CHILDHOOD FEBRILE ILLNESS, ARE WE OVER DIAGNOSING MALARIA?

This dissertation is submitted to the School of Public Health, University of Ghana, Legon, in partial fulfillment of the requirement for the award of Master of Public Health Degree.

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Declaration

I declare that this study has been the result of my own research conducted under supervision, and has not been presented for a degree in any other University or Institution

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I also wish to thank the caregivers and the children who allowed us to enroll them into the study

Dedication

This work is dedicated to the children who took part in this study.

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List of Acronyms

HPF-----High Power Field

IMCI---------- Integrated Management of Childhood Illness

RBM ----------Roll Back Malaria

ul----------microliter

UNICEF-----United Nations Children's Fund

wbc-------white blood cells

WHO-----World Health Organization

Abstract

Malaria and bacterial infections are major causes of febrile illness in the developing world.

To investigate the contribution of malaria and concurrent bacterial infection to febrile illness in children, 50 children aged 6 to 60 months, who presented with fever 37.5 C (axillary) or above at the Dodowa Health Center, a primary care center between July and August (wet season) 2003 were enrolled into a study.

The most common presenting signs were vomiting (54%), inability to suck or eat (56%) liver enlargement (48%) and pale conjunctivae (48%).

The mean axillary temperature recorded was 38.53 C (SD 2.889). The highest recorded temperature was 40 C (in 8% of cases).

Ninety-six percent (96%)of participants had positive blood smears for malaria parasites, but only 28 % had parasite densities above 2500/ul (clinical malaria). All positive smears had plasmodium falciparum species. The mean parasite density was 3541.74 counts per ul (minimum and maximum parasite densities were 80 and 28,800 counts per ul respectively).

Of those who had presenting axillary temperature 40 C or above (N=4), two had no bacterial growth; one had mixed bacterial growth (of acute phase blood culture), which was more probably due to contamination of the sample with skin flora, whiles one had positive streptococcal spp growth.

Sixty percent (60%) of the children had been given some sort of treatment before presentation, Thirty percent (30%) were given antimalarial (chloroquine) but only 15% receive adequate doses. Two percent were given antibiotics

It is recommended that caregiver education on the prevention and proper management of fever be intensified. There is also the need for more research into malaria and concurrent bacterial infection.

Chapter One

1.0 Introduction

1.1 Background

Malaria and Infectious diseases remain the leading causes of morbidity and mortality in sub-Saharan Africa where malaria alone represents 9% of the continental disease burden (World Health Organization 1993). Proportionally, malaria caused 9% whiles acute respiratory infections caused 19% of mortality among under five year old children worldwide in 2001 (WHO, 1993). These two are also the lead contributors to the burden of febrile illness in children.

About 300 to 500 million clinical cases of malaria occur each year worldwide, approximately 2 million of which are fatal, primarily in children. The vast majority of malaria-related deaths are due to infection with Plasmodium falciparum. It is estimated that 200 people, primarily children in Africa, (which is hyper endemic for malaria) die of malaria every hour of everyday all year round. It has been estimated that countries in tropical Africa account for approximately 80% of all clinical cases and more than 90% of asymptomatic cases world-wide (World Health Organization, 1991, World Health Organization, 1993). The malaria situation is acute-on-chronic in the West African Sub region and is one of the main obstacles to its socio-economic development.

In the first two months of life, children may not contract malaria, or even if contracted, the manifestations may be mild with low-grade parasitemia, due to the passive immunity offered by maternal antibodies.

In endemic and hyper endemic areas, the parasite prevalence rate increases with age from 0 to 10% during the first three months of life to 80 to 90% by one year of age and

the rate persists at a high level during early childhood. The mortality rate is highest during the first two years of life. By school age, a considerable degree of immunity would have developed and asymptomatic parasitemia can be as high as 75% in primary school children, and this increasing resistance to infection and disease with age is conventionally thought to reflect a slow and gradual acquisition of protective immunity.

Fever in infants has been defined as axillary temperature of 37.5°C or higher. In older children, an axillary temperature of 38°C or an oral temperature of 37.8°C is generally considered abnormal. In the tropics, the main causes of fever are bacterial, viral and malarial infections.

1.2 Rationale for Study

Malaria is endemic in Ghana. It is one of the major causes of morbidity and mortality, accounting for 40% of all out patient visits. (Ahmed, 1989). Children five years and below suffer the most morbidity and mortality. Studies on malaria mortality have shown that deaths occur predominantly among young children and that malaria mortality rates among patients is consistently high, with hospital case fatality rates varying from 5% to 30% in established centers. Such mortality rates in established centers may be higher still in rural areas with little or no established health care facilities.

Severe falciparum malaria is the commonest cause of death in infants and children in areas endemic and hyper endemic for malaria. Inadequate immunity results in rapid increase in the parasite count and development of complications. Delay in diagnosis and treatment also contributes to this problem.

Roll Back Malaria (RBM), a health strategy developed by the World Health Organization (WHO,1998), and its partners, advocates four technical approaches, supported by low cost interventions to reduce malaria mortality and morbidity through improved prevention.

These are:

1. Prompt access to treatment, especially for young children
2. Prevention and control of malaria in pregnant women
3. Vector control
4. Prediction and containment of epidemics

Another strategy by WHO and the United Nations Children's Fund, UNICEF, Integrated Management of Childhood Illnesses (IMCI) has been developed to offer an integrated approach to child health, that focuses on the well being of the whole child. It recognizes that in the developing world, children brought to seek medical treatment often suffer from more than one condition, making a single diagnosis impossible.

The proper use of insecticide-treated nets combined with prompt treatment of malaria in the community can reduce malaria transmission by 60% and the mortality rate in young children from all causes by at least 20% (WHO, 2003).

There is an urgent need to make effective antimalarials available to those most at risk. The drugs needed exist but those who need them most urgently do not have access to them and only a small proportion have bed nets treated with effective insecticides.

Improvement in existing disease management and prevention methods for children is critical as well as the development of methods / tools to improve access to prevention,

early treatment and referral of malaria to the bulk of rural dwellers in the primary health setting.

1.3 Purpose of Study

The purpose of this study is thus to draw attention to the contribution of malaria and bacterial infection to the burden of febrile illness among under five year olds in a primary health care setting.

Chapter Two

2.0 LITERATURE REVIEW

2.1 Malaria and Bacterial Infections

Bacterial infection and malaria are both major health problems in tropical countries and represent the two most common causes of fever in children in those countries. It is therefore not surprising that concurrent infections with these two common pathogens should occur.

Malaria typically presents with fever that may be accompanied by chills and headache. Symptoms and signs may be subtler in partially immune and immune children. Anaemia and hepatosplenomegaly may also be present. Children may also present with respiratory distress and/or rapidly progressing cerebral malaria that manifests as altered sensorium and sometimes with seizures. Thick blood smears help to determine when infection is present, but a single smear without parasites is not sufficient to rule out malaria. Thin blood smears identify the species of the malaria parasite.

Patients diagnosed with malaria can suffer from other bacterial or protozoan diseases as either super-infections or co-infections. Some bacterial infections are differential diagnosis for malaria, the classical being typhoid fever. Manifestations of secondary infections and of malaria can overlap. Fever, cough, diarrhea and dysentery can be seen in malaria, making the identification of the secondary infections rather difficult. There is a long history of proposed interactions between malaria and typhoid fever, which to a certain extent, had been explained away as the result of false positive Widal serologic

tests in acute malaria infection (Widal test may show positive titers up to 1:320 dilution even in malaria.). (Jhaveri et al., 1995, Khubnani et al., 1995).

Most bacterial infections in children over 3 months are caused by *Streptoccocus pneumoniae* (in non-immunised children), *Neisseria meningitidis*, *Haemophilus influenzae* and *Salmonella* species(Green, 1998).

A study in Gambia, also suggested that co-infection was not common (Enwere et al., 1998), but, in most parts of the world where malaria is rampant, so many other infectious diseases are also prevalent, sometimes resulting in co-infection rather than super-infection. Persistence of fever even after 48-72 hours of correct antimalarial treatment and reduction in parasitemia should raise the possibility of concomitant infections. Neutrophilic leukocytosis in the absence of severe falciparum malaria may indicate bacterial infection.

Typhoid fever is difficult to differentiate from other causes of infection such as malaria because their signs and symptoms often overlap.

In a cross-sectional study carried out to determine the prevalence of typhoid fever in 200 consecutive patients with fever and symptoms clinically compatible with typhoid fever to verify recent estimates of a high prevalence of typhoid fever in Cameroon, Nsutebu et al (2003) enrolled 207 patients in three of the 10 provinces of Cameroon. Blood culture, thick and thin blood smears and Widal tests using acute sera were performed in all cases and stool culture for 120 patients. Typhoid fever was confirmed in only 2.5% as evidenced either by culture (four cases) or high salmonella antibody titers (one case); malaria was diagnosed in 94 (47%) patients. It was concluded that Typhoid fever is not as endemic in Cameroon as recently feared.

2.2 Some Immunological aspects of malaria

Malarial infection has depressant effect on the immune system. In addition, falciparum malaria can be predisposing factor for certain specific infections. These associated infections are more common in patients with P. falciparum malaria. Recent studies, however, from Cameroon, Malawi, and Ghana have suggested that there may indeed be more interesting interactions between *P. falciparum* and bacterial infection (*Salmonella* species to be specific) than mere coexistence in the same individual host (Ammah et al., 1999, Commey et al., 1994).

This phenomenon has been explained by immunosuppression due to acute malaria infection, which may lead to loss of control to colonising bacterial species with resultant bacteraemia. Acute malarial parasitemia has a profound immuno suppressant effect, probably through the activation of suppressor T cells. In a malaria endemic area, young children may suffer from severe infections (viral like measles or bacterial) due to this immunosuppression.

2.3 Malaria

In their study "The impact of malaria diagnostic algorithm and poly pharmacy", Marfo et al (1998) found that prescribers diagnosed malaria in 78.9%of children with fever in the wet season and 74.5% of children reporting at out patient clinics. The signs and symptoms commonly presented by those children diagnosed with malaria are vomiting, fever (temperature of 37.5 C), cough, headache pallor and body weakness. Out of 231 slides, which were positive for malaria parasites, only one was plasmodium

malariae, the rest were plasmodium falciparum. Parasite densities ranged from 27/ul to 396/ul. Parasite density had no correlation with the temperature at presentation.

Tarimo et al (2001) found that in many holo-endemic areas, it is unclear whether laboratory tests to confirm that such signs are the result of malaria would be very relevant or useful. Children from a holo-endemic region of Tanzania were therefore checked for malarial parasites by microscopy and by using two rapid immunological tests. At the time they were tested, each of these children had been targeted for antimalarial treatment. Only 70% of the 395 children classified to receive antimalarial drugs by the IMCI algorithm had malarial parasitaemias (68.4% had Plasmodium falciparum trophozoites, 1.3% had only P. falciparum gametocytes, 0.3% P. ovale and 0.3% P. malariae). As indicators of P. falciparum trophozoites in the peripheral blood, fever had a sensitivity of 93.0% and a specificity of 15.5% whereas pallor had a sensitivity of 72.2% and a specificity of 50.8%. Wherever the effective drugs for the first-line treatment of malaria are cheap (e.g. chloroquine and Fansidar), treatment based on clinical diagnosis alone should prove cost saving in health facilities without microscopy.

Childhood fever is a common symptom, (Chong et al (1996)) reflective of multiple causes. The majority of febrile children have non-bacterial upper respiratory tract infection and indiscriminate use of antibiotics is inappropriate, ineffective and leads to drug-resistance such as the emergence of Penicillin-resistant Streptococcus pneumoniae. The need to know when to use antibiotics appropriately at the primary care setting is critical especially at the primary care setting where laboratory support may be lacking. The need to identify a simple approach using the presence or absence of associated or localising symptoms though serious bacterial infections can still occur despite

unremarkable physical findings. Management of fever needs to take into account the toxicity, immune status and age of the patients as well as the source of the infection.

Nkuo et al (2002) investigated the prevalence of asymptomatic malaria parasitaemia and anemia in nursery and primary school Out of 297 nursery and primary school children two to 11 years old selected: the prevalence of asymptomatic malaria in children was 30.3%. Parasite prevalence and density was independent of age and sex.

In the study Clinical diagnosis of Plasmodium falciparum among children with history of fever, Sindh, Pakistan. Hozhabri et al (2003) examined 438 children with a history of fever at a primary care setting in Pakistan. 6% were slide positive for malaria. An algorithm comprised of fever 3 days duration and (absence of cough or having rigors) had 100% sensitivity and 63% specificity for detecting P. falciparum. It was concluded that in this low malaria prevalence region, restricting the diagnosis of malaria to persons who had >3 days of fever and absence of cough or rigors, remained highly sensitive but was more specific than current practice.

Chapter Three

3.0 STUDY PROTOCOL

3.1 Study Objectives

3.11 GENERAL

- To determine the proportion of febrile illness attributable to malaria in children 6-60 months old presenting at the Dodowa Health Center

3.12 SPECIFIC

- To document the clinical parameters associated with the diagnosis of malaria at the center
- To document the contribution of concurrent bacteria infection to clinical malaria.

3.2 Definition of Clinical Malaria

Clinical Malaria

Presentation at a clinic with a history of fever or fever (axillary temperature ≥ 37.5C) plus

i) 5 or more *P. falciparum* parasites per HPF (approx. 2500 /μl)

ii) No other obvious cause found for the fever

3.3 Study Site

Malaria is endemic in Ghana as in most of sub-Saharan Africa. This study was carried out at the Dodowa Health Center. It is situated in the Dangme West district, a rural district in the Greater Accra Region, on the coastal belt of Ghana.

The Dangme West District is one of the 5 districts of the Greater Accra region.

The district, with its capital at Dodowa is situated in the South-eastern part of Ghana, and lies between latitude 5 degrees 45' south and 6 degrees 05' North and Longitude 0 05 East and 0 degrees 20 West. It shares boundaries with the Yilo Krobo District on the North West, North Akwapim District on the West, Tema District on the Southwest and Dangme-East District on the East. The Volta River and the Atlantic Ocean wash the northeastern and the southern portions of the district respectively. It has a coastline stretching over 37 kilometers

The District has a total land area of 1,700 squared kilometers, making it the largest out of five districts in the Greater Accra Region. The vegetation is mainly coastal savannah though there is a patch of forest in the Dodowa sub-district

The main occupation being fishing, food processing, stone quarrying crop and livestock farming. 68% percent of the district is classified as rural and 32% as urban. The district has a population of 96,015 (2000 census) with a projected growth of 3%.

The district is subdivided into four sub-districts for administrative purposes. Each sub-district is served at least by a health centre, but there is no hospital in the district. Referrals from the health centres and community clinics go to hospitals in surrounding districts.

Malaria transmission in Dodowa is hyper-endemic but with marked seasonal variation (Afari et al, 1994). The main rainy season, June to July is the peak season for malaria transmission and has a higher incidence of malaria and the highest incidence rates are among those under 10 years (Afari et al, 1995). A one-year survey conducted at Dodowa in 1992 put the incidence rate of clinical malaria at 106.6 per 1000 population (Afari et al, 1995).

The Dodowa Health Center serves the Dodowa Sub-district. A team, headed by the Medical Assistant in Charge mans it.

3.4 Study Design:

3.41 TYPE OF STUDY

Descriptive

3.42 STUDY POPULATION

Children aged 6 - 60 months who presented ill at the Dodowa Health Centre during July and early August 2003

3.43 SAMPLE

All those children 6-60 months who presented with fever (axillary temperature >37.5C) and whose caregivers gave consent to participate in the study during the study period. Within the sample, those with temperatures above 40.0C had blood cultures for concurrent bacteria infection.

3.44 KEY PARAMETERS FOR ILL CHILDREN

a. Prevalence of fever.

b. Prevalence of positive blood film for malaria parasites.

c. Prevalence of positive blood cultures for bacteria

3.45 SAMPLE SIZE CALCULATION

$$n=\frac{Z^2(p)(q)}{d^2}$$

•Prevalence of malaria as 20%= p, and q = 1- p

Z=1.96 (confidence interval of 95%)

Error margin =d =10%

Sample size, n = 61

3.46 SAMPLING STRATEGY

All those satisfying the study inclusion/exclusion criteria on presentation and whose attending caregivers consented to take part were enrolled into the study.

3.47 RECRUITMENT

Cases were recruited at the Dodowa Health Center. For the study, a case was defined as a child between the ages of 6 to 60 months, who presents at the center with fever (axillary temperature of 37.5 C or above) during the study period. Once identified the study doctor assessed each child, and obtained consent from the parent or caretaker for inclusion into the study. If consent was given and the child fulfilled all the entry criteria and had none of the exclusion criteria, s/he was enrolled into the study.

Inclusion Criteria

- Child aged between age 6-60 months with a presenting axillary temperature of 37.5 C or above at the Dodowa Health Center between July – August 2003.
- Parental Consent from caretaker or parent to enroll into study.

Exclusion criteria

- Impaired sensorium
- Severe dehydration
- Other conditions that need urgent referral.

3.5 Laboratory Evaluations and Blood Draws

All procedures were done under aseptic conditions using sterile disposable supplies with adequate haemostasis secured.

The following table breaks down the blood requirements for the various aspects of this study in each of the cases.

3.51 Blood requirements:

Case 1- Those with axillary temperature between 37.5 and 40.0 C

Case 2- Those with axillary temperature 40.0 C and above

Test	Case 1	Case 2
Blood Culture	_	2ml
Blood smear	200 µl	200 µl
Total	200 µl	2.2ml

3.52 Laboratory Methods

Thick and thin blood smears were done for all participants using finger prick or venous blood. The blood smears; thin and thick were stained using 3% Giemsa solution for 30 minutes. Thin smears were used to identify for parasite identification whiles the thick films were used for parasite counts. The parasite density was scored against 200 white blood cells (wbc) and converted to parasites per microliter (ul) by assuming a wbc count of 8000/ul.

Blood cultures were transported by road to the Department of microbiology of the University of Ghana Medical School on the same day.

3.6 Data Management & Statistical Analysis

- Structured questionnaires were administered by the study doctor once a child has been recruited into the study by a nurse (screened and consent obtained from the adult accompanying the child) to the adult accompanying the child.

- Physical Examination were done on the children and entered into physical examination report forms.
- Analysis of Blood films were done at the Dodowa Health Center laboratory whiles blood cultures were done at the University of Ghana Medical School, Department of Microbiology laboratory.
- Coding of Data and Entry
- All the study data was captured onto case record forms bearing subject demographic and identification numbers. All the forms were edited and checked by the study investigator and errors corrected before data entry. Data entry was done.
- Analysis was done with EPI INFO (2000) and SPSS (version 10)

3.7 Limitations

The researcher's inability to cover the sample size (especially for the blood cultures) due to time constraints limits the generalization of the study results. The limitation of the period of data collection to the wet season also limits the generalizations of the results of the study.

Intra and inter observer errors may have occurred. This was minimized by training of nurses who took part in the study.

All the questionnaires and physical examinations were done by the study doctor to prevent inter observer errors. The blood smears were done by one technologist and were

read by two technologists at different times and the differences that arose were reconciled.

The generalization of this study is limited due to the above limitations.

Chapter Four

4.0 RESULTS

4.1 General Characteristics

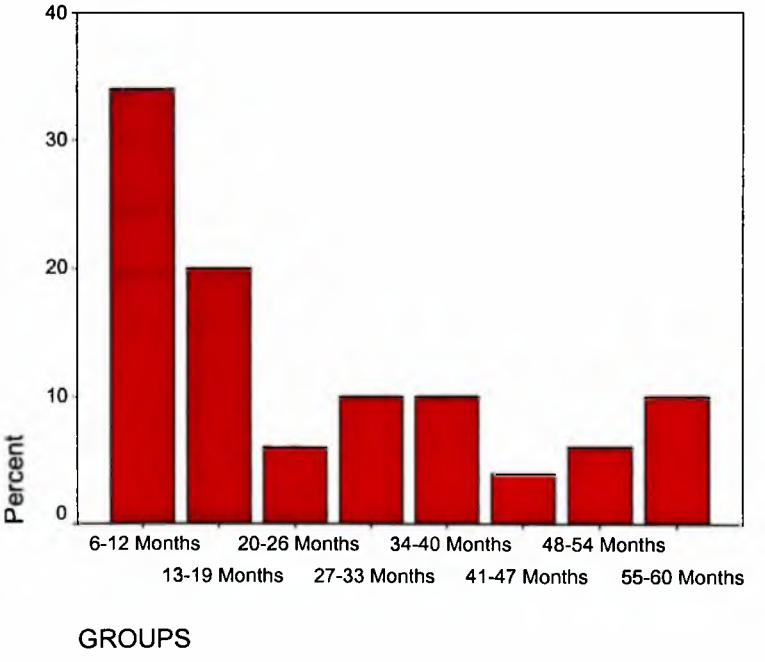
Fifty (50) children aged between 6 and 60 months were enrolled into the study .The gender is as follows.

Table 1; Sex of participants

N=50

	Frequency	Percent
Male	30	60.0
Female	20	40.0
Total	50	100.0

Figure 1. Age group distribution of participants.



The mean weight is 11.44 kg (range is 6 – 20 kg). The mean height is 85.64 cm (range is 64 –110cm).

Ten percent (10%) of the children were being cared for, primarily by their grandmothers, 86% by their mothers and 4%by others (aunts).

Eighty percent (80%) of the caregivers are married, 12% are single and 8% are divorced.

Table 2; Occupation of Caregivers

N=50

Occupation of caregivers	Frequency	Percent	Cumulative Percent
Farming	9	18.0	18.0
Government service	2	4.0	22.0
Hairdresser	2	4.0	26.0
Housewife	2	4.0	30.0
Seamstress	9	18.0	48.0
Stone quarry	1	2.0	50.0
Trading	25	50.0	100.0
Total	50	100.0	

Fifty two percent (52%) of the primary caregivers of the children did not complete basic formal education. Table 3 gives the details.

Table 3; Distribution of Formal Education levels attained by Primary Caregivers

N=50

Caregiver's Education Level

	Frequency	Percent	Cumulative Percent
0-3 years	16	32.0	32.0
Primary 4-6 years	9	18.0	50.0
JSS (7-8 years)	1	2.0	52.0
Basic (9 years)	20	40.0	92.0
Post Basic (10-15 years)	4	8.0	100.0
Total	50	100.0	

4.2 Case Histories and Examinations

Recent Past Medical History of Children

Twenty (20) percent of the children have been hospitalised, 4% for anaemia and blood transfusion, 6% for convulsions, 8% for malaria and 2% for others.

In 62% of the children, caregivers had given some form of treatment before coming to the clinic, but only 30 % gave an antimalarial, (chloroquine) which was obtained mainly from the drug stores in the respective communities. 50% of those who were given chloroquine were given adequate doses for 3 days. 2% gave antibiotics and 8%gave multivitamins.

Presenting signs and symptoms

In 54% of cases, respondents complained of vomiting, diarrhoea in 20% of cases, chills in 32.7 of the cases and inability to suck or eat in 56% of cases.

Forty eight percent (48%) had liver enlargement, 16% had the spleen enlarged, 2% had visible jaundice, 48% had pale conjunctivae, 2% had moderately impaired hydration status and 2% had oedema.

The mean axillary temperature recorded was 38.53 C (SD 2.889). The highest recorded temperature was 40 C (in 8% of cases)

Blood Smear Results

Ninety six (96) percent of the patients had positive blood smear results for malaria parasites (all of them had plasmodium falciparum species). The mean parasite density was 3541.74 counts per ul. The minimum and maximum parasite densities were 80 and 28,800 counts/ul respectively, but only 28% had parasite densities above 2500/ul, (the clinical diagnosis cut off point)

The proportion of patients with parasite densities above 20, 000/ul is 4%. These were aged 40 months and above. About 75% of those with parasitaemia had parasite densities 3240/ul and below.

Figure 2;Distribution of mean parasite densities (count/ul) among the age groups

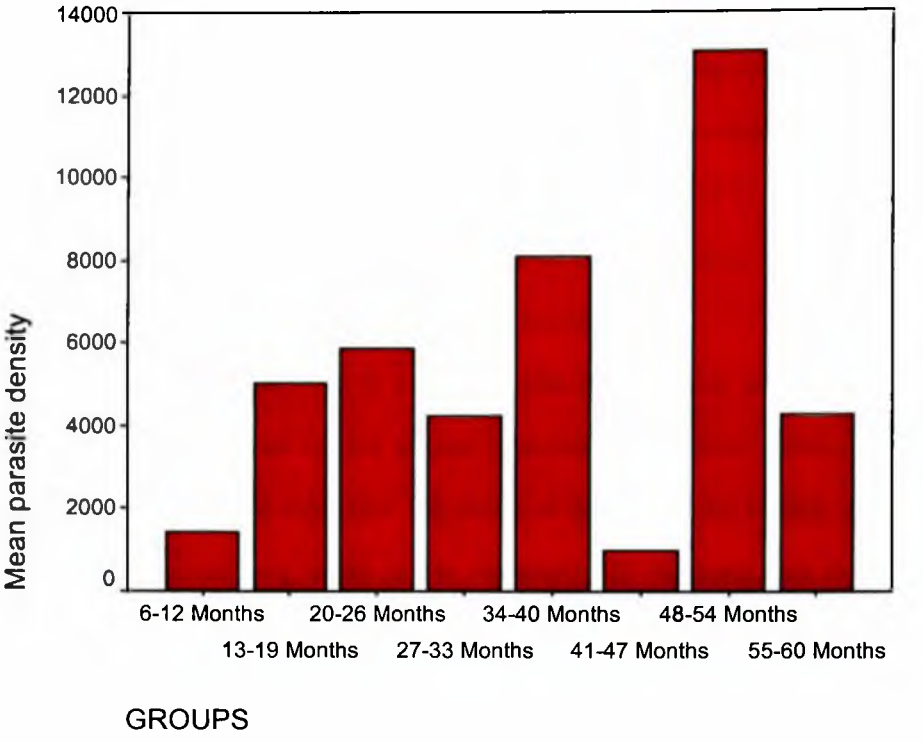


Table 4;

Blood Culture Results

N=4(Those who presented with axillary temperature 40 C)

Result	**Frequency**
Mixed growth of bacteria	1
No bacterial Growth	2
Streptococcal Growth	1
Total	4

Chapter Five

5.0 DISCUSSION

Malaria is a major contributor to the burden of febrile illness among children under five years. The percentage of those with positive blood smears (96%) though higher than those found by Marfo et al (1998) 78.6% compares favorably, but only 28 % had parasite densities above the 2500/ul and thus satisfied the criteria for clinical malaria.

62.5% of those with parasitaemia were aged 6 to 24 months.

Home treatment with antimalarials is a common practice, and may save lives by ensuring that more malaria cases receive prompt treatment. Chloroquine remains the commonest antimalarial drug for caregivers. The source of the chloroquine in most cases (86.7%, N=15) was private drug stores in the community of residence, this is not surprising with a lot of education going on through the IMCI campaign on Healthier Happier Home campaign on Obonu FM, a local radio station. In 86.7% of those who were given chloroquine, the duration of treatment was 3 days, which is also commendable though only 50% of them gave adequate doses for the age of the child. This has implications for patient's caregivers' education.

Plasmodium falciparum was the main species, and this agrees with the findings of others (Marfo et al 998, Jhaveri et al 1995, Binka et al 1994, Koram et al)

The commonest presenting symptoms were also lethargy (80%, N=48), vomiting (54%), and inability to eat/suck (55%).

The sample size for the blood cultures remain small (N=4) for any conclusions to be drawn on it. The mixed blood culture growth in one was too "mixed" and therefore most

probably due to contamination of the sample by skin flora. Significantly one of the patients had streptococcal growth.

Enwere et al (1998) as part of a treatment trial of cerebral malaria in a similar study at the Royal Victoria Hospital, Banjul, did blood cultures in 276 Gambian children, aged between 1 and 9 years, with cerebral malaria. Fourteen (5%) of these were positive. The organisms isolated were Staphylococcus aureus (6), coliforms (4), Pseudomonas spp. (2), Salmonella spp. (1) and Streptococcus spp. (1). Thirteen of these children survived, most without appropriate antibiotic treatment. Most of the retrieved organisms were therefore suspected to be contaminants. It was concluded that bacteraemia complicating cerebral malaria is not common in The Gambia, and therefore routine antibiotic treatment of children with cerebral malaria is not warranted.

The patient (who had a positive blood culture for streptococcal growth) was clinically well on the third day review. She was given antibiotic cover. At the one-week review, she had completely recovered.

This is inconclusive. The need for more work to be done in this area is therefore critical.

Chapter Six

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

In a group of children aged 6- 60 months with presenting axillary temperatures 37.5 C or above recruited into a study, 96 % had positive blood smears for plasmodium falciparum, but only 28% had parasite densities above 2500/ul to satisfy the clinical diagnosis criteria.

Malaria is thus a significant contributor to febrile illness in children 6 –60 months presenting at primary care setting in Ghana.

6.2 Recommendations

1. There is the need for further studies into the contribution of bacterial infections to febrile illness in children. This will prevent misdiagnoses and the inappropriate prescription of antibiotics especially at primary care centers where a misdiagnosis may mean death for some children as they might not make it back to the health center
2. There is the need to intensify the training on IMCI guidelines to cover all prescribers in the primary care settings.
3. The use of insecticide treated bed nets by families, especially those with children under five years be encouraged and promoted actively in the Dangme West District.
4. Caregiver education on management of malaria at home needs to be intensified.

REFERENCES:

1. **Ahmed, K.** 1989. Epidemiology of malaria in Ghana. Ghana Med. J. **23:**190-195.
2. **Marfo, C.** Asante, M; Arhinful, S; 1998. The Impact of Malaria diagnostic Algorithm on Poly-Pharmacy and cost. Unpublished
3. **Ortega, L.I**; Binka F. 1994. Clinical Parameters Associated with the Diagnosis of Malaria in PHC Settings. Unpublished
4. **WHO-** (1991) Report on a meeting on the application of rapid assessment methods to tropical diseases, WHO/SER/RAM/91.3. Geneva:UNDP/ World Bank/ WHO Special Programme for Research and Training in Tropical Diseases.
5. **Anonymous,** A global strategy for malaria control. World Health Organization, Geneva. 1993.
6. **Binka FN**. Morris SS, Ross DA et al., (1994). Patterns of malaria morbidity and mortality in northern Ghana. Trans. Roy. Soc. Trop. Med. Hyg. 88, 381-385
7. **Koram. KA,** Owusu-Agyei S, Utz G et.al. Severe Anaemia in Young children after High and low Malaria Transmission seasons in the Kasena-Nankana District of the Northern Ghana. Am J. Trop. Med. Hyg. 2000 Jun; 62 (6): 670-4
8. **Baird JK,** Owusu-Agyei S, Utz G et. al. Seasonal Malaria Attack Rates in Infants and Small Children in Northern Ghana. Am. J. Trop. Med. Hyg. 2002 Mar; 66(3): 280-6

9. **Fernando** SD, Wickremasinghe AR. The clinical and epidemiological features of childhood malaria in moderately endemic area of Sri Lanka. Southeast Asian J Trop Med Public Health 2002 Dec;33(4):671-7

10. **Ibekwe** AO. Febrile illness, a major cause of profound childhood deafness in Nigeria. West Afr J Med. 1998 Jan- Mar: 17(1): 15-8

11. **Tarimo** DS, Minjas JN, Bygbjerg IC. Malaria diagnosis and treatment under the strategy of the integrated management of childhood illness (IMCI): relevance of laboratory support from the rapid immunochromatographic tests of ICT Malaria P.f/P.v and OptiMal. Ann Trop Med Parasitol. 2001 Jul; 95(5): 437-44.

12. **Chong** CY, Allen DM. Childhood fever. Singapore Med J. 1996 Feb; 37(1): 96-100.

13. Anonymous, www.malariasite.com/543/children.htm. Malaria in Children.

14. Anonymous, Malaria Kills 3000 Children a day in Africa. Bull WH Organ, 2003, vol 81 810.6 p.472-42, ISSN 0042- 9686

15. **Artavanis-Tsakonas** K, Tongren JE, Riley EM. The war between the malaria parasite and the immune system: immunity, immunoregulation and immunopathology. Clin Exp Immunol. 2003 Aug;133(2):145-152

16. **Nkuo** Akenji TK, Ajame EA, Achidi EA. An investigation of symptomatic malaria parasitaemia and anaemia in nursery and primary school children in Buea District Cameroon.Cent Afr J Med. 2002 Jan-Feb;48(1-2):1-4.

17. **Nsutebu** EF, Martins P, Adiogo D. Prevalence of typhoid fever in febrile patients with symptoms clinically compatible with typhoid fever in Cameroon. Trop Med Int Health. 2003 Jun;8(6):575-8.

18. **Hozhabri** S, Luby SP, Rahbar MH, Akhtar S.Clinical diagnosis of Plasmodium falciparum among children with history of fever, Sindh, Pakistan. Int J Infect Dis. 2002 Sep;6(3):233-5.

19. http://www.mosquito.who.int/cgi.../dhome_rbm.jsp

20. http://www.who.int/child-adolescent-health /integer.htm

21. **Jhaveri** KN, Nandwani SK, Mehta PK, Surati RR, Parma BD. False positive modified Widal test in acute malaria. J Assoc Physicians India. 1995 Nov;43(11):754-5.

22. **Ammah** A, Nkuo-Akenji T, Ndip R, Deas JE. An update on concurrent malaria and typhoid fever in Cameroon. Trans R Soc Trop Med Hyg.1999 Mar-Apr ;93(2):127-9

23. **Khubnani** H, Phalke D, Khubnani AH, Jain RC. Coexistence of anti – Salmonella agglutinins in falciparum malaria. J Assoc Physicians India. 1995 Aug;43(8):585-6

24. **Enwere** G, Van Hensbroek MB, Adegbola R, Palmer A, Onyiora E, Wood, Greenwood B. Bacteremia in cerebral malaria. Ann Trop Paediatr. 1998 Dec; 18(4): 257-8

25. **Green** M. Fever In: *Pediatric diagnosis*. Philadelphia: Saunders, 1998: 203

26. **Commey** J, Quarm-Goka B, Agyepong I. Persistent Fever in severe malaria in children. Cent Afr J Med. 1994 Sep; 40(9): 257-60

27. **Afari** EA, Dunyo S, Appawu M, Nkrumah FK. IN vivo seasonal assessment of Plasmodium falciparum sensitivity to chloroquine in two different malaria endemic communities in southern Ghana. Afr J Health Sci. 1994 Aug;1(3):112-115

28. **McGowan** JE Jr, Bratton L, Klein JO, Finland M. Bacteremia in febrile children seen in a "walk-in" pediatric clinic. *N Engl J Med* 1973; 288: 1309-12

29. **McCarthy** PL, Sharpe MR, Spiesel SZ, Dolan TF Jr. Observation scales to identify serious illness in febrile children. *Pediatrics* 1980; 65: 1090-5

30. **Afari** EA, Appawu M, Dunyo S, Baffoe –Wilmot A, Nkrumah FK. Malaria infection, morbidity and transmission in two ecological zones in Southern Ghana. Afr J Health Sci. 1995 May; 2(2): 312-315

31. **Baker** MD, Bell LM, Avner JR. Outpatient management without antibiotics of fever in selected infants. *N EngI J Med* 1993; 329: 1437-41

32. **Baraff** LJ. Management of fever without source in infants and children. *Ann Emerg Med* 2000; 36: 602-14

33. **Bachur** R, Harber MB. Reevaluation of outpatients with Streptococcus pneumoniae bacteremia. *Pediatrics* 2000; 105: 502-9

34. **Jones** RG, Bass JW. Febrile children with no focus of infection: a survey of their management by primary care physicians. *Pediatr Infect Dis J* 1993; 12: 179-83

35. **Itzhak** Brook, Unexplained fever in young children: how to manage severe bacterial infection, BMJ 2003; 327:1094-1097 (8 November), doi: 10.1136/bmj.327.7423.1094.

35. **Itzhak** Brook, Unexplained fever in young children: how to manage severe bacterial infection, BMJ 2003; 327:1094-1097 (8 November), doi: 10.1136/bmj.327.7423.1094.

APPENDICES

1. Consent to participate in a research project form

INTRODUCTION AND BACKGROUND

We are from the Dodowa Health Center and are about to conduct further studies into malaria in this community and would like to invite your child/ward to take part in this study. A germ that is passed from one person to the other by the bite of a mosquito that carries the malaria germ causes malaria. Malaria is a very serious health problem in Ghana. The disease strikes people of all ages, male or female. It can be particularly severe in children and may cause death. To understand this problem we need to study children who come to the health center with malaria. All children younger than five years old who come to the hospital with fever will be invited to take part in the study.

Taking part in the study involves having a little blood, about half teaspoonful of blood drawn from the arm of your child or ward to check for malaria germ and other germs in the blood.

Taking part is completely voluntary; you are not required to participate. You have every right to refuse. If you should refuse it is all right. Whether or not you participate in the study your child/ward will receive the same, appropriate medical care for malaria at the health centre. This study will be carried out over approximately two months, beginning in June 2003 and will involve participation of about 100 children. We would like to invite your child to take part in the study. Take your time and read this consent form or have it read to you. You must ask and receive satisfactory answers to all of your questions, if you have any. Your child will be one of up to 60 volunteers to take part in this study. Your child's/ward's taking part is entirely

voluntary, and you may withdraw him or her from the study at any time without penalty. We are hopeful that the knowledge gained may be of benefit to all in the community.

CONFIDENTIALITY

The medical information collected shall be used only for the purposes of this study. We will collect data on forms provided specifically for this protocol.

QUESTIONS

You are encouraged to ask questions at any time before and during the study. If you have any questions concerning this study, you may contact the following persons;

1. Dr Alberta Amu Quartey,

Dodowa Health Center

2. The Medical Assistant,

Dodowa Health Center

3. Dr. Irene Agyepong

District Health Management Team

Dangme West

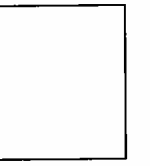
Dodowa

SIGNATURE OF VOLUNTEER WILLING TO PARTICIPATE

I have read all of the above or have had this document read to me, asked questions, received answers concerning areas I did not understand, and am willing to give consent for my child/ward to participate in this study. I will not have waived any of my rights by signing this consent form. Upon signing this form, I will receive a copy of this consent document for my personal records.

Name of participant or ward.....

Name of parent(s)/guardian.....



Signature/Left parent/guardian.....

Thumbprint

2. Blood Smear Results Form

	Study Identification no.			
	Hospital Identification no.			
		RESULTS		
#	**Parameter**			
1	Parasitaemia	1.Yes	2. No	
2	Species	1.PF	2.PM	3.PO
3	Count /200wbc			
4	Trophozoites/200wbc			

3. Questionnaire

Section A

STUDY IDENTIFICATION NUMBER							

HOSPITAL IDENTIFICATION NUMBER							

Name of Child.....

Sex	1. Male	2. Female

Age (in months)	1.6-24	2. 25-60

Community/Residence.....

Name of Respondent.....

Relationship of Primary Respondent to Child:

1. Mother	2. Father
3. Other (specify)	

Name of caregiver.....

Relationship of Primary Caregiver to Child:

1. Mother	2. Grandmother
3. Other (specify)	

Number of years/months Primary caregiver has lived with Child:

Number of years of formal education of primary caregiver:

Occupation of primary caregiver:

1. House wife	2. Farming	3. Trading	4. Government/ Public service	5. Other

Marital Status of primary caregiver:

1. Married	2. Single	3. Divorced	4. Separated	5. Widowed

Section B

Recent Past Medical History

1. Have you given/ gone for treatment for the child somewhere before coming to the health center

1. Yes				2. No
3. Home	4. Herbalist /traditional healer/ Religious healer	5. Health Facility	6. Others	

2. Treatment given:

3. Has this child had malaria treatment this past week?

1. Yes	2. No	9. NK

(If no, go to 9)

4. Date treatment started:

(dd/mm/yyyy)

5. Source of the malaria drug administered:

1. Clinic	2. Market	3. Drug store	4. Peddler	5. Other

6. Name of malaria drug administered:

1. Chloroquine	2.Fansidar	3. Camoquine	4. Artesunate	5. Other

7. Duration of the malaria treatment (in days)

8. Dose given

Adequate	1. Yes	2.No

9. Hospitalization

1. Yes	2. No	99. NK

10. If Yes, reason for hospitalization/admission:

1. Short of blood	2. Convulsion	3. Respiratory infection	4. Diarrhoea	5. Malaria	6. Other

Section C

Presenting symptoms

11. Fever	1. Yes	2. No	
12. Shaking chills/rigors	1. Yes	2. No	
13. Diarrhoea (3 or more watery stools)	1. Yes	2. No	
14. Vomiting	1. Yes	2. No	
15. Joint pains	1. Yes	2. No	
16. Cough	1. Yes	2. No	
17. Difficult in breathing	1. Yes	2. No	
18. Bloody urine	1. Yes	2. No	
19. Inability to suck /drink /eat	1. Yes	2. No	
20. Inability to sit/stand unaided	1. Yes	2. No	
21.Convulsions.	1. Yes	2. No	

4. PHYSICAL EXAMINATION REPORT FORM

STUDY IDENTIFICATION NUMBER:

CASE CODE

1. Respiration (number/minute):
2. Axillary Temperature (C):
3. Pulse / (minute):
4. Systolic blood pressure (mmHg)
5. Diastolic blood pressure (mmHg):
6. Weight (Kg):
7. Height / Length (cm):

9. Presence of Oedema

1 = Ascites, 2 = Facial, 3 = Pedal, 4 = General, 8 = NA				

11. Hydration Status:	1. Normal	2. Some impairment	3. Severe Impairment

12. Pallor:	1.Yes	2.No

13.Jaundice:	1.Yes	2.No

14. Respiratory distress:	1. Present	2. Absent

15. Spleen enlarged	1. Yes	2. No	

16. Liver size (cm):	

17. Lethargy	1. Present	2. Absent

18. Convulsions	1. Present	2. Absent

19. Restlessness

1. Present	2. Absent

20. Consciousness

1. Clear	2. Unconscious/semiconscious

Blood Samples taken	**Yes**	**No**
Blood Culture		
Blood smear		
Total		