Malaria control in Bungoma District, Kenya: a survey of home treatment of children with fever, bednet use and attendance at antenatal clinics

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Objective To lay the basis for planning an improved malaria control programme in Bungoma District, Kenya.
Methods By means of a cluster sample household survey an investigation was conducted into the home management of febrile children, the use of bednets, and attendance at antenatal clinics.
Findings Female carers provided information on 314 recently febrile children under 5 years of age, of whom 43% received care at a health facility, 47% received an antimalarial drug at home, and 25% received neither. Of the antimalarial treatments given at home, 91% were started by the second day of fever and 92% were with chloroquine, the nationally recommended antimalarial at the time. The recommended dosage of chloroquine to be administered over three days was 25 mg/kg but the median chloroquine tablet or syrup dosage given over the first three days of treatment was 15 mg/kg. The total dosages ranged from 2.5 mg/kg to 82 mg/kg, administered over one to five days. The dosages were lower when syrup was administered than when tablets were used. Only 5% of children under 5 years of age slept under a bednet. No bednets had been treated with insecticide since purchase. At least two antenatal visits were made by 91% of pregnant women.
Conclusions Carers are major and prompt providers of antimalarial treatment. Home treatment practices should be strengthened and endorsed when prompt treatment at a health facility is impossible. The administration of incorrect dosages, which proved common with chloroquine, may occur less frequently with sulfadoxine-pyrimethamine, as its dosage regimen is simpler. High levels of utilization of antenatal clinics afford the opportunity to achieve good coverage with presumptive intermittent malaria treatments during pregnancy, and to reach the goal of widespread bednet use by pregnant women and children by distributing nets during antenatal clinic visits.

Keywords Malaria/prevention and control/drug therapy; Antimalarials/administration and dosage; Chloroquine/administration and dosage; Bedding and linens/utilization; Prenatal care; Fever/drug therapy; Home nursing; Child; Households; Sampling studies; Cluster analysis; Kenya (*source: MeSH*).

Mots clés Paludisme/prévention et contrôle/chimiothérapie; Antipaludique/administration et posologie; Chloroquine/administration et posologie; Literie et linge/utilisation; Soins prénatals; Fièvre/chimiothérapie; Soins infirmiers domicile; Enfant; Ménages; Etude échantillon; Sondage en grappes; Kenya (*source: INSERM*).

Palabras clave Paludismo/prevención y control/quimioterapia; Antimaláricos/administración y dosificación; Cloroquina/administración y dosificación; Ropa de cama y ropa blanca/utilización; Atención prenatal; Fiebre/quimioterapia; Cuidados domiciliarios de salud; Niño; Hogares; Muestreo; Análisis por conglomerados; Kenya (*fuente: BIREME*).

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Introduction

WHO estimates that at least 1.5 million deaths are attributable to malaria each year (*1*), two-thirds of which occur among children under the age of 5 years living in sub-Saharan Africa. In western Kenya, intense malaria transmission occurs throughout the year and there are high levels of chloroquine resistance (*2*). A community survey conducted 130 km south of Bungoma District in Western Province revealed prevalences of *Plasmodium falciparum* parasitaemia in non-symptomatic children as high as 95% and 51% during the high and low transmission seasons, respectively (*3*). Malaria is the most frequently diagnosed condition in outpatients at health facilities in Bungoma District. It is the principal cause of death at the district hospital (*4*) and is a major contributor to the province's high mortality rate

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among children aged under 5 years, estimated to be 110 deaths per 1000 live births (5).

We conducted a household survey in order to obtain data that would provide a basis for designing and evaluating interventions to be introduced through the Bungoma District Malaria Initiative. The goal of this initiative, and of the Africa Integrated Malaria Initiative of which it is part, is to demonstrate the effectiveness of model, district-level malaria control programmes in reducing mortality and severe morbidity among children under the age of 5 years (6). The strategies used to achieve this goal involve improving case management of malaria in health facilities and households, providing intermittent presumptive malaria treatment or chemoprophylaxis during pregnancy, and achieving widespread distribution and use of insecticide-treated bednets. The survey provided an opportunity to collect baseline data on and to characterize the management of febrile children in the specified age group. Information was gathered on: home care practices and health facility utilization; the sources, availability and use of antimalarial drugs in the community; carers' knowledge of the cause and prevention of malaria; the use of bednets by children under 5 years of age; the utilization of antenatal care by pregnant women.

The population of Bungoma District is approximately 670 000, 80% of whom live in rural areas. Children under 5 years of age constitute 20% of the population (7). The Luhya are the predominant ethnic group. The villages consist of homesteads, usually inhabited by a male elder, his sons and their families. Each homestead is made up of several households. A household is defined by the District Statistical Office as a person or group of people living under one roof or on one homestead who share the same source of income. Over a quarter of the married women in Western Province are in polygynous unions (5). Co-wives typically live in separate houses but may be part of the same household.

There are 5 hospitals and 28 registered governmental and nongovernmental health facilities in the district. An unknown number of non-registered health care providers work in small private clinics or in their own homes. Community health workers, traditional birth attendants, traditional healers and drug sellers are present. Drug sellers and pharmacists can provide antimalarial drugs without prior consultation with a clinician.

Reliable microscopic diagnosis of malaria is not available in most governmental health facilities in the district. Children under 5 years of age with fever or a history of fever are regarded as having malaria, in accordance with WHO guidelines for areas where the disease is endemic and microscopic diagnosis is unavailable. Also consistent with WHO recommendations is the national policy that pregnant women living in areas of endemicity should receive antimalarial chemoprophylaxis or presumptive intermittent therapy in order to reduce the risk of placental parasitaemia (7, 8). At the time of our survey, the nationally recommended drug for first-line treatment against malaria was chloroquine, and the recommended regimen for chemoprophylaxis during pregnancy involved its weekly administration. In 1999 the national malaria policy was revised with the following consequences. Sulfadoxine–pyrimethamine is now the drug recommended for the first-line treatment of any febrile child under 5 years of age who resides where chloroquine-resistant malaria is highly endemic. Pregnant woman living in areas where malaria is endemic should receive one treatment dose of sulfadoxine–pyrimethamine during the second trimester and another early in the third trimester. Sulfadoxine–pyrimethamine should be available for the treatment of malaria to community volunteers and households as well as to the higher levels of the health care system.

The national malaria guidelines advocate the use of insecticide-treated bednets for the prevention of malaria (8). Immediately before the household survey we conducted a qualitative study in which visits were made to vendors of bednets in large markets in Bungoma Town, the capital of the district. The investigators were told that the bednets were not pretreated with insecticide. Furthermore, insecticide appropriate for bednet treatment was sold in only a few places in the district and was typically packaged in large quantities for the treatment of many nets simultaneously (9).

Materials and methods

Study design and data collection

We conducted a cluster sample household survey in July 1996, the peak of the malaria season. The probability of selection of the 36 primary sampling units, i.e. villages or neighbourhoods, was proportional to the estimated total population. Primary sampling units containing more than 150 households were divided into segments on the basis of easily identifiable landmarks. The probability of selection of a segment was proportional to the estimated number of households in it. All households within selected segments of primary sampling units were mapped and 33 were selected by systematic random sampling before the arrival of the interviewers. The sample size was calculated to provide a precision of at least $\pm$ 0.10 for principal estimated proportions.

Most of the interviewers were from Bungoma District, and all were Luhya speakers. Consent for participation was obtained in accordance with requirements established by the local and national authorities. The surveyors administered standardized questionnaires in Luhya to primary female carers of all children under the age of 5 years. When no female carer lived with a child, survey questions were addressed to the primary male carer. Households with a primary carer who was not present at the time of the first visit were revisited later the same day. If the primary carer was still unavailable the household was left out of the study and no replacement was made.

Home treatment was defined as involving the use of an antimalarial drug before or in the absence of a visit to a health facility. Chloroquine, sulfadoxine–pyrimethamine, amodioquine, quinine, metakelfin, tetracycline and cotrimoxazole were all considered to be antimalarial drugs. Health facilities included hospitals, health centres, dispensaries and clinics, both public and private. Carers were asked to describe the care provided to each child who had had fever during the previous two weeks, and information was recorded on the care provided to all febrile children in each household. In order to avoid the exclusion of care-providing behaviour during current episodes of fever, which would have taken place after the interviews were conducted, we limited our analysis of the home management and prompt treatment of febrile illness to children in whom episodes of fever had been completed. We did not collect information on the care provided at health facilities, as this was more reliably ascertained by direct observation. We considered that appropriate care-seeking behaviour by a carer consisted of either taking a child to a health facility or providing home treatment within two days of the onset of fever. This definition of promptness was chosen in the light of studies in the Gambia showing that death from malaria could occur rapidly after the onset of illness. In one study, children with cerebral malaria who were admitted to the national referral hospital had a mean duration of illness before admission of only 1.8 days (10). In another the mean duration of symptoms among children who died in the community from presumed malaria was only 2.8 days (11). The rapid progression from the first signs of illness to death indicates that treatment should be administered promptly, preferably on the first day of illness and no later than the second day, in order to avert death from severe malaria.

Carers were asked to state the names of the antimalarials given in home treatment. In the event that a carer was unsure about this, he or she was requested to select the product that had been used from a tray of samples. The carer was then asked how many tablets or teaspoonfuls had been given on each day of the illness. All children who received home treatment were weighed so that the antimalarial dosage in mg/kg body weight could be calculated.

Our analysis of dosages and dosage schedules used in antimalarial home treatment was restricted to chloroquine tablets and syrup, since chloroquine was the antimalarial recommended for the first-line treatment of clinical malaria at the time of the survey and was used more often than other products. The quantity of chloroquine provided in injection form could not be reliably determined and we made no attempt to estimate it. The possibility existed that treatment begun at home was prematurely terminated when children were taken to health facilities, and for this reason we restricted the analysis to children for whom such care was not sought. National policy at the time of the survey was to give 25 mg/kg of chloroquine, administered at 10 mg/kg, 10 mg/kg and 5 mg/kg on successive days.

If a carer reported that someone in a household used a bednet, the sleeping area of each child under 5 years of age was observed, and bednets, when present, were examined and their condition was recorded. To characterize antenatal care-seeking practices, all carers interviewed who had given birth in the preceding two years were asked about antenatal care-seeking behaviour during their last pregnancy.

Data analysis

Data analysis was performed using SAS V8.1 (SAS System for Windows, version 6.12, SAS Institute Inc., Cary, NC) and/or SUDAAN Release 7.5 (SUDAAN Software, version 7.5, Research Triangle Institute, NC, USA) for the analysis of correlated data. Data on each child were weighted inversely by their probability of selection. Student's t-test was used to test for differences in means, and the χ^2 test for differences in proportions. All results were adjusted to allow for the effects of the cluster sampling design.

Results

Visits were made to 1188 households in the 36 clusters, and a primary carer was available for interview in 1180 of them. In 412 households (35%) there were no children under the age of 5 years; in 84 households (7%) no primary carer of the children in this age group was at home; 11 households (0.9%) were not found or were abandoned; and carers in 3 households (0.3%) refused to be interviewed. In the 670 households where interviews were conducted there were 666 primary female carers, 1 primary male carer, and 1046 children under 5 years of age. Among these children, 659 (64%) had experienced fever during the preceding two weeks, 343 (54%) were still febrile according to their primary carer, and 314 (46%) had recovered from an episode of fever. During the preceding two years, 428 female primary carers (65%) had given birth.

Home management of fever

Among the 314 children with completed fever the median interval since its onset was 7 days and its median duration was 5 days. Among the predominant associated symptoms were cough, shaking, chills, poor appetite and headache (Table 1). When asked 'What sickness do you think affected the child?', 68% of carers responded with 'malaria'. Carers who did not give this answer were asked 'Do you think your child's symptoms were caused by malaria?' The answers to these two questions, taken together, indicated that 94% of carers thought their children had had malaria.

Of the 314 recently febrile children, 43% were taken to a health facility, 47% received home treatment with an antimalarial, and 25% were neither

treated at home nor taken to a health facility; 32% received their only antimalarial treatment at home (Table 2). Children were more likely to have received home treatment than to have been taken to a health facility soon after the onset of fever (Fig. 1).

Carers routinely administered an antimalarial or another class of drug to febrile children, 78% of whom received a medication at home before or instead of going to a health facility. Only 6% of children consulted a community health worker and only 3% consulted a traditional healer (*khumufumu*) during their illness.

Of the 134 recently febrile children who were taken to a health facility, 98% were given or prescribed medication. According to the carers, 87% of the children were given tablets or syrup, 68% were given an injection, and under 1% were admitted. Of the carers who took their children to a health facility, 58% reported that they had medication left over after treatment ceased.

Of the 148 children who were treated at home with an antimalarial drug, 91% received it during the first two days of illness (95% confidence interval (CI) = 85–97%). In contrast, only 51% of the 134 children who were taken to a health facility arrived within the first two days of illness (95% CI = 44–57%). Of the 314 recently febrile children, 59% received antimalarial treatment at home or were evaluated at a health facility within two days of the onset of fever (95% CI = 52–66%). Ideally, children would receive antimalarial treatment or an evaluation on the first day of fever. Among children receiving home treatment, 63% were treated on the first day of fever (95% CI = 52–75%). The corresponding value was only 9% for children taken to a health facility (95% CI = 3–15%). Thirty-four per cent of children received treatment at home or were evaluated at a health facility on the first day of fever. The mean delay in seeking treatment at a health facility among children treated first at home with an antimalarial drug was 3.2 days. The corresponding delay for children not treated with an antimalarial at home before being seen at a health facility was 2.7 days. There was no significant difference between the distributions of treatment-seeking delays in these two groups according to the Kolmogorov-Smirnov test ($P = 0.25$) (Table 3).

Most antimalarials used for home treatment were bought from pharmacies (54%) or small shops (29%); 9% were obtained from health facilities at an earlier visit for another illness. The median walking distance from home to a site where chloroquine could be obtained was 1.0 km, the range being <0.1–3 km.

Chloroquine was included in the home treatment of 92% of recently febrile children who received such treatment, and was the antimalarial most commonly administered. Of the febrile children treated at home with chloroquine, 48% received tablets, 44% were treated with syrup, and 5% were given injections. Of the children receiving home treatment, 15% received cotrimoxizole and 3% received sulfadoxine–pyrimethamine.

Table 1. **Frequencies (%) of associated symptoms in recently febrile children, Bungoma District, Kenya, July 1996 ($n = 314$)[a]**

|	
Cough	72
Chills/shivering	68
Poor appetite	64
Headache	54
Vomiting	42
Difficult breathing	34
Diarrhoea	30
Joint pain	21
Convulsions	6
Other	19

[a] The results are weighted.

Table 2. **Frequencies of visits to health facilities and of treatment with an antimalarial drug at home, recently febrile children, Bungoma District, Kenya, July 1996 ($n = 314$)[a]**

Seen at health facility	Given antimalaria drugs at home[b]		
	Yes (%)	No (%)	Total (%)
Yes (%)	15	28	43 (36–49)
No (%)	32 (26–40)	25 (19–30)	57
Total (%)	47 (41–54)	53	100

[a] Treatment with an antimalarial drug at home defined as treatment given before or instead of going to a health facility. The results are weighted.

[b] Values in parentheses are 95% confidence intervals.

Fig. 1. **Frequency and promptness of health facility visits and antimalarial home treatment, recently febrile children, Bungoma District, Kenya, 1996**

■ Brought to a health facility
■ Given treatment at home
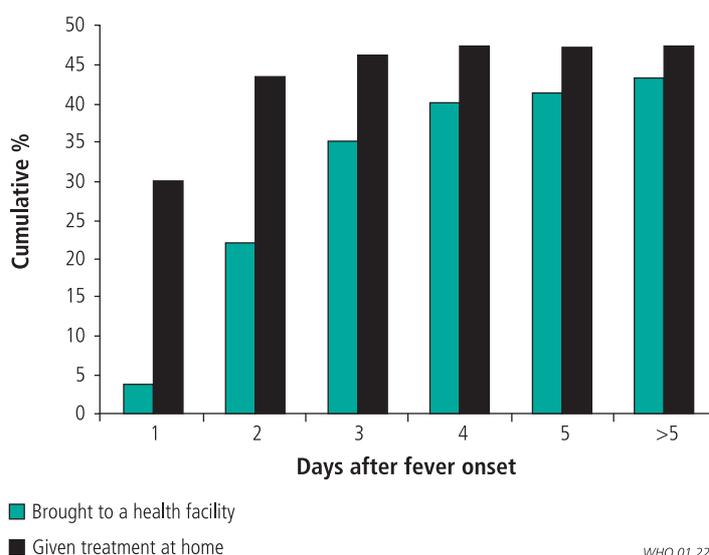
WHO 01.224

Eighty-five children received chloroquine tablets or syrup and did not seek care from a health facility. The total chloroquine dosage given to these children ranged from 2.5 mg/kg to 82.0 mg/kg and the median dosage was 16.0 mg/kg; the drug was administered over one to five days. The median dosage of chloroquine given during the first three

days of home treatment was 15.0 mg/kg, the range being 1.25–75.0 mg/kg. Of the children who received chloroquine, 62% received a three-day dosage of less than 20 mg/kg (Fig. 2). Early termination of treatment was a factor in the low chloroquine dosage given to some children. The median number of consecutive days of chloroquine treatment was two, whereas the national recommendation was three days. Only 66% of children given a first dose of chloroquine received a dose the next day, and only 35% received chloroquine treatment on three consecutive days. Carers were significantly more likely to provide a subtherapeutic dosage of chloroquine syrup than of chloroquine tablets. The mean three-day dosage of chloroquine syrup administered to children who did not seek care at a health facility was 14 mg/kg, while the mean three-day dosage of chloroquine tablets administered was 24 mg/kg ($P = 0.0002$).

The question arose as to whether carers understood that the amount of chloroquine administered should increase with the growth of the children in order to maintain a constant dosage per unit weight. Children aged under 24 months were given a mean dosage of 24 mg/kg while those 24 months and older received a mean dosage of 19 mg/kg ($P = 0.16$). Although the difference was not statistically sig-

nificant it suggested that carers did not adequately increase the amount of chloroquine administered to children as they grew.

Carers of all sick children were asked if they preferred oral or injectable treatment for malaria at the health facility when their children were sick; 47% said they preferred injection, 14% preferred oral antimalarials and 38% had no preference. Among the carers who preferred injections, 69% described injections as working faster and 35% described them as stronger than oral medications.

Knowledge of cause and prevention of malaria
All carers of children aged under 5 years ($n = 667$) were asked what caused malaria and how it could be prevented. The most frequently mentioned causes were mosquitoes (63%) and cold weather (54%) (Table 4). The most frequently mentioned means of malaria prevention were antimalarial drugs (35%) and warm clothes (25%). Only 17% of carers spontaneously responded that bednets were a means of preventing the disease.

Use of bednets
When asked directly, 97% of carers said they had heard of a net that was put over a bed to keep mosquitoes and nuisance bugs away. Observations were made on the sleeping areas of children in the 51 households where bednets were used. Only 5% of children under 5 years of age in the district slept on a bed or mat that was covered with a bednet. In households where at least one bednet was used, however, 63% of children in this age group slept covered with a bednet. Most bednets were purchased in shops (52%) or from street or market vendors (31%); 81% were in good condition, without tears; 93% were large enough for the sides to be tucked under a bed or mat. The median interval since purchase was 36 months. None of the bednets had been treated with insecticide after purchase. Of the carers interviewed, 61% knew how much had been paid for their household's bednet. The prices ranged from 200 to 600 Kenya shillings and the median price was 360 shillings (ca US$ 7.00 at the time of the survey). Bednet use was low, irrespective of the carer's knowledge that malaria was transmitted by mosquitoes.

Utilization of antenatal care
Of the primary female carers interviewed, 428 had given birth during the previous two years; 94% of these said they had made at least one antenatal visit, and 91% said they had made at least two such visits. Of the women in their first or second pregnancy, 94% had made at least two antenatal visits. Medical records showing written evidence of the dates of antenatal visits were produced by 17% of the women. Only 36% of these women had made their first antenatal visit during the first or second trimester of pregnancy.

Table 3. **Frequencies of prompt visits to health facilities or prompt treatment with an antimalarial drug at home, recently febrile children, Bungoma District, Kenya, July 1996 ($n = 314$)[a]**

Seen at health facility within two days after fever onset	Antimalarial drug given at home within two days after fever onset		
	Yes (%)	No (%)	Total (%)
Yes (%)	4	16	20
No (%)	39	41	80
Total (%)	**43**	**57**	**100**

[a] Treatment with an antimalarial drug at home defined as treatment given before or instead of going to a health facility. The results are weighted.

Fig. 2. **Dosages of chloroquine given to 79 recently febrile children during their first three days of home treatment, Bungoma District, Kenya, 1996***
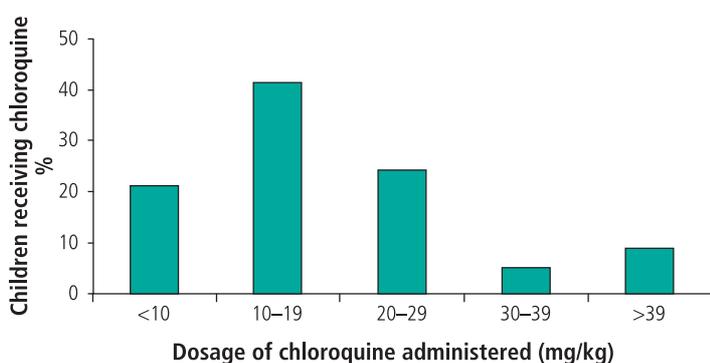
* Weighted results; only children not taken to a health facility are included.   *WHO 01.225*

Discussion

The chief limitation of the study was that, being a retrospective evaluation of self-reported behaviour patterns, it was subject to recall bias. Furthermore, interviews on attendance for antenatal care were conducted only with women who had given birth during the previous two years and were caring for children aged under 5 years. This could have led to the exclusion of women whose children had the greatest chance of dying and of women whose recent pregnancy ended in spontaneous abortion or stillbirth.

Home management of fever and utilization of health facilities

Carers demonstrated a high level of awareness that malaria was a frequent cause of childhood febrile illness. Home treatment with an antimalarial drug was given to 47% of children either before or without their attendance at a health facility; 43% of children were taken to a health facility. This suggested that carers and health workers were both major providers of treatment to febrile children. These results were in the middle range of the rates reported in other African countries. Health facility utilization rates for febrile children have ranged from 18% at a site near Bungoma District (*12*) to 76% in Swaziland (*13*), and home treatment rates have ranged from 1% in Swaziland (*13*) to 83% in Togo (*14*) (Table 5).

Given the current level of health facility utilization in Bungoma District, home treatment greatly increases the proportion of febrile children who receive an antimalarial drug. Over half the febrile children in Bungoma District were not taken to a health facility during their illness, and for a third of febrile children the only administration of an antimalarial took place at home. Carers provide modern medications, whether antimalarials or some other class of drug, to the great majority of febrile children. Consequently, the proportion of children receiving appropriate home treatment could be increased if carers could be redirected to administer an antimalarial to children with fever. In many African communities, access to a health facility where children can be diagnosed and receive antimalarial treatment is often poor because of geographical or economic barriers, and carers may not be able to reach health care providers even though they recognize that their children are ill. Carers may find it difficult to take children to health facilities because of competing priorities at home. In such circumstances, home treatment may be the only means by which a febrile child can receive an antimalarial drug.

Home treatment enhances the promptness of antimalarial treatment. Carers in Bungoma District who provided home treatment usually did so on the first or second day of illness, whereas those who took their children to health facilities tended to wait more than two days before seeking care. This tendency to provide home treatment earlier than seeking care at a health facility has been seen in East Asembo, Kenya (*12*) and Togo (*14*).

Table 4. Carers' knowledge of causes and means of preventing malaria, Bungoma District, Kenya, July 1996 ($n = 667$)[a]

Cause	%	Prevention	%
Mosquitoes	63	Antimalarials	35
Cold	54	Wear warm clothes	25
None suggested	12	None suggested	23
Eating new foods	9	Bednets	17
Getting rained on	6	Sprays/coils	11
Change in climate	5	Clear bushes	9
Standing in stagnant water	5	Destroy vessels holding	
Bushes	3	water	8
Witchcraft	0.1	Burn leaves/dung	1

[a] The results are weighted.

Table 5. Frequencies of visits to health facilities and of home treatment with an antimalarial drug, febrile children aged under 5 years, various African countries

	Seen at health centre (%)	Given home treatment with antimalarial (%)
Ethiopia (central)[a]	41	59
Guinea (Conakry)[b]	43	53
Kenya (East Asembo)[c]	18	75
Kenya (Bungoma District)[d]	43	47
Swaziland (Lowveld)[e]	76	1
Togo (Haho, Kloto, Wawa)[f]	20	83
Zaire (Pai-Kongila Health Zone)[g]	45	28

[a] Home treatment defined as treatment given at home. No children received home treatment and sought care at a health facility (*15*).

[b] Home treatment defined as given at home, including treatment given after visiting a health facility (*17*).

[c] Home treatment defined as given at home as the first treatment step (*12*).

[d] Home treatment defined as treatment with an antimalarial drug before or without a visit to a health facility (present study).

[e] Home treatment defined as treatment given before or instead of going to a health facility (*13*).

[f] Home treatment defined as treatment given before or instead of going to a health facility (*14*).

[g] Home treatment defined as treatment given at home (*16*).

Despite national educational messages and the widespread use of chloroquine, many carers providing home treatment with this drug gave subtherapeutic doses, while others provided potentially toxic doses. Furthermore, the dosage of chloroquine syrup administered was much more likely to be subtherapeutic than that of chloroquine in tablet form. The incorrect administration of the drug in the community is not surprising and has been reported elsewhere in Africa (*14*, *16–18*). It is not known whether the dosing of chloroquine is more reliable when initiated at a health facility. Fortunately, sulfadoxine–pyrimethamine is given in a single dose that can be administered under direct observation in health facilities and, in some cases, in pharmacies. Sulfadoxine–pyrimethamine has fewer side-effects than chloroquine and lacks the bitter taste associated with this drug. These favourable attributes may result in better adherence to the sulfadoxine–pyrimethamine dosing schedule, improved cure rates and a smaller risk

of toxicity as this drug is adopted for first-line therapy in both facility-based and home treatment of fever.

The main disadvantage of home treatment is that there is no evaluation by trained health workers. This could result in missed alternative diagnoses and delays in appropriate therapy. Other potential disadvantages include: the promotion of drug-resistant *Plasmodium* strains due to widespread antimalarial use, especially if subtherapeutic dosing is common; the risks associated with potentially toxic doses of antimalarial drugs; and a rise in severe adverse drug reactions as more children are exposed to sulfadoxine-pyrimethamine. The development of drug resistance and adverse events should be closely monitored as home treatment is promoted.

Almost two-thirds of children seen at health facilities received injections. The preference of carers for injection over oral medication possibly influenced the practices of health workers. Injections were also received by a small proportion of children treated at home. Efforts should be made to alter these expensive and potentially harmful practices. Further investigation of these matters is necessary.

A self-sustaining community-based system for the distribution of antimalarial drugs already exists in Bungoma District: shops and pharmacies are within reach of almost all carers. Measures to promote correct home treatment practices require an educational campaign directed at carers, drug sellers and pharmacists. Messages should concentrate on the treatment of all febrile children with an effective antimalarial drug, the administration of correct dosages, the avoidance of unnecessary injections, and the recognition, reporting and referral of patients who develop signs of adverse drug reactions associated with sulfadoxine–pyrimethamine. Carers should be discouraged from administering incomplete dosage regimens in order to save medication for future use. Innovative means of promoting the sale and administration of correct and complete dosages should be explored, including the distribution of prepackaged age-specific dosages with illustrations that clearly depict the age range appropriate for each package.

The Kenyan Ministry of Health recommends that all children with fever or a reported history of fever living in Bungoma District be treated presumptively for malaria (*8*). The present study, previous studies and Kenya's current health policy all argue in favour of the development and promotion of a national home treatment policy for children with fever who cannot be taken promptly to a health facility. We recommend that, when possible, every febrile child be taken to a trained health worker for a complete evaluation and appropriate treatment within two days after the onset of febrile illness. If this cannot be done, however, children should be treated promptly at home with an effective antimalarial.

Use of bednets

The use of bednets substantially reduces childhood mortality (*19–21*). Most carers in Bungoma District know what a bednet is. In the few households where bednets are used, over two-thirds of children less than 5 years of age sleep under a bednet. This indicates that bednet owners understand that children should be given such protection. Unfortunately, because bednet coverage in the district is so low, the vast majority of children remain unprotected by this proven means of reducing mortality. Another matter of concern is that the insecticidal treatment of bednets, necessary to ensure the prevention of malaria transmission, is not practised in the district.

A strategy for distributing bednets and promoting their use and routine insecticide treatment in Bungoma District should be accompanied by an educational campaign to correct misconceptions about malaria transmission and infection. Carers who believe that malaria is transmitted by means other than mosquitoes may not respond to strategies promoting bednets for malaria protection. Likewise, carers who do not understand *Anopheles* behaviour patterns in Western Kenya, specifically that feeding occurs late at night and early in the morning, usually between 22:00 and 06:00 (*22*), may not fully understand how bednets can provide adequate protection. Carers who assume that all fevers are caused by malaria may be disappointed in the effectiveness of bednets. This arises because even children who consistently sleep under bednets may suffer from febrile conditions that are not attributable to malaria. Wider distribution of affordable insecticide in single-use or family-size packaging should accompany the increased distribution of bednets. More information is needed in order to determine the best educational and promotional methods for increasing the use of bednets and routine insecticidal treatment, and for encouraging target populations to sleep under bednets every night. Strategies for reducing the cost of bednets, including local manufacture, heavy subsidization from the donor community and duty-free importation of bednets and insecticide, should be explored. The development of schemes to support the purchase of bednets should be considered, perhaps involving the introduction of revolving funds, deferred intermittent payments or barter systems. Antenatal clinics could serve as suitable sites for the distribution of bednets and insecticides, since pregnant women and children under 5 years of age constitute the target population for bednet use and nearly all pregnant women attend these clinics.

Antenatal care utilization

Stillbirths and spontaneous abortions may result if malaria occurs during pregnancy. In areas where the disease is endemic it contributes to low birth weight, the major cause of neonatal death (*23*). Antimalarial chemoprophylaxis and intermittent treatment with sulfadoxine-pyrimethamine begun during the second trimester of pregnancy have been shown to reduce the incidence of low-birth-weight infants born to women in their first and second pregnancies (*24–26*). In

Bungoma District there is a high incidence of low birth weight, almost a quarter of neonates in the district hospital weighing under 2500 g (4). The Kenyan Ministry of Health currently recommends presumptive intermittent therapy with sulfadoxine–pyrimethamine once during the second trimester and once early in the third trimester of pregnancy (8). Almost all carers in Bungoma District who gave birth during the two years before the survey used antenatal services at least twice during pregnancy, suggesting that the introduction of intermittent sulfadoxine–pyrimethamine therapy during pregnancy would be feasible. Women should be encouraged to begin antenatal care before the third trimester, and their attention should be drawn to the benefits of intermittent sulfadoxine–pyrimethamine therapy, its few associated side-effects and its safety for mother and fetus.

To summarize, the study provided information that would help to guide efforts to strengthen malaria control through the Bungoma District Malaria Initiative. We identified home treatment of febrile children by their carers as a major resource, which should be further supported and promoted to ensure that such children are treated promptly with an antimalarial. The policy change promoting sulfadoxine–pyrimethamine, a more efficacious antimalarial drug than chloroquine in Western Kenya, can be expected to make home treatment more effective, and single-dose therapy may improve compliance. Bednets were seldom used. The adoption of bednets for malaria prevention may be hindered because of false perceptions about the cause and prevention of the disease. It is therefore important to correct these perceptions. Because a large majority of pregnant women attended antenatal clinics at least twice during pregnancy, intermittent sulfadoxine–pyrimethamine therapy for every pregnant woman may be an attainable goal. Moreover, the distribution of bednets through antenatal care clinics could be an effective means of reaching pregnant women and small children. ∎

Résumé

Lutte antipaludique dans le district de Bungoma (Kenya) : enquête sur le traitement à domicile des enfants fiévreux, l'utilisation des moustiquaires et les visites aux dispensaires anténatals

Objectif Etablir les bases de la planification d'un programme amélioré de lutte antipaludique dans le district de Bungoma, au Kenya.

Méthodes On a étudié, au moyen d'un sondage en grappes sur les ménages, le traitement à domicile des enfants fiévreux, l'utilisation des moustiquaires et les visites aux dispensaires anténatals.

Résultats Les mères ou autres femmes s'occupant des enfants ont fourni des informations sur 314 enfants de moins de cinq ans ayant récemment eu de la fièvre : 43 % d'entre eux ont reçu des soins dans un établissement de santé, 47 % ont reçu un médicament antipaludique à domicile et 25 % n'ont reçu aucun traitement. Parmi les traitements donnés à domicile, 91 % ont été mis en œuvre dès le deuxième jour de fièvre et dans 92 % des cas le médicament administré était la chloroquine, antipaludique alors recommandé au niveau national. La dose recommandée de chloroquine à administrer sur trois jours était de 25 mg/kg, mais la dose médiane réellement donnée au cours des trois premiers jours de traitement sous forme de comprimés ou de sirop était de 15 mg/kg. La dose totale administrée sur un à cinq jours allait de 2,5 à 82 mg/kg. Les doses étaient plus faibles avec le sirop qu'avec les comprimés. Seuls 5 % des enfants de moins de cinq ans dormaient sous une moustiquaire. Aucune moustiquaire n'avait été traitée par un insecticide depuis son achat. Parmi les femmes enceintes, 91 % s'étaient rendues à au moins deux visites anténatales.

Conclusion Les personnes qui s'occupent de l'enfant sont les principales dispensatrices de traitement antipaludique, lequel est donné sans retard. Le traitement à domicile, qui doit être renforcé, doit être adopté chaque fois qu'un traitement rapide dans un établissement de santé n'est pas possible. L'administration de doses incorrectes, qui semble fréquente avec la chloroquine, devrait moins se produire après l'adoption de la sulfadoxine-pyriméthamine, dont la posologie est plus simple, comme médicament recommandé. Les visites régulières aux dispensaires anténatals offrent la possibilité d'assurer une bonne couverture par un traitement antipaludique présomptif administré de façon intermittente pendant la grossesse et permettent de distribuer à cette occasion des moustiquaires aux enfants et aux femmes enceintes.

Resumen

Lucha antipalúdica en el distrito de Bungoma (Kenya): encuesta sobre el tratamiento domiciliario de los niños febriles, el uso de mosquiteros y la utilización de los dispensarios de atención prenatal

Objetivo Sentar las bases para planificar un programa mejorado de lucha antipalúdica en el distrito de Bungoma (Kenya).

Métodos Se realizó una encuesta de hogares basada en muestras por conglomerados para investigar el tratamiento domiciliario de los niños febriles, el uso de mosquiteros y la asistencia a dispensarios de atención prenatal.

Resultados Las cuidadoras encuestadas proporcionaron información sobre 314 menores de cinco años con fiebre reciente, de los cuales el 43% recibió atención en un centro de salud, el 47% recibió un medicamento antipalúdico en el hogar, y el 25% no recibió tratamiento alguno. En cuanto a los tratamientos antipalúdicos aplicados en el domicilio, el 91% se iniciaron al segundo día de fiebre, y el 92% consistieron en la administración de cloroquina, el antipalúdico recomendado por entonces a nivel nacional. Aunque la dosis de cloroquina que se recomendaba administrar a lo largo de tres días era de 25 mg/kg, la dosis mediana efectivamente administrada durante los tres primeros días de tratamiento en forma de comprimido o jarabe fue de 15 mg/kg. La dosis total varió entre 2,5 y 82 mg/kg,

administrados a lo largo de uno a cinco días. La posología fue menor cuando se administró jarabe en lugar de comprimidos. Sólo el 5% de los menores de cinco años dormía protegido por un mosquitero, y ninguno de los mosquiteros había sido tratado con insecticida desde el momento de la compra. El 91% de las mujeres embarazadas hicieron al menos dos visitas prenatales.

Conclusión Los cuidadores son fundamentales para dispensar tratamiento antipalúdico con prontitud. Es preciso reforzar el tratamiento domiciliario en previsión de los casos en que el tratamiento rápido en un centro de salud resulta imposible. La administración de dosis incorrectas, bastante común al emplear cloroquina, debería ser un error menos frecuente al emplear sulfadoxina-pirimetamina, ya que la pauta de dosificación de esta combinación es más sencilla. El alto nivel de utilización de los dispensarios de atención prenatal brinda una oportunidad para conseguir una buena cobertura de tratamiento intermitente de los casos sospechosos de paludismo durante el embarazo y para, al mismo tiempo, distribuir ampliamente mosquiteros entre los niños y las mujeres embarazadas.

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