Impact of Home-based Management of Fever on Progression to Severe Illness in Children under Five Years Undergoing Treatment for Malaria at Kericho District Hospital, Kenya

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A Research Project Report Submitted in Part Fulfillment of Postgraduate Diploma in Biomedical Research Methodology of University of Nairobi Institute of Tropical & Infectious Diseases

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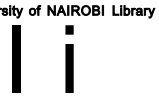

DECLARATION

This is my original work and has not been done or presented for any diploma or degree in any institution.

Candidate

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Abstract

Background: Mortality in children under five years of age is contributed substantially by malaria and 75% of estimated malaria deaths occur in African children. Home-based management of fever is common as the first step in treatment of malaria. It has been adopted as one among strategies for Roll-Back Malaria (RBM) by the WHO through training of caregivers at community level to enhance prompt and correct use of antimalarial drugs.

Objective: To establish the impact of home-based management in progression of fever to severe illness in children under 5 years undergoing treatment for malaria.

Method: A case-control study was conducted between 30th July and 31M August 2007 at Kericho District Hospital in Rift Valley Province on children under five years undergoing treatment for malaria. Diagnosis was based on National Guidelines for Diagnosis, Treatment and Prevention of Malaria for Health Workers in Kenya (MOH, 2006) and for purpose of this study both confirmed and probable cases of malaria were included in the study. Cases were children seeking inpatient treatment for malaria whereas controls consisted of febrile children treated for malaria as outpatients at the hospital. Mothers for both cases and controls were interviewed using a standard questionnaire collecting data on home-based management characteristics.

Results: 45 children (22 cases and 23 controls), mean age of 22.8 months, diagnosed with malaria were consecutively enrolled. Out of all the children that were studied, 55.6% received home-based management of fever. None of home-based management reported having administered antimalarial drugs to their febrile children but 73.1% used analgesics (panadol and paracetamol). The practice of home-based management was detected in 31.8% and 78.3% of cases and controls respectively with an odds ratio of 0.13, P=0.00 and indicating that it was not associated with increased risk of severe illness but on the contrary was protective against severe illness.

Majority (61.1%) of the severely ill children were treated at the dispensary or private clinic before being brought to the hospital while none of the children with mild illness reported the same. Treatment in the dispensary/private clinic seemed to have caused delay incoming to the hospital, 113.5 hours, after detection of illness in the children compared to 70.4 hours. P= 0.12. Due to the small numbers of controls that were treated in dispensary or private clinic, it was impossible to obtain odds ratio associated to it; consequently, though a possible confounding factor, was not controlled for in obtaining association between home-based management of fever and severe illness.

In addition, duration of illness, place of residence and presence of training in prevention of malaria were not significantly different between the cases and the controls. Though statistically insignificant, place of residence and presence of training in prevention of malaria increased the risk by two fold (OR= 2.8 and 2.5 respectively). Furthermore, duration of illness, place of residence and presence of training in prevention of malaria that were possible independent risk factors did not need to be controlled for because of their lack of association with severe illness.

Conclusions: The practice of home-based management of fever in children under 5 years was prevalent and it reduces' the likelihood of progression from mild fever to severe illness in malaria. This may appear as a spurious finding given that the type of medications administered during home-based management did not include antimalarial drugs. Treatment in dispensary or private clinic that resulted in delay among the cases is a factor to investigate given that none of the children treaty with mild illness reported having utilized it hence resulting to an infinitely high odds ratio in its association with severe illness. Place of residence, though not significantly associated, cannot be ruled out as a contributing factor and requires further investigation as well.

ACKNOWLEDGEMENT

This study would not have been completed successfully without the support of various people that gave their time and skills in guiding me through the development of the study proposal and the conduct of the study.

1 am indebted to the following people who contributed in different ways to this study:

Dr Mark Joshi, my supervisor. Prof Estambale, Director (University of Nairobi Institute of Tropical and Infectious Diseases, UNITID), Dr Machoki. Deputy director (UNHID), all the UNITID staff, the Kericho District Hospital staff: Dr Otomu (Deputy Medical Superintendent). Dr Tsichutsu (Paediatrician), all the Ward 2 and MCH staff and my fellow classmates for their invaluable advices and encouragement during proposal development and execution of this study. Finally, I am grateful to the University of Nairobi for awarding me a partial scholarship that enabled me to enroll in the postgraduate diploma programme.

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DEFINITION OF TERMS

For the purpose of this study, the following terms were used with their meanings as given below:

Home-based management: the initial action by the mothers/caregivers in response to detection of fever in their children that excludes seeking formal health services

Confirmed malaria: Blood smear positive of malaria parasite

Probable malaria: Blood smear negative but on clinical symptoms, malaria cannot be ruled out hence they are put on malaria treatment

Severe illness of malaria: the level of sickness in confirmed and/or probable malaria that results in admission in the hospital

CHAPTER 1

1.0 Introduction

Over 90% of the deaths caused by malaria globally occur in Sub Saharan Africa and almost all in children (1). Around 60% of the cases of clinical malaria with 80% mortality rate occur in Africa south of the Sahara and more than 1 million Africans who die from malaria each year, most are children under 5 years of age (2).

According to WHO, mortality attributable to malaria for children under 5 years in Kenya by the year 2000 was estimated at 13.6% of all child deaths. Different malaria transmission characteristics are experienced around Kenya with Nyanza and Coast region being areas of stable transmission while the highlands such as Kericho and Nandi Mills are areas of unstable transmission that experience seasonal epidemics of malaria.. Malaria in Kericho has recorded an increasing trend since 1980s after being declared a malaria-free zone through 1960s (3). According to malaria surveillance by the Ministry ot Health, 19.5% of the 2003-projected population of children under five years developed malaria. The seasonal epidemic experienced in the highlands reaches its peak between May and Jhiy annually. An underlying principle for the clinical patterns of disease and mortality among these unstable transmission populations is that risks are equivalent among all age groups owing to a fack of functional immunity acquired through repeated parasite exposure (4).

Studies have shown an estimated 40-70% of malaria episodes receive self-treatment as an initial response to fever (5). However, over 60% of the fevers in children are treated with simple fever drugs, such as paracetamol and aspirin, but not with antimalarials. Hven when antimalarials are purchased, they are commonly administered in inappropriate doses in over 80% of the fevers. However, it has been shown that mothers are able to recognize symptoms associated with uncomplicated malaria which studies show that it is closely correlated to diagnosis by medical assistant and positive blood-slide of malaria (6). Additionally, management of malaria by African communities have shown that training of drug sellers on correct dispensation of antimalarials is feasible and likely to have significant impact (7). Several other studies have supported enhancement of the practice of home-based management of malaria to increase prompt and effective treatment in malaria. Such evidence led to inclusion of home-based management of

malaria in WHO's Roll-back Malaria (RBM) strategies and it basically focus on training on the correct use of antimalarials.

Despite the probable effectiveness of home-based management malaria, unsuitable and inappropriate doses of drugs and delay in accessing formal services are potential risks of allowing progression to severe malaria. Therefore, it is important to investigate the practice of home-based management as a first step of response to fever in children and its role in severe outcome of malaria by the time of seeking formal health services.

Home-based management of fever was used in this study to refer to all treatment actions by caregivers that a competent health worker is not involved in the diagnosis and prescription of drugs. A competent health worker included all persons that have adequate knowledge on diagnosis and prescription and are then qualified to offer treatment. The study used "caregivers" to refer to the persons the enrolled children under 5 years are under their care and for the purpose of this study, the caregivers were the mothers.

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1.0 Justification

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Severe malaria is a life-threatening stage of malaria with a mortality rate of 15-20% by the time of treatment as compared to about 0.1% rate during uncomplicated stage. Reducing the risk of severe malaria is directly related to reduction ot mortality in children less than 5 years ot age, with 75% of children deaths due to malaria occurring in Sub-Saharan Africa region. Not all cases of malaria progress to severe stage by the time of seeking formal health services. Beneath the factors such as endemicity of malaria, level of parasitemia and acquired immunity of individuals, an outstanding factor of delay in seeking treatment, as for any other disease, plays a central role in the severity of malaria.

In Africa where about 40% of the urban and 70% of the rural malaria episodes are treated with self-administered drugs, effective treatment is likely to be deferred and formal health services sought only when the illness has worsened. Determining the factors and their associated risks that contribute to progression of fever to severe malaria is important because of the high fatality associated with severity. Therefore, understanding the practice of home-based management of tever as the first step taken by caregivers in response to fever is important in describing its influence in children attending formal health services during severe stage of malaria. The

information obtained from such a study will contribute to prevention of mortality due to malaria in African children.

1.2 Literature Review

Malaria is the leading cause of mortality and morbidity in Africa, particularly among pregnant women and children under 5. Present estimates are that around 350-500 million clinical disease episodes occur annually (2). According to the Centers for Disease Control and Prevention (CDC), an estimated 700,000-2.7 million persons die of malaria each year and 75% of them are African children. CDC reported malaria as the fourth cause of death in children in developing countries, after perinatal conditions, lower respiratory infections (pneumonias), and diarrheal diseases and it caused 10.7% of all children's deaths in developing countries in 2002.

Plasmodium falciparum is the parasite that cause malaria mainly in Africa and three other different species are known to be potential causes in human. Falciparum species is the predominant cause of death and nearly all morbidity in Africa. Malaria begins with mild symptoms that are non-specific and usually recognized, though not in all cases, as headache, lassitude, fatigue, abdominal discomfort and muscle and joint aches, followed by fever, chills, perspiration, anorexia, vomiting and worsening malaise. These are typical symptoms of uncomplicated malaria, which at this stage, with no evidence of vital organ dysfunction, has a low case-fatality rate of about 0.1% (8).

Malaria in 2001 was ranked the eighth highest contributor to the global disability adjusted life year (DALY) and second in Africa. The estimation was based on the effects of *Plasmodium falciparum* infection as a direct cause of death and, among other effects, malaria-specific anemia and neurologic disability following cerebral malaria (4).

Severe malaria is due to *Plasmodium falciparum* infection and usually occurs as a result of delay in treating an uncomplicated attack of falciparum malaria. Progression to severe malaria is always rapid, and most children die within 48 hours of onset of illness (6). It manifests in different ways that include coma (cerebral malaria), metabolic acidosis, severe anaemia, hypoglycaemia and, in adults, acute renal failure or acute pulmonary oedema and the symptoms

may appear singly or combined. At this stage, mortality on people receiving treatment has risen to 15-20% and almost always fatal if untreated (8).

Seasonal epidemics of malaria are experienced almost annually in the regions of Western Kenya highlands. These contribute to the highest hospitalization and deaths during the season that runs from May to July (3). Malaria surveillance by the Ministry of Health estimated an overall malaria burden in Kericho at 110 cases per 1000 people during the year 2003. An estimated 17,773 malaria cases in children under 5 years were reported equivalent to 19% of the 2003-projected population of children under 5 years. 37.4% of these cases occurred during the period between May and July and the rest distributed fairly evenly throughout the year. It has been studied that of the deaths that occur due to malaria in the Kericho tea estates, most are the result of severe anemia in young children, a condition that typically explains severe malaria (9).

Studies have established that mothers are able to recognize symptoms associated with uncomplicated malaria as closely correlated as diagnosed by a medical assistant and positive blood-slide of malaria (6). It is important to note that some local classification systems of the term 'malaria' is used to describe an illness that is compatible with the biomedical definition of malaria. In many areas, there is no specific illness category that approximates malaria. A common pattern is a single term that approximates "fever* (10). Furthermore, many communities in Kenya are unable to distinguish malaria-specific paroxysms from generalized fever and it is the latter that serve as indicator of the treatment action (11). Some relate the approximation with malaria, but others attribute it to a number of other causes, including evil spirits and witchcraft. In Kenya and Tanzania, *homa* is used to describe fever. Some people recognize a specific form of *homa - homa ya* malaria. However', severe anaemia and cerebral malaria are not associated with malaria. In Kenya, the response to convulsions was found to be more likely to involve a traditional healer, and less likely to involve shop-bought drugs (10). Due to the widespread lack of knowledge for malaria diagnosis, treatment that is offered at home is more likely to focus on alleviation of symptoms rather than treating the cause.

Since malaria begins with mild symptoms often accompanied by fever, previous studies have established that the earliest action taken during febrile conditions in a majority of episodes is self-treatment that may'4nclude herbal medicines, leftover drugs from previous visits to health

centers or drugs bought from local shops (14). In Africa, home-based treatment of malaria is common and more than 70% of malaria episodes in rural areas and > 40% in urban areas are self-treated with drugs bought from local private drug sellers (5). Self-medication is often associated with underdosing and blamed for emergence of resistant strains, although the evidence for these relationships is not clear. Safety and cost of drugs such as chloroquine have been identified as among the factors motivating home-based treatment of malaria. Independent of antimalarial effect of chloroquine, it has an antipyretic effect that results to it being perceived to be more effective than alternatives because of its ability to reduce fever quickly. Most alternative drugs are expensive and have higher rates of side effects. The inexpensive and reasonably safe sulphadoxine-pyrimethamine (S-P) that replaced chloroquine as first line drug has been used also for managing fever at home. Besides time, cost and perception of severity that emerge repeatedly as related to self-treatment, prior experience with the disease is also a factor that influences treatment choices. Some choose self-treatment because of their past experience of malaria and the confidence they have in treating the disease (10). However, it is known that most treatments are incorrect or sub-optimal among populations acnoss Africa and effective treatment is likely to be much lower than those who were simply treated with the correct drug (11).

In Africa, there is a widespread pattern of stopping medication when symptoms resolve and the drugs are kept for future episodes or given to family or friends. A study established that knowledge of correct dosage was high, about 58%, in Kisii District especially with prepackaged brands. However, a 'gap' between knowledge and behaviour is illustrated by another study among Kenyan schoolchildren, which found that dosages of antimalarials were typically inadequate, even though the correct 'dose was known. The results from many studies have suggested that overdosing may be almost as common as underdosing (10). Foundation to any successful efforts to reduce the mortality burden posed by malaria is through effective case management of febrile illness. Harly death or deterioration are a common feature of malaria cases that progress to severe illness, implying a narrow window of opportunity for instituting ettective treatment in these most'severe cases (11).

I he April 2000 Abuja summit, that involved 53 African heads of states that adopted a plan to cut the number of malaria deaths in half by the year 2010. recognized the difficulty experienced by

majority of population in accessing health care services and called upon member states to make diagnosis and treatment of malaria available as far peripherally as possible, including home treatment (10). In the Abuja declaration, the Heads of States committed themselves and their countries to ensuring that 60% of fevers in the continent are treated promptly within the first 24 h with safe, effective, quality antimalarials. However, a study done among four communities in Kenya indicated that only 2.3% of fevers were managed in the first 24 h using SI\ the recommended first-line therapy for uncomplicated malaria in Kenya. This suggests that delay in accessing effective treatment is still widespread which the study found out that there was a median waiting period of 2 days (IQR: 2, 4) across the four districts to treatment (11). This delay is enough for progression of malaria from mild symptoms of fever to severe illness that can kill within 48 hours.

Strategies by WHO are now in place to accelerate prompt and effective treatment of by enhancing the practice of home-based management of malaria (HMM) aiming at reducing morbidity and mortality. Training community health,providers and drug sellers is among the approaches taken to meeting the objective. This also will ensure that drug resistance by malaria parasites through incorrect dosages of antimalarials is avoided.

Moreover, though a high proportion of children are affected by malaria in Africa, only a small proportion, perhaps 1-2%, who become ill with malaria develop severe malaria. It is suggested that the size of the inoculum of the sporozoites explains the severity of illness in among the few who develop severe malaria (12). On the basis of the outcome of severe malaria, studies have determined indicator symptoms that place African children at high risk of death. The study done at Kilifi District hospital indicates the presence of impaired consciousness or respiratory distress as identifiers of those at high risk for death (13). However, no research has been done to study the behaviour of caregivers on basis of management of fever when it is first recognized in children. It is therefore important to understand home-based management of fever given to children so as to determine the risk it carries in progression of fever to severe malaria.

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1.3 Research Question

Is there an association between severity of malaria and practice of home-based management of fever in children under 5 years?

1.4 General objective

To establish the impact of home-based management on progression of fever to severe illness in children under 5 years undergoing treatment for malaria in Kericho District Hospital.

1.5 Specific objectives

1. To determine the proportion of practice of home-based management of fever and the types of medication used among children under 5 years being treated for malaria in Kericho District Hospital
2. To determine the proportion of caregivers with training on home-based management of malaria among children under 5 years undergoing treatment for malaria in the hospital
3. To determine the proportion of correct practice ..of home-based management of malaria among trained caregivers
4. To determine the proportion of severe illness among children under 5 years undergoing treatment of malaria in the hospital
5. To determine the odds ratio of developing severe illness associated to practice of home-based management of fever among children under 5 years undergoing treatment of malaria in the hospital.

CHAPTER 2

2.0 Methodology

2.1 Study Area

The study was conducted at Kericho District Hospital in Kericho District, Rift Valley Province. The district is located between 1600 to 3000 metres high with a population of 468,493 among which 30, 023 live within the municipality. The hospital is situated to the east end of Kericho Town, an area surrounded by vast tea plantations, 100 meters off Nakuru-Kisumu road.

2.2 Study Population and Design

The study utilized case-control design and children under five years of age brought for treatment at Kericho District Hospital in 30th July and 31 st August 2007 was the target population.

2.3 Sample size

The size of the population, N, that was interviewed on each arm of the case-control study was obtained using the formula:

$$N = \frac{(PoQo + Piqi) * (Zi\text{-}a/2 + Zi\text{-}p)^2}{(Pi - Po)^2} \quad (15)$$

Pi - proportion of exposure among cases

Po - proportion of exposure among controls ,.

qi = 1- Pi

q⇐ 1- Po

Zi-o/2-test of significance at 0.05 level

Zi.p - 80% statistical power

Pi = Po * RR

Po - proportion of exposure among controls is estimated at 50%

RR-approximated relative risk of 1.7 is used

By using the above formula, a sample size ot 22 cases and 22 controls was obtained that was able to estimate an odds ratio of at least 1.7 at 95% significance level and 80% statistical power 'I indeed there is an association between home-based management of fever and subsequent severity of illness in malaria.

2.4 Sampling method

Sampling procedure was based on diagnosis of malaria according to clinical and laboratory procedures described in the National Ckiidelines for Diagnosis, Treatment and Prevention of Malaria for Health Workers in Kenya (MOH, 2006). The study population was selected from all febrile children under 5 years undergoing treatment of malaria.

2.5 Eligibility criteria

2.5.1 Inclusion:

1. Children under 5 years brought to the hospital by their mothers.
2. Children under 5 years born and raised within the old Kericho District region.

2.5.2 Exclusion:

1. Children under 5 years that have used drugs prescribed by competent health worker before the visit to the hospital
2. Recurrent cases of malaria after previous treatment

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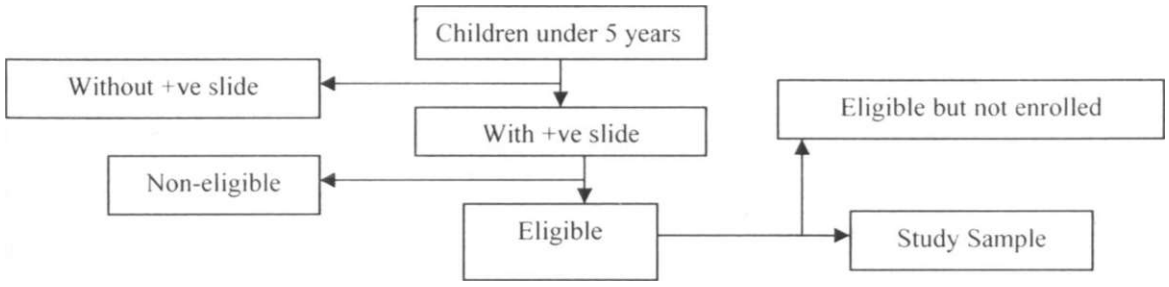
Enrollment of participants was done using convenient sampling method. The children under 5 years who were eligible and whose mothers were wiling to participate were consecutively enrolled in the study. The study population for the case-control study comprised of febrile children under 5 years diagnosed with confirmed/probable malaria. The cases were confirmed/probable cases of malaria that, according to the clinician, were severe enough to require inpatient treatment and the controls were the mild cases seeking outpatient treatment.

Figure 1: Flow Chart showing Sampling Procedure



2.6 Definition of cases/controls

2.6.1 Cases (Severe illness):

Children under 5 years that underwent inpatient treatment of malaria in the Kericho District Hospital.

2.6.2 Controls (Mild illness):

Children under 5 years that underwent outpatient treatment of malaria in the Kericho District Hospital.

2.7 Materials

2.7.1 Personnel

1. Physician - 1
2. Laboratory technician - 1
3. Investigator - 1

2.7.2 Supplies

1. Questionnaires - 1 10
2. Consent forms - 220
3. Biro pens-5

2.S Data Collection Procedures

The physician who examined the children under 5 years referred all suspected cases to the laboratory for parasitological confirmation of malaria. Blood smears were made to examine parasitemia in all the children.

The confirmed and probable malaria cases were sorted into mild and severe illness of malaria. Then, informed consent was sought from the mothers of the children under 5 years before administering interviews. After informing them adequately on the objectives, risks and confidentiality of the study, mothers were asked to participate by signing the consent form that was presented to them by the investigator. The mothers who consented and signed the form were interviewed using standard questionnaires to collect data on socio-demographic and exposure characteristics. The exposure variable whose data was collected on was home-based management fever administered bv mothers on their febrile children.

2.9 Data Analysis

The information contained in the questionnaires of each child were coded, entered and cleaned in Microsoft Excel. Data analysis was performed using intercooled STATA 9.2 statistical software. Socio-demographic characteristics of the children and mothers were summarized using means and proportions for continuous and categorical data respectively. Means for age of the child and the mother, income, time taken and bus fare to health facility and mean duration of illness were compared between the cases and controls using t test. The cases and controls were also compared based on the categorical variables such as sex of the child and marital status, educational level and occupation of the mother, and other characteristics that were risk factors to severity of illness using chi-square (A^{i2}) test. Odds ratio was obtained for home-based management of fever using logistic regression model and adjusted OR was not obtained since the various characteristics that would have been risk factors to severity of illness, such as duration of illness and place of residence, were not significantly different between the cases and the controls. All tests of significance were performed at 95% confidence interval.

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CHAPTER 2

3.0 RESULTS

The hospital routinely perform blood smear for malaria parasites on the suspected cases of malaria but it often turn out to be negative though based on clinical examination, malaria cannot be ruled out. The very low number of blood smear results that were positive of malaria led to the amendment of the protocol that initially had relied on parasitological diagnosis as the basic criteria for enrolment into the study. Therefore, clinical officers examined patients and the clinician judgment on the cases that exhibited clinical symptoms of malaria, parasitological confirmation notwithstanding, became the basis of enrollment. Diagnosis of mild illness of probable cases of malaria was made on the basis of either or all of these symptoms: presence of fever, profuse sweating, diarrhoea, vomiting and refusal to eat. Presence of either or all of the symptoms that indicated mild illness of malaria and, in addition, severe diarrhoea and either convulsions and/or prostration was the basis of diagnosing severe illness in probable cases of malaria. Furthermore, none of the children under 5 years that were diagnosed with severe illness and that were being treated of malaria had the laboratory tests of severe anaemia and hypoglycaemia with levels typical of severe malaria. Therefore severe illness, as described above, in children that underwent treatment of malaria was used to approximate severe malaria as defined in the National Guidelines for Diagnosis, Treatment and Prevention of Malaria for Health Workers in Kenya (MOH, 2006). The children under 5 years that received inpatient and outpatient treatment of malaria from the hospital were considered to be severe and mild cases respectively. Unfortunately, specific data was not recorded on the various clinical symptoms for which the enrolled children became eligible into the study.

The study targeted a sample size of 110 children under 5 years (55 cases and 55 controls) that were to be selected by matching on places of residence and distance to the hospital. Due to the very low number of patients appearing with clinical symptoms of malaria in Kericho District Hospital and the limited time period of the study, matching was not done and the targeted sample size was not reached. Therefore, between 30th July and 3P1 August 2007. all febrile children were screened for malaria at outpatient and inpatient department of Kericho District Hospital. Despite the negative results obtained from screening malaria, 45 children under 5 years of age and exhibiting clinical symptoms not associated to any other disease but malaria were consecutively enrolled in the study.

Baseline characteristics of the study population

Of the 45 children under 5 years that were enrolled in the study, 22 children were inpatients in the hospital and were considered as cases of the study while 23, who were considered in the control arm of the study, sought outpatient treatment at MCH clinic of the hospital. Description and the comparability of the study population are shown below in Table la and lb respectively

Table la: Overall description of the study population

Characteristics	Mean/frequency (%)
Age	
Mothers	25.3 years
Children	22.8 months
Age group of the children	
Below 3 years	31 (68.9%)
3 years and above	14(31.1%)
Sex of the children	
Male	31 (68.9%)
Female	14 (31.1%)
Marital status of the mother	
Married	40 (88.9%)
Single	4 (8.9%)
Separated	1 (2.2%)
Educational level of the mother	
None	1 (2.2%)
Primary	21 (46.7%)
Secondary	21 (46.7%)
Post-secondary	7 (4.4%)
Occupation	
None	16(35.6%)
Casual worker	4 (8.9%)
Fanner	6(13.3%)
Businesswoman	17 (37.8%)
Civil servant	2 (4.4%)
Monthly income (Kshs.)	5725.9
Time taken to the nearest health facility (mins)	52.0
Used vehicle to the health facility	
Yes	29 (64.4%)
No	16(35.6%)
Transport cost to the health facility (Kshs.)	37.4
Suffered previous illness	
Yes	32(71.1%)
No	13 (28.9%)
Time of previous illness	19.9 weeks ago
Type of previous illness	
Fever/malaria	20 (62.5%)
Other	10(31.3%)
Missing	2 (6.3%)
Treatment of previous illness	
Home treatment	7(21.9%)
formal health services	24 (75.0%)
Other	1 (3.1%)

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Type of previous illness	
Fever/malaria	20 (62.5%)
Other	10(31.3%)
Missing	2 (6.3%)
Treatment of previous illness	
Home treatment	7(21.9%)
Formal health services	24 (75.0%)
Other	1 (3.1%)

Table lb: Comparability of the cases and controls at the baseline

Characteristics	Cases	Controls	P-Value
Mean Age			
Mother (in years)	25.9(23.5-28.3)	24.7(22.1-27.3)	0.5
Child (in Months)	21.5(15.0-27.9)	24.0(16.0-32.0)	0.62
Sex of the children			
Male: Count	17	14	0.24
%	77.3 (58.8-95.7)	60.9(39.9-81.8)	
Female: Count	5	9	
%	22.7(4.3-41.2)	39.1 (18.2-60.1)	
Mother's marital Status (%)			
Married: Count	20	20	0.61
%	90.9(78.3-100)	87(72.5-100)	
Single: Count	2	2	
%	9.0 (-3.6-21.7)	8 7 (-3.4 -20.8)	
Separated: Count	Nil	1	
%		4.35 (-4.4-13.1)	
Mother educational level (%)			
None: Count	Nil	1	0.78
%		4.4 (-4.4-13.1)	
Primary: Count	11	10	
%	50.0 (28.0-72.0)	43.5 (22.2-64.8)	
Secondary: Count	10	11	
%	45.5 (23.6-67.4)	47.8(26.4-69.3)	
Post-secondary: Count	1	1	
%	4.5 (-4.6-13.7)	4.4 (-4.4-13.1)	
Occupation of the mother			
None: Count	9	7	0.14
%	40.91 (19.3-62.5)	30.4 (10.7-50.2)	
Casual worker: Count	Nil	4	
%		17.39(1.1-33.7)	
Farmer: Count	4	2	
%	18.18(1.2-35.1)	8.70 (-3.4-20.8)	
Businesswoman: Count	9	8	
%	40.91 (19.3-62.5)	34.78(14.3-55.2)	
Civil servant: Count	Nil	2	
%		8.70 (-3.4-20.8)	
Monthly income (mean)	6368.2 (I842$_y$0$_r$ 10894.4)	4565.2 (1612.2-7518.3)	0.49
Time taken to health facility (in minutes)	56.0(28 1-83.6)	45 (10.0-80.0)	0.61
Used vehicle to the health facility (%)	59.1 (37.5-80.7)	69.6 (49.8-89.3)	0.46
Transport cost to the health facility (Kshs)	43.0(17.4-68.8)	32.8(7.6-58.0)	0.55
Suffered Previous illness: Count	14	18	0.28
%	63.6(42.5-84.8)	78.3 (60.5-96.0)	
Time of previous illness (weeks)	15.2 (8.9-21.6)	24.7(9.4-39.9)	0.21
Previous ill of fever/malaria: Count	10	10	0.30
%	76.9	58.8	
Treatment of previous illness			
Home treatment: Count	1	6	0.13
%	7.14	33.33	
Formal health services: Count	12	12	
%	85.7	66.67	
Other: Count	1	Nil	
%	7.14		

The sex distribution of the participants was 31 (68.9%) boys and 14 (31.1%) girls and sex did not differ significantly between cases and controls (P=0.24). The overall mean age of the children

Table 1b: Comparability of the cases and controls at the baseline

Characteristics	Cases	Controls	P-Value
Mean Age			
Mother (in years)	25.9(23.5-28.3)	24.7(22.1-27.3)	0.5
Child (in Months)	21.5 (15.0-27.9)	24.0(16.0-32.0)	0.62
Sex of the children			
Male: Count	17	14	0.24
%	77.3 (58.8-95.7)	60.9(39.9-81.8)	
Female: Count	5	9	
%	22.7(4.3-41.2)	39.1 (18.2-60.1)	
Mother's marital Status (%)			
Married: Count	20	20	0.61
%	90.9(78.3-100)	87(72.5-100)	
Single: Count	2	2	
%	9.0 (-3.6-21.7)	8 7 (-3.4 -20.8)	
Separated: Count	Nil	1	
%		4.35 (-4.4-13.1)	
Mother educational level (%)			
None: Count	Nil	1	0.78
%		4.4 (-4.4-13.1)	
Primary: Count	11	10	
%	50.0 (28.0-72.0)	43.5 (22.2-64.8)	
Secondary: Count	10	11	
%	45.5 (23.6-67.4)	47.8 (26.4-69.3)	
Post-secondary: Count	1	1	
%	4.5 (-4.6-13.7)	4.4 (-4.4-13.1)	
Occupation of the mother			
None: Count	9	" 7	0.14
% *	40.91 (19.3-62.5)	30.4 (10.7-50.2)	
Casual worker: Count	Nil	4	
%		,1,7.39(1 1-33.7)	
Farmer: Count	4	2	
%	18.18(1.2-35.1)	8.70 (-3.4-20.8)	
Businesswoman: Count	9	8	
%	40.91 (19.3-62.5) .	34.78(14.3-55.2)	
Civil servant: Count	Nil	2	
%		8.70 (-3.4-20.8)	
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Time taken to health facility (in minutes)	56.0(28.1-83.6)	45 (10.0-80.0)	0.61
Used vehicle to the health facility (%)	59.1 (37.5-80.7)	69.6(49.8-89.3)	0.46
Transport cost to the health facility (Kshs)	43.0 (17.4-68.8)	32.8(7.6-58.0)	0.55
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Previous ill of fever/malaria: Count	10	10	0.30
%	76.9	58.8	
Treatment of previous illness			
Home treatment: Count	1	6	0.13
%	7.14	33.33	
Formal health services: Count	12	12	
L %	85.7	66.67	
1 **Other:** Count . ..	1	Nil	
0/0	7.14		

The sex distribution of the participants was 31 (68.9%) boys and 14 (31.1%) girls and sex did not differ significantly between cases and controls (P=0.24). The overall mean age of the children

was 22.8 (2-60) months and age was not different between the cases, 21.5 (CI 15.0-27.9) months and controls, 24.0 (CI 16.0-32.0) months; P = 0.62. More children, 68.9% (CI 54.8-83.0), were below 3 yrs of age and 31.1% (CI 17.0-45.2) were 3 years and above. The figure 2 below shows the age distribution of the children that participated in the study.

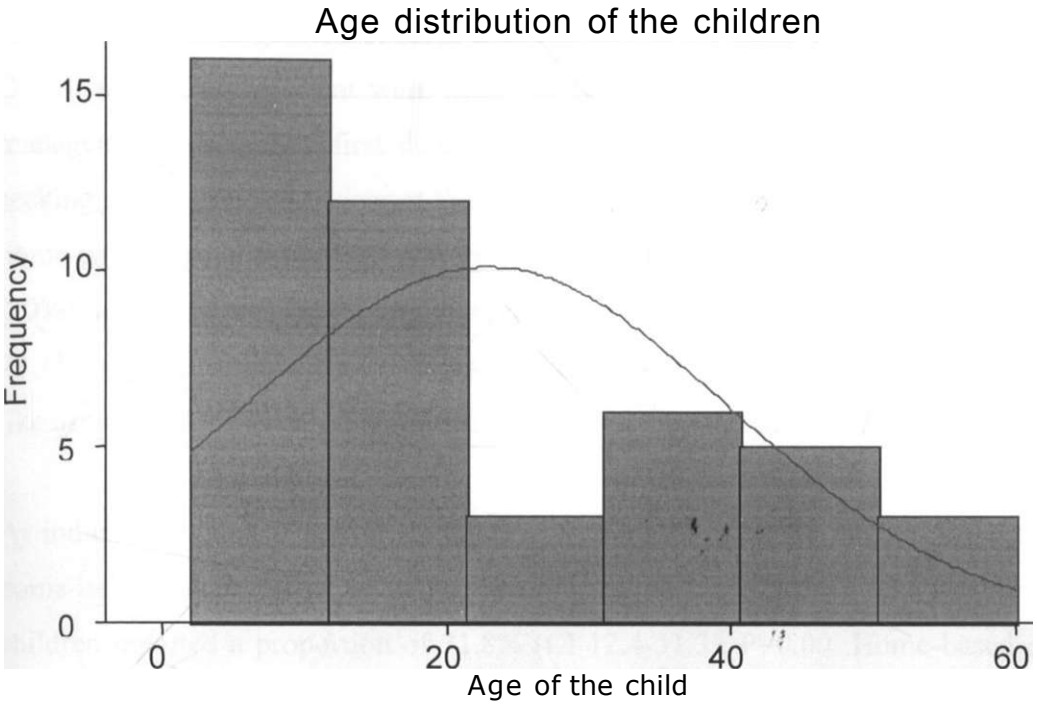

Figure 2

The age of the mothers ranged between 18 to 40 years with a mean of 25.3 years. The mean ages for the cases and controls were 25.9 years (CI 23.5-28.3 years) and 24.7 years (CI 22.1-27.3 years), P=0.5, respectively. 88.9% of the mothers were married and 98% attended at least primary education. Both marital status and the level of education were not significantly different between the cases and the controls. Though the cases seemed to be higher earners (Kshs. 6368 per month) than controls (Kshs. 4565 per month), occupation and the income of the mothers were not different between the two study arms (P = 0.14 and 0.49 respectively).

Slightly over half of the children (25) came from places where they do not use a vehicle to reach the nearest health facility. The overall mean time to the nearest health facility was 52 minutes as indicated in table 2 below, the cases showed a longer mean time of 56 minutes while the

A*

controls used a mean time of 45 minutes; however, there was no significant difference in time between the two arms of the study. Those who use a vehicle to get to the health facility together with how much they pay as bus fare were not significantly different between the cases and the controls.

Home-based management of fever and the associated factors

Out of all the mothers that were interviewed, 25 (55.6%, CI 40.5-70.7) practiced home-based management when they first detected fever in their children before taking the next step of seeking formal health services at the district hospital or dispensaries/private clinics. The type of home-based management utilized by the mothers on their children included herbal medicine (20%), leftover drugs (28%) and local shop drugs (52%). Among those that administered drugs, 73.1% reported to have used analgesics mainly panadol or paracetamol, 3.9% used antipyretics like aspirin and 23.1% used other drugs such as antibiotics and ORS.

As indicated in table 2 below, the mildly ill children Veported a higher proportion of practice of home-based management of fever standing at 78.3% (CI 61.4-95.1) while the severely ill children reported a proportion of 31.8% (CI 12.4-51.3), P-0.00. Home-based management was significantly associated with the outcome of fever \yjth an odds ratio of 0.13 (0.03-0.49), P=0.00. This suggested that practice of home-based management of fever before seeking formal health services was protective against progression of fever to severe illness in children under 5 years.

Table 2: Home-based management and other factors associated to severe illness

Exposure	Cases	Controls	P Value*	Odds Ratio	P Value**
Presence of home-based management i%)	7 31.8(12.4-51.3)	18 78.3 (61.4-95.1)	0.00	0.13 (0.03-0.49)	0.00
Mean duration of illness (in hours)	86.2 (44.4-127.9)	73.0 (46.2-99.9)	0.58	1.00 (0.99-1.01)	0.58
Place of residence (%) Parts of Kericho adjacent to Kisumu	11 50(29.1-70.9)	6 26.1 (8.1-44.0)	0.10	2.80 (0.80-9.90)	0.10
Treatment at dispensary/private clinic	11 61.1 (38.6-83.6)	Nil	0.00	Infinite	.
Presence of training prevention of jnalaria (%)	6 27.3 '(7.7-46.9)	3 13.0 (0.0-27.5)	0.23	2.50 (0.5-11.60)	0.24

•Compares each characteristic between cases and controls

'•Shows the statistical significance of the odds ratio corresponding to each characteristic

Additionally, those who practiced home-based management and those who did not practice it were not different in terms of the duration of illness by the time of coming to the hospital; reporting 76 (51.0-100.7) hours and 84 (37.8-130.2) hours respectively; P=0.73. The cases reported a longer mean duration of illness, 86.2 hours (CI 44.4-127.9) before treatment in the hospital compared to 73.0 hours (CI 46.2-99.9) of the control group though the difference was statistically insignificant, P=0.58. Therefore, duration of illness did not predict the severity of illness of the children; C)R=1.00 (0.99-1.01), P=0.58. Furthermore, the children who received home-based management seemed to be older, 25.3 (18.0-32.7) months, than those who did not, 19.6 (12.0-27.1) months, P=0.26.

Since all predictor variables such as duration of illness, place of residence and presence of training in prevention or treatment of malaria were insignificantly associated with the severity of illness, it was meaningless to do adjusted odds ratio for home-based management of fever in a logistic regression model.

Prior Therapy

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A section of mothers reported to have taken their children to either a dispensary or private clinic before seeking treatment for their febrile children at the hospital. 61.1% of the children who were admitted in the hospital (cases) and none of those treated and discharged (controls) had received treatment at either a dispensary or private clinic before seeking treatment at the hospital. As indicated in Table 2 above, this difference was statistically significant, P=0.00, hence treatment in either a dispensary or private clinic was strongly associated with severity of illness. Since none of the controls was treated in dispensary or private clinic it was impossible to calculate the odds ratio, which came out as an infinite value. Furthermore, as illustrated on Figure 3 below, treatment in the dispensary/private clinic seemed to have caused delay by coming to the hospital H3.5 (39.5-187.4) hours after detection of illness compared to the rest that sought treatment after a mean duration of illness of 70.4 (46.9-93.9) hours, P= 0.12.

.Previous illness

71.1% of the children were reported to have bepn ill previously at a time averaging 19.9 weeks before the time of the interview. Among the group that reported previous illness, 75% reported

that they sought formal health services for treatment of the illness and only 22% managed the illness at home while the remaining 3% did not do anything. 63.6% of the cases compared to 78.3% of the control group reported previous illness at 15.2 and 24.7 weeks respectively; P=0.21, before the illness for which they were being treated for at time of the study. The cases reported a higher proportion, 76.9%, compared to the controls that reported 58.8% of previous illness being fever or associated with malaria, which was however, statistically insignificant difference. Whether one was a case or a control was not associated with the type of treatment of previous illness (P=0.13).

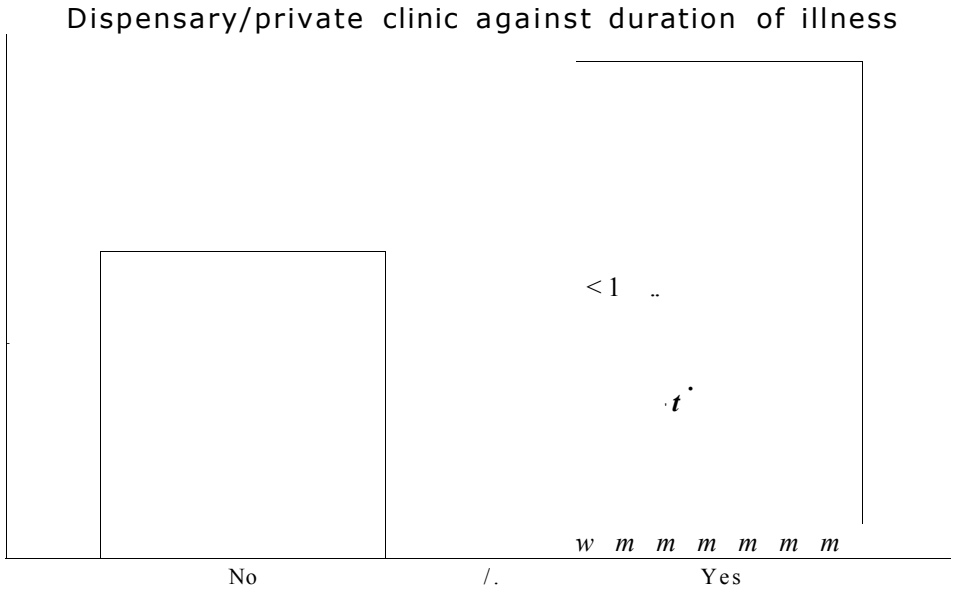

Figure 3

Training on home-based management of malaria and its correct practice

None of the mothers reported to have received training in home-based management of malaria. However, only 20% of the mothers reported to have received some teaching on prevention of malaria that mainly focused on the use of insecticide-treated nets (ITNs) and was given at MCH clinic. The cases and the controls were not different in terms of training on prevention of malaria reporting 27.3% (CI 7.7-46.9)'and 13.0% (CI 0.0-27.5), P=0.23 respectively. Having received training on prevention of malaria was not associated with severity of illness; OR=2.5 (0.5-11.6). P=0.24. Unfortunately, the study did not collect data on whether the mothers had received training on management of fever

Since none of the mothers had received any training on home-based management of malaria and neither antimalarial drugs had been administered on children during home-based management, no data was obtained regarding correct practice of home-based management of malaria.

Place of residence

Place of residence seemed to differ between the two groups with the cases reporting 50% (CI 29.1-70.9) of the participants living in the parts of Kericho adjacent to the endemic areas of Kisumu (Soin division) while the controls reported only 26.1% (8.1-44.0). Though the difference is large, it did not show statistical significance (P=0.10) between the cases and the controls. Children that lived in areas adjacent to malaria endemic areas of Kisumu seemed to be at a higher risk of severe illness with an odds ratio of 2.8 (0.8-9.9), P=0.10 than those living in other areas of Kericho District.

CHAPTER 2

4.0 DISCUSSION

Previous studies have reported that younger children are more likely to be taken to the health facilities while older ones are more likely to experience delays in being taken to hospital[10]. This study found no association between severity of illness and age of the children neither did age predicted delay before treatment. Similarly, educational level has been found to be associated with health behaviours[111] and it was found to be associated with promptness in seeking care from a health care provider[1] . However, in this study, educational level of mothers did not show any association with the duration taken by the mothers before they sought formal health services.

This study found out that home-based management of fever was practiced among 55.6% of all children. This agrees with other studies that have reported home-based treatment ranging between 40-70%[6]. A high proportion of home-based management of fever (78.3%) was found in those children who suffered mild illness while the severely ill reported a 31.8%. Consequently, practice of home-based management of fever was fouvid to be reducing the likelihood of severe outcome of illness with the non-severe children exhibiting 87% more protection than the severe cases. This is despite the fact that none of the mothers administered antimalarial drugs to their children.

Generally, the drugs that were most commqnly administered during fever were analgesics such as panadol and paracetamol showing that 73.1% of the children had used the drugs before they were brought to the hospital. Among those who treated their children at home before bringing to the hospital, 76.5% of the mildly ill and 66.7% of the severely ill administered panadol or paracetamol. Furthermore, the study found out that mothers were more likely to use shop-bought drugs (52%) or remaining drugs used in previous illnesses (28%) while herbal medicine accounts for 20% of the type of treatment. The mothers reported that the herbs they use do not treat specific diseases but are generally used on young children as advised by the old women in the community. Since the commonly used analgesics do not have antimalarial effect, the protection obtained from home-based management against clinical malaria may not be linked directly to the drugs that were given to the children but could be due to other factors related to practice of home-based management.

Despite being a strategy recommended by WHO on rolling-back malaria deaths, mothers did not report having received any training on home-based management of malaria. However, 20% of the mothers reported to have received teaching mainly on prevention of malaria using insecticide-treated nets (ITNs) to avoid mosquito bites. Therefore, due to the lack of training in home-based management of malaria, no findings were obtained on the proportion of the mothers that practiced it correctly.

Delay in seeking treatment of any disease is known to increase the likelihood of severity. This study found out that the severely ill children (cases) took longer than the mildly ill children (controls) in seeking formal health services though there was no difference statistically between the two in duration of illness. Therefore, duration of illness was not associated to development of severe illness in children. Similar results have been reported in Uganda in a study that aimed at determining the influence of transmission intensity on manifestation of severe malaria showing that duration of illness was not independently associated to a child developing seizures[17]. However, in this study, the confidence interval obtaWd Tor cases, 44.4-127.9 hours, and controls, 46.2-99.9 hours, suggested that the sample size might not have had enough power to show the difference between the durations of illness of the two-groups. In addition, home-based management of fever did not contribute to delay in seeking formal health services though the sample size may be attributed to the lack of statistical significance. Moreover, though statistically insignificant, the children that received home-based management were older (25.3 months) than the ones that did not (19.6 months).

Treatment in the dispensary or private clinic was the most outstanding characteristic in this study. 61.1% of the mothers whose children suffered severe illness reported to have sought treatment in either a dispensary or private clinic before bringing them to the hospital. On the other hand, none of the children who were treated with mild illness in the hospital had initially received treatment in either dispensary or private clinic. This was a significant difference between the two groups that resulted in an infinitely high value of odds ratio. Moreover, the children that were treated in dispensary/private clinic seemed to have stayed longer time, 113.5 hours (4.7 days), before seeking treatment in the hospital compared to the others not treated in

dispensary/private clinic, 70.4 hours (2.9 days). The lack of statistical significance in the difference between the two durations of illness may be attributed again to the size of the sample.

Malaria transmission intensity, which is directly related to the geographical location, has been reported previously in Uganda to be independently associated with a child developing seizures[17]. Though statistically insignificant, this study established that the children that lived in parts of Kericho adjacent to endemic areas of Kisumu seemed to be 2.8 times at a higher risk of severe illness than those living in other areas of Kericho District. This factor warrants further investigation using appropriate sample size to assess its association with severe illness in children under 5 years.

4.1 Limitations of this study

The study was commenced late after the documented season of malaria that occurs between May and July annually. This is likely to have contributed largely on the very few children that were being treated for malaria at the time of the study, /^ndther reason that may explain the reduced number of cases for malaria is the wide spread campaign on the use of insecticide-treated nets and indoor residual spraying of homes by the Ministry of Health.

This study relied on the routine clinical and laboratory examination of patients that attended treatment of fever. The parasitological diagnosis of malaria in the hospital resulted in very few blood smear slide positive cases that numbered about 1-3 positives per week or even none at all. Due to the relatively short time allocated to this study given that it was a case-control design, it was not feasible to use the blood smear parasite positive as an enrollment criteria. This led to modification of the enrollment criteria that relied wholly on the clinical diagnosis, negative or positive parasitological results notwithstanding. The severe malaria as defined by the WHO guidelines on malaria diagnosis is also rare in Kericho and seeking to enroll using the definition would have outlived the study period hence not feasible. Therefore, severe illness in children clinically diagnosed and undergoing treatment of malaria was used as a proxy to severe malaria.

This makes it difficult to conclusively claim that the children that came with mild fever suffered from malaria as the chfrdren that presented with fever and were admitted as being severely ill.

Therefore, the change in the criteria threatened the validity of the results of this study which may reduce the confidence in making conclusions about the relationships that are there between the different characteristics presented on this report.

This study presented a big case of possible reclassification and this may have been mitigated by the uniform approach used in selection of both cases and controls. Therefore, the non-differential misclassification that may have occurred did not affect the validity of the results.

Information bias was also likely in terms of the mothers remembering the time the illness began in their children; especially those who have been ill for a longer time and also on the information they gave on home-based management. The mothers may not have been willing to reveal the details of what they did to their children at home before seeking formal health treatment. Even the fact that many do not really understand the drugs they give during home-based management may have led to either over- or under-estimation of the type of medications used in the treatment.

Matching of cases and the controls would have been done on place of residence and distance to the health facility. Since data was collected on both place of residence and distance to the health facility, it was possible to control for the factors-at the analysis level hence their confounding effect did not affect the association of home-based management to severity of illness.

CHAPTER 5

5.0 CONCLUSIONS

Home-based management that has been termed interchangeably as either home treatment or self treatment in previous studies continues to be practiced highly as the initial step before seeking formal health services. This study is not exceptional because it registered a more than half of the studied population of children to have received home-based management when fever was first detected. The types of medication that is more likely to be used are mainly analgesics that include panadol or paracetamol. Antimalarial drugs are less likely to be the choice drugs when the mothers administer treatment on their sick children. Nevertheless, according to this study, practice of home-based management of fever reduces the likelihood of progression of mild fever to severe illness. Furthermore, although it did not show any significance, the children that received home-based management were brought earlier to the hospital and they were older in age compared to their counterparts.

I hough a traction ot mothers reported that they have received teaching on the use of 11'Ns in preventing malaria, none of them has received training on home-based management of malaria. This means that even though they may suspect malaria in their sick children and given their likelihood of administering treatment at home, they cannot be able to give the right drugs and in the right doses to their children.

The place of residence and treatment in the dispensary/private clinic are two factors that cannot be ignored as possible risk factors in developing severe illness in malaria among children under five years of age. Place of residence, however, did not give significant result in this study while treatment in dispensary/private clinic gave a perfectly high significance with infinitely high odds ratio. Both require further studies to investigate their role in progression of fever to severe illness in malaria among children under five years.

5.1 RECOMMENDATIONS

1. The same study should be done that will use the correct definitions of malaria to increase the validity of the results presented on this report.
2. A study should be designed to investigate the role of duration of illness, place of residence and treatment in the dispensaries/private clinics on progression of fever to severe malaria in children under five years.
3. A study should be done to evaluate the quality and effectiveness of malaria treatment of children under five years of age at the dispensary and private clinic levels.

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APPENDIX Is CONSENT FORM/INFORMATION STATEMENT

Study on Home-Based Management of Fever in Children Under 5 Years presenting with Severe Malaria in Kericho District Hospital

Introduction

Good morning/afternoon madam,

May I take some of your time to explain about a study I am conducting in this hospital? I am a postgraduate student at the university of Nairobi undertaking a research project on the impact of home-based management of fever on progression to severe malaria in children under 5 years*. This study is part of fulfillment of the postgraduate diploma course and aims at finding whether there is an association between home-based treatment of children during fever and severe outcome of malaria by the time of seeking formal health services.

Your participation in this study is voluntary and all the information about it will be presented to you before you are asked to sign a consent form that shows that you agree to take part in the study.

Your participation and cooperation is vital for the success of this study and through it the results and the conclusions of this study have the potential of contributing to policies that will help in prevention of severe malaria and the deaths in children associated with it.

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Investigators' statement

You are asked to participate in this study by answering some questions I have about your child. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study. Please listen to it carefully as it is being read to you.

Procedures

The procedure is non-invasive and you are only asked to spare about 10 minutes of your time to answer some questions about you and your child.''

Consent information

i) Your participation in this study is voluntary and you are free to refuse to participate in it without lose of benefits you and your child are entitled to.

ii) You are free to withdraw from the study at any level without penalty.

iii) The selection of your child to participate in the study is based on no other reason apart from having been tested positive of malaria and under five years of age and that this study cannot be done on a population of any other age group.

iv) There no known risks and/or discomforts associated with this study.

v) There will be neither monetary nor material benefit that will be given to you in return to your participation in the study.

vi) The results of the study that directly affects you and your child's health status may be made available to you if you are interested in it.

vii) Eithics Review Committee of Kenyatta National Hospital that safeguards the interest of research participants has approved the study.

viii) All information collected during this research will be held in the strictest confidence and no identifying information of any kind will be released to any other person or

agency without your specific consent. I will not publish or discuss in public anything that could identify you unless with your written consent. Only the investigator will have access to information that will be used to identify you, however, once the study is complete all records that can be used to identify you will be removed.

You may ask questions before you answer any question about the risks, the benefits, your rights as a volunteer, or anything about the research or in this form that is not clear. When all your questions have been answered, you can decide if you want to be in this study or not. I will give you a copy of this form for your records.

In case of any questions arising from the conduct of this study or any information that has not been explained to your satisfaction about the study, you can contact the investigator (interviewer) through the contact given in the table below. If you need to contact an independent person/body other than the investigator, use the contacts of the persons given below or contact. The Secretary, Kenyatta National Hospital-Ethics Review Committee (KNH-ERC), P.O. Box 20723, Nairobi, Tel: 726300-9.

Name	Position	Department	Phone Number
Mr. Kenneth Mutai	Investigator	UNITID (UON)	0725-884 990
Dr Mark Joshi	Supervisor	Clinical epidemiology (UON)	0722- 516 904
Prof Estambale B. B.	Director	UNITID (UON)	0722-700 185

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Signature of investigator. . . . . Date

< i

Participant's statement

The study described above has been explained to me. J .voluntarily consent to participate in this activity. I have had an opportunity to ask questions.

Signature of participant. . . . . "_____Date

Copies to: 1. Participant 2. Investigator's file

APPENDIX 2: Questionnaire

Personal Identification

1. Mother's details
   a) Name
   b) Age(yrs)
   c) Marital status
   a) Place of residence
   d) Educational level N o n e Q Primary! I Secondary! | Post-secondary | |
   e) Occupation
   t) Income_____per Month
2. Child's details
   b) Name
   c) Sex Male|_____I Female|_____I
   d) Age (in Months)
   e) Date of birth
   0 Place of birth

Explanatory characteristics

1. What administrative division in Kericho district is your place of residence located?

2. I low many hours do you take to get to the nearest health facility? Hours

3. Do you use a vehicle (***matatu)*** when going to the health facility?

   Yes [1] [1] No[1] [1]

   How much do you spend for bus fare? Kshs

   Has your child suffered an illness previously other than the one being treated for today?

   Yes |_____| No |_____|

   a) If yes. what illness?
   b) When was the illness?
   c) What treatment did you seek?, ,

   Home treatment |_____[

   Formal health services I_____1

   Other ^ I I

5. When did you first recognize the illness for which you have brought your child to be treated in this hospital?

6. Did you offer any treatment at home in response to this illness?

   Yes 1 1

   No I I

   a) If yes. what type of treatment?

      Herbal medicine I I

      Leftover drugs I I

      Drugs bought from local shop |_____|

      Other, specify

   b) If drugs were administered,

      i. Do you remember the name of the drugs? Give name

      ii. 1 low many/much did you give to the child?

      tablets/tablespoonful

      times per day

      days

6. Do you know of any training on prevention and/or treatment of malaria within the community?

   Yes |_____1 No |_____|

   a) If yes, what kind of training?

      Prevention |_____|

      Treatment I I

      Both I I

   b) Have you received any of the training? Yes I I No I I

   c) If yes, which one? Prevention! I Treatment I I Both I

a*