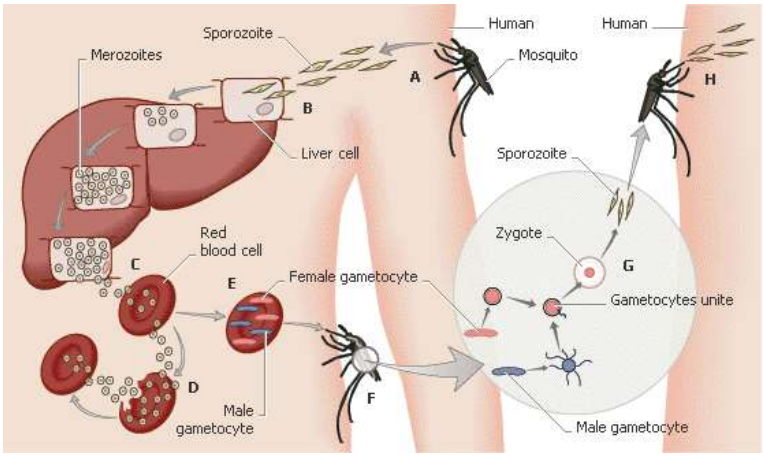


Fig. 2.1: Life cycle of malaria parasite.

(Centers for Disease Control, Atlanta, Georgia, USA)

Key:

A: Human host B: Sporozoites

C: Merozoites D: Red blood cells

E: Gametocytes F: Infected human

G: Mosquito stomach H: Initiation of cycle

In red blood cells (D), merozoites grow and divide to produce more merozoites, eventually causing the red blood cells to rupture. Some of the newly released merozoites go on to infect other red blood cells. Some merozoites develop into sex cells (E) known as male and female gametocytes. Another mosquito bites the infected human (F), ingesting the gametocytes. In the mosquito's stomach (G), the gametocytes mature. Male and female gametocytes undergo sexual reproduction, uniting to form a zygote. The zygote multiplies to form sporozoites, which travel to the mosquito's salivary glands. If this mosquito bites another human, the cycle begins again (H).

The first clinical attack of intense rigor and sweating with high fever develops when a large number of red cells are infected and burst. As they continue to flood into the blood stream, the resulting merozoites attach to the surface of other red blood cells and create a continuous cycle of replication. In the case of *P. vivax* and *P. ovale*, dormant forms known as hypnozoites develop in the liver cells, remaining viable for up to 50 years (Krotoski, 1982). The actual time required for the replication in the mosquito depends upon the species of parasite and on ambient temperature. With an average life span for

most anophelines of less than one week, ambient temperature is critical to transmission.

The timing of the relapse of *vivax* in different climates is variable and relates to the seasonality of *Anopheles* breeding. A powerful variable in malaria transmission for anophelines is longevity (Targett, 1991).

For control efforts to be successful, the distinction between disease and infection needs to be understood. Infection with malaria does not necessarily result in disease. In highly endemic areas, childhood prevalence of infection exceeds 50%, but few will have acute

symptoms (Institute of Medicine, 1996). The density of infection at which symptoms appear is also greater in early life and becomes lower with age because of rising levels of immunity (Smith, 1994).

The clinical manifestations of malaria are varied, from episodic shaking chills to intense fevers to drenching sweats. Where malaria is common, infected individuals may have symptoms (often associated with flu, involving fevers, and sometimes periodic) that mimic other diseases, which makes diagnosis difficult. The fact that malaria does not have a distinctive symptomatology means that it is ethnomedically subdivided by a number of different disease labels. This was the case in early biomedicine, where the periodicity of the fever spikes was used to distinguish what we know as infection by different plasmodium species (WHO, 1987).

2.2 Case fatality and social epidemiological distribution of severe malaria

Most clinical episodes of malaria include febrile illness with non-specific symptoms. There are marked differences in the spectrum of severe disease in young African children, who may present with symptoms that range from listlessness to pyrexia, abdominal cramping, and difficulty in breathing, mental disorientation, or convulsions. Anemia is common, and coma also occurs. Certain features important in adults appear to be rather rare in children, including pulmonary edema, hepatic failure, and acute renal failure. Other complications, such as hypoglycemia, assume greater importance in children. *P. falciparum* causes a variety of pathophysiological and potentially lethal conditions in children that include severe malarial anemia and fits, prostration, and hyperparasitaemia. Additional complications include splenomegaly, and renal and pulmonary pathology. A wide range of serious neurological sequelae has been reported.

About 80% of deaths in adults are due to cerebral malaria (Institute of Medicine, 1996). Malarial anaemia is an important contributor to *P. falciparum*-associated morbidity and mortality. Malaria during pregnancy can cause miscarriages, fetal death, intrauterine growth retardation, low birth weight, and premature delivery. Women pregnant for the first time are at particular risk for severe anaemia and sometimes death.

During late pregnancy, resistance to malaria decreases, resulting in severe infection. Recrudescence and relapses of malaria during the second trimester is common because of immunosuppression associated with pregnancy. People continuously exposed to malaria in endemic areas develop a degree of immunity that needs to be maintained with constant exposure. This acquired immunity is what differentiates endemic and epidemic malaria and why temporary interruption in malaria transmission in highly endemic areas might cause more harm than good in the long run. Asymptomatic persons may be more responsible than those with symptoms for infecting mosquitoes (Strickland, 1992) Furthermore, latent malaria may become symptomatic. Even after repeated infection, complete immunity seldom occurs. A partial immunity develops that is species- and strain-specific, yet there seems to be no cross-immunity between species.

2.3 World wide distribution of malaria

Studies on *P. falciparum* in highly endemic regions show enormous genetic diversity and complexity, which is manifested through variations in allelic frequencies, as well as in actual genotypic variations in parasite populations. The force of transmission of malarial infection requires the interaction of four epidemiologic factors: the human host; the malarial parasite; the Anopheles vector; and the physical, biological and socioeconomic environment. The level of transmission or the "force of infection" is

determined by: 1) the prevalence of infection in man (reservoir); 2) characteristics of the local vector mosquitoes, including their density, feeding, and resting behavior, susceptibility to infection, and their effectiveness as a vector; 3) the presence of a susceptible human population; and 4) local climatic conditions that affect vector breeding (Strickland, 1992). The force of infection depends on vector competence, which is a linear factor; abundance; temperature, which is an exponential factor; and narrowness of the host range, which is a squared factor. The annual fluctuations and sequence of malaria transmission in different areas are in turn dependent on seasonal variations of temperature, rainfall, and humidity. Due to the local variability of the vector and the intensity of transmission, there is a need for "micro ecologically germane" interventions to control malaria. Not all regions where malaria is present are the same (Institute of Medicine, 1996).

The habits and longevity of the vector mosquitoes largely determine the degree of endemicity of malaria. Endemic malaria may be highly stable, with low epidemic potential because of transmissions by mosquitoes that feed on humans by choice, have a long life (four to six weeks), and inhabit warm and humid climates. Endemic malaria, however, may also be less stable and punctuated by occasional brief epidemics because of transmission by mosquitoes that are as likely to feed on animals as on people or with higher chances of mortality and thus require large numbers to maintain transmission. The degree of immunity acquired by a population is generally proportional to the degree of transmission and consequently may vary widely within a country and even within districts. For example, immunity may be lower in the plains areas of India than it is in the hilly, forested areas, where more efficient vectors thrive (Clyde, 1987). Physical,

biological, and social environments play an essential part in the epidemiology of malaria. For the larval and adult stages Anopheles, the physical environment depends on favorable climatic temperatures, humidity, rainfall, and/or the presence of standing or gently flowing water. Biologically, plants accumulating small collections of water may support Anopheles breeding while domestic animals may be beneficial by diverting mosquitoes from feeding on people. Socially, factors encouraging the transmission of malaria include close proximity of houses to mosquito breeding sites, types of house construction that facilitate mosquito entry, failure to remove peri-domestic collections of fresh water, and various activities and occupations that increase exposure to adult mosquitoes or promote mosquito breeding. Agricultural development, irrigation, availability of drugs, pesticides, knowledge of and attitudes toward the disease, migration, and nocturnal labor all play a part in the local epidemiology of the disease. Research shows that the parasite is a fragile organism that has completely adapted to a parasitic life cycle. Malaria continues to exist only if the transmission cycle is uninterrupted. If any link in this chain were removed, the disease would disappear (Fantini, 1994). Transmission of the disease and the intensity of malaria vary from season to season and from year to year. Differences in the malaria parasite and the mosquito vector and human populations as well as in climate and physical environment create a variety of malaria situations (WHO, 1997).

2.4 Malaria in Children

Malaria accounts for one in five of all childhood deaths in Africa. Anemia, low birth weight, epilepsy, and neurological sequelae, all frequent consequences of malaria, compromise the health and development of millions of children throughout the tropics (Snow, *et al.*, 1999). 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 less than 5 years infected with *P. falciparum*. 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 (Snow, *et al.*, 1999). The profound consequence that one or more episodes of malaria may have on a child's subsequent health and development are often unrecognized or inadequately managed.

Malaria in pregnancy leads to low birth weight and premature delivery, both of which are associated with an increased risk of neonatal death and impaired cognitive development. Because specialist care for low birth weight babies is very limited in developing countries, low blood glucose (a common problem in low birth weight babies) if untreated, may cause brain damage. Approximately 7% of children who survive cerebral malaria are left with permanent neurological problems. These include weakness, plasticity, blindness, speech problems and epilepsy. The limited availability of specialized educational provision and equipment for such children means that opportunities for subsequent learning, and for attainment of independence, are compromised even further. Epilepsy may be inadequately treated, or untreated, due to lack of appropriate drugs and expertise, and further injury or death may result from uncontrolled convulsions (Holding, 1999). Malaria is one of the most important factors predisposing children to anemia. Antimalarial drug resistance exacerbates them by increasing the proportion of children who fail to adequately clear parasitaemia after treatment, and who consequently remain anemic. It has been estimated that severe malarial anemia causes between 190, 000 and 974,000 deaths each year among under five

children (Murphy and Brehman, 2001). African children have between 1.6 and 5.4 episodes of malarial fever each year (WHO, 2000). This figure varies according to geographical and epidemiological circumstances. Children are vulnerable to malaria from about 4 months of age, and in highly endemic areas during the peak transmission season, approximately 70% of one year old have malaria parasites in their blood. Fever reduces appetite, and exacerbates malnutrition. Recurrent episodes of malaria in the child, may likely result in the loss of a substantial amount of time from school (WHO, 2000).

2.5 Mobility and Malaria Transmission

Population movement plays an important role in malaria transmission (Prothero, 1977; Oaks, 1991). For example, movement from one type of ecological condition to another can result in new, or increased, exposure of non–immunes (Oaks, 1991). Movements also bring different groups into contact with one another and thus increase the likelihood of malaria transmission (Prothero, 1965; Oaks, 1991). Mobile populations are not usually reached by government malaria control programmes since these programmes treat human groups as stable entities and do not account for possible mobility (Oaks, 1991). Thus, mobile populations fall out of the loop of most public health efforts since temporary homes often cannot be identified and therefore do not receive services. Understanding the migratory pattern of mobile groups, including nomadic Fulani is important to the success of public health programmes aimed at malaria control (Martens and Hall, 2000).

Human movement can be divided into two categories: migration and circulation (Prothero, 1977). Migration involves change of residence and is usually a permanent event, while circulation refers to movement away from a place of residence, with eventual return. Circulation implies a temporary, often seasonal, movement. Circulation

may take place daily. Circulation may also be periodic, for a series of days or weeks; it may be seasonal, for a period of months; or it may be even more long-term. Whatever the length of absence from home base, circulation implies that there is a recognized residence to which the person or people eventually return to (Prothero, 1977; Oaks, 1991;). Occupations that by their very nature involve constant movement also put people at risk (Oaks, 1991).

Nomadic groups are, by definition, highly mobile. Since nomads often live in fringe areas or in forests, and since preserving their way of life from government regulation or control may sometimes depend on avoiding detection, any public health measure can be difficult to sustain in these groups without political will (Singhanetra-Renard, 1993). Nomadism has been treated as the negation of agriculture, as having classic and attenuated forms; as involving fully specialized herders, entirely devoted to the care of domesticated animals; and in the process they move dramatic distances (Barque, 1959). Moving livestock to seasonal grazing pasture areas is the central strategy regularly used by nomads in many parts of the world to convert crop residues, and grasses and herbs into human food. Therefore livestock husbandry and mobility are frequently associated, because the livestock must be fed regularly throughout the year. However, in some regions of the world where marked seasonality predominates, and where production harvest, and storage of fodder is not a viable option because of shortages of capital or labor, migration to exploit seasonal pastures represents the best strategy for maintaining a regular supply of food for livestock. Nomadism, therefore, is the mode of existence of human communities totally or partially dependent on the husbandry of one or more species of domesticated animals (Barque, 1959).

Nomadic and settled populations in rural Africa are exposed to the same kind of health problems but the frequency of disease occurrence and the availability of systemic surveillance data greatly differ (Sheik–Mohammed, 1999). Most land inhabited by nomads is semi-arid with considerable variation in annual rainfall pattern. During the rainy season when superficial water and vegetation are in good supply, nomads concentrate over small tracts of land while in the dry season they tend to disperse over large tract of land, concentrating around river valleys or lakes. Infectious diseases, including malaria have been identified as leading causes of infant mortality and child mortality (Sheik-Mohammed, 1999). This situation is exemplified among the Turkana nomads of East Africa who have a statistically significant higher infant mortality rate than the settlers. Also, 69% of all deaths among nomadic communities in northern Somalia were due to diarrhea, pneumonia, birth related problems and vaccine preventable diseases. The difference in mortality between nomads and settlers has been ascribed to lack of access to health service delivery among the nomads (Sheik-Mohammed, 1999). In Central and Northern Ethiopian highlands, Central and Northern regions of Somalia, where 70% of the population are nomads, malaria is almost absent or unstable except in years when there is substantial rainfall. This is because the area is not conducive to mosquito breeding. However, some nomadic regions, which are close to rivers, are hyperendemic for malaria. Serological studies among nomads have revealed a 36.8% and 45%-60% seropositive level for southern Somalia and Malian Gorman/Fulani nomads respectively for *P. falciparum* (Omar, 1992; Nathan, 1996 and Sheik-Mohammed, 1999).

Quite a number of studies have documented the epidemiology of malaria and migration. Duarte *et at.,* (2004) observed an overall malaria prevalence in an Amazonian migrant

population to have ranged from 0.3% to 5.4% and the malaria incidence rate was 4.49 per 100 person-months. Among individuals who had had malaria during his or her lifetime, 14.03% reported hospitalization (median duration = 3 days) and 70.1% reported days of work lost (median duration of 4 days for *P. falciparum* malaria and 3 days for *P. vivax* malaria) related to the last malaria episode. Barcus, *et al.,* (2003), found out that 89% (217) of Javanese migrants to Indonesian Papua were found to be infected with *P. falciparum* and/or *P. vivax*. The incidence of malarial infection in the children investigated (who were aged 6 – 10 years) was indistinguishable from that in the adults (aged >20 years), with 1.10 and 1.14 *P. falciparum* infections/person – years. During their first infections, the children had higher *P. falciparum* parasitaemias than the adults but similar *P. vivax* parasitaemias. In a similar study, Kitvatanachai, *et al.,* (2002) found out an overall prevalence rate for malaria among mobile Cambodians to be 2.4%, with 93.75% of the infections being due to *P. vivax* and 6.25% due to *P. falciparum.* Almost all cases had low level of parasitaemia and no sexual stages were found. Similarly, Rajagopalan, *et al.,* (1984), found out that population movement greatly contributes to the high prevalence of malaria among fishermen. In addition, a mass blood survey found 138 (3.38%) of 4073 individuals positive for malaria, 107 (15.74%) of 680 fever cases examined were positive for malaria (Rajagopalan, *et al.,* 1984). McGreevy, *et al.,* (1984), found that the number of malaria cases increased five fold over a four – year period and that the predominant malaria parasite changed from *P. vivax* to *P. falciparum*. Increased malaria followed increased immigration and colonization of the forest. A series of epidemiological studies suggested the linkage between malaria and immigration as the prevalence of malaria was 1.2% at the Fort, a stable community, 8 – 9% at Costa

Marques, a growing community, and 14 – 26% in the new settlements in the forest (McGreevy, *et al.,* 1984).

The basic fact from the afore-stated points is that nomadic health problems are due mainly to infectious diseases that are highly treatable and preventable. The lack or inadequate health services and the continued neglect of these communities by Government have worsened the situation. Studies have shown that nomadic groups have the least access to health care in Africa, and there have been no satisfactory strategies devised to deliver proper health care to them. This is quite disturbing despite the over 50 million nomads in developing countries with Africa, accounting for almost 60% of this figure. Effort at International level aimed at improving this dismal situation has proved difficult to co-ordinate, costly and mostly ineffective (Omar, 1992; Sheik–Mohammed, 1999). Surveillance data on the health status of nomads is virtually non-existent due to nomadic lifestyle of this population group. Information gathered so far is based mainly on small-scale studies providing only small part of the overall picture. It is a known fact that mobility is an important determinant of health the world over and nomads can be active transmitters of disease to the communities they move into. They in turn, can also be exposed to hazards when they come in contact with settled populations. This explains the reason why the last case of Smallpox occurred in Somalia as a result of continual movements of nomads and their reintroduction of the disease to settled population (Sheik–Mohammed, 1999).

2.6 Malaria Diagnosis

Since the first microscopic identification of a causative organism by Laveran in 1880, and subsequent species identification early in the last century, a method for rapidly and

accurately distinguishing malaria from other febrile illnesses has been available. This has been supplemented by highly effective specific treatment since the 1940s. However, despite the extensive development of microscopy services during the eradication attempts of the 1950s and 1960s, most diagnosis of malaria, and decisions on subsequent management of the disease, continue to be based on signs and symptoms that are poorly specific across a range of epidemiological settings (Armstrong-Schellenberg, *et al.*, 1994; Smith, *et al.*, 1995; Font, 2001; Reyburn, 2004). Late and accurate diagnoses are major contributors to malaria mortality (Smith, *et al.*, 1995; Reyburn, 2004) and to mortality from non-malaria illnesses, particularly bacterial diseases, that malaria symptoms can resemble (Peters, 2004; Berkley, 2005; Carcillo, 2005). Inaccurate diagnosis also accounts for the uncertainty relating to current estimates of mortality attributable to malaria, usually calculated to be 1 to 2 million deaths annually, mostly in children in Africa (Hay, *et al.*, 2005; WHO, 2005).

Globally, early diagnosis and appropriate treatment is a basic tenet of current malaria policy (WHO, 2005). The battle for appropriate treatment through the introduction of more effective, but higher cost, antimalarial drugs to counter parasite resistance has been fought and mostly won at a public policy level (Ridley and Toure, 2004), however, there is a lack of emphasis on identifying the parasitaemic cases that would benefit from the administration of these drugs.

Although some countries maintain impressive parasite-based diagnostic programmes for malaria (India , for example, examines approximately 100 million blood films per year, of which less than 2 million are positive) (WHO, 2005), high-quality parasite-based diagnosis has remained unavailable to most patients with tropical febrile illness.

Maintenance of a good-quality, effective microscopy service requires an organized health system infrastructure, including the provision of high-quality supplies and reagents, the presence of satisfactory microscopes, maintenance and technical competence, an adequate workplace environment and the ability to prepare usable blood films. Field microscopy, where established, often falls short of these requirements (Durrheim, 1997).

The introduction of lateral flow immuno chromatographic assays for malaria in the early 1990s promised a revolution in the management of tropical febrile disease (Shiff, *et al.*, 1994). A remote village health worker could, for the first time, rapidly and accurately distinguish between parasitaemic and non-parasitaemic febrile illnesses in areas where microscopy was impractical, without relying predominantly on guess work. However, good-quality microscopy still remains the superior diagnostic method, providing accurate parasite quantification and species identification, allowing reliable monitoring of the response to therapy and having a role in identifying other aetiologies. Indeed, this method probably provides lower cost diagnosis (per case) when the case load is high. However, the sustainability of a microscopy service in remote areas is limited by the capital investment, maintenance and the skill level required (Durrheim, *et al.*, 1997; Kachur, 1998).

Although antigen-detecting rapid diagnostic tests (RDTs) have other applications, including travel health market, (Armstrong-Schellenberg, *et al.*, 1994), prevalence surveys and in complex emergencies (WHO, 2004; WHO, 2005), potentially the most powerful application of this technology is providing a rapid and accurate diagnostic service for malaria where high-quality microscopy service cannot be sustained. For more than a decade, these assays were used sparingly in malaria-endemic areas, primarily in

South America and South East Asia, as a means to diagnose clinical malaria. More recently, however, the emergence of resistance to traditional malaria drugs has necessitated the switch to more expensive artemisinin-based combination therapies (ACT), a shift that requires the implementation of the more evidence-based approach to the use of malaria diagnosis and has led to the current upsurge in the use of these RDTs (WHO, 2006). However, although the procurement of RDT devices is rapidly rising in sub-Saharan Africa, symptom-based diagnosis remains the predominant methodology in this region (Kachur, 1998; WHO, 2005).

Ready access to antimalarial drugs can be provided by formal health services at the village level, and can reduce morbidity and mortality (Okanurak and Ruebush, 1996; Bell, *et al.,* 2005). Parasite-based diagnosis provides a more cost-effective way of providing these drugs appropriately and of reducing malaria morbidity (Goodman, *et al.,* 1999), although improving accessibility to this service at the village level represents a considerable challenge to health systems with low budgets and other competing priorities. For many rural areas, there are no nearby healthcare workers or facilities, so families have to walk many kilometers and hours, and even then with no promise of care at the end of their trip. So people often do not even attempt to seek out care, and instead use local remedies or just 'wait it out' (WHO, 2005).

The lack of access to good quality diagnostic tests for infectious diseases contributes to the enormous burden of ill health in the developing world, where infectious diseases are the major causes of death and account for more than half of all deaths in children (Kent and Yin, 2006). Each year, more than 2 million people die of malaria. More than 95% of these deaths are in developing countries. Early diagnosis and treatment not only reduces

the risk of the patient developing long-term complications, but prompt treatment also reduces further transmission of the disease to other members of the community.

A confident diagnosis can be made on the basis of clinical signs or symptoms.

Most cases of malaria in the rural area are diagnosed based on clinical signs. The reliability of presumptive diagnosis based on fever depends on knowledge of the local malaria situation which is influenced by many factors including seasonal and climatic variations. A confident presumptive diagnosis is necessary in order to reduce false negative based on clinical assessment which could result in over diagnosis, cost of treatment and the attendant health implications of inappropriate or delayed treatment of the disease (WHO, 1995). Attempts have been made at improving the sensitivity and specificity of clinical diagnosis by incorporating fever with other indicators and developing these into algorithms that can be used in the field.

2.7 Improving malaria case management through integrated management of childhood illness

In settings where access to diagnostic laboratory services is limited, the WHO recommends the use of a syndromic approach to clinical management, where patients presenting with a particular syndrome are treated for all of the major causes of the syndrome. Algorithms for syndromic management have been developed for common childhood diseases, through the integrated management of childhood illness (IMCI). Such algorithms are simple to use and the recommended treatment packages are generally inexpensive (WHO, 2005). The integrated management of childhood illness (IMCI) is among the strategies outlined to improve the case management of uncomplicated malaria. IMCI is an approach piloted in few African countries, with the aim to improve the

treatment of the most common childhood diseases and conditions such as acute respiratory infections, measles, malaria, diarrhea and malnutrition (Gove, 1977). Due to the considerable overlap in the signs and symptoms of these diseases, a single diagnosis for a sick child is often inappropriate, and may lead to other serious and potentially life-threatening conditions being overlooked. IMCI involves the training of health workers in integrated case management and the development of guidelines (Catherine, *et al.,* 2000). The IMCI was highly cost-effective, with a cost effective ratio of between $30 and $50 in low income countries, but this did not reflect the incremental cost-effectiveness of introducing IMCI over and above current treatment practices (World Bank, 1993). Adoption of the IMCI guideline by African countries has been phenomenal. Most African countries have also scaled- up plans of action for malaria control. This is in line with the global strategy which ensure that drug is available and its supply sustainable and that rapid diagnostic tests be available at Health centers (WHO, 1997).

As commendable as these measures appear, their degree of success in lowering the impact of morbidity and mortality in the target population is contingent on the indigent populations' perception of the health risk associated with childhood illnesses. This is so because patterns of treatment seeking depend on whether such illness is perceived as amenable to modern treatment or not (McCombie, 1996; Winch, *et al.,* 1996).

Prompt access to effective anti malaria treatment is one of the major strategies for reducing the burden of malaria. Prompt access means having treatment available as near to the home as possible so that it is given within 24 hours of onset of symptoms. In Africa, where the mortality burden from malaria is greater, the majority of children die before they reach health facilities (WHO, 2005). Factors such as distance from home ,

poverty, financial constraints, the demand of domestic life, perceived poor quality of service drug stock outs, and health workers' behavior has led to the by-passing of health care facilities being bypassed by communities in favor of health care from the private or informal sector with inappropriate or poor quality drugs. The availability of appropriate and effective treatment near to or in the home should be an important strategy (WHO, 2006).

Malaria diagnosis, treatment and referral at facility level constitute important components of the clinical management algorithms of IMCI. Most of the IMCI strategy life threatening conditions present with fever and other symptoms of the respiratory and gastrointestinal system, hence the need for an integrated approach for their management (Perkins, *et al.,* 1997). Most African countries which are endemic for malaria including Nigeria, have adopted the IMCI strategy (WHO 1997), and completed plans of action for malaria control in line with the global strategy that ensures availability of drugs and rapid diagnostic tests at Primary Health Centers (PHC) levels (WHO, 1995). These measures however, may have little impact on reduction of morbidity and mortality if the target communities do not perceive childhood illness as a health problem (McCombie, 1996). This is so because the patterns of treatment – seeking at modern health facilities depend on whether such illness are perceived as being amenable to modern treatment (Winch, *et a.,* 1996). Therefore, by strengthening quality assurance and quality control for malaria commodities and services as well as by enhancing national and regional drug procurement services in setting where a major proportion of facilities.

2.8 Home based management of malaria

In Africa, more than 70% of malaria episodes in rural areas and more than 50% in urban areas are self-treated (McCombie, 1996). The first treatment often involves drugs bought

from ordinary retail shops that sell essentials to the local population. Home based treatment for most febrile episodes is initiated promptly and usually within a day of onset of symptoms (McCombie, 1996). Decisions to seek outside help from, for example, a public health facility are made only if home-based treatment is ineffective. Mothers are often aware of the poor advice they receive from drug sellers but still consult them because of limited time, transport, or funds for hospital fees. Mothers are able to recognize the symptoms associated with uncomplicated malaria. In one community in Nigeria and two in Ghana (Dunyo, 2000), a mother's recognition was very closely correlated with the diagnosis made by the medical assistant and a positive blood-slide for malaria. Most fevers in children (>60%) are treated with simple drugs, e.g. paracetamol and aspirin, but not with antimalarials. Even when antimalarials are purchased, they are commonly (>80% of cases) administered in inappropriate doses. The private sector is the major source of drugs and provides information for about two in three malaria cases. However, lack of knowledge plus the private sector's profit interests may mean that malaria patients receive ineffective, inappropriate, or expired drugs, in incorrect doses.

Progression to severe malaria is always rapid, and most children die within 48 hours of onset of illness. Treatment must therefore be prompt. Sirima, (2003) showed that provision of early treatment within the community reduced progression to severe malaria episodes by 50%. The nearer the source of appropriate treatment is to the home; the more likely it is that proper treatment will start early (Sirima, 2003). Fifty to Seventy percent childhood deaths occur at home without any contact with formal health services. Studies reveal that home-based management of malaria reduces progression to severe disease by more than 50% and under-five overall mortality by 40% (Kidane and Morrow, 2000;

Sirima 2003). Appropriate use of antimalarials through provider and community training and pre-packaging of the drugs provides opportunities to control an increasingly chaotic component of the informal health sector and may reduce drug resistance. Educating mothers and providing them with antimalarials through mother coordinators will result in early treatment and will save lives (Kidane and Morrow, 2000).

In the past there has been opposition to improving home-based management of malaria because of concerns that indiscriminate use of antimalarials by the so-called "illiterate population" could lead to increased antimalarial drug resistance (WHO, 2000). Mothers were thought to be unable to comply with the complicated diagnosis and dosing schedule that proper treatment requires. It is now generally agreed that, with appropriate training and using prepackaged drugs, mothers can recognize fever, and administer prompt, appropriate treatment. It is uninformed households seeking ineffective treatment that contribute to the development of drug resistance (WHO, 2000).

Kleinman (1980) stressed that most decisions about health care and treatment occur in the popular sector – as differentiated from the 'folk' and the professional sectors. Numerous studies have documented the importance of home treatments. Ryan (1995) found that in a Kom village of Cameroon, 83% of the illnesses were treated at home, with 22.5% of the 454 illness episodes seeking treatment outside the home. Kroeger (1983) reported that 80% of illnesses are managed within the household, further pointing to the importance of looking at the home as a major player in the management of health problems. In Guatemala, Weller (1997) showed that up to 90% of the initial treatment actions take place at home and they may involve use of home remedies or remedies obtained from a

pharmacy. Of the remaining 10%, 8% of the initial actions involved seeing a physician or a nurse while about 2% of the people visited a folk healer. The importance of home treatment with a particular emphasis on malaria has been shown in a variety of studies (Foster, 1995; Hamel, 2001; Nyamongo, 2002). In developing countries, constrained access to health care facilities reinforces the need to focus on local solutions in the management of illnesses. Particularly in the field of malaria, interventions have been designed to improve access to drugs and treatment compliance (Nyamongo, 2002).

The following approaches have been shown to improve home based management of malaria (WHO, 2004): unit-dose packaging of full-course therapy, and pictorial labeling; training of local communities, especially mothers and other community resource persons; training shopkeepers, drug vendors, chemical sellers, and drug-shop owners; and community-targeted information, education and communication for behavioral change (WHO, 2004).

2.9 Attitude and perception about malaria

Understanding people's perceptions of malaria, and the factors which influence these perceptions, must be a central part of mounting successful interventions to the control of malaria (Bradley, 1991; Ahorlu, 1997). People in different societies hold a variety of beliefs about the cause and transmission of malaria that vary according to cultural, educational, and economic factors, and have direct consequences for both preventive and treatment – seeking behavior as well as for activities to control malaria (Lipowsky, 1992). These issues cannot be viewed simplistically, since "improving or increasing knowledge does not necessarily result in changes in perceptions or behavior (Espino and Manderson, 1997). Behavior is not just a consequence of knowledge and belief. Levels

of alcoholism, community, social and political divisions, or lack of control by women of household budget, for example are also significant determinants (Winch, 1997). Attention to these perceptions is critical to public health efforts for three reasons. First, beliefs that differ from the scientific explanation about the causes and transmission of malaria may lead to inaction, a delay in seeking appropriate treatment, or ineffective actions, all with serious consequences. These attitudes may also inhibit effective preventive measures (Winch, 1997). Secondly, people often hold various seemingly contradicting views about malaria at the same time (Espino and Manderson, 1997). Although they may concur with the scientific explanation of how transmission occurs, their preoccupation with why it occurs, for a particular person at a particular time, may be unique and at odds with orthodox public health knowledge. The explanation might be related to witchcraft or seen as the consequences of immoral or illegal actions, a logical conclusion since, "the complex transmission of malaria lends itself to spiritual etiologies, mosquitoes are present most of the time, but fever is a periodic occurrence (Helitzer–Allen, 1993). As a result both appropriate and what is scientifically considered irrelevant or ineffective preventive and "treatment" actions may be taken at the same time. If health personnel denigrate the apparently ineffective behaviors, such as the wearing of an amulet, the unintended result may be to prejudice many against the appropriate use of health services (Polgar, 1963; Eisenberg and Kleinman, 1981). Thirdly, fever and other severe and unstable varieties of symptoms such as convulsion are frequently not associated with malaria obviating the need for treatment or preventive measures associated with these symptoms, which can have dire consequences for the sufferer (WHO, 1999).

Africans have had to deal with the consequences of malaria from millennia (Bruce-

Chwatt, 1980). This long history has resulted in the use of a range of different terms and disease categorizations, which may all relate to malaria but which may not necessarily be perceived as such. Moreover, these terms are not necessarily translatable into English words “malaria”. However appropriate choice of terminology has been found to be critical for the development of effective health communication interventions (Winch, 1996). In most African countries there are from six to more than ten different, terms for malaria or its different manifestation. These terms may also have a number of sub categories. An awareness of the use of a wide range of labels, related to the tremendous variability in symptoms is highly significant for understanding people’s perceptions and their preventive, treatment and malaria control behaviour. It should be noted that local illness terms are in a constant state of flux, so that cultural rules that make sense now might be entirely inappropriate in a few years (Winch, 1996; Gordon, 2000). Even when perceptions about appropriate treatment and preventive actions may in general correspond with the scientific public health position, necessary actions may not be taken because it is often thought the people at certain stages of their lives such as very young children or pregnant women must be treated with special care. In some cases it is believed that young children should not be in contact with the highly toxic impregnated bed nets, and pregnant women should not ingest bitter substances such as Chloroquine, because a large proportion of those studied believed that Chloroquine may cause abortion (Elzubier , 1997).

From, Sri Lanka it is reported that poor compliance with Chemotherapy is as a result of the common perception that side-effects of Chemotherapy are far more debilitating than the disease and uncertainly as to the validity of the cure (Jayawardene, 1993). This is

even more compelling for the use of prophylaxis for malaria prevention. Many link efficacy of drugs with toxicity and as found in a Tanzanian study, these aspects are felt to go hand in hand; the greater the demonstrable side effects of a 'dawa' (drug/medicine/treatment), the greater the potential for toxicity (Winch, 1997). The effect of strong (toxic and effective) anti-malaria drugs was of particular concern to mothers of young children. A "strong" drug is good for getting rid of the sickness, but it may be too "strong" for certain age groups and people in particularly vulnerable conditions (McCombie, 1996).

Classification of foods, medicine and diseases as either "hot" or "cold" (not necessarily in temperature) is also prevalent among people in malarial zones in Africa (Coinbra, 1998). Following the belief that therapy is dependent on establishing a balance, if an anti-malarial preventive or therapeutic medicine is perceived as "hot" it will not be taken for the "hot" disease of malaria. In Brazil, for instance, malaria is categorized as a "hot" disease and if popular ideas of health and disease are based on the belief that health depends on a proper balance between "hot" and "cold" elements, it makes sense that people will not pay much attention to explanations relating mosquitoes and *Plasmodium* to the transmission of malaria (Coinbra, 1998). Similarly, in Sri Lanka it was reported that people with malaria did take orthodox antimalarial drugs, but expended a great deal of money on "cold" foods, following the belief that both the disease and the modern antimalarial drugs have a healing effect, which should be neutralized by special (cold) foods (Konradsen , 1997).

Foremost in understanding the pivotal role of socio-cultural factors in relation to malaria is the existence of different explanatory causative models which are also related to the

tendency for particular preventive and treatment actions. Right from when humans started to live in groups, they've had ideas about why they became ill and what to do to try to prevent and treat illnesses – with certain people thought to have special powers in this regard. Different explanatory models are formed by cultural and sub-cultural ethno medical norms as well as personal illness experience or those of friends, relatives and particular social groups. Most of these explanatory models vary. Individuals may hold several explanations for the occurrence of any one disease and this might delay or inhibit effective therapy and prevention. These differing explanatory models, often deeply rooted in local culture guide behavior. For a number of diseases, including malaria, early diagnosis and treatment may be of critical importance in reducing mortality. Caretaker's behavior in response to signs of disease are influenced by a wide range of factors other than accessibility and availability of services, including social networks and socio-economic factors as well as perceptions of severity of illness (Smith and Kane, 1970). These social factors apply to malaria as they do to other infectious diseases although compared to malaria, they remain poorly researched.

Perception of illness, knowledge and understanding of illness are socially and culturally constructed, as are actions taken with regard to treatment. In all of these, important gender differences exist (Vlassoff and Bonilla, 1994). In order to study treatment seeking with respect to malaria it becomes necessary to identify local disease categories or illness term that approximates to malaria. The roles of patients' and caretakers' illness perceptions are an essential factor in deciding where and when professional help is sought, knowledge of cause, symptoms and treatment of malaria have been studied in the Gambia, Liberia and Nigeria (Jackson, 1985; Rama-Krishna,1989; Aikins, 1993). In

some places, malaria is seen as a distinct disease, and knowledge of symptoms and transmission through mosquito bite is high. This is due in part to educational efforts

(Menon, 1992; Ruebush , *et al.,* 1992).

The Dangbe of Ghana (Agyepong, 1990) refer to "*asra*" as fever and is believed to be caused by prolonged contact with heat. The difficulty in choosing local terms is illustrated by the concept of "*nyongo*"in Zimbabwe. No agreement exists among respondent about whether *nyongo* was equivalent to malaria. Some respondent recognized the term and said that nyongo was not the same as malaria (Vundule and Mharakurwa, 1996). In Kenya, (Munguti, 1998), other aetiological beliefs included: mild vegetables (13.1%), and milk (9.8%).

Multiple resorts are often used, especially when a treatment fails. In some cases certain illnesses are seen as amenable to treatment by modern practitioners, while others are considered best treated by traditional methods. Use of modern medicine in some form is generally common and there is a great demand for modern pharmaceuticals. These are often obtained through pharmacies and drug sellers without appropriate diagnoses (van der Geest, 1987; Fosu, 1989). It is a recognized fact that a large proportion of malaria cases are treated outside of the official health care system (Foster, 1991). This is done to specifically reduce the impact of malaria. For instance, a study was carried out in Kenya to promote community-based distribution of Chloroquine. This resulted in change in source of treatment but had no impact on mortality, perhaps because use of Chloroquine was already high (Mburu and Spencer, 1987; Spencer, *et al.,* 1987).

In order to plan appropriate interventions, it is important to understand current patterns of

treatment. In the absence of laboratory confirmation, the diagnosis of malaria becomes a problem. Developing a clinical definition of malaria is difficult due to the wide variety of symptoms that may occur. People "know" when they have malaria and knowledge of symptoms is high (Okonofua, *et al.*, 1992; Abyan and Osman, 1993). There is a correlation between traditional perceptions of signs and symptoms and parasitological results (Jackson, 1985), however, less than half of malaria patients in hospitals thought they had malaria in a study in Sri Lanka (Ramasamy, *et al.*, 1992). There is evidence that fever is treated at a very high rate than other symptoms (Dabis, *et al.*, 1989). Some studies recorded multiple treatments in which individuals reported a combination of resorts including self-treatment, traditional medicine or more than one clinic or health provider. The proportions that have had two or more treatments shows considerable range (11-90%), but most are above 40% (Snow, *et al.*, 1992; Kengeya-Kayondo, 1993). Number of treatment appears to be related to severity (Snow, *et al*., 1992). Mothers recognize fever and treat promptly, and consider chloroquine in conjunction with antipyretics to be the appropriate treatment. Most treatment begins at home, although the majority of cases are also seen in the formal health system. However, whether treated at home or taken to the health center, most children did not receive appropriate care (Baume, 2000). In this case, a 3-day course of chloroquine was given, because of problems of access and lack of understanding of the importance of giving the full dose. Further, those children who continue to have fever despite receiving chloroquine seldom receive the recommended second-line treatment with sulfadoxine-pyrimethamine. Most children with symptoms of convulsions are taken to the health center, but are more likely than children with simple malaria to receive traditional treatments as well (Baume, 2000).

Given that multiple treatment are common, it is useful to examine this question in terms of a hierarchy of resort. The categories of self treatment, use of the official sector, and use of traditional medicines are not mutually exclusive. They represent options that are chosen in a specific situation, but many people move from one to the other and back as an illness progresses. A number of authors reported that traditional healers were not considered important in the treatment of malaria (Makubalo, 1991), sometimes because they did not claim to cure it (Agyepong, 1990, Espino, 1992) or because the people already knew how to treat malaria with traditional or modern medicine (Abyan and Osman, 1993). In Kenya, Mwenesi (1993) found that traditional healers were not an important source of treatment for uncomplicated malaria but convulsions, splenomegaly and anemia were not associated with malaria by the people, and traditional healers were likely to be consulted in these cases. Treatment of in-patients, who can stay in special patients-houses, is offered by half of the traditional healers (Gessler, *et al.*, 1995a). Divination used as a diagnostic tool was found mainly among men. Referral of patients to the hospital was mentioned by almost all respondents in cases where they failed with their own treatment or when they knew that the patient would be better treated in the hospital or dispensary. More than 70% of patients with malaria had treatment from non-public health sources (Nuwaha, 2002). This included use of traditional healers (12%). Reported use of traditional medicine was highest in Somalia, where people were asked how they would treat malaria (Abyan and Osman, 1993). The second highest rate was found in the Gambia, where 45% said they had ever used herbs (Aikins, *et al.*, 1993). In Columbia 15% said they would use traditional remedies (Lipowsky, *et al.*, 1992).

In Guatemala, it is believed that a traditional herbal remedy could cure malaria (Ruebush,

et al., 1992). However, most of those who thought they had malaria used drugs from stores and pharmacies (56%) or sought care in the health system (32%) (Ruebush, *et al.,* 1992b). In Mali (Traore, *et al.,* 1992), questions about preferred treatment elicited significantly different responses from women and men. Women preferred modern methods more than men (71% to 57%), and were less likely to express a preference for traditional methods (41% versus 27%). In addition, women were more likely to be aware of chloroquine (32% versus 16%). In Uganda, 22% of those who came to the health centre had used herbal remedies to reduce fever before coming (Kengeya–Kayondo, 1993). Few of these medicines have been studied, and some may have value in the treatment of malaria or alleviation of symptoms. In a Brazilian study, one of the local remedies named came from *Artemisia sp*. plant, the same species that is the source of Artemisin, a new antimalarial drug derived from Chinese traditional medicine (Brandao, *et al.,* 1992). For the most part, use of traditional healers and medicines as a sole treatment is low, and a number of studies suggest that the majority of people recognize the value of modern drugs in the treatment of malaria (Silva, 1991) or perceive the value of antimalarials in promoting health even when the drugs are not associated with malaria (Allen, *et al.,* 1990). In Tanzania, mothers recognized the efficacy of chloroquine used for prophylaxis in under five children and began diverting the supplies to others with fever (MacCormack and Lwihula, 1983).

2.10 Health seeking behaviour

Health-seeking behavior studies acknowledge that health control tools, where they exist, remain greatly under or inadequately used. Understanding human behaviors is prerequisite to changing behavior and improves health practices. In order to respond to

community perspectives and needs, health systems need to adapt their strategies, taking into account the findings from behavioral studies.

Knowledge, attitudes and practices surveys are the most frequently used studies in health-seeking behavior research. Knowledge is usually assessed in order to see how far community knowledge corresponds to biomedical concepts. Typical questions include knowledge about causes and symptoms of the illness under study. People's reported knowledge which deviates from biomedical concepts is usually termed 'beliefs' (Good, 1994). This distinction between 'knowledge' and 'beliefs' markedly deviates from the use of terms in psychosocial theory where 'beliefs' have a much broader meaning and include also beliefs concerning perceptions about one self. Downie, *et al.,* (1998) stated the illustrative example where the belief that 'I'm not good at sports' may restrict a person's readiness to engage in health exercise. Also beliefs about illness severity and susceptibility are seldom enquired.

Attitudes form a more complicated issue. Attitude has been defined as 'a learned predisposition to think, and feel and act in a particular way towards a given object or class of objects'. As such, attitudes result from a complex interaction of beliefs, feelings, and values. They are important in designing health promotion campaigns which aim to change attitudes. Attitudes may be inferred from a variety of statements and answers, but direct asking is usually problematic since people often respond in terms of what they think is the 'correct' answer. In particular attitudes towards traditional medicine might be hidden. Attitudes are central to understanding behavior. Questions related to practices usually enquire about the use of preventive measures or different health care options (Yoder, 1997). One of the major unresolved questions in health-seeking behavior studies

is how far knowledge actually determines practice. It is most common to assume, that changing knowledge entails behavior change. However, improving knowledge with well designed IEC campaigns will not automatically lead to improved health behavior. This is because apart from knowledge, there are a range of other factors relevant for health-seeking behavior: unavailability of health facilities, lack of drugs, lack of money to pay for preventive or treatment costs, demonstrating the complexity of influences on an individual's behavior at a given time and place. But there are two points to consider in the relationship between knowledge and practice: the uncertainties of illness and non-reasoned behavior. Often illness symptoms are diffuse and ambiguous, and illness course or treatment outcomes are unexpected. Facing uncertainty, people follow a trial and error search for relief and meaning (Whyte, 1997; Ryan, 1998). Under these circumstances, even good biomedical knowledge would not affect behavior.

Attempts are now being made to incorporate knowledge about health seeking behavior into health service delivery strategies in a way, which is sensitive to the local dynamics of the community (Steen and Mazonde, 1999), as proper understanding of health seeking behavior could reduce delay to diagnosis, improve treatment compliance and improve health promotion strategies in a variety of contexts.

2.11.0 Utilization of the health system

The decision to seek care through a particular channel is influenced by a variety of socio-economic variables (sex, age, social status, nature of illness, access to services and perceived quality of the service) (Tipping and Segall, 1995). Bedri, (2001) developed a pathway to care in exploration of abnormal vaginal discharge in Sudan. Five stages were identified where decision was made, and delay could be introduced, towards adoption of

'modern care'. There are four 'sub pathways that women may follow, from seeking modern medical care immediately to complete denial and ignoring of symptoms. This approach offers an opportunity to identify key junctions where there may be delay in seeking competent care, and is thus of potential practice relevant for policy development. Husbands should be involved in health education programme about vaginal discharge to optimize the path ways taken by women, and women should also be allowed to conduct home vaginal swabs. Health care seeking behavior around vaginal discharge and malaria revealed that women follow quite different pathways for different conditions, relating predominantly to the role of the husband, social networks and cultural customs which has implications for health systems development. However, the desired health care seeking behavior is for an individual to respond to an illness episode by seeking first and foremost help from a trained allopathic doctor, in a formally recognized health care setting. For some illnesses, people will choose traditional healers, village homeopaths, or untrained allopathic doctor, in a formally trained practitioners or government health facilities (Ahmed, *et al*., 2001) found women in Nepal than men to seek help from traditional healers first. The scale may be reflected in findings by Rahman (2000) in rural Bangladesh, where 86% of women receive health care from non qualified health care providers. This has implications for diagnosis, and women have been found to have significantly longer delays to diagnosis than men (Needham, 2001).

Despite the ongoing evidence that people do choose traditional and folk medicine or providers in a variety of context which have potentially profound impacts on health, few studies recommend ways to build bridges to enable individual preferences to be incorporated into a more responsive health care system. Ahmed *et al*., (2001) concluded

that “efforts should be made to raise community awareness regarding the importance of seeking care from trained personnel and the availability of services”. Nevertheless there is now growing recognition of the need to be more sensitive to the realities of health care seeking behavior. In Bangladesh, there is a large and growing sector of non-qualified allopathic providers engaged in the traffic of modern pharmaceuticals. They provide an accessible means of reaching Western medicines to a wider range of the population, yet lack of formal medical training. There is the accompanying problem of bad, unregulated prescriptive practices. Incorporating these unqualified providers into more formal training may be beneficial (Ahmed, *et. al*., 2001). This traditional and unqualified practitioners needs to be recognized as ‘the main providers of care’ (Rahman, 2000) in relation to some health problems in developing countries. In trying to understand women’s preference for care, it was found that some groups wander between practitioners (traditional healers and unofficial sources) rather than seek care through the health facility (Moses, *et al.,* 1994). Rahman (2000) found that different facilities were frequented for different needs according to a complex interplay of factors, sometimes regardless of the intended purpose of those facilities. Hence, the health care seeking behavior and local knowledge need to be taken seriously in programmes and intervention to promote health in a variety of context. Integration of private sector providers with public care is necessary (Needham 2001).

2.11.1 Illness response process

A number social cognition models’ have been developed to predict possible behavioral patterns. (Conner and Norman, 1996). These are based on a mixture of demographic, social, emotional and cognitive factors, perceived symptoms, access to care and

personality (Conner and Norman 1996). The underlying assumption is that behavior is best understood in terms of individuals' perception of their social environment. One of the most widely applied is the 'heath belief model' (Sheeran and Abraham, 1996). Action in the Health Belief Model is predicated on: (1) beliefs about the impact of illness and its consequences (threat perception) which depend on: perceived susceptibility, or the beliefs about how vulnerable a person considers him or herself in relation to a certain illness or health problem; perceived severity of illness or health problems and its consequences; (2) Health motivation, or readiness to be concerned about health matters; (3) Beliefs about the consequences of health practices and about the possibilities and the effort to put them into practice; (4) Cues to action, which include different, internal and external factors, which influence action. For example, the nature and intensity (organic and symbolic) of illness symptoms, mass media campaigns, advice from relevant other (family, friends, health staff, etc.); (5) Beliefs and health motivation are conditioned by socio-demographic variables (class, age, gender, religion) and by the psychological characteristics of the interviewed person (personality, peer group pressure). While there is evidence that perceived susceptibility, severity, benefits and barriers of the health belief model are relevant factors in health behavior (Sheeran and Abraham, 1996), this model neglects further determinants which are present in other models, like previous experiences, advantages of mal-adaptive behavior, behavioral intention, perceived control etc. Through the health belief model interesting and highly relevant findings for health promotion can be determined. For example, for a disease like tuberculosis or AIDS which is associated with a specific group(the poor, homosexuals), persons who do not include themselves into these groups will hardly consider themselves vulnerable to the disease.

This has particular implications for health messages about AIDS, which in later campaigns needed to be explicitly targeted to heterosexuals in order to create risk awareness. Studies which found that in endemic areas, malaria is not considered a severe disease (Mwenese, 1993), or that mosquito-nets were not felt effective against malaria because 'mosquitoes bite day and night', are other examples which show the implications of perceived threat for health behavior. The same applies to diarrhea which was locally understood as a way of 'cleansing' the body, and vomiting, perceived to be a sign of relief, rather than of aggravation of disease (Nyamongo, 2000; Hausmann-Muela, 2002).

The theory of Planned Behavior (TPB), is about factors which lead to a specific intention to act, or behavioral intention. In this model, behavioral intention is determined by: (1) Attitudes towards behavior, determined by the belief that a specific behavior will have a concrete consequence and the evaluation or valorization of this consequence; (2) Subjective norms, or the belief in whether other relevant persons will approve one's behavior, plus the personal motivation to fulfill with the expectations of others; (3) Perceived behavioral control, determined by the belief about access to the resources needed in order to act successfully, plus the perceived success of these resources (information, abilities, skills, dependence, or independence from others, barriers, opportunities (4) Socio-demographic variables and personality traits which condition attitudes, subjective norms and perceived behavioral control.

An outstanding aspect of this model is the central role of social network support. Health promotion among sex workers, with the collaboration of committed sex workers who were trained to distribute information and to offer support to their colleagues, provided positive results in a South African mining community (Campbell and Mzaidume, 2001).

Similarly, the support of friends and partners has been central for South African adolescents to attend STD clinics (Meyer-Weitz, 2000). Another key factor emphasized in the TPB is the encouragement of feelings of self-control. In order to promote HIV/AIDS preventive measures, Meyer-Weitz (2000) used a TPB approach in order to stimulate feelings of control and self-efficacy in negotiating with partners or clients to use condoms. The advantages of the TPB are clearly the taking into account of motivational aspects of personal disease control and the influence of social networks and peer pressure. Unfortunately, the TPB approach has scarcely been used outside STDs/AIDS research

The socio-behavioral model (Andersen and Neuman, 1975), group in a logical sequence, three clusters or categories of factors (predisposing, enabling and need factors) which can influence health behavior. The model was developed to investigate the use of biomedical health services. Later versions have extended the model to include other health care sectors, i.e. traditional medicine and domestic treatments (Weller, 1997). Examples of factors organized in the categories of the Health Care Utilization Model (Weller, 1997), are: (1) Predisposing factors: age, gender, religion, global health assessment, prior experiences with illness, formal education, general attitudes towards health services, knowledge about the illness; (2) Enabling factors: availability of services, financial resources to purchase services, health insurance, social network support; (3) Need factors: perception of severity, total number of sick days for a reported illness, total number of days in bed, days missed from work or school, help from outside for caring; (4) Treatment actions: home remedies (herbal, pharmaceuticals), pharmacy, over the counter drugs from shops, injections, traditional healers, private medical facilities, public

health services.

The model centers specifically on treatment selection. It include both material and structural factors, which are barely taken into account in the social psychology models The model has also been used for gaining evidence on the weight of different factors for health service use (Weller, 1997). The advantage of the socio-behavioral models is the variety of factors which are organized in categories, making interventions on therapeutic actions (or lack of actions) feasible. They permit the establishment of how and why the different factors affect therapeutic selection (Weller, 1997).

It has become popular among to use different categories which group key factors for health-seeking behavior. Consequently, the following grouping into the 'four As' (1) Availability: this refers to the geographic distribution of health facilities, pharmaceutical products; (2) Accessibility: this includes transport, roads; (3) Affordability: this includes treatment costs for the individual, household or family. A distinction is made between direct, indirect and opportunity costs; (4) Acceptability: this relates to cultural and social distance. This mainly refers to the characteristics of the health providers-: health worker' behavior, gender aspects (non acceptance of being treated by the opposite sex, in particular women who refuse to be seen by male nurses/doctors), excessive bureaucracy. The model of the 'four As' has been widely used by researchers who mainly emphasized distance (both social and geographical) and economic aspects as key factors for access to treatment (Good, 1987). The advantage of the 'four As' is the easy identification of key potential 'barriers' for adequate treatment.

Starting with recognition of symptoms, they centre on the path that people follow until they use different health services (home, traditional healer, biomedical facility). An

example of a pathway model which stresses the importance of 'significant others' and the decision making process is that by Good, (1987). The pathway model involve: perception of illness, 'significant others', therapy choice (self-treatment, biomedical and traditional practitioner). 'Significant others' are part of the therapy managing group', a concept elaborated by Janzen (1978) which is key for understanding decision making in therapeutic processes. This idea challenges the strong emphasis on the individual and stresses the pivotal role of extended groups of relatives and friends in illness negotiation and management. In the course of the illness episode, the involvement of support groups in illness management can successively change. Pathway models acknowledge these dynamics of illness and decision-making (Good, 1987). Most of the studies which use pathway models investigate the path until the first contact with a health facility. More recently, there has been an increasing emphasis on successive therapy choices. Nyamongo (2002), elaborated a descriptive model which includes treatment sequences for malaria in a Kenyan community, taking into consideration different factors (duration of illness, knowledge) and logics (minimizing expenditure) which determine therapy choice and switching from one modality to another. The strength of pathway models is that they depict health seeking as a dynamic process. Factors are sequentially organized, according to the different key steps (recognition of symptoms, decision making, medical encounter, evaluation of outcomes, and re-interpretation of illness) which determine the course of the therapy path (Nyamongo, 2002).

Ethnographic decision making models attempt to predict health- seeking behavior. The methodology they use in order to identify key factors involved in therapy choice follows several steps. In the first step, the key factors as pointed out by the community are

enquired. Finally, a series of rules is elaborated (Weller, 1997).

Four key criteria are relevant for treatment choice. These are: (1) gravity of illness, (2) whether an appropriate home remedy is known for the illness, (3) faith or confidence in the effectiveness of home remedies for a given illness, and (4) expense of treatment and the availability of resources(Young, 1981; Garro, 1998) . Similarly, Weller (1997), found (1) severity of illness, (2) economic resources and (3) prior experience with an illness as the main criteria for treatment choice. The capacity for prediction of the decision-making models was found to be high.

An important advantage of the decision-making studies is that the rules permit us to infer basic logics which guide the therapeutic selection. The central idea is that persons follow predefined patterns (do not act randomly), both in their first therapeutic selections and when they move from one treatment modality to the next (Garro, 1998; Ryan, 1998).

In his study in rural Cameroon, Ryan (1998) studies the behavioral patterns which lead to a sequential use of different medical alternatives, in order to search for underlying organizational principles. Departing from a series of general observations, he elaborated a model of home management for acute illnesses, on three basic tenets: (1) Lay people minimize uncertainty by identifying illness types that require particular health actions and by delaying actions. Waiting is a key strategy of people, because it permits them to observe the evolution of illness in terms of severity and of better identification (Ryan, 1998). Ryan (1998) emphasizes the state of uncertainty which accompanies illness processes, especially in their beginnings. On the other hand, Nyamongo (2002), found that for common illnesses, which people recognize well, waiting seems not to their strategy; (2) Lay people minimize the cost of care by choosing treatments that are less

expensive and easier to administer or by reducing the number of treatments tried. This logic explains why the majority of treatments are initiated in the home; (3) Lay people maximize treatment variety in the hopes of finding at least one treatment that helps stop the illness.

The studies of health-seeking behavior centre on the characteristics of the implied persons for explaining, from an applied public health perspective, reasons for delay in receiving adequate treatment, non-compliance with treatment, or non-utilization of preventive measures. Centering on the personal characteristics tends to 'blame the victim', showing the individuals themselves as responsible for inadequate health-seeking behavior. In general, they overestimate the capacity for an individual to choose and follow behavior which is considered adequately. In most cases, health-seeking behavior models depart from the assumption that individuals generally aim to maximize utility and thus prefer behaviors which are associated with the highest expected benefits. This is, however, a very utilitarian vision which does not necessarily correspond to reality (Sahlins, 1976; Good, 1994). Emotional aspects and non-rational behavior which influence strongly health-seeking behavior are much less considered. Decision making issues are also manifestations of power relations which encompass interests in conflict that go beyond the strict ambit of health. Actions contain also a symbolic value, and much of behavior is determined by political and politicized discourses. Peer pressure factors and social relations of the theory of planned behavior to a certain extent consider these points, but they commonly understate the social forces from a more historical perspective. More explicitly, the behavioral models attempt to identify key factors, and their weight in behavior. Key factors can, however, not be isolated from the context in

which they occur. Sauerborn (1996), showed how perception of illness severity changed with seasonality, related with climatic conditions and work load. The re-interpretation of malaria in terms of witchcraft (Hausmann-Muela, 1998) was found to depend much on both the perceived failure of biomedical treatment and the social conflicts in which a person or family is involved.

Behaviors cannot be deduced from one or various isolated factors. For example, a certain practice can be correlated with an etiology, but in the illness models, etiologies often have moral implications that give meaning to behavior. To identify key factors relevant for health-seeking behavior process is helpful for planning health policy interventions. But in order to correctly understand behaviors, these factors need to be contextualized. Ideally, a contextualized analysis of health behaviors should (1) be necessarily interdisciplinary, combining 'natural sciences' with 'social sciences' approaches; (2) not fail to consider that the studied 'contexts' are part of a historical process; (3) combine 'micro' with 'macro' levels; and (4) triangulate qualitative and quantitative investigation techniques.

2.11.2 Factors That Influence Health Seeking Behavior

Human behavior is influenced by social, cultural, economic, and political factors and is undoubtedly related to health, including the risk for infectious diseases like malaria. Whether it is intentional or not, human behavior affects health-promoting and diseases-preventing activities, in some instances increasing risk and in others reducing it (Inhorn and Brown, 1990). Human groups have often unwittingly facilitated the spread of infectious diseases through culturally coded patterns of behavior or through changes in the crucial relationship among infectious disease agents, their human and animal hosts,

and the environments in which the host-agent interaction takes place. Beyond human behavior as such, prevalent socio-cultural factors also contribute to shaping how humans act, and therefore must be seen, in and of themselves, as epidemiological predictors of health and disease patterns (Inhorn and Brown, 1990). Although people's behavior may increase the risk, of having malaria, to change such behavior is not easy. Indeed, there are many reasons why particular behaviors exist and they often are tied to considerable benefits in areas quite distinct from health. The principal reasons for why people do not accept new kinds of health behavior is that the behavior being advocated is inconvenient, produces unwanted side-effects, or does not give visible results (MacCormack, 1984). Thus, it is not usually the case that "these people don't know any better," but rather that their native logic and rationality make sense within the realities and limitations of their local circumstances. We should be careful to avoid thinking that "they" have "false beliefs" (not knowledge), which need to be changed, whereas "we" have knowledge, which needs to be imported (Good, 1994).

Local people's understanding of health and disease is often dismissed as irrational, and words like "ignorant" and "superstitions" are frequently used to describe their behaviour. Research, however, has shown that local understandings of health and illness can be complex and detailed. Given the opportunity, local people can explain their interpretations and observations in ways that are inherently rational. Their reasoning is inductive – based on lived experiences and built up over time, just as modern medicine is (WHO, 1995). Local perceptions of health and illness should be understood and appreciated. Their basis and the validity they have for local people must be recognized and taken into account in the design of new health information. In many cases people's

behavior corresponded closely to modern medical ideas. Only certain aspects that are inappropriate or harmful may need to be pointed out. Health information can be designed to incorporate traditional and modern biomedical practices so that it is meaningful within local people's lives and within their range of possible actions (WHO, 1995). It is important not to exaggerate people's agency, or power, to effect beneficial changes for their own health and welfare (Farmer, 1999). The physical environment, and people's proximity and exposure to vectors or parasites, including microbiological and parasitological factors, are clearly essential for transmission of infection and constitute necessary and immediate risk factors. However, people's behavior and the socio-cultural factors that affect their lives are equally crucial and constitute underlying risks for the spread of infection. These more fundamental risks must be addressed by any effort to control malaria on a worldwide scale. Certain socio-cultural factors such as poverty and social disenfranchisement may place people at continuous "risk of risks" and may make the affliction from infections and other diseases inevitable (Link and Phelan, 1995; Farmer, 1999). Although the presence of proximate microbiological risk factors is essential, it is not sufficient, since the ultimate causation is tied to socio-cultural factors, in particular, to inequality (Inhorn and Brown, 1990; Farmer, 1999). With the advent of social epidemiology and medical anthropology, there was a shift in twentieth-century thinking about socio-cultural factors as being complementary to bacteriological ones. Any public health effort would be delinquent and short-sighted if it did not pay significant attention to how behavioral and social factors contribute to risk for and prevention of malaria control (Paul, 1955; Polgar, 1963).

The interrelationship between infectious disease and socio-cultural characteristics

is now well established. Malaria and other infectious disease can be studied from a biological, ecological or socio-cultural point of view, and, indeed, considerable work has been done in each of this area, with most weight given to the biological sphere (Inhorn and Brown, 1990). It is only with a combined, interdisciplinary approach that the best results may be obtained.

In order to understand the importance of socio-cultural factors for malaria, it is important to note the existence of different etiological explanatory models– many tied to distinct ethno medical traditions– that are also related to inclinations for particular preventive and therapeutic actions. From when humans started to live in groups, they have had ideas (explanatory models) about why they became ill and what to do to try to prevent and treat illness, with certain persons thought to have special powers in this regard (Polgar, 1963). Different explanatory models are still prevalent throughout the world, in developed as well as developing countries, and are primarily formed by cultural and sub-cultural ethno medical norms but also by more specific factors such as personal illness experiences or those of friends, relatives, and particular social groups. Most of these explanatory models vary, at least to some degree, from the biomedical model, even in developed societies (Polgar, 1963; Etkin, 1991).

Individuals may hold several etiological explanations for the occurrence of any one disease. Biologically, thoughts might focus on nutritional status, degree of immunity, and other such factors as being relevant, but thoughts about the "why me?" question are often more likely to concern witchcraft or personal factors, such as having committed a sin or transgressed a social taboo or some other offence for which the illness is seen as a form of punishment. Explanatory models that present such dual "how and why" explanations

may not be a major problem to the malaria control effort if the "how" aspect does not conflict with conventional biomedical wisdom, and if preoccupation with the "why" aspect does not take precedence in terms of preventive and treatment action thus delaying or inhibiting effective therapy and prevention. Unfortunately, that is often the case. What presents more of a problem however, is when neither the single (how) nor the multiple (how/why) aspects of an explanatory model fit with a public health model. For example, when the "how" explanation is linked to hard work, cold weather, and a number of other factors, there is reason for concern. These perceptions often delay appropriate treatment and foster misguided preventive measures. Different explanatory models do exist. They are often deeply rooted in local culture and they guide behavior. Effective malaria programmes need to be aware of these factors and to establish a public health alliance with individuals and communities.

2.12 Consequences Of Sociocultural Factors

Too often behavioral and socio-cultural involvements come too late and are too peripheral. This does not imply that any and all social science involvements in malaria control have been or will be sufficient or productive. Research carried out to date widely agrees that inattention to the socio-cultural factors was a major reason for the failure of earlier malaria control efforts. Communities were not invested enough to hold on to preventive programmes, and governments felt they lacked resources to go on providing the means to attack mosquito-breading sites (Wessen, 1986). Societies actively change their ecology so as to increase or decrease the risk of particular diseases (Inhorn and Brown, 1990). Cultural systems tend to favor practices which minimize the risk of disease and maximize the health and welfare of groups. This may not always lead to the

reduction of infectious disease (Inhorn and Brown, 1997). It may seem strange that people actively change their ecology in a way that will increase risk for disease. Yet, as noted by MacCormack (1984) "we sometimes modify our environment to gain nutritional or convenience benefit to the detriment of our disease status. Those who benefit most from these ecological changes, especially in hierarchically structured societies, are not those most at risk of the increased disease consequences. Rather the worst consequences fall on the peasants displaced by dam construction, or the population marginalized into urban slums or into a perpetual cyclical rural – urban migratory process.

Also to be considered in health-seeking behavior are motivational factors and stigma which may influence health–seeking. In addition factors like treatment expectations, satisfaction with health care services, decision making for health care and external barriers (e.g. financial constraints, accessibility of health services) contribute to health seeking behavior (Nichter, 1993). Although the physical environment and the close association of people to vectors and parasites are essential parameters for the transmission of infection, people's behavior and the socio-cultural factors surrounding their way of life are equally important components in the spread of infection. Poverty and social deprivation are examples of two social factors, which have a tendency of placing people at continuous risks and may make the affliction from infectious and other diseases inevitable (Inhorn and Brown, 1990; Link and Phelan, 1995; Farmer, 1999).

2.13 Parasitological versus mothers' diagnosis of malaria in children

In a rural area in Guinea (Diallo, *et al*., 2005), it was reported that where a high proportion of children under five were infected with malaria, mothers had a low ability to identify fever and to diagnose malaria. The positive predictive value of maternal

diagnosis of malaria was put at 37% inspite of the fact that the area is mesoendemic for malaria. In The Gambia (Alonso, 1993), 76% of malaria cases diagnosed by mothers of children under-five were confirmed by clinical examination and blood smears. Similarly, in Cameroon, as in Uganda (Lubanga, 1997; Nuwaha, 2002), the results were 45% and 40% respectively. In Niger (Olivar, *et al.*, 1991), of the 87.8% (n=172) of children diagnosed to have malaria, 53.9% (n=160) were correct. Almost half of the presumptive diagnoses were erroneous.

2.14 The Nomadic Fulani

Nomads may be defined as people who depend for their livelihood on the management of ungulates which obtain their nourishment primarily from natural vegetation, and in doing so, their daily and seasonal rounds are determined by the needs of their animals for food, water and protection. A society is nomadic to the degree that the needs of the animals set the pattern of activity. This is the essence of nomadic life style (Myers, 1941; Krader, 1959). However, exploitation of pastures cannot be said to be the only reason why livestock herders move. The use of livestock as a major resource gives the human population dependent on herds, the option of moving to avoid a wide range of hazards in the physical and social environments (Krader, 1959). Also, nomads may move with their herds to avoid diseases, reduce incessant competition with other groups; and to avoid external authorities. There are other factors that induce the movement of nomad's e.g. political factors, local government restrictions; taxations, and the presence of markets and the willingness of settled agriculturalists to foster peaceful coexistence with pastoralists. Since a unique constellation of ecological, political and economic factors

determine the patterns of movement of each pastoral society, it is not surprising that there is enormous variation in the patterns of mobility (Krader, 1959; Awogbade, 1974). Nomadic and semi-nomadic pastoralists form a small but significant minority of the population of countries throughout the Sahelian belt of sub-Saharan Africa. The total pastoral population is estimated to be 30-40 million of which a half is in sub-Saharan Africa. In Nigeria, pastoralists are found in 31 out of the 35 States of the Federation with an estimated population of above 10 million (NCNE, 1989). The nomadic Fulani are grouped into two categories: The Fulbe Na'i and the Fulbe Wuro. This division is based on their mode of settlement over the years in different parts of Northern Nigeria. The Fulbe Wuros are semi-settled transhumance pastoralist. They are a split movement group since a part of the family (young men, their wives, children and some younger relations) takes a greater number of the family herd to seek for pasture and water during the dry season. The rest of the family (mostly older people) remains at the base camp with some milking cows for their sustenance. The transhumance split group return to the base camp during the wet season. The Fulbe Na'i are a total movement group because the entire nomadic family moves from one place to another in search of fodder and water (Ezeomah, 1983a).

Nomads live in rather large, mobile bush encampments and are prepared to either defend themselves or flee depending on the strength of their enemy. Their easy dispersal at short notice has tended to make them to maintain little contact with sedentary authorities and to depend less on them. Their seasonal movements are not undertaken in a disorderly and unplanned manner. Through their experience of various localities and interaction with sedentary people over the years, the nomadic Fulani have developed

systems of linkage with information gathering from their new areas of stay (Ezeomah, 1983b).

The nomadic Fulani in Nigeria raise a variety of cattle: the short-horned zebu, the white Fulani, the Gudali, the Banyo, and Ngaundere as well as sheep and goats. These animals are herded together. Their method of animal management and exploitation is subsistence pastoralism. They are therefore, predominantly multi-product oriented, producing milk, butter, cheese and meat from their animals. The nomadic Fulani are becoming increasingly difficult in recent times, due to cropping pressure on the land, long drought which had decimated their herd and forced many of them to shift towards arable agriculture or to mixed cropping and a more sedentary lifestyle (Blench, 1985). The nomadic Fulani are conservative and a times refuse innovations imposed from outside.

Over the years, there are observable out-migration trends among the nomadic Fulani groups. One of the reasons for this is the depletion of the herd through disease, drought and degradation of grazing land (Blench, 1985). Other factors that have motivated movement of nomadic groups are their desire for independence and freedom from interference and supervision by sedentary authorities, freedom from cattle raiding, the avoidance of disease infested areas, and as an over riding factor, the never-ending search for new pastures (Ezeomah, 1983a; Ezeomah, 1983b). This nomadic way of life predisposes the nomad to exposure to vectors and hence diseases. They probably served as carriers for the spread of disease agents from one part of West Africa to the other. Although this plays a major role in disease epidemiology, it is very little studied. Since they live in sparsely populated, geographically marginalized areas, government health services do not reach them (Hampshire, 2002). This is because health services are

typically concentrated in more densely populated areas of the permanent settlement. Mobility in itself may restrict access, particularly where extended courses of treatment are indicated (Foggin, 1987). Other barriers include political marginalization, cultural, ethnic and linguistic differences with service providers and very low literacy level (Hampshire, 2002). A few studies have documented health problems associated with this population group.

2.15 The nomadic Fulani and malaria

It is a well established fact that the Fulani have a relative resistance to malaria compared with other sympatric tribes in West Africa. This resistance has been attributed to their higher levels of serum immunoglobulin (lgG) antibodies to malaria antigens. This appears not to be a reflection of a general hyper reactivity in the Fulani (Bolad, *et al.,* 2005). In a similar study in Mali, it was found that the Fulani had a significantly higher spleen enlargement rate, lower parasite rate, and were less affected by the disease than their Dogon counter parts. Suggesting a role for antimalaria antibodies in the immune protection seen in this group (Dolo, *et al.,* 2005). The lower susceptibility to malaria observed among the Fulani as compared to their neighbor ethnic tribe could be as a result of the association of higher antimalarial IgE and lgG antibodies and increased number of specific interleukin – 4 (IL – 4) and games interferon (IFNY) producing cells compared to the other tribe (Modiano, *et al.,* 1995; Luoni, *et al.,* 2001; Farouk, *et al.,* 2005; Paganotti, *et al.,* 2004;). In the Sudan, Creasey *et al* (2004), found a distinctly variable level of disease susceptibility to malaria among the Fulani. 32% of the population never reported malaria symptoms or required malaria treatment while others experienced up to 8 clinical episodes over the 11 years duration of the study (Creasey, *et al*, 2004).

The nomadic Fulani are among the least studied group. Though with less access to modern health care facilities and more exposed to diseases, they are known to be very conscious of their own health and have evolved, perhaps several coping strategies for ensuring healthcare for the nomadic family (Sheik, 1999).

Few studies have documented how the Fulani deal with malaria related illness. Malaria is a common illness that attacks them and is seldom treated (Akogun, 2002; Sawa, 2006). Njobdi (2006), found a prevalence of 87.5% among the Fulani population he studied, with varying degrees of parasitaemia. In this sample, 50.6% of malaria positive participants were asymptomatic.

CHAPTER THREE

3.0 MATERIALS AND METHOD

3.1 Study Area

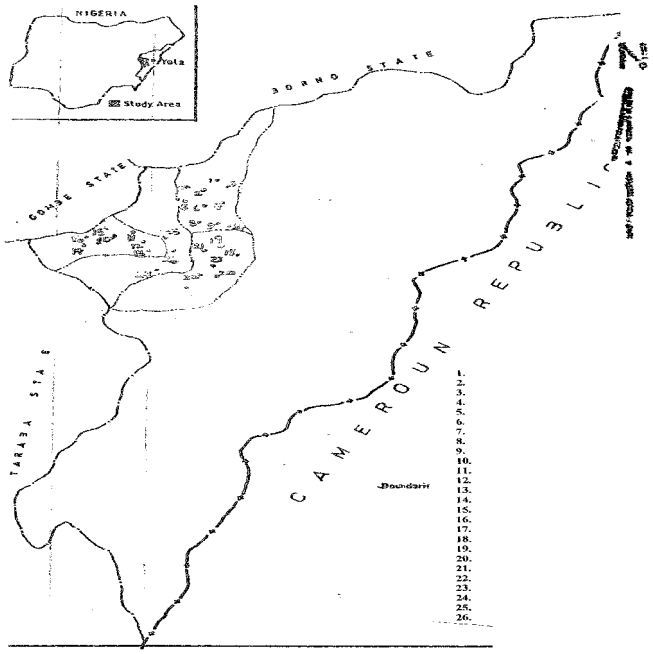
The study area comprised of 26 camps (settlements) of nomadic Fulani scattered over four Local Government Areas (LGAs) in the Southern part of Adamawa State, namely: Demsa, Numan, Shelleng and Lamurde LGAs. The study area constitutes a major route for the yearly movement of the nomadic Fulani and their animals. It (Fig. 2) covers an area of 4,396 sq km, and is situated between Longitude 10^{o} 24' and 12^{o} 45' East and on Latitude 90^{0} 39' North and 90^{o} 11 South. The camps are of varying population sizes. Nine of the camps (Kambla, Kpongnoduma, Labbao, Borrong, Ganigaku1, Jeddo, Kadiri, Bafere and Kupta) are located around River Benue in Numan and Demsa, while the remaining 17 (Dumburi, Gargashi, Bernga, Wuroyanka, Wuromunci, Kande, Jaligel, Lababiri, Boshikiri, Lafiya, Kwapuke, Tingno, Lakan, Godigoron, Zekun, Hoki and Ruwa) are situated around water sources with the River Benue and River Gongola basins in Shelleng and Lamurde LGAs. The area lies within a river valley and is watered by River Benue and its tributaries as well as fishing ponds. Disrupting the low-lying plains, are mountain ranges and hills.

The study area lies within the dry and hot Guinea savannah, which is clearly marked by the dry and rainy seasons. The rainy season starts in April and ends in October, while the period between November and March, mark the dry season. The north easterly Trade wind blows across the area during the dry (November-March) season with its characteristic harmattan haze. Average rainfall is about 67mm with a temperature range of between 32 ^{0}C and 40 ^{0}C.

There are two notable vegetation zones within the study area, the Sub-Sudan zone and the Northern Guinea Savannah zone. The former is marked by short grasses and short tress, while the latter is thick with tall grasses and trees. Along the banks of the rivers, the Fadamas and flood plains, are tall grasses of different species interspersed with shrubs, common among them are the hard stock gamba grass, the elephant grass (*kyesuwa*) and herbs like casto.

The study population comprised all nomadic Fulani camps found within the study area at the time. Based on population data obtained from the state, the study area had a nomadic population of 2, 065, 700

2. ...


NIGERIA
Study Area
BORNO STATE
GOMBE STATE
TARABA STATE
CAMEROUN REPUBLIC
Boundary

3.2 Human subjects

Human subjects were volunteers who gave informed consent to participate in the study and were recruited and selected by the researcher.

3.3 Blood samples

Blood samples were from children under-five. Blood was collected by finger pricking using a sterile lancet.

3.4 Materials

Olympus binocular microscope, staining rack, microscope slides and, cover slips , staining dish, , reagent bottles, timer (clock), cotton wool, oil immersion, blood lancets made by Surgifriend medicals, Middlesex, England.

3.5 Chemicals

Giemsa powder, 70% Ethanol, Glycerol, Disodium hydrogen phosphate (Na_2HPO_4), Potassium dihydrogen phosphate (KH_2PO_4), Distilled water, Chloroquine phosphate tablets made by GMBH-25421, Pinneberg-Germany. Chlorpheniramine malate tablets made by Dana Pharmaceuticals PVT Ltd. Paracetamol tablets B.P. 500mg (lot IP 560) made by May & Baker, Nigeria Plc ..

3.6.0 Methodology

3.6.1 Study Design

The Study area was divided into two based on the concentration of nomadic Fulani people. One area, which comprised 4 LGAs, was selected as study area. Nomadic Fulani camps in the selected study area were identified as well as their migratory periods and routes. The different tribes and clans among these camps were also identified as well as their hierarchical arrangement. The study was conducted in both dry and wet season.

A contact person was identified and in this particular case a female who was well acquainted with Fulani culture and tradition and fluent in Fulani language, the formal language of the study population.

2 Laboratory staff were also employed.

Permission for the study was sought from nomadic Fulani elders, householders and mothers (care givers) as well as young men and women to allow us carry out the study.

Focus Group Discussion guide was developed. Questions were developed for parents, grannies, key-informants, to ascertain their knowledge, perception and attitude towards malaria infection among the nomads.

Blood samples of children under five were collected for thick and thin smear to determine prevalence of malaria and to correlate this result with mother's presumptive diagnosis

Survey Instrument: A structured interview questionnaire was designed with most common answers listed on the form with numerical codes for data entry purposes. Most questions were asked in an open-ended format, with the interviewer recording the first response given. Prompting was allowed to assist in the proper identification of medications and for questions in which more than one response could be given. Places of treatment were recorded. Efforts were made to conduct the interviews in the first language of the person being interviewed. When this was not possible interviews were conducted in the national language (Hausa). Thirty clusters were identified and ten households were randomly selected from each cluster and both the mother of an under five child and her child were included in the study on the basis that the mother presumptively diagnosed malaria in her child. In all, 300 mothers and their under five children were interviewed.

Data gathering was undertaken in two stages. Stage I employed multiple qualitative approaches: key in formant (oral interviews, focus group discussions (FDGs) were used to collect information on knowledge, attitudes and practices and health behaviors in relation to malaria illness. Information obtained from this stage was used to develop the instrument for stage II. Stage II consisted of a cross-sectional survey of mothers of sick under five children using a semi-structured questionnaire. The informal, relaxed, free conversational approach with occasional prompting was employed during FGDs, and key-informant interviews.

Result were tabulated and subjected to appropriate ANOVA statistical analysis.

3.6.2 Pilot study

A plot study was conducted to test and refine the research instrument in Guduso in Girei LGA with socio-cultural similarity to those that were used for the study.

3.6.3 Sampling

A cluster-sample survey methodology, modified from the Expanded Programme on Immunization cluster-sampling methodology (Henderson and Sandaresan, 1982) was used to identify the 300 households, in 30 clusters.

A list of all camps (ruga) with their population sizes was obtained from the LGA office for nomadic education and the sampling interval calculated by dividing the total population by 30, in order to determine the 30 cluster. A random number was generated to identify the starting cluster. Since the "ardo's" (camp head) hut was always the first in line, it was used as the direction or starting point to select huts where interviews were conducted. For each cluster, 10 mothers of children under five were interviewed. The next closest 'ruga' was identified as alternate ruga in the event that the first ruga had fewer mothers to be interviewed.

Every third hut consecutively, was chosen and the mother (care-giver) of an under five child was selected, provided she alleges that her child was sick of malaria. If the next household didn't satisfy this criterion, the next household in line was chosen until the sample size of 300 was reached. In cases where the mother was not available at the time of the interview, the interview was rescheduled. If the mother was not present at the time of the rescheduled appointment, another household (the household nearest to the last household) was to be chosen.

3.7 Consent and Ethical Consideration

Prior to the commencement of the study, meetings where held with Fulani community leaders, householders and mothers of under five children at the camps. The objectives, design and importance of the study were clearly explained to all the parties involved. Permission to go on with the study was obtained from both parties. Participation was voluntary and mothers were informed that they have the option to withdraw at any stage of the study without any consequence. Lancets used for the study were opened in the presence of mothers and were told to feel free to examine same before use. Laboratory test result was disclosed and discussed with each mother and treatment was given by a Community Health Assistant. Laboratory work was executed by a qualified and experienced laboratory scientist. For all laboratory investigations, sterile lancet was used for each child. Lancets were opened in the presence of participants, and

on confirmation of a positive-malaria smear result, anti-malaria drugs was provided for the treatment of the child by a Community Health Assistant (CHA) as service delivery.

3.8.0 Focus Group Discussion

Forty focus group discussions were conducted among men and women. Each group consisted of 8 people. The general purpose and procedures of the FGD were explained to the participants, and their consent to join was obtained. Every third person found in the camp was asked to join. The groups were stratified according to sex and age-group. The age-group and gender composition of the group helped in facilitating free discussion. Besides, people talk more openly if they are in a group of people who share similar background or experiences. Participants were selected by the researcher on the very day discussions were held. Discussions were held in the morning and participants sat on a mat at a place which was free from disturbance in the camp. Participants were encouraged to air their views freely and were at liberty of leaving at any moment they felt so (Dawson, *et al., 1992).*

FGDs were conducted by sex and age-categories as follows:

i. Female parents
ii. Male parents
iii. Female grandparents

Discussions centered on general health problems of the population group with particular reference to community views about malaria, treatment-seeking behavior for febrile illness, preferred forms of medication. The cause, sign and symptoms of malaria-related illness, and prevention in the community, as well as problems associated with getting help in the event of a disease with fever and experience concerning mosquito and mosquito avoidance (Agyepong, 1990) (Appendix1).

3.8.1 Oral Interview

21 oral interviews were conducted with key informants: with camp head (6), nomadic primary education teachers (5), religious leaders (3), health workers (3), grannies (2), male and female), healers (1) and drug sellers (1). This was done to obtain information on recognition and classification of fever, pattern and mode of health seeking

and illness experience in relation to malaria in under five children among nomadic Fulani (Agyepong, 1990). The in-depth interview guide with key informants is set out in Appendix 2 and 3). Informal, free-ranging discussion sessions were held covering a number of topics relating to health, illness and the social aspects and about possible migratory routes and livelihood. In order to establish routes of access to health resources, and the role of social support systems, questions were asked specifically about: symptoms and the process of diagnosis, processes of decision-making, about courses of action, details of who provided information, advice, financial or other material resources, and care and outcome.

3.8.2 Questionnaire administration

A structured questionnaire was used in collecting numerical data on knowledge and health seeking behaviors for malaria. 300 mothers of under-five children were administered the questionnaire. The questionnaires was divided into demographic characteristics, local naming of malaria-like illness, knowledge of malaria, time of illness onset and frequency of attack, symptoms of malaria and treatment in children and subsequent care approach, prevention on malaria, perception of mosquitoes and mosquito avoidance. The questionnaire was administered after explaining to each respondent the objective of the study and the respondents' right to refuse to answer any question (Agyepong, 1990; Dawson, *et al.*, 1992*)*. The questionnaire is set out in Appendix 4.

3.9.0 Specimen collection

First, the child's axillary temperature was taken using a digital thermometer. For malaria microscopy, thick and thin films were made on different slides for each child. The thin film was for species confirmation, while the thick film was used to detect and count the number of malaria parasites. The procedure was as follows: Cotton wool lightly soaked in methylated spirit was used to clean the third finger of the left hand (big toe, in the case of an infant). The ball of the finger was then punctured with a sterile lancet and a drop of blood was expressed in the middle of a microscope slide. Using another clean slide as spreader, the small drop was touched with the spreader and the blood allowed to run along its edge. The spreader was firmly pushed along the slide, making sure the

spreader was in even contact with the surface of the slide all the time the blood was being spread.

Using the corner of the spreader, the larger drop of blood on the second slide was quickly joined together, and excessively stirred but spread in a circular form. Both slides were labeled with the same patient number using a pencil and allowed to dry in a flat, level position protected from files. Films were stacked in slide boxes and taken to the laboratory for staining (WHO, 1990).

3.9.1 Fixing of specimens

The films were fixed with methanol, whilst not touching the thick films for five minutes. The Slides were put in a staining dish, stained with 10% Giemsa solution for 10 minutes after which slides were removed and washed with clean water to remove excess stain. Slides were then placed in a draining rack and allowed to dry, film side downwards, making sure the film does not touch the slide rack. A drop of immersion oil was applied to an area of the film. The oil was spread to cover an area of about 10mm in diameter. An area that is well stained and not too thick were selected and examined for malaria parasites and malaria pigments under the light microscope. Estimation of parasite numbers was carried out by multiplying the average numbers of parasite per high power field (HPF) (100 x objective) by 500 and 10-50 fields (depending on parasitaemia) was examined to determine the average number of trophozoites per high power (HPF). Ten fields was sufficient when the parasite density was high. The factor of 500 proposed by Greenwood and Armstrong (1991), that about 5-8µl is the volume of blood required to make a satisfactory thick film and that the volume of blood in one HPF of a well prepared thick film is about 0.002µl was adopted and used. Therefore, this number of parasite per HPF multiplied by 500 will give the estimated number of parasite/µl of blood (Greenwood and Armstrong, 1991).

Parasite count = $X * 500$ parasite/µl

$$\frac{\quad}{N}$$

Where X = number of parasites counted

N = number of fields counted

500 = Greenwood and Armstrong's factor

Those children who were confirmed positive for malaria by parasitological technique as well as those with positive clinical symptoms but negative parasitological test were given standard oral chloroquine doses. Children who reacted were given chlorpheniramine malate tablets. All drug administration was done by a trained Community Health Assistant. Treatment was done as community service. For parasite detection, 100 fields were examined irrespective of the parasites encountered. The parasitological data were crosschecked by another laboratory technician, blind to the results and verified by the supervisor if there was any controversy. The number of asexual parasites per 200 leucosytes was counted and parasite densities (asexual parasites/µl) were calculated assuming a normal value of 500 leucosytes/µl blood. Identification was noted for positive films. Slide result for each child was matched with the mothers response in the questionnaire, computed, and analyzed.

3.10 Data analysis

Data generated were pre-coded, and keyed into the computer, processed with *Epi-info* and analysed with *SPSS* software packages respectively. Proportions were compared by the analysis of variance (ANOVA), while Pearson's correlation was used to test the correlation between mothers' presumptive diagnosis and parasitological diagnosis.

Plate 3.2: A typical nomadic Fulani hut (Ruga)

Plate 3.3: A nomadic Fulani woman and her child welcoming visitors to her homestead. In the background is a millet farm ready for harvest

Plate 3.4: A nomadic Fulani granny having leisure time with some nomadic Fulani children under five

Plate 3.5: Nomadic Fulani girls posing for a picture

Plate 3.6: Nomadic Fulani clan elders with an interpreter

Plate 3.7: Nomadic Fulani boys

Plate 3.8: A young nomadic Fulani boy-herder taking care of calves around the camp

Plate 3.9: A nomadic Fulani woman, preparing an early meal for the family. Some of her children in the background, watching and waiting.

Plate 3.10: Conducting a Focus Group Discussion with nomadic Fulani males

Plate 3.11: Having a breakfast of corn porridge at the end of FGD

Plate 3.12: Posing for a picture at the end of a Key-Informant Interview with nomadic Fulani clan elders

Plate 3.13: Having a breakfast made of corn meal before setting out for the day's activities

Plate 3.14: Young adolescent nomadic Fulani males who participated in a FGD

Plate 3.15: Young nomadic Fulani maidens who participated in FGD

Plate 3.16: Two nomadic fulani women with thier children

Plate 3.17: A nomadic fulani mother with her child under five

Plate 3.18: A nomadic fulani head of household with some of his children inside a hut

Plate 3.19: A nomadic fulani man, his wife, son and some of his animal son a migratory trip

Plate 3.20: A nomadic fulani woman, her son and some donkeys conveying their goods on a migratory trip

Plate 3.21: A nomadic fulani religious leader

Plate 3.22: The nomadic fulani clan head encountered in the study

CHAPTER FOUR

4.0 RESULTS

4.1 Atitude and perception of the nomadic Fulani in relation to malaria

Table 4.1 show local names for malaria among the Fulani which included: ‘pabboje’ (60.7%), ‘nyaubandu’ (23.0%), ‘jonte’ (7.0%) and others (9.3%).

Table 4.1: Local names of malaria among Fulani

Local Name	Frequency	Percentage (100%)
Pabboje	182	60.7
Nyaubandu	69	23.0
Jonte	21	7.0
Others	28	9.3
Total	300	100

4.1.1 Knowledge about the cause of malaria

Table 4.2 show cause of malaria as indicated by respondents. This showed that, overall, only 32 (10.7%) of the respondents indicated that malaria is transmitted by mosquitoes. Other causes given were eating fresh corn (37.8%), eating fresh millet (36.0%) or even inhaling pollen dust while walking by/through a millet farm, eating fresh groundnuts (6.7%), eating wild fruits/berries during raining rainy season (2.3%), and traditional ideas like inhaling smoke while roasting corn (1.7%), staying long under the hot sun (0.3%). Believe in the supernatural force, drinking unboiled, fresh cows' milk in the rainy season represent 4.7% of restlessness, linking these to the cause of pabboje (Table 1). Ideas about the causes of malaria did not differ significantly between ethnic group X^2 cal= 48.17, X^2 tab= 32.67, P> 0.05). All respondents in the focus group discussions disliked the nuisance of mosquitoes but a few did not think they caused any ill health. Pearson's R, (0.027); Spearman's Correlation, (0.53).

Table 4.2: Causes of childhood malaria among Fulani in relation to clan background

Cause of malaria	Dialect (%)				
	Kiriyen	Jafun	Woda'abe	Garkwa	**Total**
Eating fresh corn/maize	61(20.3)	30(10.0)	6 (2.0)	16(5.3)	113(37.7)
Eating fresh groundnut	17(5.7)	2(0.7)	1(0.3)	0(0)	20(6.7)
Eating fresh millet/sorghum	68(22.7)	28(9.3)	4(1.3)	8(2.3)	108(36.0)
Eating wild fruits	6(2.0)	1(0.3)	0(0)	0(0)	7(2.3)
Inhaling smoke from roasting corn	1(0.3)	0(0)	1(0.3)	3(1.0)	5(1.7)
Staying long under the sun	1(0.3)	0(0)	0(0)	0 (0)	1(0.3)
Mosquitoes	21 (7.0)	4(1.3)	6(2.0)	1(0.3)	32(10.7)
Others	7(2.3)	4(1.3)	3(1.0)	0(0)	14(4.7)
Total	**182(60.7)**	**69(23.0)**	**21(7.0)**	**28(9.3)**	**300(100)**

ANOVA: *P*=0.186, F=1.717

Table 4.3 show the seasonality of malaria. Fifty one (17.0%) of respondents said it occurred in the dry season, while 59.3% and 23.7% thought rainy season and all year round, respectively.

Table 4.3: Seasonality of malaria

Season	Frequency	Percentage (100%)
Rainy season	178	59.3
All year round	71	23.7
Dry season	51	17.0
Total	300	100

Table 4.4 show annual frequencies of malaria attacks experienced among nomadic fulani. Respondents differ on the frequency of malaria. While, 45.7% were of the opinion that one could experience malaria twice in a year, 35.3% said malaria can only be gotten once a year and 19.0% said it can be contracted more than twice a year.

Table 4.4: Annual frequencies of malaria attacks among nomadic Fulani

	Frequency	Percentage(100%)
Once a year	106	35.3
Twice a year	137	45.7
Thrice a year	57	19.0
Total	300	100

Table 4.5 show the category of people afflicted by malaria among nomadic Fulani. Respondents were of the opinion that children (47.3%), adults (30.7%) and all categories (22.0%) can suffer the consequences of malaria.

Table 4.5: Category of people afflicted by malaria

Category	Frequency	Percentage
Children	142	47.3
Adults	92	30.7
All	66	22.0
Total	300	100

With respect to causation, 37.7% of mothers believe that eating fresh corn (maize), eating fresh millet (36.0%) or even inhaling pollen dust while walking through a millet farm could cause malaria. 10.7% of mothers cited mosquitoes as being responsible for the transmission of malaria, 6.7% of mothers thought eating fresh groundnuts causes malaria and traditional ideas like eating wild fruits (2.3%), inhaling smoke from roasting corn (1.7%), staying long under the sun (0.3%) persist. Believe in the supernatural force, drinking unboiled cow's milk represent 4.7% of the 'others', linking these to the cause of malaria (Table 4.1).

4.2 Mothers' recognition of childhood malaria

Table 6 show mothers recognition of childhood malaria in relation to age-group. Diarrhea and headache (36.3%), hot body and shivering (30.6%), coughing and crying (7.6%), vomiting and unable to play/restlessness (2.3%) and restlessness (2.3%) are signs used by nomadic Fulani mothers for the recognition of malaria in under-five children. This definition is consistent with the symptomatology of malaria as seen in clinical practice. No mother used convulsion as a sign of malaria in children under-five. Several symptoms were combined. There was no significant relationship between signs and symptoms used by nomadic Fulani mothers for the recognition of childhood malaria and mothers age-group (X^2 cal=, 111.99, X^2 *tab*=108.90 at $P>$ 0.05). Pearson's R (0.38); Spearman Correlation, (0.36).

Table 4.6: Mothers recognition of childhood malaria in relation to age-group (n=300)

Mothers Age Group	Diarrhea & Headache	Vomiting & Unable to Play	Coughing & Crying	Hot body & Shivering	others	**Total**
15-24	30(27.5)	2(2.9)	3(13.0)	20(21.7)	0(0)	55(18.3)
25-34	35(32.1)	14(20.3)	4(17.3)	35(38.0)	0(0	88(29.3)
35-44	33(30.3)	28(40.6)	6(26.0)	30(32.6)	2(28.6	99(33.0)
45-54	7(6.4)	17(24.6)	4(17.3)	7(7.6)	4(57.1)	38(13.0)
55+	4(3.7)	8(11.9)	6(26.0)	0(0)	3(42.8)	21(6.3)
Total	**109(36.3)**	**69(2.3)**	**23(7.6)**	**92(30.6)**	**7(2.3)**	**300 (100)**

*****others: joint pain, restlessness

ANOVA:*P*=0.235,F=1.519

Table 4.7 show signs mothers used for the recognition of childhood malaria in relation to parity. Among younger mothers with one child, 11.9% identified fever with diarrhea and a severe headache and attributed pabboje as the major symptom out of a total number of 22 mothers who had only one child (7.3%), while 38.3% of those with at least two child-births presumed malaria on noticing hot body/shivering. Mothers with either one child-birth and those with more than one child-birth didn't differ significantly with respect to enteric symptoms (X^2, $P> 0.05$). Persistent crying/coughing was used by 40.9% of mothers who had between 2-5 child-births. When pabboje caused a protracted or severe illness, it was felt to be operating not in conjunction with other factors. In situations like these, a spiritualist (mallam) would be consulted to determine the spiritual basis of the condition and provide more potent herbal preparations and ritualistic directives. From the result, 22.7% of mothers who had one child mentioned hot body and shivering as a symptom they used in diagnosing malaria in children under-five, this is in addition to headache 13 (11.9%), and gastrointestinal manifestations, in particular, vomiting and unable to play (a physiological and behavioral symptom) 4(5.8%), respectively No mother in this group associated malaria with coughing and unable to eat (loss of appetite).. Mothers with 2 to 3 children presumptively diagnose malaria with hot body (38.3%), followed by 45.8% who used diarrhea and headache as a symptom. This was followed by unable to play; vomiting and diarrhea, excessive crying and coughing, and joint pain and restlessness, at frequencies of 57.9%, 40.9%, 12.5% respectively. Mothers with 4 to 5 children associated malaria with headache and diarrhea, hot body and shivering and vomiting and unable to play at frequencies of 33.9%, 20.0% and 33.3% respectively.

Table 4.7: Mothers recognition of childhood malaria in relation to parity

Parity	Diarrhea & Headache	Vomiting & Unable to Play	Coughing & Crying	Hot body & Shivering	Others	Total
1st	13(11.9)	4(5.8)	0(0)	5(22.7)	0(0)	22(7.3)
2nd-3rd	50(45.8)	40(57.9)	9(40.9)	62(38.3)	1(12.5)	162(54)
4th-5th	37(33.9)	23(33.3)	9(40.9)	19(20.0)	7(87.5)	95(31.7)
6th+	9(8.3)	2(2.9)	4(18.2)	6(28.5)	0(0)	21(7.0)
Total	**109(36.3)**	**69(23.0)**	**22(7.3)**	**92(30.7)**	**8(2.6)**	**300(100)**

ANOVA:P=0.005,F=5.164

Mothers with 6 children and above were 28.5% likely to mention hot body and shivering, respectively, as the most important symptom for malaria. This is in addition to 18.2% who mentioned excessive cries and coughing, respectively. Mothers (2.9%) in this group associated malaria with the symptom of vomiting. There was no significant association between signs and symptoms used by nomadic Fulani mothers for the recognition of childhood malaria and parity (X^2 cal= 45.05, X^2tab=36.41 at P< 0.05). Pearson's R (0.012), Spearman Correlation (0.094).

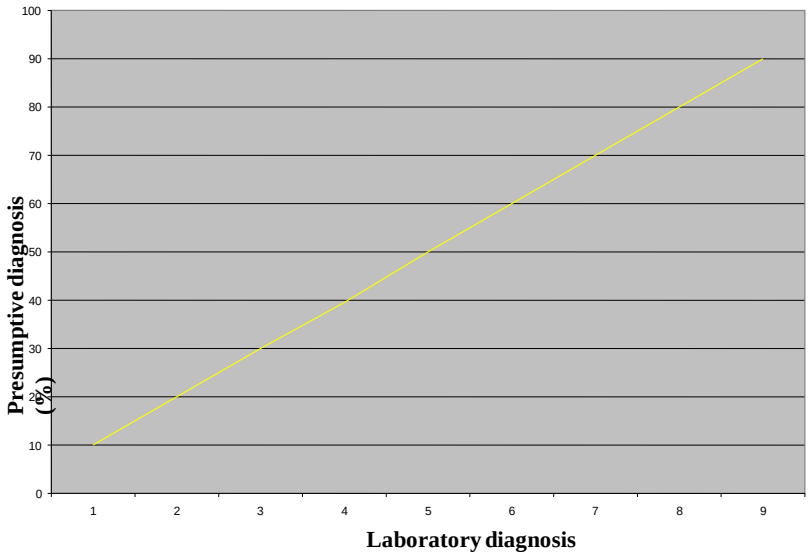


Fig 4.1: Correlation between presumptive and laboratory diagnosis

4.3 Care-seeking behaviour

The sequence of events in the treatment of malaria infection among nomadic Fulani is described in Figure 4.2 and Table 4.8.

Table 4.8 show care-seeking behaviour to malaria in relation to mothers' age group. At onset of symptoms, 109(36.3%) of respondents do not take any action in relation to malaria. Of this group, 62(33.7%), were young mothers, while 47(40.5%), belong to the older women age-group, those mothers who have attained the age of 30 years and above. The mean duration before taking a first-line action was 2.5 days. The main reason cited by mothers for tis delay was the notion that pabboje has a non-lethal effect on the population generally. If symptoms persist after waiting on the child for 2-5 days without resolving, a total of 81(27.0%) of both older and younger mothers resorted to self-treatment. Such treatment involves herbal medicine, herbal preparations and herbal inhalations, and herbal baths and other home remedies/cultural practices. Older mothers were known to practice self-treatment with herbs more that younger women at frequencies of 35.3% and 21.8% respectively. Eighty (26.7%) of mothers practice self-treatment with analgesics and antipyretics such as paracetamol, chloroquine, and quinine. Younger mothers (33.2%) were twice as more likely than older mothers (16.4%) to patronize these drug outlets.

Additionally, 11.4% of young mothers and 7.8% of older mothers said they would give the child a cold bath as first line treatment for malaria. There was no significant difference between care-seeking (First-line of action) to malaria in children under-five and mothers age-group (X^2 cal= 12.55, X^2 tab= 7.81, P>0.05).

If symptoms continue, 7.3% (n=22) of both younger and older mothers wont take action as second line of care (Table 4.8). This is a far cry from the 36.3% (n=109) of both younger and older mothers who appeared reluctant to take action the first time their child took ill. Eighty seven mothers (29.0%), comprising both younger and older mothers, gave herbal portions. The frequency of older mothers (31.9%, n=37) resorting to self-treatment with herbal preparations was found to be higher than

that of their younger counterparts (27.2%, n=50) Table 4.8. Sixty eight (22.7%), of both younger and older mothers stated that they would continue to self-medicate in the event of continuing symptoms primarily by using drugs bought from the chemist. The proportion of older mothers seeking this second line of care (23.3%, n=27)

Table 4.8: Care-seeking behavior to malaria in children in relation to age group

	Younger mothers (≤30 years)	Older Mothers (≥30 years)	Total
Sample (n=300)	184	116	300
First action:			
No action taken	62(33.7)	47(40.5)	109(36.3%)
Self-treatment (with herbs)	40(21.8)	41(35.3)	81(27.0%)
*Self-treatment	61(33.2)	19(16.4)	80(26.7%)
Apply cold treatment	21(11.4)	9(7.8)	30(10.0%)
Total (First line action)	**184(61.33%)**	**116(38.67%)**	**300(100%)**
If symptoms persist:			
No action	17(9.2)	5(4.3)	22(7.33%)
Self-treatment (with herbs)	50(27.2)	37(31.9)	87(29.)%)
Self-treatment (chemist/clinic/ hospital)	41(22.3)	27(23.3)	68(22.70%)
Consult herbalist/healer	44(23.9)	33(28.4)	77(25.70%)
Seek fathers opinion before Taking action	22(11.9)	10(8.6)	32(10.7%)
Consult with neighbor	10(5.4)	4(3.4)	14(4.70%)
Total (Second line action)	**184(61.33%)**	**116(38.67%)**	**300(100%)**

is slightly higher than that of younger mothers (22.3%, n=44). As regards the utilization of clinics and hospitals, only 41(22.3%) of younger mothers and 27(23.3%) of older mothers gave an indication of their willingness to visit these health facilities. Seventy seven (25.7%) of both younger and older mothers preferred to consult with a herbalist or traditional healer. Older mothers have a higher frequency of 28.4% (n=33) in their willingness to see an herbalist or traditional healer than younger mothers (23.9%, n=44). Thirty two (10.7%) of both category of mothers would prefer to seek the advice of the child's father before taking any action, while 10(5.4%) and 4(3.4%) of younger mothers and older mothers, respectively would seek the advice of a neighbour with whom they normally confide in, in malaria related illness. There was no significant difference between care-seeking (Second line of action) to malaria in children under-five and mothers age-group (X^2 cal=1.77, X^2 tab= 11.0, P>0.05).

4.4 Factors that influence care-seeking behaviour.

Table 4.9 show factors that influence care-seeking behaviour among nomadic Fulani. Among mothers, factors that influence health seeking behavior include, convenience (26.3%), low cost (35.0%), affordability of treatment cost (27.0%) and inability to know treatment avenue (11.7%).

Table 4.9: Factors influencing care-seeking behaviour

Factors	Frequency	Percentage (100%)
Low cost	105	35.0
Cannot afford treatment cost	81	27.0
Convenience	79	26.3
Don't know treatment venue	35	11.7
Total	300	100

4.5 Parasitological diagnosis of malaria versus mother's presumptive diagnosis

Table 4.10 show prevalence of *Plasmodium* infection by sex among children under five The results show that 282 (94%) were found positive by parasitological technique. All positive diagnosis was trophozoites of *P. falciparum*. The result also showed that of the 157 males examined parasitologically, 151 (50.3%) were infected, while 131 (43.7%) of females were infected. It appears that males tend to be more infected than females. There was no significant association between gender and prevalence of malaria (X^2 cal= 2.62, X^2 tab= 3.84 , P>0.05). The prevalence rate by age showed that the 13-24 months had the highest infection of 106 (35.3%). This was followed by the 37-48 months children with a prevalence of 82 (27.3%). The 25-36 months children and the 49-60 months old children had the least prevalence of 66 (22.0%) respectively. There was no significant difference between prevalence and age (X^2 cal= 0.36, X^2 tab=0.59, P> 0.05).

Table 4.10: Prevalence of Plasmodium infection by sex among children under five

Sex	Number examined	Number positive (%)
Male	157	151(50.3%)
Female	143	131(43.7%)
Total	300	282(94%)

Tables 4.11 show the prevalence and density of *Plasmodium* infection by ethnic group. The highest prevalence of 61.35% was found among the Kiriyen. This was followed by the Jahun (24.11%), and the Garkawa (7.45%). The least prevalence of 9.0% was found among the Woda'abe (7.09%). The difference in prevalence based on ethnicity was not statistically significant (X^2 cal= 0.6, X^2 tab=0.7, P>

0.05). Among the ethnic groups found in this study, the Kiriyen had 78.6% among those who had a parasite density of 1-1000/µl, followed by the Jahun (15.0%), Garkawa (3.5%) and least by the Woda'abe (2.9%). This pattern is repeated in the 1001-1600 parasites/µl in that order. In the 1601-2200 parasites/µl, the Kiriyen had 33.3%, followed by the Garkawa (26.7%) and lastly by the Jahun and Woda'abe (20%) respectively. Only the Woda'abe and Garkawa had a parasite density in the range 2201-2800/µl, thus Woda'abe (71.4%) and Garkawa (28.6%).

Table 4.11: Prevalence of *Plasmodium* infection by ethnic group among children under five

Ethnic Grp	No Exam	No Pos (100%)	1-1000/µl	1001-1600/µl	1601-2200/µl	2201-2800µl
Kiriyen	182	173 (61.35%)	136(78.6%)	32(36.8%)	5(33.3%)	0
Jahun	69	68 (24.11%)	26(15.0%)	39(44.8%)	3(20%)	0
Woda'abe	21	20 (7.09%)	5(2.9%)	7(8.1%)	3(20%)	5(71.4%)
Garkawa	28	21 (7.45%)	6(3.5%)	9(10.3%)	4(26.7%)	2(28.6%)
Total	300	282 (94%)	173(100%)	87(100%)	15(100%)	7(100%)

Table 4.12 show the distribution of *P. falciparum* parasite density by age-group. The infants (0-12 months) had a zero parasite density. Those children with 1-1000 parasites/µl among the 13-24 months age-group had a frequency of 97(56.06%), followed by 31(17.91%) among the 25-36 months age-group, while 27(15.60%) and 18(10.40%) among the 37-48 months and 49-60 months age-group respectively. Only 87 children under five had a parasite density between 1000-1600/µl. This include 6(6.90%) in the 13-24 months age-group, 31(35.63%) in the 25-36 months age-group, 43(49.43%) in the 37-48 months age-group and 7(8.04%) in the 49-60 months age-group. Among those children with a parasite density 1600-2200/µl only 15 fall under this category. 3(20.0%) were under the 25-36 months age-group, 11(73.33%) fell under the 37-48 months age-group and 1(6.67%) is in the 49-60 months age-group. Very few children under five (n=7) had between 2200-2800 parasites/µl in their blood. This is made up

of 3(42.85%) in the 13-24 months age-group, 1(14.29%) in the 25-36 months age-group, 1(14.29%) in the 37-48 months age-group and 2(28.57%) in the 49-60 months age-group.

Table 4.12: Distribution of parasite density by age-group in children under five

	Parasite Density (Number parasite/µl)			
Age (months)	1-1000/µl	1001-1600/µl	1601-2200/µl	2201-2800/µl
0-12 mo	-	-	-	-
13-24 mo	97(56.06)	6(6.90%)	-	3(42.85%)
25-36 mo	31(17.91%)	31(35.63%)	3(20.0%)	1(14.29%)
37-48 mo	27(15.60%)	43(49.43%)	11(73.33%)	1(14.29%)
49-60 mo	18(10.40%)	7(8.04%)	1(6.67%)	2(28.57%)

Table 4.13 show the distribution of *Plasmodium* parasite density by sex. Among the children with a density of between 1-1000 parasites/µl, males had 61.3% and females had 38.7%. Those with 1001-1600 parasites/µl, males had 35.6%, while females had 64.4%. Nine (60%) males had between 1601-2200 parasites/µl, while females had 6(40%) in the same category. Only 7 children had a density of 2201-2800/µl. This is made up of 5(71.4%) males and 2(28.6%) females.

Table 4.13: Distribution of *Plasmodium* parasite density by sex.

	Parasite Density				
Sex	0/µl	1-1000/µl	1001-1600/µl	1601-2200/µl	2201-2800/µl
Males	6(33.3%)	106(61%)	31(35.6%)	9(60%)	5(71.4%)
Females	12(66.7%)	67(38.7%)	56(64.4%)	6(40%)	2(28.6%)
Total	18(100%)	173(100%)	87(100%)	15(100%)	7(100%)

Table 14 show test performance of mothers' presumptive diagnosis compared with parasitological test With respect to the performance characteristics of presumptive diagnosis in terms of sensitivity, specificity (reliability) and predictive value, data showed that the sensitivity is 0.98, while specificity was 0.66. The positive predictive value and negative predictive value of presumptive diagnosis were 0.98 and 0.66 respectively. An indication that presumptive diagnosis is low in sensitivity compared to parasitological diagnosis. Its positive predictive value is as good as parasitological diagnosis Table 4.11.

Table 4.14: Test performance of mothers' presumptive diagnosis compared with parasitological test

		Parasitological Test		
		MP+	MP-	Total
Mother's	Positive	276	6	282
Diagnosis	Negative	6	12	18
	Total	282	19	300

4.5.1 Preventing malaria

Table 15 show method of preventing malaria among nomadic Fulani. One hundred and thirty two (44%) of the mothers advised that fresh corn should not be eaten, 23.3% were of the opinion that fresh millet shouldn't be taken, 15.0% suggested that one should stay away from eating fresh groundnut, 5.3% of the mothers said not eating wild fruits/berries during the rainy season and keeping mosquitoes away, respectively, would stop them from having the illness. Those who were not willing to take any precautionary measure constituted 3.7%, since taking any action would be counter productive in their own words; while 3.3% would resort to taking chloroquine.

Table 4.15: Method of preventing malaria among nomadic Fulani

Method	Frequency	Percentage (100%)
Not eating fresh corn	132	44.0
Not eating fresh millet	70	23.3
Not eating fresh groundnut	45	15.0
Not eating wild fruits	16	5.3
Keeping mosquitoes away	16	5.3
Do nothing	11	3.7
Take Chloroquine or Paracetamol	10	3.3
Total	300	100.0

Bed net ownership

Table 16 show availability (ownership) of bed net among nomadic Fulani. From the table, only 23.3% of respondents said they owned mosquito net, while 74.7% did not have a mosquito net in their dwelling place.

Table 17 show bed net usage among nomadic Fulani. Two hundred and twenty one (73.7%), said no one sleeps under a net, 7.3% said children alone should be given the privilege of sleeping under a mosquito net, 5.0% said breast feeding mothers should be allowed to sleep under a mosquito net, while 42 (14.0%) felt fathers are the ones to sleep under a mosquito net.

Table 4.16: Bed net ownership among nomadic Fulani

Ownership	Frequency	Percentage (100%)
Yes	76	25.3
No	224	74.7
Total	300	100

Table 4.17: Bed net usage among nomadic Fulani

Who sleeps under net	Frequency	Percentage (100%)
Nobody	221	73.7
Children	22	7.3
Breast feeding mother	15	5.0
Father	42	14.0
Total	300	100

Table 18 show perception on effectiveness of mosquito net among nomadic Fulani. Ninety six percent felt they were not sure of it's effectiveness in controlling malaria, while 3.7% said the mosquito net is effective in the control of malaria. Only 1 (0.3%) said it is very effective in the control of malaria.

Table 4.18: Perception on effectiveness of bet net among nomadic Fulani

Effectiveness	Frequency	Percentage (100%)
Not sure	288	96.0
Effective	11	3.7
Very effective	1	0.3
Total	300	100

CHAPTER FIVE

5.0 DISCUSSION

5.1 Attitudes and perception of the nomadic Fulani in relation to malaria.

It has been established from this study that nomadic Fulani people of northeastern Nigeria have a common name for malaria, which, they refer to as *Pabboje,* and is normally identified by its symptoms. It has been observed that the general season for transmission was the rainy season. These names generally refer to the symptoms of malaria such as fever, headache, shivering and tiredness (weakness of the body). But these symptoms have to occur every other day (intermittently) before the Fulani man can subsume it to be pabboje. The name pabboje is used by all Fulani ethnic groups. Pabboje means 'illness of the fulani'. Malaria as we know it today in local parlance is a distinct illness that is quite different from what the Fulani refer to as pabboje, which also differs from zazzabi (jabbjabi). Zazzabi (Hausa) means 'fever'. Zazzabi is a symptom complex which approximates the clinical case definition of malaria among the Fulani. Used in isolation pabboje is not synonymous with malaria nor with zazzabi.

Our findings agree with results from other studies carried out elsewhere (Ramakrishna, 1989; Espino, *et al.*, 1997), where malaria was recognized by the indigent population with a local terminology., being variously known as *foulakoka*, *dembadimi*, and *dannawali* in Soussous, *dembale*, in Mandinka, and *dionte* in Peuhl. The most commonly used names for the malaria in rural areas were: *kadjeh* or *kajewo, kirikiroo, bala maakuey* (Mandinkas), *sibirra* (Wollofs), and *jontinojeh*, *joforo* and *jofe* (Fulas). These names refer to the symptoms associated with the disease.

Africans have had to deal with the consequences of malaria for long. This has resulted in

the use of a range of different terms and disease categorizations, which may all relate to malaria but may not necessarily be perceived as such. These terms may not be easily translatable into the English taxon 'malaria'. Appropriate choice of terminology is critical for the development of effective health communication interventions. Outsiders are therefore faced with a communications challenge since there are up to 6 or more different terms for malaria or its various manifestations, with each term having a number of subcategories. An awareness of the use of a wide range of labels, related to the tremendous variability in symptoms of malaria, is pivotal for understanding people's perceptions of malaria, their treatment and control behavior.

People in different societies hold a variety of beliefs about the cause and transmission of malaria that may vary according to socio-cultural, educational and economic factors.

Its presence is linked to the environment and is felt to display a distinct seasonality in prevalence and severity People believed that the onset of rains (mainly the months of June- July), when grasses have begun to sprout, coincided with the coming of pabboje. However, with the exception of January-March ending, all other months were mentioned. Informants felt exposure to pabboje was inevitable, and that contracting it was largely determined by fate and the possibility of exhibiting illness was unpredictable.

The belief underlying this term is that the infection is considered to have a natural and cultural significance only among nomadic Fulani. Thus, it is believed by this population group that only the nomadic Fulani have this illness. It is not seen as serious needing quick and appropriate action that could prevent convulsions. This view is not unlikely when one considers that adults who hold the view are to a large extent immune to malaria or so and naturally would see an attack a relatively inconsequential experience. A similar

situation was found in United States of America (Ackerknecht, 1945), where 'in the beginning the 'chills' were regarded as a necessary element of the inevitable 'acclimatization' and after having the 'shakes' for years, people got used to it that they hardly paid attention to a little 'argue'. This is how an objectively dangerous and burdensome bodily condition can subjectively, by social convention, even lose the character of disease. The Uhrobos' of Delta State, south-south Nigeria, also viewed malaria as an ordinary inconvenience requiring little worry (Igun, 1982).

Thus, if a fulani presents with symptoms of *pabboje* in the dry season, the illness in question cannot be attributed to malaria, but to catarrh.

The widely held belief that *Pabboje* is caused by agents other than biomedical concepts still prevails as observed in this study. This is similar to the studies carried out in Tanzania and Ghana (Winch, *et al.*, 1994; Gessler, 1995 and Ahorlu, 1997). In Ghana, malaria is perceived as an environmentally related disease caused by excessive contact with external heat which upset the blood equilibrium (Agyepong, 1992). In parts of Guatemala malaria is thought to be caused by bathing too frequently or by drinking unboiled water (Ruebush, *et al.*, 1992). Elsewhere in Guatemala, malaria is thought to be derived from exposure to cold or wet conditions and eating too much of the wrong foods (Klein,1995). These misconceptions that people hold have direct implications for both preventive and treatment-seeking behavior as well as for malaria control activities.

Thirty two (10.7%) of Fulani mothers in this study were aware of the role of mosquitoes in the transmission of malaria (Table 4.2), although few knew how mosquitoes acquired their infections. The bite of mosquitoes was presented as more menacing than the way

they disturb ones sleep. This is suggestive of some local variation within the study population in terms of knowledge of malaria and possible exposure to health education, not in terms of health education delivered formally, but with respect to information gathered through media (radio) and one-on-one communication especially health personnel and outsiders, for example missionaries. It was obvious from interaction with health workers, that mothers might one way or the other obtained this idea.

From interviews held in a FGD, the following opinion was obtained:

'although mosquitoes (chuffi) were known to be abundant during the rainy season, there is no known link between mosquitoes and disease'.

All cases of malaria-related illness, irrespective of their cause were thought to occur only during the rainy season.

An informant said: *Pabboje doesn't kill people (Fulani). It doesn'y kill because that is what it is (it nature). Its duration in individuals differ from one person to the other. In an individual with small blood (mo e em), it could last for seven days, while in another person with bigger blood, (e em du dam), it could last up to 14 days.*

Here is what an informant said "*<u>Pabboje</u> is such a common phenomenon among (we) the nomads and it is linked with the rainy season. At such times, an individual could come down with it lasting between 3 -7 days. Atimes, it could take up to 20 days before recovery. No matter the length of period it takes, it sure doesn't kill. Small boils starts to appear on one' lips, an indication that you will not have it again that season. In the event that modern medicine is taken by the patient, be sure that it will come back again"*

A key informant said: *Pabboje has a natural occurrence among our people (fulani). It is an inheritance among the Fulani.So long as you are a fulani of pure blood*

(descent), you will catch it. That is why most ethnic groups refer to it as Fulani illness. By mere eating of fresh corn or perceiving the aroma of fresh maize, you begin to shiver as a sign that you have pabboje. Sometimes, by walking through a millet farm and inhaling the pollen dust, could give you pabboje, even before you get home.

Ideas about the causes of malaria differ significantly between age group,

5.2 Mothers' recognition of malaria

Early diagnosis of malaria illness is a vital component of strategies to reduce malaria-related morbidity and mortality in children in developing countries (WHO, 2008). This in turn depends upon recognition of symptoms of malaria in the household by mothers. The presenting complaint for each child was *Pabboje*. Malaria was cited as the commonest childhood illness presenting with hot body and vomiting by 30.7% of respondents (Table 4.6), indicating that mothers have a high suspicion index for uncomplicated childhood malaria. However, none of the respondents cited convulsion as a symptom for malaria, suggesting that this important symptom of complicated malaria is not recognized. Convulsions are given a different meaning.

Diunugo, a locally recognized illness among the nomadic Fulani characterized by convulsions, in which the child twists and shakes –which closely corresponds to severe malaria, is attributed to an evil spirit. This belief is widespread among the nomads and spiritualists are consulted, where exorcism plays a greater part in the treatment process. This action can have dire consequences for the victim because as a result of inappropriate treatment, the victims condition may worsen, leading to death. Misconceptions of this

kind could inhibit appropriate preventive and therapeutic options. Whyte (1997) and Ryan (1998) opined that illness symptoms are often diffuse and ambiguous, and illness course or treatment outcome are unexpected. Facing uncertainty, people follow a trial and error approach in search of relief and meaning. This is in agreement with other works elsewhere (Aikins, 1993; Mwenesi, *et al.*, 1995), which recognized a link between malaria and supernatural forces. Malaria, especially in children, is often perceived as a result of the child being possessed by an evil spirit or devil. Convulsions in a child may quite 'naturally' be seen as the child being possessed by a foreign force that is making the child's body to twist and shake. Similarly, in Tanzania, as in Kenya (Mwenesi, 1993), convulsions (also known as (*ndege-ndege*) in young children are not associated with malaria. People in this part of the world believe that if a child with *ndege-ndege* is given injection, he or she will surely die (Mwenesi, 1993). Thus, children with convulsions are usually taken to the traditional healers but not to a health centre or hospital (Tarimo, 2000).

These differing and often conflicting perceptions, as delineated some time ago by Foster (1976), may stem from a dualistic aetiological perception, common among many people who think about disease causation in either 'naturalistic' or 'personalistic' terms. The 'personalistic' etiological perception includes the belief that certain diseases may be human, non-human, or supernatural. This way of perceiving disease causation sees the sick person as a victim, with no room for accident as an explanation.

Mothers' ability to associate malaria with hot body has important implications on child survival. In this study, hot body and vomiting represented by 30.7% and enteric symptoms (unable to eat, vomiting and diarrhea, representing 20.3%), featured

prominently as important symptoms of malaria, followed by other physiological and behavioral symptoms. These symptoms have important implications on the identification of the sick child with malaria and should be evaluated within the context of the Integrated Management of Childhood Illnesses strategy among this population group.

The number of childbirths played an important role in the mothers' ability to recognize and diagnose malaria. Fever was recognized by mothers as hot body or as a syndrome including hot body and other symptoms i.e. headache, unable to play/restlessness. Malaria was correctly defined as fever or fever with other symptoms provided it occurred continuously, although it was seen to be different from pabboje. Fever (pabboje) was not considered as a dangerous feature that could lead to any complication such as convulsion or death as revealed by focus group discussion (FGD). Convulsions were not regarded as symptoms of malaria but rather manifestations of an evil force that only a diviner could handle and not modern medicine.

5.3 Care-seeking behaviour

Malaria was not regarded by survey respondents as a 'cause of concern' and the initial response to treatment at the household level was that of apathy. Since it was an accepted belief that malaria has a natural and cultural significance and that it would normally resolve on its own after a few days, it was not surprising that 36.3% (n=109) of mothers take no action (Table 4.8 and Figure 4.2). This state of complacency and delay has important implications on the overall outcome of illness on the child. The belief that even though no action was taken, symptoms would resolve naturally can be pictured from the clinical features of malaria. The clinical features of malaria vary from nothing to mild

and to severe, according to the species of parasite present, the patient's state of immunity, the intensity of the infection, and the presence of accompanying conditions such as malnutrition, anemia or other diseases. Delay in initiating treatment can only prolong the course of illness leading to severe malaria and possibly death. For this reason, prompt treatment with antimalarial drug is imperative. Participants in this study employed a 'wait and see' approach in the pathway to treatment and it is only when symptoms persist do they see the need to initiate treatment.

Self-care (Table 4.8) was found to be the first and major therapeutic activity undertaken by a majority of the study population for managing malaria- related illnesses, this is in line with findings from rich and poor countries alike (Stevenson, *et al., 2003;* Tuan, *et al., 2005*). Use of self-care is also justified depending upon the type of illness and standardization of its treatment so that the common people can use it safely and effectively (WHO, 2000). However, self-care involves risks such as incorrect self-diagnosis, absence of knowledge of alternative treatments, irrational use of drugs including selection, incorrect dosage and duration as well as side-effects and neglect of interactions with other drugs. This is especially important in a population with low literacy level like the nomadic Fulani where self-care is largely uninformed, and may be harmful due to the above risks. The free availability of prescription drugs' in the unlicenced and unregulated drug retail outlets also exaggerates risks inherent in self-care.

Secondly, analgesics and antipyretics are bought from vendors and shops in towns. This is in consonance with Agyepong and Manderson (1994), where people treat symptoms themselves first, using either traditional home remedies or pharmaceuticals. It is only after exhausting all possible options as far as home remedies is concerned do mothers

seek outside help.

Drug and retail shops are often the first and only source of healthcare outside the home for a majority of patients. This is facilitated by easy availability of essential drugs at low cost. Treatment tends to be a function of negotiation between patient and provider regarding what the patient or their families can afford. Medicines are usually sold per tablet, capsule or spoon in case of syrups on the basis of what is prescribed by a relative, and seldom involve the direct examination of the patient. Misuse of antibiotics is a cause of concern due to development of resistance from inappropriate dose. They present a formidable barrier in the rational use of drugs.

Care of the sick person is a dynamic process. The caretaker diagnoses on the basis of a variety of symptoms, then treats, assess treatment success, alter the treatment regime or seek advice. Nomads use a combination of treatment options for malaria-related illness i.e. self treatment with herbal mixture, traditional medicines, patent medicine shops and medicine vendors. In their treatment-seeking patters, the official health sector is seldom utilized because of a long standing tradition of herbal treatment and the cold treatment meted out to them by health personnel (Personal Communication). This alternation from one type of care to another is described by McCombie (1996) as a “hierarchy of resort”. There is a large range of variation in treatment-seeking patterns. Severity of illness may be related to this hierarchy of resort, with the use of multiple treatment options. As one treatment fails recourse is taken as the patient’s condition deteriorates. There are four criteria relevant for treatment choice: (1) gravity of illness, (2) whether an appropriate home remedy is known for the illness (3) faith or confidence in the effectiveness of home remedies for a given illness, and (4) expense of treatment and the availability of

resources. Persons follow predefined patterns, both in their first therapeutic choice and when they move from one treatment modality to the next (Hausmann-Muela, *et al.*, 2002). For non-severe illnesses, actions by the nomadic Fulani are cost-oriented. They start with less costly treatment, home treatments (herbs) (Table 4.8) as the first line of defense and only opt for more costly alternatives of cure, and normally persons opt for a healer/spiritualist and will be prepared to pay any amount in order to obtain health.

Those who self-treat with modern drugs among the nomads purchase their supplies from poorly-informed vendors and drug sellers mostly at rural markets which serve as meeting point. Often time too, patent medicine sellers in towns are patronized. The haphazard nature with which these drugs are taken by Fulani's should be a cause for concern and may be one of the reasons for developing drug resistance. Their reliance on local drug shops for treatment is based on the fact the nomads receive prompt consultation and treatment without stress, and because these are their nearest source of care. Since they are always on the move they seldom have time for settled modern techniques. These drugs are bought from drug vendors, shops, and chemist and drug hawkers at local markets on market days.

In most cases, these drugs are bought if they are cheap, and oftentimes, drugs obtained are chemist's recommendations. This raises the question of the possibility of fake drugs being sold to these nomads. The amount of drugs self-administered varies. Some respondents stated taking one tablet of paracetamol, others one-half tablet of chloroquine. The bitter taste of some of these tablets is repulsive to children and shy away from taking them after an initial trail. So long as the symptom is not there, the child stops taking the

medication, the remaining tablets are then kept at a safe location in the hut until such a time when another family member complains or if a neighbor requests for same. Inadequate drug regiment is a common phenomenon among this population group.

Cultural practices and traditional malaria treatment is hinged on the use of substances (roots, leaves, and bark of certain trees) most of which are mixed in different combinations, boiled in water and taken as a drink. These substances are sometime burnt with the patient made to inhale the toxic fumes of the material. They are generally bitter in taste and this is thought to cure. At other times, the steam from boiling leaves and bark of trees in inhaled. Also herbs are heated in fire and placed on the body of the patient to draw the illness away before throwing the herbs away. This is particularly applicable in serious illness situations. Their effectiveness is questionable as are their concentration. Although they might posses active ingredients which could be effective in the treatment against malaria-related illness.

When subjects do nothing as a first line of action in treatment option for malaria related illness the situation has dire consequences and has important implications for child survival among the Fulanis. This is not suspiring as most of the study subject's belief that malaria-related illness posses no serious threat to life. Informants also have the notion that pregnant women who have *Pobboje* should not be taken to the hospital. This erroneous belief is of grave danger as a woman's altered immunity during pregnancy puts her at increased susceptibility to *P. falciparum* and increased risk of material and infant morbidity and mortality.

Social network play an important role in the various ways by which people make decisions to seek care for specific stages of an illness. The decision as to where to

seek care are influenced by lay references. This is especially true in areas where people may be affected by a network of kin, neighbours, and friends who constitute a "Treatment Management Group" and therefore contribute to diagnosis and selection of treatment sources, both of which have an impact on the course of treatment. The person who takes decision within the household, may play an important role in which kind of treatment is sought (Janze, 1978; and Igun, 1982).

Among the nomadic Fulani, treatment seeking determinations were usually made by the head of household. Thus, social roles plays an important part in the decision making process. The reason being that it helps to keep issues within the household as well as protecting the male head's position within it. When treatment fails, the head of household, who has the exclusive preserve as to the next line of action is notified. A healer may be invited to the camp to treat the sick person and the husband is prepared to pay any amount once it is they who call for the services of the healer. As to what work for an individual is fundamentally that of trial and error by the healer. After the first healer have tried and failed, another healer might be consulted. Of the 10.7% who opted to consult with the child's father (Table 4.8), following failure of the first line action, a few suggested clinic/hospital as the next resort. At this point, the patient's condition would have deteriorated. Most often, private clinic/hospitals, if at all, are patronized by this population group, rather than government run services.

Traditional healers are consulted by the nomads because instead of the array of questioning they faced at the health facility, the healer does much of the talking by way of invocation of the spirit world, thereby serving as a mediator. So, the ordinary nomad feels at home in the presence of a healer. Moreover, the healer empathizes with their

clients, showing some level of sympathy over the condition of the patient. No harassment is involved.

The proportion of respondents reporting self-treatment as a first line of care is high (21.8% for younger mothers, and 35.3% for older women) (Table 4.8), indicating greater self-medication among this population group. This is true because when people employ a hierarchy of resort in seeking treatment for malaria, home treatment usually serves as the first line of defence. This agrees with the findings of Foster (1995), who found that self-treatment, especially in rural areas is the rule rather than the exception. And equally supported by Agyepong and Manderson (2000) in their study in Ghana where self-medication as the first line of care was the order of the day. Cost and convenience are obvious reasons for home treatment, yet perceptions also play a contributory role. The general perception of the people in this study is that illness should first be treated at the home front, and only after such treatment fails and the illness persists should other types of care be sought after. Self-treatment entails many potentials dangers. It may result in delays in taking patients with severe malaria for appropriate treatment. Care-takers may wait until the condition resolves on its own or when the illness does not resolve and indeed worsens, it may be too late, as a delay of even a couple of days may prove deadly in cases of severe malaria. Mothers in this study were found to delay action at the onset of illness for about 2-4 days.

The higher proportion of respondents (25.7%, Table 4.8) in this study consulting with traditional healers agrees with the findings of other researchers. In Kenya (Mwenesi, *et al.*, 1995; Snow *et al*, 1992), as in Tanzani (Gessler, 1995), Ethiopia (Yeneneh, 1993) and Thailand (Okunurak, *et al.*, 1993), traditional healers were consulted for a variety of

reasons.

In any given disease episode, all of these symptoms need not be present for pabboje to be subsumed, but one underlining fact is that the symptoms must occur intermittently (every other day) before nomadic Fulani can conclude it is pabboje.

5.4 Factors that influence health seeking behaviour

In addition to consideration of the most appropriate treatment methods, there are various other ways by which people make decisions to seek care for specific stages of an illness. Social networks play an important part. Many decisions about where to seek care are influenced by relations, because of the network of kin, neighbours and friends and this contribute to diagnosis and selection of treatment sources, and may have an impact on the course of treatment (Foster, 1995).

Who makes the decision within the household, may play an important role in which kind of treatment is sought. In this study, the head of household generally made decisions (Table 4.9). This agrees with the work done by Mwenesi, *et al.*, (1995) along the Kenyan Coast. Social roles played an important part in the decision-making process, especially ideas about who 'owns' the child. In the absence of a husband, male in-laws and brothers or fathers made the determinations. A primary reason for this was to keep matters within the household and to protect the male head's position within it.

5.5 Parasitological versus mothers' presumptive diagnosis

Clinical and parasitological findings suggest that the area under study had a low level of malaria transmission during the period for which the survey was executed. This is an illustration of local variation in the pattern of malaria transmission that could occur and the need for detailed studies to be undertaken. The low level of parasite density

associated with females relative to their male counterparts in this study could be interpreted to mean that females were able to mount a good immune response to malaria antigens, giving them an enhanced parasitological advantage. In addition to them having a strong humoral immunity, they might also possess a strong natural immune response or a quicker cellular response. The generally lower levels of parasite densities observed in Fulani children in this study might imply that these Fulani children were protected against malaria. This agrees with the work of Modiano *et. al.*, (1996) who documented the high tolerance to malaria by the Fulani ethnic group.

In this study 6% (18/300) of infants had a negative blood smear. These are children between the age of 0-4 months of age. Newborns are innately resistant to acute malaria infection and rarely become ill with malaria in the first 3 months of life. This agrees with the study done by Playfair (1982), who had a similar finding. Between 3 months and 5 years of age, however, children can experience attacks. The relative protection of the newborn may result from its immunological experience in utero and from nonimmunological determinants as well. Transplacental transfer of protective antibody, *IgG* isotype, from an immune mother has long been thought to be important in imparting innate immunity to malaria. From a theoretical point of view, prenatal induction of antigen-specific or non specific defense mechanism in the fetus might also occur and influence early susceptibility to malaria. Mothers antibody probably do not delay significantly the acquisition of the first infectio. The density of asexual stages of the first infections increasea with the age of the infant (Tables 4.11, 4.12 and 4.13). This increase in density of asexual stages may be explained by the loss of passive immunity.

5.5.1 Prevention of malaria

Among 25.3% of nomadic Fulani who own nets, these nets are used to prevent the nuisance caused by mosquitoes during sleep and their irritating bites, not in an attempt to prevent malaria-related illness. The nets were not impregnated with insecticide , as these nomads haven't heard about insecticide impregnated bed nets. Purchasing nets requires an outlay of cash by nomads and this is a great burden among them. As such not all family members sleep under these nets, for those families that owned one. In place of net, some nomads spend money on less inexpensive methods, including burning various substances to repel mosquitoes. The implication here is that one has to say awake for most part of the night to keep coils burning or fire stokes. These substance causes irritation to the system and often times gives respiratory problems. Most nets observed were in poor condition. Some of them had between 6-12 holes.

Seasonality is a major feature in the use of nets among nomads. The rainy season was identified as the time when net usage were common, during the high mosquito season. It would therefore be good to target this period for the delivery and promotion of insecticide nets among nomads. Such promotion campaigns ought to adopt a balance view on the useful benefit of nets for protection against malaria, and protection against nuisance of mosquitoes.

Among those who do not own nets, they were of the view that owning nets is a luxury and a sign of prestige.

Use of nets may fluctuate based upon perception of nuisance, which in turn may be related to seasonal variations in mosquito density (Hweitt *et al*, 1992). In this population group perceptions about risk of malaria and mosquito in not made, and the majority of

nomadic Fulani's in this study do not see the link between malaria and mosquito as being more abundant during the raining season, the time when the locally recognized malaria was thought to be very common. Although this population group do not differentiate malaria-related illness based upon duration of symtomatology alone, but rather on the time of year in which the illness occurred. Febrile illness during the long dry season were more often ascribed catarrh.

CONCLUSION

The predominance of self-care for managing illnesses by the underserved population group was observed. Self-care will continue to thrive among the nomadic Fulani as the main resort for the majority of illness including *Pabboje* in the foreseeable future, as there are no mobile health units to address the health needs of migrant populations. This resource should be used to its full potential for the benefit of both the people and the health system. Thus, integration of self-care as an essential, informed and efficient component of the Primary Health Care, and as a cost-effective complement to the formal healthcare, is suggested. It would be therefore helpful to identify group of individuals who can be trained in recognizing and managing common illness among this population group.

Training module should take cognizance of the low literacy level of the nomadic Fulani; as such pictorials/vignettes should feature prominently. This should enhance home treatment by reducing some of the dangers and pitfalls inherent with self-treatment. Delay in taking patients with severe malaria to health centers will be eliminated as caretakers will no longer wait for the condition to resolve on their and when it is not resolving after a few days of applying first line treatment they will immediately apply appropriate action.

For meeting the healthcare needs of the underserved population, it is necessary to have health manpower that is close to the community they serve in terms of cultural and ethnic characteristics and also, he/she should be able to communicate with them socio-culturally. Human resources for health is important for population health outcomes, and

presumed to be one of the limiting factors in achieving the millennium development goals (MDGs). In this context, the importance of para-professionals for healthcare in the rural areas should be recognized and their capacity developed to ensure that the poor and the disadvantaged get an acceptable level of care.

In spite of low socio economic status they sought private care. Private care was preferred due to availability, accessibility, quick relief and good individual attention.

Unless nomadic Fulani mothers are empowered with the capability to recognize and treat malaria, its impact on child mortality will continue unabated. The need is to educate mothers to suspect malaria first in every case of febrile illness and take appropriate action to rid the child of malaria to expose the underlying ‘Iska’ ("evil"). This is a more acceptable form of education than an insistence on replacing local knowledge with biological epidemiology of malaria. The challenge before health personnel is to identify and exploit local beliefs about aetiology in effecting management procedures among culturally different peoples irrespective of their acceptance of biological models of disease transmission.

Our findings indicate the importance of understanding women's perspective in community-based malaria prevention and control. The envisaged reduction in malaria morbidity and mortality will depend on the successful implementation of malaria control strategies by involving the local community. A more concerted effort is needed for scaling-up the distribution of ITNs, improving the knowledge of the community about the link between malaria and mosquitoes, causation of malaria and its preventive methods particularly on the proper utilization of ITNs. One important area that must be given priority in the effective implementation of ITNs is considering the pivotal role of women

in the community. Women are role models for their family members particularly for their children. Raising awareness and understanding, and involvement in malaria prevention and control could enhance the proper use of ITNs by their children as well as other family members. Effective antimalarial drugs should also be available at the grassroots level where the problem of malaria is widespread.

RECOMMENDATIONS

There is the need to sensitize this population group on the importance of bed nets against mosquitoes and malaria. They should be encouraged through health education campaigns to acquire and own insecticide impregnated bed nets.

Since complicated malaria is associated with very high mortality, health education interventions should focus on improving the nomadic Fulani mothers' perception and knowledge to recognize the link between malaria and convulsions. Health education should focus on changing the misconception and beliefs about convulsions by improving their knowledge. The importance of nonscientific and traditional theories of illness causation to malaria control should not be underestimated, since they summaries the communities' perception of the local epidemiology of malaria and their perception of risk. Based on knowledge of local realities, new ideas should be introduced in as harmonious ways as possible, allowing old perceptions to be amended and new perceptions to be adopted. An antagonistic approach, especially one which involves labeling people ignorant and unscientific peasants, will not meet with much success, either in the short or long run. A formal recognition of differences and a negotiation of mutually agreeable solutions, through cultural accommodation, should be employed and this will help from the basis of successful malaria control efforts.

Since mothers are able to recognize symptoms associated with malaria, it is suggested that these positive attitudes and practice should be reinforced through health interventions for the reduction of morbidity and mortality from childhood malaria through improved case detection and appropriate treatment and management. Health education message

should also focus on changing the general perception about malaria among the population to minimize delays in care seeking.

It might be worthwhile to improve literacy level of the nomads. Since mothers have a greater potential impact as family health promoters, training them on the basics of identifying and treating malaria cases would be an added advantage to the nomadic family and community at large. Their participation in malaria prevention activities within households should be taken into account in health education programmes.

Enhancing people's capacity for safe and informed self-care along with the capacity to assess services available locally, to judge provider competence and to evaluate whether costs are justified and reasonable, are needed.

Improving the quality of traditional medicine through institutional training, registration and licensing so that they are dependable may reduce the cost of therapeutic care and pressure on the formal healthcare system.

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APPENDICES

APPENDIX 1: Focus group Discussion guide

Introduction

Good morning. My name is Godly Chessed, a post graduate student from the Department of Biological Sciences, Federal University of Technology, Yola. I am here to learn from you about some type of activities related to the management of malaria in the home. I have invited you because of your experience in this community and the trust I have in you. Please, feel free to voice your opinion, as there are no right or wrong answers.

The discussion will last for about 45minutes, and participation is voluntary, as such you may wish to pull out of the discussion whenever you feel like doing so without any prejudice. What you disclose to me will help a great deal in developing a strategy for training members of similar community in the management of malarial disease in the home and consequently help in improving the health of children in this community and others. My discussion with you will be treated with utmost confidentiality.

1. What do we mean when we say someone is healthy?

a. What are the common febrile illnesses that are common in this community?

b. Are there differences between children's and adult sickness" (for each illness ask for symptoms). Are there any other word used for this illness?

c. What is the local name for malaria? (Signs and symptom)

d. What are the causes of febrile illness?

e. How does fever progress in a child if not treated promptly?

2. What do you do to take care of a child with fever? (First action, Second action, Third action etc, Probe)

a. For those illnesses associated with hot body, what are the common forms of treatment?

b. Are there problem people face in getting help when you have a disease with fever?

3. Are there different types of malaria?

a. What is the local name for convulsion? what are the causes?

b. Is there any link between malaria and convulsions?

c. If a child suffers from convulsion, where do you seek help? why? If treatment fails, what do you do next and why?

4. What do people in this community do to prevent illness?

a. Tell me something about mosquito? (Probe for problems with mosquitoes and effort to get rid of them.

b. Is there anything different you can do to avoid getting malaria?

APPENDIX 2

Oral interview guide

(For camp head, Nomadic primary school teachers),

1. What are the common illness people in the community suffer from? (Category of people who suffer from them and when (season). Which ones are considered serious and severe?
2. What local name do nomads have for illnesses associated with fever?
3. What is the local term for malaria? Are there different types of malaria? If yes what are they?
4. What causes (local name for malaria)? When is it frequently encountered?
5. What are the signs and symptoms for malaria? Any categorization of (local name for malaria?)
6. Has your child ever suffered from malaria? If yes, how did you know it?
7. Has your child ever suffered from convulsion? What could have been the cause?
8. What did you do to treat the child and why? Did the treatment work?
   If not what did you do next? Why?
9. Is it possible to prevent convulsion? If yes, how? (Describe)
10. Who decides what to do and where to go when someone is sick in the family?

a. Do you pay or give something for treatment?

b. Does the fact that you pay influence your choice of health service?

11. How is malaria prevented? Probe for all options available (insecticides, bed nets, coils and reasons for use).

APPENDIX 3

Oral interview guide (Traditional healer)

1. Who are your clients and what are the major complaints that they contact you for?
   Do mothers come to see you with their children?
   What kind of complaints do they bring to your notice?
   How do you confirm or reject their complaints?
   What is the most common diseases among under five children? probe for cause, signs and symptoms)
   How do you determine if a person has fever?
   What are the cause of fever?
   How do you treat fever in children and adults
   Following this treatment, if the patient does not recover, what is the next step?
   If the condition does not improve, what will be your conclusion?
   What is the local name for malaria? Are there different types of malaria?
   What are the symptoms of malaria?
   If a child has malaria, how do they get treated?
   If a child has convulsions what could be the possible cause and how is treatment given.
   How is malaria prevented?

APPENDIX 4

Questionnaire on perception and health seeking behaviour in relation to malaria among nomadic Fulani

All mothers or caretakers of under-five children in selected household are to be administered the questionnaire. Questionnaire number……

1. Location of ruga (camp)……
2. Dialect……..

3. Number of person in household ……
   (any still birth)
   sex age sex age

4. What is the local name for (malaria)
   1. Pabboje 2) Nyaubundu 3) Jonte 4) other
   (sutstitute malaria with the appropriate local term.)
3. What cause (malaria)
   1. Eating fresh corn/maize 2) g/nut 3) Millet/sorghum
   4. Eating wild fruits 5) Inhaling smoke roasting maize
   6. Staying long under the sun
   7. Mosquitoes 8. Other
6. What (time) of the year is the illness most (common?)
   1. Dry season 2) rainy season 3) all year round
7. What category of (people) are mostly (afflicted) by this illness
   1. Children 2) adults 3) men 4) women 5) others
8. How often do people (experience) this illness?
   1. Once 2) Twice 3) Thrice 4) other
9. What are the (signs) of malaria in a (child)?
   1. Headache 2) Vomiting 3) Diarrahea 4) Unable to play
   2. Feverish 6) coughing 7) Joint pain 8) Hot body
   9) other

10. What are the (signs) of malaria in an (audlt?)

1. Nothing 2) Loss of appetite 3) bitterness of the mouth

4. Feverish 5) coughing 6) Joint pain 7) others

11. What is the (first) thing you (do) when your have malaria?

1. Nothing 2) Take paracetamol 3) go to clinic

4. Chloroqunine 5) herbal 6) chemist 7) others

12. If no recovery, what would you (do nest?)

1. Mix milk with ash (from wild paw paw) and drink

2. see a healer 3) chemist 4) other

13. What are the (reason(s) you chose this care (approach?)

……

……

14. What is your (first action) when your child has malaria?

a. Nothing 2) take paracetamol 3) go to clinic

4. Chloroquine 5) herbal 6) chemist 7) others

15. If child does not recover what would you (do next?)

1). Give paracetamol 2) give chloroquine 3) chemist

4). clinic/hospital 4) other

16. What is the (reason) you chose this care (approach?)

……

……

17. If a person has this illness and does obtain cure, what do you t think would happen?

Explain

……..

……18.

How do you prevent (malaria?)

1). Not eating fresh corn 2) Not eating Groundnut 3) not drinking fresh milk 4) Not stay for too long under sun

5) keeping mosquitoes away 6) not eating fresh sorghum 8) take chloroquine 9) others

19. Do you think there are a lot of (mosquitoes) here?

    1). Yes 2) No 3) Don't know

20. Do you consider their presence (nuisance?)

    1). Yes 2) No 3) other

    If yes, in what ways are they a nuisance?.....

21. (Why) do you think there are (mosquitoes) around here?

    1. Too much rain 2) too much grasses 3) too much cold

    4) living close to river 5) living close to stagnant water

    6) other

22. What do you do to (keep) mosquitoes (away)?

    1). Use nets 2) coils 3) water piapia 4) insecticide sprays 5) deterrents 6) nothing 7) other

23. Do you (use) a (bed) net?

    1). Yes 2) no 3) sometimes

24. Do you (have) any (bed) net in your household?

    1). Yes 2) No

25. If you have nets, please give (reasons)……

26. (Who) sleeps under a (bednet)

    1.) Child 2) breat feeding mother 3) whole family

    4) others

27. What is your perception about (effectiveness) of bed (nets) in preventing illness

    1). Very 2) somewhat 3) not at all

    If effective, which illness ……..

APPENDIX 5

Formulae for evaluating test performance

Test performance of mothers' presumptive diagnosis compared with parasitological (laboratory) test.

		Parasitological		
		MP+	MP-	Total
Mother's Diagnosis	Positive	a	b	a+b
	Negative	c	d	c+d
Total				

Sensitivity: a/ (a+c)

Specificity: d/ (b+d)

Positive predictive value (PPV): a/ (a+b)

Negative predictive value (NPV): d/(c+d)

APPENDIX 6

Laboratory result

S/No	Sex	Age	Presumptive Diagnosis	Laboratory Diagnosis	Species	Parasite density
1	M	6mo	F,HB,L,D	+ve	*P. f.*	640/ul
2	M	2yrs	F,HB,D,L	+ve	*P. f.*	920/ul
3	F	2yrs	HB, F, HD ,Ca	+ve	*P. f.*	440/ul
4	F	2yrs	HB, F, HD, Ca, D	+ve	*P. f.*	1080/ul
5	M	1yr	V,D,F,HB,L	+ve	*P. f.*	720
6	F	1yr	Ca, D,F,L	+ve	*P. f.*	680
7	F	2yrs	F,D,HD	+ve	*P. f.*	1360
8	M	3yrs	V,L,D	+ve	*P. f.*	1400
9	M	6mo	F	-	*P. f.*	-
10	M	1yr	F,D,V,L	+ve	*P. f.*	480
11	F	4mo	F	+ve	*P. f.*	480
12	M	2mo	F,HB,V	+ve	*P. f.*	800
13	M	2yrs	F,HB,D,	+ve	*P. f.*	760
14	M	3yrs	F,HD,W	+ve	*P. f.*	1520
15	M	2mo	HD, Ca, JP	+ve	*P. f.*	960
16	M	3yrs	F,HD,W	+ve	*P. f.*	1240
17	M	3yrs	F,HB,V	+ve	*P. f.*	720
18	F	3yrs	HD,HB	+ve	*P. f.*	520
19	M	3yrs	F,W,JP,D	+ve	*P. f.*	880
20	F	2yrs	HB,F,JP	+ve	*P. f.*	1080
21	F	4yrs	HB, JP. HD, V, Ca	+ve	*P. f.*	1120
22	M	3yrs	HD, Cd, F, L	+ve	*P. f.*	1360
23	F	3yrs	V,F	+ve	*P. f.*	1040
24	M	3yrs	Ca, HD , JP	+ve	*P. f.*	1120
25	F	4yrs	Ca, HD, JP	+ve	*P. f.*	1600
26	M	4yrs	HB,HD,L	+ve	*P. f.*	1760
27	M	3yrs	HB,W,C,D,HD,L	+ve	*P. f.*	1560
28	M	5yrs	C, HB, D, Ca	+ve	*P. f.*	1720
29	M	4yrs	HB,C,D,W	+ve	*P. f.*	880
30	F	5yrs	W,JP,F,L	-	*P. f.*	-
31	F	3yrs	HD,V,JP,L	-	*P. f.*	-
32	F	4yrs	L,HD,HB	+ve	*P. f.*	2400
33	M	4.5yrs	F,V,JP,HD	+ve	*P. f.*	2360
34	F	3yrs	L,HD,D	+ve	*P. f.*	960
35	M	3yrs	D,HD,W,HB	+ve	*P. f.*	1320
36	M	4yrs	F,HD	+ve	*P. f.*	1640
37	F	2yrs	HB,D,HD	+ve	*P. f.*	840
38	M	2yrs	F,HD,V	+ve	*P. f.*	800
39	M	1.5yrs	W,JP,L	+ve	*P. f.*	720
40	F	2yrs	HD, Ca, F, W	+ve	*P. f.*	760

41	M	3yrs	V,HB,W,HD	+ve	*P. f.*	600
42	M	3.5yrs	F,HD	+ve	*P. f.*	1240
43	M	4yrs	F,HD	+ve	*P. f.*	1120
44	M	2yrs	D,W,HD,JP	+ve	*P. f.*	1160
45	F	2yrs	D, Ca, HB, W	+ve	*P. f.*	1200
46	M	2yrs	F,D,JP	+ve	*P. f.*	440
47	F	1.5yrs	HB,JP,F	+ve	*P. f.*	400
48	M	7mo	HD	-	*P. f.*	-
49	M	1yr	W,HD,JP	+ve	*P. f.*	600
50	M	3yrs	HD,	+ve	*P. f.*	680
51	F	2yrs	HB	-	*P. f.*	-
52	F	3yrs	L,HB,Ca	+ve	*P. f.*	1040
53	F	3.5yrs	HD	+ve	*P. f.*	1240
54	M	3.7mo	F,JP,W	+ve	*P. f.*	1120
55	M	3yrs	HD,Ca,L,Dz	-	*P. f.*	-
56	M	2yrs	F,W	+ve	*P. f.*	1560
57	F	2yrs	F,HD,JP,W,HB	+ve	*P. f.*	1120
58	F	2.5yrs	HD,HB	+ve	*P. f.*	960
59	M	4yrs	W,L,C	+ve	*P. f.*	2040
60	M	5yrs	HD,F,HB	+ve	*P. f.*	2400
61	M	5yrs	HD	-	*P. f.*	-
62	F	4.5yrs	HB,W,D	+ve	*P. f.*	1400
63	F	3yrs	V,D,W,JP,HD	+ve	*P. f.*	1600
64	F	1yr	W	-	*P. f.*	-
65	M	2yrs	W	+ve	*P. f.*	880
66	M	3yrs	V	+ve	*P. f.*	1640
67	F	2yrs	JP,HD	+ve	*P. f.*	400
68	F	2yrs	HD	+ve	*P. f.*	520
69	M	3yrs	W	-	*P. f.*	-
70	M	1yr	HD	+ve	*P. f.*	800
71	M	6mo	C,L	-	*P. f.*	-
72	F	5mo	F,HD	+ve	*P. f.*	480
73	F	7mo	D,V,JP	+ve	*P. f.*	520
74	F	3yrs	HD,F,JP,W,Dz	+ve	*P. f.*	800
75	M	2yrs	F,HD,JP	+ve	*P. f.*	1080
76	M	2.2yrs	HD,F,L	+ve	*P. f.*	560
77	M	3.5yrs	HD	+ve	*P. f.*	1560
78	M	3yrs	D,HD	-	*P. f.*	-
79	F	3yrs	V,D	+ve	*P. f.*	960
80	M	1yr	HD	+ve	*P. f.*	1040
81	M	2.5yrs	W,HB	+ve	*P. f.*	520
82	M	2yrs	HB,L	-	*P. f.*	-
83	F	2yrs	F,HD,W,C	+ve	*P. f.*	600
84	F	2yrs	JP,HD,HB	+ve	*P. f.*	880
85	M	4yrs	L	-	*P. f.*	-
86	F	3yrs	C,HD	+ve	*P. f.*	1600

87	M	3yrs	C,W	+ve	*P. f.*	1960
88	F	2yrs	W,HB,L	+ve	*P. f.*	1760
89	M	2yrs	JP	-ve	*P. f.*	0
90	M	1yr	HD,HB	+ve	*P. f.*	800
91	M	1.7yrs	W,C	+ve	*P. f.*	440
92	F	1.9yrs	HB	+ve	*P. f.*	760
93	M	2yrs	W,JP	+ve	*P. f.*	640
94	M	3yrs	HB,W,F,JP	+ve	*P. f.*	400
95	F	5yrs	W	-ve	*P. f.*	0
96	M	11mo	L	+ve	*P. f.*	800
97	M	2yrs	Up,L	+ve	*P. f.*	880
98	M	1yr	HB	+ve	*P. f.*	960
99	M	2yrs	W	+ve	*P. f.*	1240
100	F	5yrs	HB,JP	+ve	*P. f.*	1440
101	M	3yrs	HB,D	-ve	*-ve*	0
102	F	2yrs	W,L	+ve	*P. f.*	800
103	M	3yrs	HB,C	+ve	*P. f.*	840
104	F	3.5yrs	W,JP,C	-ve	*-ve*	0
105	M	2yrs	JP,HD	+ve	*P. f.*	760
106	m	2.5YRS	HD,F,C,W	+ve	*P. f.*	920
107	M	2yrs	D,JP,L,HD,HB	+ve	*P. f.*	560
108	M	1yr	W,HD	+ve	*P. f.*	440
109	M	3yrs	W,HB	+ve	*P. f.*	760
110	F	3yrs	W	-ve	*-ve*	0
111	F	2.2yrs	HB	+ve	*P. f.*	1360
112	M	2.9yrs	JP	+ve	*P. f.*	880
113	M	2.6yrs	HB,JP	-ve	*-ve*	0
114	F	2.7yrs	W,L	+ve	*P. f.*	840
115	M	2yrs	HB,L	+ve	*P. f.*	720
116	M	2yrs	L	-ve	*-ve*	0
117	M	3yrs	L	+ve	*P. f.*	560
118	F	5yrs	HB	-ve	*-ve*	0
119	M	3yrs	HB,HD	+ve	*P. f.*	680
120	M	5yrs	W	-ve	*-ve*	0
121	F	3yrs	L,W,JP	+ve	*P. f.*	680
122	M	2yrs	HB,HD	+ve	*P. f.*	760
123	F	2yrs	HB	-ve	*-ve*	0
124	M	3yrs	W	+ve	*P. f.*	-ve
125	F	3yrs	HB,HD	+ve	*P. f.*	1120
126	F	2yrs	L,W,JP	+ve	*P. f.*	680
127	F	2yrs	W	-ve	*-ve*	0
128	M	5yrs	HD,F,HB,L	+ve	*P. f.*	560
129	M	5yrs	HB,W,D,L	+ve	*P. f.*	1560
130	F	3yrs	HB, L	-ve	*-ve*	0
131	M	3yrs	W,HB	+ve	*P. f.*	1120
132	F	4yrs	HB,F,HD,L	+ve	*P. f.*	680

133	M	5yrs	W,JP	-ve	*-ve*	0
134	M	3yrs	D,W,L	+ve	*P. f.*	520
135	F	3yrs	D,L	+ve	*P. f.*	760
136	M	2yrs	W,HB	-ve	*-ve*	0
137	M	2yrs	HB,HD	+ve	*P. f.*	560
138	F	2yrs	L,W	-ve	*-ve*	0
139	M	3yrs	W,HB,F	+ve	*P. f.*	840
140	F	3yrs	HB	-ve	*-ve*	0
141	M	3.5yrs	W,C,HD	+ve	*P. f.*	1240
142	M	3.7yrs	HB,D,L	+ve	*P. f.*	1760
143	M	3yrs	HB,HD	+ve	*P. f.*	1480
144	M	2yrs	W,JP	+ve	*P. f.*	1520
145	M	2yrs	JP,HD,L	+ve	*P. f.*	600
146	M	1yr	F	-ve	*-ve*	0
147	M	1.7yrs	HB,	+ve	*P. f.*	680
148	F	1yr	C,HD,L	-ve	*-ve*	0
149	F	4yrs	W,JP	+ve	*P. f.*	440
150	M	1yr	L,W,HD,F	+ve	*P. f.*	480
151	M	1yr	W,HB,L	+ve	*P. f.*	560
152	F	2yrs	HB	-ve	*-ve*	0
153	M	2.2yrs	W	+ve	*P. f.*	800
154	M	2yrs		-ve	*-ve*	0
155	F	2yrs	JP	-ve	*-ve*	0
156	M	3yrs	D	+ve	*P. f.*	1200
157	M	3yrs	L,JP	+ve	*P. f.*	440
158	F	2yrs	W,HB	-ve	*-ve*	0
159	M	2yrs	HB,HD,JP	+ve	*P. f.*	760
160	M	5yrs	W,D,HB,HD	+ve	*P. f.*	1160
161	M	3yrs	W	-ve	*-ve*	0
162	M	2yrs	JP	+ve	*P. f.*	600
163	F	5yrs	HD,HB,W,L	+ve	*P. f.*	1040
164	F	1.5yrs	HB	-ve	*-ve*	0
165	M	1yrs	W,L	+ve	*P. f.*	840
166	M	4yrs	HB,W	+ve	*P. f.*	840
167	M	3yrs	HD,JP	-ve	*-ve*	0
168	M	2yrs	HD,D,L,F	+ve	*P. f.*	1000
169	F	2.5yrs	HB,HD,JP	+ve	*P. f.*	1200
170	F	2yrs	W,HB	+ve	*P. f.*	440
171	M	1.5yrs	L,HB	+ve	*P. f.*	680
172	M	2yrs	HB,W	+ve	*P. f.*	1160
173	M	3.5yrs	W,L	-ve	*-ve*	0
174	F	3yrs	HB,HD	+ve	*P. f.*	2040
175	M	2.5yrs	W,L,HB,HD,C	+ve	*P. f.*	1440
176	F	3yrs	HB,HD,F	+ve	*P. f.*	1640
177	M	9mo	W,L,HD	+ve	*P. f.*	520
178	M	5mo	W,L	-ve	*-ve*	0

179	M	1.5yrs	L	+ve	*P. f.*	600
180	M	2yrs	HB	+ve	*P. f.*	640
181	M	3yrs	HB,HD	+ve	*P. f.*	680
182	F	2.5yrs	W,HB,HD,F,Dz	+ve	*P. f.*	2400
183	M	8mo	L,W	-ve	*-ve*	0
184	F	3yrs	W	-ve	*-ve*	0
185	M	3.5yrs	L,HD	+ve	*P. f.*	1320
186	M	4yrs	W,HD,HB	+ve	*P. f.*	920
187	F	4.5yrs	HB	-ve	*-ve*	0
188	M	3.5yrs	HB	-ve	*-ve*	0
189	M	4yrs	W,HB,	+ve	*P. f.*	1640
190	M	3.5yrs	W,HB,C	-ve	*-ve*	0
191	F	3.7yrs	HB,HD,W,JP	+ve	*P. f.*	720
192	M	2.5yrs	Dz,HD,HB	+ve	*P. f.*	1040
193	M	3yrs	W,HB,L	+ve	*P. f.*	1160
194	M	2yrs	HB,W	+ve	*P. f.*	920
195	F	2yrs	HB	+ve	*P. f.*	800
196	M	1.5yrs	W,Dz	-ve	*-ve*	0
197	M	7mo	L,HD	+ve	*P. f.*	800
198	M	3yrs	W,HB,L	+ve	*P. f.*	1440
199	m	3mo	HD	+ve	*P. f.*	400
200	M	1.5yrs	W	-ve	*-ve*	0
201	M	2yrs	L,W	+ve	*P. f.*	800
202	M	2.5yrs	HB,HD,F	+ve	*P. f.*	1120
203	M	3yrs	HD	-ve	*-ve*	0
204	M	1.5yrs	W,HB	+ve	*P. f.*	880
205	F	6mo	L,HD,HB	-ve	*-ve*	0
206	F	3yrs	HB,HD	+ve	*P. f.*	1120
207	M	4yrs	HD,F,HB,L	+ve	*P. f.*	1480
208	M	3yrs	W,HB	+ve	*P. f.*	1440
209	m	2.5yrs	HB,W	+ve	*P. f.*	1200
210	M	3yrs	W,L,Dz	+ve	*P. f.*	1120
211	F	1yr	W,HD	-ve	*-ve*	0
212	M	2yrs	HD	+ve	*P. f.*	560
213	M	1yr	HD,W,JP	+ve	*P. f.*	760
214	M	6mo	W,L	-ve	*-ve*	0
215	F	8mo	L,HB	-ve	*-ve*	0
216	M	2yrs	HB,HD	+ve	*P. f.*	760
217	M	2yrs	HB,JP,HD,Dz	+ve	*P. f.*	840
218	F	2yrs	W,JP,C,HB	+ve	*P. f.*	1200
219	M	3yrs	HB,L,W	+ve	*P. f.*	1360
220	M	1yr	L	-ve	*-ve*	0
221	M	1yr	L,W,Dz,HD	-ve	*-ve*	0
222	M	2yrs	HD,HB,F	+ve	*P. f.*	1120
223	F	3yrs	W,HB	+ve	*P. f.*	960
224	m	2YRS	HB,F,HD,L	+ve	*P. f.*	840

225	M	1yr	W,L	+ve	*P. f.*	520
226	M	1yr	HB,Dz	-ve	*-ve*	0
227	M	1yr	HB	-ve	*-ve*	0
228	M	3yrs	HB,HD,JP	+ve	*P. f.*	560
229	F	2yrs	W,L	+ve	*P. f.*	920
230	M	4yrs	HB,Dz,HD	+ve	*P. f.*	2800
231	M	5yrs	HB,W	+ve	*P. f.*	2040
232	M	3yrs	W,HD,L	+ve	*P. f.*	880
233	M	3yrs	HB,W,HD	+ve	*P. f.*	1640
234	M	2yrs	HD,F,HB,	+ve	*P. f.*	1240
235	M	2.5yrs	HD,F	+ve	*P. f.*	800
236	F	3yrs	HD	+ve	*P. f.*	1560
237	M	4yrs	HD,Cd,W	+ve	*P. f.*	1880
238	M	3yrs	HB,HD	+ve	*P. f.*	2320
239	M	2.5yrs	W,L	-ve	*-ve*	0
240	M	1.5yrs	HB,Dz	+ve	*P. f.*	840
241	F	1yr	HB	-ve	*-ve*	0
242	M	6mo	L,HD	+ve	*P. f.*	440
243	M	3mo	HB,L	-ve	*-ve*	0
244	M	1yr	W,HB	-ve	*-ve*	0
245	M	1.5yrs	W,HB,Dz,F	+ve	*P. f.*	640
246	M	2yrs	HB,W	+ve	*P. f.*	760
247	M	3yrs	W,L	+ve	*P. f.*	800
248	F	4yrs		+ve	*P. f.*	1160
249	M	3yrs	W,HB	+ve	*P. f.*	1200
250	M	3.5yrs	HB,HD,Dz,L	+ve	*P. f.*	1440
251	M	2yrs	HB,C	-ve	*-ve*	0
252	F	1.5yrs	L,W,Ca	+ve	*P. f.*	840
253	F	3yrs	HD,Cd	+ve	*P. f.*	1320
254	F	2yrs	W,JP,HD	+ve	*P. f.*	800
255	F	4yrs	D,W,JP	+ve	*P. f.*	1040
256	M	2yrs	W,HD,C	+ve	*P. f.*	960
257	M	2.5yrs	HB,HD,L	-ve	*-ve*	0
258	M	3yrs	HB,HD,F	-ve	*-ve*	0
259	M	3.5yrs	W,HD,JP	-ve	*-ve*	0
260	F	3yrs	HB,Dz,L	-ve	*-ve*	0
261	M	2yrs	HB,W	+ve	*P. f.*	1240
262	M	1yr	L,JP,Ca	+ve	*P. f.*	800
263	F	2mo	L,D	+ve	*P. f.*	600
264	M	3mo	V	-VE	*-VE*	0
265	M	6mo	HB,D,JP	+ve	*P. f.*	680
266	M	2yrs	W,HB,C	+ve	*P. f.*	920
267	F	2yrs	F,Ca	+ve	*P. f.*	440
268	F	2yrs	HB,W	+ve	*P. f.*	1080
269	M	1yr	L,HB,Ca	+ve	*P. f.*	720
270	F	1yr	W	+ve	*P. f.*	680

271	F	2yrs	HB,D	+ve	*P. f.*	1360
272	M	3yrs	W,HB,L	+ve	*P. f.*	1400
273	M	6mo	L,D	-ve	*-ve*	0
274	M	1yr	HB,HD	+ve	*P. f.*	480
275	F	4mo	HD,HB,L	+ve	*P. f.*	480
276	M	2mo	W,HB	+ve	*P. f.*	800
277	M	2yrs	HB,L,D	+ve	*P. f.*	760
278	M	3yrs	W	+ve	*P. f.*	1520
279	M	2mo	L,C	+ve	*P. f.*	960
280	M	3yrs	F,W,HD,HB	+ve	*P. f.*	1240
281	M	3yrs	HB,C,D	+ve	*P. f.*	720
282	F	3yrs	V,JP	+ve	*P. f.*	520
283	M	3yrs	W,C	+ve	*P. f.*	880
284	F	2yrs	HD,HB	+ve	*P. f.*	1080
285	F	4yrs	HB,L,V	+ve	*P. f.*	1120
286	M	3yrs	W	+ve	*P. f.*	1360
287	F	3yrs	HD,W	+ve	*P. f.*	800
288	M	3yrs	L	+ve	*P. f.*	1120
289	F	4yrs	HB,W	+ve	*P. f.*	1600
290	M	4yrs	HD,Ca,C,JP	+ve	*P. f.*	1760
291	M	3yrs	HD,F	+ve	*P. f.*	1560
292	M	5yrs	HD	+ve	*P. f.*	1750
293	M	4yrs	W,JP	+ve	*P. f.*	880
294	F	5yrs	HB,JP	-ve	*-ve*	0
295	F	3yrs	W,L	+ve	*P. f.*	1640
296	F	3.5yrs	HB,HD,Ca	+ve	*P. f.*	2400
297	M	4yrs	HD,F,D,JP	+ve	*P. f.*	2360
298	F	3yrs	HB	+ve	*P. f.*	960
299	M	3yrs	HD,F,L	+ve	*P. f.*	1320
300	M	4yrs	W,JP	+ve	*P. f.*	1640

Key:

HD: Headache JP: Joint pain

HB: Hotbody D: Diarrhoea

W: Weakness L: Loss of appetite

C: Cough

Ca: Catarrh F: Fever

Appendix 7

Table 4.1: Local names of malaria among Fulani

Local Name	Frequency	Percentage (100%)
Pabboje	182	60.7
Nyaubandu	69	23.0
Jonte	21	7.0
Others	28	9.3
Total	300	100

Appendix 8
Table 4.2: Causes of childhood malaria among Fulani in relation to ethnic (clan) background

Cause of malaria	Dialect (%)				
	Kiriyen	Jafun	Woda'abe	Garkwa	**Total**
Eating fresh corn/maize	61(20.3)	30(10.0)	6 (2.0)	16(5.3)	113(37.7)
Eating fresh groundnut	17(5.7)	2(0.7)	1(0.3)	0(0)	20(6.7)
Eating fresh millet/sorghum	68(22.7)	28(9.3)	4(1.3)	8(2.3)	108(36.0)
Eating wild fruits	6(2.0)	1(0.3)	0(0)	0(0)	7(2.3)
Inhaling smoke from roasting corn	1(0.3)	0(0)	1(0.3)	3(1.0)	5(1.7)
Staying long under the sun	1(0.3)	0(0)	0(0)	0 (0)	1(0.3)
Mosquitoes	21 (7.0)	4(1.3)	6(2.0)	1(0.3)	32(10.7)
Others	7(2.3)	4(1.3)	3(1.0)	0(0)	14(4.7)
Total	**182(60.7)**	**69(23.0)**	**21(7.0)**	**28(9.3)**	**300(100)**

ANOVA:*P*=0.186,F=1.717

Appendix 9

Table 4.3: Seasonality of malaria

Season	Frequency	Percentage (100%)
Rainy season	178	59.3
All year round	71	23.7
Dry season	51	17.0
Total	300	100

Appendix 10

Table 4.4: Annual frequencies of malaria attacks among nomadic fulani

	Frequency	Percentage(100%)
Once a year	106	35.3
Twice a year	137	45.7
Thrice a year	57	19.0
Total	300	100

Appendix 11

Table 4.5: Category of people afflicted by malaria

Category	Frequency	Percentage
Children	142	47.3
Adults	92	30.7
All	66	22.0
Total	300	100

Appendic 12

Table 4.6: Mothers recognition of childhood malaria in relation to age-group (n=300)

Mothers Age Group	Diarrhoea & Headache	Vomiting & Unable to Play	Coughing & Crying	Hotbody & Shivering	Others	**Total**
15-24	30(27.5)	2(2.9)	3(13.0)	20(21.7)	0(0)	55(18.3)
25-34	35(32.1)	14(20.3)	4(17.3)	35(38.0)	0(0	88(29.3)
35-44	33(30.3)	28(40.6)	6(26.0)	30(32.6)	2(28.6	99(33.0)
45-54	7(6.4)	17(24.6)	4(17.3)	7(7.6)	4(57.1)	38(13.0)
55+	4(3.7)	8(11.9)	6(26.0)	0(0)	3(42.8)	21(6.3)
Total	**109(36.3)**	**69(2.3)**	**23(7.6)**	**92(30.6)**	**7(2.3)**	**300 (100)**

ANOVA:*P*=0.235,F=1.519

Appendix 13

Table 4.7: Mothers recognition of childhood malaria in relation to parity

Parity	Diarrhoea & Headache	Vomiting & Unable to Play	Coughing & Crying	Hotbody & Shivering	Others	Total
1st	13(11.9)	4(5.8)	0(0)	5(22.7)	0(0)	22(7.3)
2nd-3rd	50(45.8)	40(57.9)	9(40.9)	62(38.3)	1(12.5)	162(54)
4th-5th	37(33.9)	23(33.3)	9(40.9)	19(20.0)	7(87.5)	95(31.7)
6th+	9(8.3)	2(2.9)	4(18.2)	6(28.5)	0(0)	21(7.0)
Total	**109(36.3)**	**69(23.0)**	**22(7.3)**	**92(30.7)**	**8(2.6)**	**300(100)**

ANOVA:P=0.005,F=5.164

Appendix 14

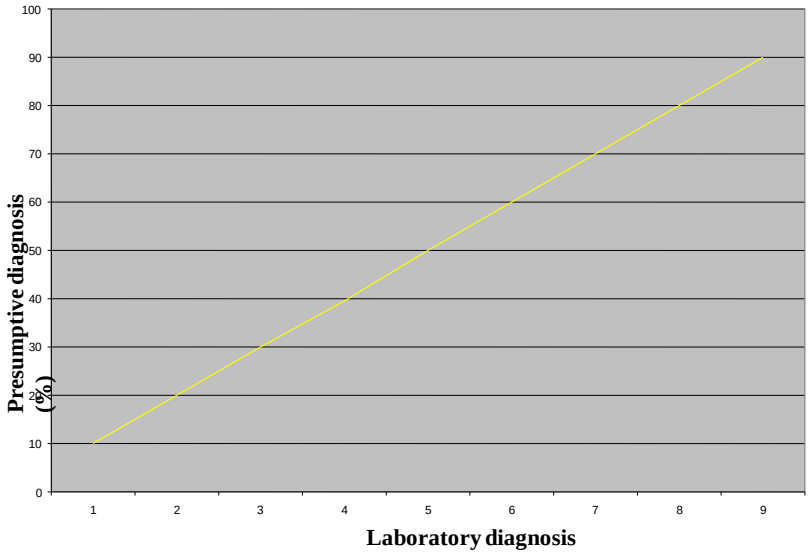
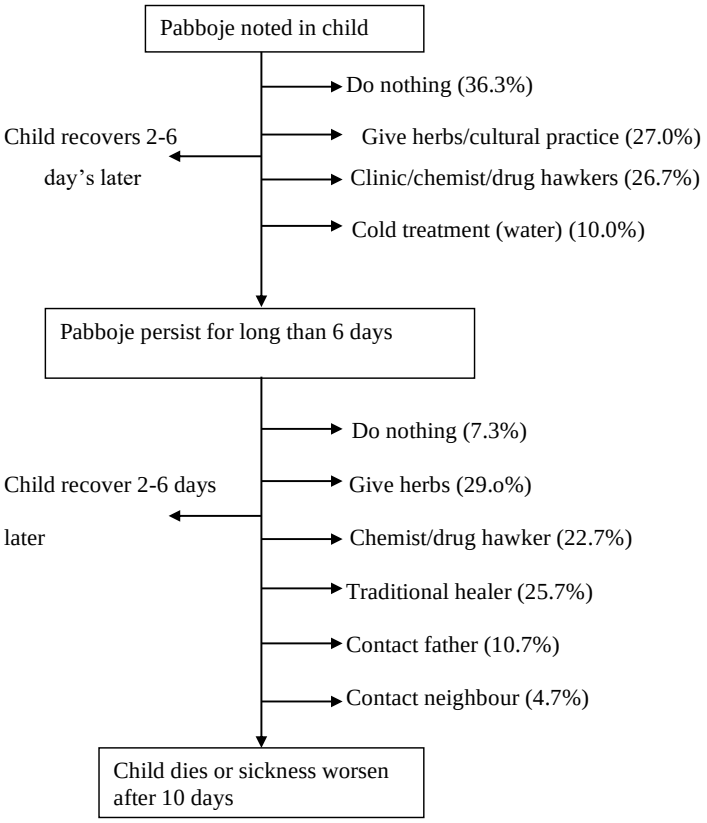


Fig 4.1. Correlation between presumptive and laboratory diagnosis



Appendix 15 Fig. 4.2: Care- seeking behaviour tree

Appendix 16

Table 4.8: Care-seeking behavior to malaria in children in relation to age group

	Younger mothers (≤30 years)	Older Mothers (≥30 years)	Total
Sample (n=300)	184	116	300
First action:			
No action taken	62(33.7)	47(40.5)	109(36.3%)
Self-treatment (with herbs)	40(21.8)	41(35.3)	81(27.0%)
*Self-treatment	61(33.2)	19(16.4)	80(26.7%)
Apply cold treatment	21(11.4)	9(7.8)	30(10.0%)
Total (First line action)	**184(61.33%)**	**116(38.67%)**	**300(100%)**
If symptoms persist:			
No action	17(9.2)	5(4.3)	22(7.33%)
Self-treatment (with herbs)	50(27.2)	37(31.9)	87(29.)%)
Self-treatment (chemist/clinic/ hospital)	41(22.3)	27(23.3)	68(22.70%)
Consult herbalist/healer	44(23.9)	33(28.4)	77(25.70%)
Seek fathers opinion before Taking action	22(11.9)	10(8.6)	32(10.7%)
Consult with neighbor	10(5.4)	4(3.4)	14(4.70%)
Total (Second line action)	**184(61.33%)**	**116(38.67%)**	**300(100%)**

Appendix 17

Table 4. 9: Factors influencing care-seeking behaviour

Factors	Frequency	Percentage(100%)
Low cost	105	35.0
Cannot afford treatment cost	81	27.0
Convinience	79	26.3
Don't know treatment venue	35	11.7
Total	300	100

Appendix 18

Table 4.10: Prevalence of Plasmodium infection by sex among children under five

Sex	Number examined	Number positive (%)
Male	157	151(50.3%)
Female	143	131(43.7%)
Total	300	282(94%)

Appendix 19

Table 4.11 Prevalence of *Plasmodium* infection by ethnic group among children under five

Ethnic Grp	No Exam	No Pos (100%)	1-1000/µl	1001-1600/µl	1601-2200/µl	2201-2800µl
Kiriyen	182	173 (61.35%)	136(78.6%)	32(36.8%)	5(33.3%)	0
Jahun	69	68 (24.11%)	26(15.0%)	39(44.8%)	3(20%)	0
Woda'abe	21	20 (7.09%)	5(2.9%)	7(8.1%)	3(20%)	5(71.4%)
Garkawa	28	21 (7.45%)	6(3.5%)	9(10.3%)	4(26.7%)	2(28.6%)
Total	300	282 (94%)	173(100%)	87(100%)	15(100%)	7(100%)

Appendix 20

Table 4.12: Distribution of parasite density by age-group in children under five

	Parasite Density (Number parasite/µl)			
Age (mo)	1-1000/µl	1001-1600/µl	1601-2200/µl	2201-2800/µl
0-12 mo	-	-	-	-
13-24 mo	97(56.06)	6(6.90%)	-	3(42.85%)
25-36 mo	31(17.91%)	31(35.63%)	3(20.0%)	1(14.29%)
37-48 mo	27(15.60%)	43(49.43%)	11(73.33%)	1(14.29%)
49-60 mo	18(10.40%)	7(8.04%)	1(6.67%)	2(28.57%)

Appendix 21

Table 4.13: Distribution of *Plasmodium* parasite density by sex.

	Parasite Density				
Sex	0/µl	1-1000/µl	1001-1600/µl	1601-2200/µl	2201-2800/µl
Male	6(33.3%)	106(61.#%)	31(35.6%)	9(60%)	5(71.4%)
Females	12(66.7%)	67(38.7%)	56(64.4%)	6(40%)	2(28.6%)
Total	18(100%)	173(100%)	87(100%)	15(100%)	7(100%)

Appendix 22

Table 4.14: Test performance of mothers' presumptive diagnosis compared with parasitological test

		Parasitological Test		
		MP+	MP-	Total
Mother's Diagnosis	Positive	276	6	282
	Negative	6	12	18
	Total	282	19	300

Appendix 23

Table 15: Method of preventing malaria among nomadic Fulani

Method	Frequency	Percentage (100%)
Not eating fresh corn	132	44.0
Not eating fresh millet	70	23.3
Not eating fresh groundnut	45	15.0
Not eating wild fruits	16	5.3
Keeping mosquitoes away	16	5.3
Do nothing	11	3.7
Take Chloroquine or Paracetamol	10	3.3
Total	300	100.0

Appendix 24

Table 4.16: Bednet ownership among nomadic Fulani

Ownership	Frequency	Percentage (100%)
Yes	76	25.3
No	224	74.7
Total	300	100

Appendix 25

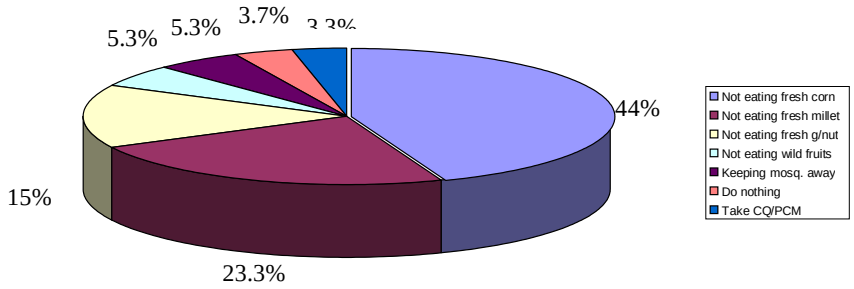
Table 4.17: Bednet usage among nomadic Fulani

Who sleeps under net	Frequency	Percentage (100%)
Nobody	221	73.7
Children	22	7.3
Breast feeding mother	15	5.0
Father	42	14.0
Total	300	100

Appendix 26

Table 4.18: Perception on effectiveness of bet net among nomadic Fulani

Effectiveness	Frequency	Percentage (100%)
Not sure	288	96.0
Effective	11	3.7
Very effective	1	0.3
Total	300	100



APPENDIX 27: **Fig 4.3:** Methods of preventing malaria among nomadic fulani