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Maternal responses to childhood febrile illnesses in an area of seasonal malaria transmission in rural Ethiopia

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Abstract

Although malaria is the leading cause of illness and death among children less than 5 years of age, there is limited information on mother's response and experience about diagnosis and treatment of the disease in children in rural areas of Ethiopia. The objective of this study was to assess maternal responses and treatment seeking behaviour for children reported to have malaria. A community-based cross-sectional study was conducted between October and November 2003 in Adami Tulu District, south-central Ethiopia. Mothers/caretakers of children less than 5 years of age were interviewed about history of febrile illness suspected to be malaria for all under-five children and the actions taken in the 2 weeks prior to the survey. Of 3872 children identified in 2372 households, 817 (21.1%) had febrile illness reported to be malaria according to the mothers/caretakers. The main symptoms included fever (99%), shivering/chills (92.2%), vomiting (55.1%), sleeplessness/restlessness (12.9%) and refusal to feed (21.3%). Of the total febrile children, 27.3% sought the first care from a public health facility, 27% visited community health workers (CHWs), 25.7% taken to private clinics, 6.4% received home treatment, and 13.3% did not get any care. Among 710 children who reported to receive any type of anti-malarial treatment, 78.8% got it from one source, 19.4% visited two sources and 1.8% sought three sources. Only 28% of the children received any form of treatment within 24 h of the onset of illness. Public facilities, private clinics and CHWs were the main sources of care sought by febrile children. Strengthening peripheral health services and community-based interventions using CHWs at village levels would improve the early diagnosis and treatment of malaria among children.

Keywords: Febrile illness; Malaria; Under-five children; Treatment seeking; Ethiopia

1. Introduction

Malaria is the leading cause of morbidity and mortality in Ethiopia (MOH, 2002–2003, 2004–2005). Unlike many countries in tropical Africa, malaria is unstable and seasonal, affecting all age groups of the population. Infections with *Plasmodium falciparum* (about 60%) and *Plasmodium vivax* (about 40%) are both found in many parts of the country (MOH, 2002–2003, 2004–2005; Adhanom et al., 2006). Early diagnosis and effective treatment of the disease is one of the basic elements of the current global malaria control strategy (WHO, 1993). To reduce the morbidity and mortality burden of malaria particularly among children, the World Health Organization (WHO) has developed a strategy that includes early diagnosis and treatment of malaria both at health facilities and household levels (WHO, 1993, 2000a).

Most febrile children in malaria endemic areas do not have access to basic health care facilities. It has

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been reported that less than 20% of children with febrile episodes visit health facilities (Breman, 2001). Studies have shown that by the time most febrile patients reach health care facilities, several days have elapsed since the onset of the symptoms and the likelihood of the disease to progress to severe form is very high (McCombie, 1996). As most malaria deaths among children occur within 2–3 days of the onset of illness (Greenwood et al., 1987), early diagnosis and prompt treatment is critical in reducing mortality. As a result, focus on community-based interventions through giving anti-malarial drugs closer to home and at village levels to all febrile children living in malaria endemic areas has become the main strategy to reduce malaria burden among children (WHO, 2005).

Effective treatment with anti-malarials at home and village levels of children with febrile illnesses can minimize the delay before treatment and reduces mortality due to malaria (Kidane and Morrow, 2000). Recognizing the real problems of malaria among children in rural areas, the Malaria Control Programme in Ethiopia has initiated and promoted community-based early diagnosis and treatment of malaria using trained voluntary community health workers (CHWs) and mother coordinators (MOH, 2001–2005 strategic plan document). In designing and formulating such community-based interventions and promoting home treatment of malaria, it is crucial to understand factors that influence treatment seeking behaviour and responses to the disease by the community. This is essential because access to health facilities in itself does not necessarily guarantee the utilization of these facilities (McCombie, 1996; Baume et al., 2000). Many studies pertaining to responses to malaria among under-five children and home management of the disease have been conducted in areas of intense malaria transmission (Deming et al., 1989; Mwenesi et al., 1995; Ruebush et al., 1995; Marsh et al., 1999; Thera et al., 2000; Diallo et al., 2001; Hamel et al., 2001).

Despite a study in northern Ethiopia that demonstrated a 40% reduction in the overall under-five mortality using chloroquine (Kidane and Morrow, 2000), there is still a general paucity of information and experience on the early diagnosis and treatment of malaria among children in Ethiopia. This makes it difficult to assess the impact of the current malaria control interventions on the treatment seeking behaviour for malaria in children and the overall coverage of the interventions.

This study was prompted to mitigate the paucity of information and addresses the rationale for the local need to investigate the experience and practice of a community towards the management of febrile illnesses such as malaria among under-five children and to examine factors affecting early treatment of the disease. This paper describes data obtained from a sample survey conducted in Adami Tulu District, south-central Ethiopia, during a peak malaria transmission period. The objectives of this survey were to determine treatment seeking behaviours for febrile illnesses suspected to be malaria among under-five children by mothers, the practice of home management for such illnesses, and the sources and availability of anti-malarials for the community.

2. Subjects and methods

A community-based cross-sectional household survey was conducted in 18 rural *kebeles* of Adami Tulu District of East Shewa Zone in Oromia Regional State, south-central Ethiopia, during the peak malaria season (October–November 2003). In 2002, an estimated population of 145 550 inhabited in the District, of which 18.5% were under-five children (CSA, 1998). The District is administratively organized into 62 rural *kebeles*, the smallest administrative units in rural areas of the country with a population of 1000–3000, and four towns. The main occupations of the population are subsistence farming and livestock herding. Major crops include maize, haricot bean, pepper, *tef* (*Eragrostis tef*) and to a lesser extent wheat and barley. Malaria is common in the District and locally known as *busa*. Transmission occurs throughout the year, the major transmission season being from September through December and the minor from March to May.

The District's public health service is a network of two health centers, three health stations, one malaria control laboratory (MCL) and two health posts. There were also 13 medium and lower level private clinics, 34 CHWs specifically trained for malaria, one missionary clinic, and more than 11 drug shops and rural drug vendors. Since the late 1990s, CHWs were trained and deployed for early diagnosis and treatment of uncomplicated malaria at village level in rural areas of the District, and to refer patients to health facilities whenever necessary. Among our study *kebeles*, 11 had CHWs already based at the villages, while seven *kebeles* did not have their own CHWs but utilized CHWs based at neighboring villages. At the time of the study, the policy for first-line anti-malaria treatment was to give sulfadoxine-pyrimethamine (SP) for patients with signs and symptoms of uncomplicated malaria (MOH, 1999), until artemether-lumefantrine replaced it in 2004 (MOH, 2004). Chloroquine was recommended if the illness was not responding to SP after 48 h of treatment or for the treatment of confirmed cases of *P. vivax*.

The desired sample size calculated for the study was 2270 households with under-five children after adjusting for the design effect by a factor of 3 and adding 15% non-response rate. This was computed using Epi Info software version 6.04d (CDC, Atlanta, GA, USA) assuming that 30% of the households with under-five children had at least one child with acute febrile illness suggestive of malaria or history of fever during the 2 weeks recall period, using 26.5% worst acceptable result at 95% confidence level. From the total rural *kebeles*, we randomly chose 18, and distributed the sample size across them with probability proportional to the size of the estimated number of households in each *kebele*. All households with under-five children in the selected *kebeles* were included in the study.

Eighteen high school graduate local interviewers who were fluent in *Afan Oromo* (the language of the survey area) and knew the local culture were recruited to administer the questionnaire. Data collectors and two supervisors from the District Health Office (DHO) received 5 days of intensive training on the use of data collection instruments, household selection and interviewing techniques. Every household was visited by the interviewers and the questionnaire was administered to all mothers/caretakers of children less than 5 years of age. We defined a household as all persons who shared family income, living together and ate from the same dining pot.

Data were collected on socio-demographic characteristics of the mothers/caretakers, and history of any illness the child had during the 2 weeks prior to the interview was asked for all study children. The focus was on history of reported malaria illness (or *busa*) over the last 2 weeks. Those mothers/caretakers who reported history of child illness were asked about the symptoms of the illness and what sickness affected the child. When the answer for the question was *busa*, then a series of questions about what actions had been taken were asked. *Busa* is a local name used to describe malaria. We also asked about the care the child received from health care providers, and any treatment the child received at home.

A total of six focus group discussions (FGDs), with 6–8 participants in each, were conducted in six *kebeles* to complement the quantitative data. Three FGDs were conducted with mothers with less than 5 years old children and the remaining three FGDs were held with fathers with children under 5. In addition, five case studies were conducted to gain practical experiences of malaria management among under-five children. Semi-structured discussion guides were prepared and used during the FGDs and case studies to elicit information at greater depth. The FGDs and case studies were conducted by the first author with the assistance of a note taker. *Afan Oromo* language was used during all group discussions and interviews. In addition to the note taking, a tape recorder was used to secure integrity of information.

Quantitative data were entered into Epi Info software version 6.04d and transferred to SPSS version 11 (SPSS, Chigaco, IL, USA) statistical software package for analysis. Frequencies and proportions were used for the descriptive analysis of the data. Our analysis of dosages and duration of treatment at home was restricted to SP and chloroquine, since SP was the anti-malarial recommended for the first-line treatment of clinical malaria at community level at the time of the survey and was used at home more often than other drugs. Qualitative data were transcribed and analyzed after data collection along major themes by the first author. All tape-recorded FGDs and case studies were transcribed and used for analysis, interpretation and comparison with the quantitative data. Some quotes from the qualitative data are integrated and presented in parallel with the quantitative information to elaborate the insights of the perceptions and practices of the community by their own words.

Ethical clearance for the study was secured from the Department of Community Health, Faculty of Medicine, Addis Ababa University. Informed verbal consent was obtained from the study participants, and appropriate measures were taken to assure confidentiality of information during data collection.

3. Results

3.1. Mothers'/caretakers' socio-demographic characteristics

From a total of 3708 visited households in 18 *kebeles*, 2372 mothers/caretakers representing 2372 households with one or more children under 5 years of age were interviewed. In 1198 (32.3%) households, there were no children aged less than 5 years; in 79 (2.1%) households the houses were vacant; in 45 (1.2%) the mothers/caretakers were not at home; 14 (0.4%) households refused to be interviewed. The majority of respondents were mothers (88%) of the child. Other respondents included the child's father (7.5%) and grandmother or older siblings (4.5%).

About 80% of the respondents were aged less than 35 years. The mean age of the interviewed mothers was 27 years. About 95% of the respondents were married: 97.5% for mothers and 75.1% for other caretakers. The predominant religion was Islam (90.6%), followed by Christians from Orthodox (6.5%) and Protestant (2.3%)

Table 1
Multiple signs and symptoms presented by children suspected to have malaria in Adami Tulu District, 2003

Major signs and symptoms mentioned by mothers/caretakers of febrile children				No. of children with these signs and symptoms	% of 809[a] children with these signs
Fever	Shivering and chills	Vomiting	Loss of appetite		
√	√	√	√	64	7.9
√	√	√	x	354	43.8
√	√	x	x	228	28.2
√	√	x	√	100	12.4
√	x	x	x	29	3.4

[a] Excludes eight children who did not present with fever.

denominations. The majority (91.4%) of the respondents were Oromo. A significant number of the mothers were illiterate (86.8%), whereas 47% of other caretakers had education. About 88% of the total respondents were 'housewives', followed by farmers (9.6%).

3.2. Characteristics of surveyed children and common symptoms of febrile children

From 2372 households with under-five children, a total of 3872 children under the age of 5 years were found with an average of 1.6 children per interviewed mother/caretaker. The mean and median age of the children was 32 and 36 months, respectively, and 62% of them were ≤3 years. Just over half of the children (51.3%) were males. From the total surveyed children, an illness episode of one or more symptoms in the 2 weeks recall period prior to the interview was reported in 906 (23.4%) children. Mothers/caretakers were asked what they thought was the cause of illness for the child. Of the total sick children identified during the preceding 2 weeks of the survey, 817 (90.2%) had experienced *busa* according to the respondents. Mothers/caretakers said that something had been done for the child's illness for about 85% of the children. Children who had a recent *busa* ($n = 817$) were found in the age range from 2 to 59 months.

The person in the household who first recognized that the child had *busa* included mother herself (90.7%), child's father (8.7%) and elder brother or sister (0.6%). The most common symptoms reported for children supposed to have *busa* included, fever (99%) and shivering/chills (92.2%). Vomiting was reported in 55.1% of the children. Other symptoms reported by mothers/caretakers included refusal to feed/loss of appetite (21.3%), sleeplessness/restlessness (12.9%), hot body (10%), diarrhea (5.4%) and cough (3.8%). Many children were reported to have presented with two or more signs and symptoms suggestive of malaria (Table 1), with 91.3% experiencing both fever and shivering/chills. In addition, 418 (51.2%) children presented with three symptoms (i.e., fever, shivering/chills and vomiting). None of the mothers/caretakers reported other possible combinations of symptoms such as fever and loss of appetite only.

3.3. Treatment seeking for children suspected to have malaria

Of the 817 children with reported malaria, 223 (27.3%) were first taken to a public facility. Public facilities in the area include health center, health station/post, and MCL. The remaining 221 (27.1%) visited CHWs, 210 (25.7%) went to private clinics, 52 (6.4%) received home treatment with anti-malarials, and 107 (13.1%) were neither treated at home nor taken to a health facility. The use of local herbal remedies at home or traditional healers as the first source of treatment was found to be uncommon (0.4%).

Among 710 children who sought some sort of treatment, 78.9% visited or got treatment from one source, 19.4% visited two sources of treatment and 1.8% sought treatment from three sources. Most of the 710 children who received care by the first action appeared to be satisfied as 78.9% of their condition improved after the visit of the first source of treatment. An additional visit for the second or third source of care provider indicates that cure was not found in the previous visit. Only 13 (8.7%) of febrile children who visited the second-line source of treatment undertook the third action at the third source of anti-malarial treatment at health care facilities (84.6%) and CHWs (15.4%).

Table 2 summarizes the second source of anti-malarial treatment compared to the first choice. The most common source of second-line treatment for those who started with public facilities but later sought additional treatment was the private clinics and the same public facilities. This trend was also similar for those chil-

Table 2
Second sources of treatment compared with first choice, Adami Tulu District, 2003

First source of treatment ($n = 710$)	Second source of treatment ($n = 150$)				
	Public health facility	Private clinic	CHW	Other[a]	Total (%)
Public health facility (%)	14 (35.9)	20 (51.3)	4 (10.3)	1 (2.6)	39 (26.0)
Private clinic (%)	8 (34.8)	10 (43.5)	1 (4.3)	4 (17.4)	23 (15.3)
CHWs (%)	32 (38.6)	51 (61.4)	0	0	83 (55.3)
Other[a] (%)	2 (40)	2 (40)	1 (20)	0	5 (3.4)
Total (%)	56 (37.3)	83 (55.3)	6 (4.0)	5 (3.4)	150 (100)

[a] Other includes home treatment, traditional medicine, mission clinic and drug shop.

dren who first sought treatment at private clinics and CHWs, but continued their search for a treatment at second source. Multiple visits were more common among children who obtained their first treatment from CHWs, with a subsequent visit to public or private health care facilities. Among 221 children who visited CHWs as a first source of treatment, 83 (37.6%) subsequently sought care from private clinics (61.4%) or public facilities (38.6%) (Table 2). Relatively few children (17.5%) who were first seen at public facilities sought a second source of treatment. Of the children who sought treatment from private clinics as a first-line care, only 23 (11%) visited a second source of anti-malarial treatment.

Most of the mothers in the FGDs described that children with malaria were primarily taken to CHWs or public health facilities. Some also mentioned taking the child to private clinics. Others mentioned home treatment with modern or traditional remedies (garlic and ginger) as a first action at home before taking the child to health facilities. "*Since antimalarial drug is available at the CHW in our village, before going to health facility first I go and obtain the drug from CHW to give the child at home*."

Some respondents in the FGDs mentioned about the inefficacy of fansidar (SP) for the treatment of malaria. They explained that after repeatedly taking SP, it could not help for curing malaria. This problem of SP inefficacy for the treatment of malaria was observed during all the FGDs and also during case-study interviews with mothers or fathers with sick children. "*Fansidar is now ineffective. It doesn't work and cure malaria. Even I myself took it three or four times. I took three tablets each time. Within two weeks period I have become sick. Malaria of this year is much more serious than the previous years*." Fansidar was locally called *mecheresha* drug (which means that it is the highly effective last resort anti-malarial drug) at the time of the study.

Survey respondents were asked to state the duration between the onset of *busa* among children and treatment initiation at health facilities, CHWs and home (Table 3). Taking a child with *busa* to a health facility or CHW was more common than home treatment with an anti-malarial drug, but it was not as prompt. Among the 654 children who visited a public health facility, private clinic or CHWs, 193 (29.5%) sought treatment within 1 day of the onset of illness. Among those, only 10% sought care immediately after the onset of illness, followed by 3.5% and 5.6% within six and 6–12 h after illness onset, respectively. On the contrary, about 60% of the children who used home care took treatment on the first day of the onset of illness. Reasons for the delay (after 1 day) of the anti-malarial treatment initiation at a health facility included mild illness (35.8%), financial constraint (21.7%), too far health facility (9.4%), shortage of time due to work overload (2.6%), prior treatment with herbal remedy (0.6%) and parental sickness (0.2%). "*The ill-*

Table 3
Promptness of treatment initiation at public health facilities, private clinics, CHWs and home, Adami Tulu District, 2003

Days of treatment initiation after symptom onset	Public facility, *n* (%)	Private clinic, *n* (%)	CHW, *n* (%)	Home treatment, *n* (%)	Total (%)
≤1	79 (35.4)	60 (28.6)	54 (24.4)	31 (59.6)	224 (31.7)
2	87 (39.0)	64 (30.5)	83 (37.6)	9 (17.3)	243 (34.4)
3	30 (13.5)	51 (24.3)	60 (27.2)	8 (15.4)	149 (21.1)
4	16 (7.2)	17 (8.1)	16 (7.24	3 (5.8)	52 (7.4)
≥5	11 (4.9)	18 (8.6)	8 (3.6)	1 (1.9)	38 (5.4)
Total	223 (100)	210 (100)	221 (100)	52 (100)	706 (100)

Table 4
Type of actions taken to respond to reported malaria among children within 24 h of the onset of illness, Adami Tulu District, 2003

Type of actions	*n*	%
No action or waited the recovery of illness by itself	588	72.0
Sought care from public health facility	77	9.4
Taken to private clinic	68	8.3
Visited CHWs	64	7.8
Used anti-malarials available at home	15	1.8
Bought anti-malarials from shops or taken to drug shop or rural drug vender	5	0.6
Total	817	100

ness starts and gets off. Some times the child is fine, but also becomes sick. If the child is well today, he/she will be sick tomorrow. Taking to the health facility was delayed because I haven't decided until today. Today I brought the child to CHW."

Mothers/caretakers were also specifically asked what they did within 24 h of the onset of symptoms. A significant proportion of children (72%) did not seek any type of treatment within 24 h after the onset of reported malaria (Table 4). Generally, 233 (28.5%) children reported with malaria visited different sources of care or took anti-malarials at home within 24 h of the onset of illness. It was found that children with malaria mainly sought treatment from public facilities, private clinics or CHWs during the 24 h after the onset of illness. Among 659 febrile children reportedly diagnosed as malaria cases at health facilities or CHWs, mothers/caretakers responded that only 35.4% were microscopically confirmed with blood testing facilities, while 64.6% were diagnosed as malaria based on symptoms and clinical signs of the disease.

3.4. Home management of reported malaria among children

Only 52 (6.4%) of the 817 febrile children were treated at home according to our informants. Considering children who received some form of treatment, the proportion of sick children who initiated anti-malarial treatment at home increased to 7.3%. Most of the children who received treatment at home were treated by modern anti-malarial drugs. The most commonly used anti-malarial was SP, which was used by 38 (73.1%) children. Two children were given both SP and antipyretics (panadol/paracetamol) and the other two received chloroquine and antipyretics. Only three (5.8%) children received chloroquine. The remaining seven (13.5%) children used a mixture of traditional herbal remedies (preparation), anti-malarials, aspirin and ampicilline. "*I grind garlic and ginger together and mix it with water to give the child to drink it in the evening. In the morning I observe the child, and if not improved, take him/her to a health facility.*"

Home treatment with an anti-malarial drug was not common but was prompt when it occurred. Among all children who received home treatment, 31 (59.6%) sought treatment on the first day (within 24 h) of the illness onset, 9 (17.3%) 1 day after the onset of fever and 8 (15.4%) 2 days after the onset of illness (Table 3). For the anti-malarial drug used at home, 40 (76.9%) children took it for 1 day, 9 (17.3%) for 2 days, and the remaining for 3 or 4 days. For 42 (80.8%) children, home treatment was administered by the mother herself, followed by the father for 10 (19.2%) children. According to the respondents, 38 (73.1%) febrile children recovered from the illness after home treatment, while 14 (26.9%) did not. Nothing was done for the eight (57%) children who did not recover from the illness by home treatment at the time of the interview.

The total SP tablet given to the children ranged from 1/2 a tablet to two tablets and the median was one tablet. Thirteen (32.5%) children received 1/2 a tablet of SP, 20 (50%) used one tablet and 7 (17.5%) received two tablets. According to the national guideline for SP dosage for children based on age (MOH, 1999), of the 40 children who received SP at home, only 14 (35%) received the correct dose, 12 were under-dosed and 14 were over-dosed. SP for home treatment was also incorrectly administered over a varying period of time, eight children received for two or more days. Chloroquine was administered over a day for two children, 2 days for two children and 3 days for a child. Of the children who received chloroquine at home, only one child received the correct dose over the recommended 3 days duration and the remaining were under-dosed.

4. Discussion

The initial choices of care for most reported malaria episodes among children were public health care facilities, CHWs or private clinics. This suggested that health workers and CHWs were the major providers of anti-malarial treatment to febrile illnesses suspected to be malaria, although majority of the cases among children are treated outside the conventional public health facilities. However, the importance of CHWs as a second source of treatment diminished significantly, while it remained high for both public and private facilities. Similarly, home treatment and the use of traditional medicine or shop-bought drugs generally took place as a first-line

source of treatment, and their importance as a second or third choice of treatment became insignificant.

The level of treatment seeking for febrile illness supposed to be malaria in our study community is relatively high. Use of health facilities was more common in this study than other studies in east Africa as 53% of the children with suspected malaria visited public and private health care providers as a first source of treatment during their illness. Health facility utilization rates for febrile children have ranged from 18% to 43% in western Kenya (Ruebush et al., 1995; Hamel et al., 2001), 20% in Togo (Deming et al., 1989), 41% in Ethiopia (Yeneneh et al., 1993), 58% in Malawi (Holtz et al., 2003) to 70% in the Gambia (Clarke et al., 2003). Increasing the use of health facilities could improve the diagnosis and appropriate treatment for febrile children, though its use can be limited by lack of access and transportation, sociocultural factors, time constraints, and other competing priorities at home (McCombie, 1996; Holtz et al., 2003; Ahorlu et al., 2006).

More than a quarter of the children in our study visited CHWs as a first source of anti-malarial treatment. A study conducted in Tigray demonstrated that 65–70% of all annual malaria cases were diagnosed and treated by CHWs, most of the cases being outside the reach of basic health care services (Ghebreyesus et al., 1996, 2000). It was revealed that in the review of a Programme set-up for community-based malaria control, recognition of clinical malaria by CHWs was similar to that of health staff operating at peripheral health facilities without access to microscopy (Ghebreyesus et al., 2000). In addition to the ultimate responsibility of the community for CHWs, the Programme was successful mainly due to wide-scale regional coverage to serve a significant proportion of the rural population at risk of malaria, implementation as a major component of malaria control strategy, and strong supervision and intensive monitoring by the health personnel. In another setting in southern Ethiopia, mobilization of community volunteers to provide early diagnosis and treatment at village level during malaria epidemics was highly successful due to the commitment of the community and local administrative bodies in supporting them, continuous supply of anti-malarials, strong supervision by health workers and the personal satisfaction they gain from helping their own community (Deressa et al., 2005). This is particularly different from other rural settings in tropical Africa that reported low utilization of CHWs (Saueborn et al., 1989).

It is recently recognized that prompt recognition of febrile illnesses among children and early treatment with appropriate anti-malarial drug at home or village level in rural endemic areas has become an alternative to health facility based services (WHO, 2005). Recently, carefully designed intervention studies have demonstrated that village based strategies to treat fever in children with anti-malarial drugs resulted in prompt treatment and reduced the incidence of severe disease or death (Kidane and Morrow, 2000). In addition to the diagnosis and treatment of malaria at health facilities, the Malaria Control Programme in Ethiopia is currently taking measures to improve early diagnosis and prompt treatment at home or village level through CHWs and trained mother co-ordinators (Adhanom et al., 2006).

In this sample survey, conducted in an area of seasonal malaria transmission in rural Ethiopia, only 28% of children reported with malaria received anti-malarial treatment within 24 h of the onset of illness. In Ghana, only 11% of children suspected to have malaria-related illness received treatment within 24 h of illness onset (Ahorlu et al., 2006) in contrast to a Malawi study that reported 37% prompt appropriate treatment (Holtz et al., 2003). This must be worrying as the Abuja target of treating 60% of malaria among under-five children within 24 h by 2005 (WHO, 2000b) has been far from the target achieved in many areas. The present study provides an important information for the follow-up and monitoring of the achievements of the roll back malaria (RBM) partnership for Ethiopia targets of at least 80% of febrile children suspected to have malaria should get access to correct and appropriate treatment within 24 h of the illness onset by 2005 (MOH, 2001–2005 strategic plan document), which may not be met even by the end of the stated period.

Multiple visits by febrile children to different care providers seem to be high in our study. Owing to the inefficacy of treatment they receive from CHWs, public health facilities and private clinics, mothers visit additional sources of treatment until they see improvements in the health of their child. The public health facilities are usually overloaded by malaria patients during peak malaria transmission periods and mothers might resort to private health facilities that incur high costs for the rural poor households. There appeared to be reduced trust in the efficacy of SP against the treatment of malaria in our study community. Health seeking behaviour of mothers for sick children can be affected by the unavailability of appropriate services and high cost of treatment at health facilities (McCombie, 1996).

In contrast to the findings from other settings that reported high levels of home treatment (Deming et al., 1989; Mwenesi et al., 1995; Ruebush et al., 1995; Thera et al., 2000; Hamel et al., 2001), home treatment of malaria for children suspected to have the disease in

this study was low (6.4%) because most of the children were treated at health care facilities or by CHWs. The availability of CHWs at village level and widespread existence of private health facilities within the reach of the community would discourage the practice of home treatment. In an area with a CHW in a village, it is possible to think that health education on what to do when a child has fever would take place. One of the messages that would be given out to the mothers is to take the sick child to the health facility or the CHW. Under reporting of home treatment, however, could not be ruled out. Although the practice of home treatment for malaria among under-five children was low in our study area, the provision of both sub-therapeutic and over dosage were common, as has been reported elsewhere in Africa (Deming et al., 1989; Hamel et al., 2001). However, it should be noted that the dosages of SP and chloroquine reported in the present study were based on self-report by the respondents; it is most likely unreliable due to recall bias.

Most malaria treatments with anti-malarial drugs for febrile children in many parts of Africa involve the use of chloroquine or SP. Currently, it is well known that these anti-malarials have been ineffective in many areas of Africa due to problems of resistance (WHO, 2000c). For example, 53.4% treatment failure for SP against *P. falciparum* was observed in our study area during the time of the study (Jima et al., 2005). The finding from this study site was alarming and the highest of all the study sites in Ethiopia. However, SP and chloroquine are still the most available anti-malarial drugs in the majority of public health care facilities, private providers, CHWs and over-the-counters. The newly recommended anti-malarial drug, artemether-lumefantrine, has not been easily accessible in malaria endemic areas of the country (MOH, 2004).

Our study is not free of limitations. The cross-sectional survey design provides a single seasonal estimate that does not allow us to generalize the findings to other times of the year. The study area is rural; therefore, our results may not be generalized to other urban populations. Although our study used a short recall period for fever (2 weeks), the data is based on self-reported treatment seeking patterns, thus susceptible to social desirability bias. Furthermore, the inability to make a definitive diagnosis of the children's illnesses based on the parents' report of malaria as a cause of illness or the symptoms of the disease was a limitation of this type of survey research in the community. Only about one-third of the recently febrile children reported microscopic diagnosis for the illness mainly due to the unavailability of blood testing facilities at many of the public and private health care facilities in the District. Most cases of febrile illnesses could have been reported to be malaria by the respondents since we used reported malaria (or *busa*) as a proxy for malaria. In Ethiopia, however, most peripheral health facilities without laboratory services in malarious areas treat malaria based on the presumptive signs and symptoms of the disease. Therefore, the significance of our study might be substantial as the study was conducted during peak malaria transmission period where most febrile illnesses are presumably due to malaria.

The results of this investigation could be used for three purposes. First, to establish base-line practices of mothers about febrile illnesses among under-five children. Second, to strengthen CHWs and peripheral health facilities to make easy access of anti-malarial drugs to children at village or home level, particularly during peak malaria transmission season. Third, to develop appropriate educational materials oriented towards strengthening knowledge and sustaining practices of early diagnosis and treatment for malaria.

In conclusion, our findings indicate that it is important to strengthen peripheral health care facilities and design appropriate community-based interventions for malaria control in rural areas. It is of concern that 72% of children with febrile illness did not receive any anti-malarials, whether at home or at health facility or CHWs, within 24 h of the onset of illness. Improving geographic and economic access to facility-based diagnosis and treatments would be not feasible in the near future. However, community-based interventions that deploy CHWs to administer anti-malarial drugs would improve the early diagnosis and prompt treatment of malaria among children. Since the present finding has strong implications for improving early diagnosis and prompt appropriate treatment, the provision of effective anti-malarial drugs such as artemether-lumefantrine within the reach of the community is crucial.

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