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Knowledge, attitudes and practice about malaria in rural Tigray, Ethiopia

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Objective: To assess the knowledge, attitude and practice (KAP) regarding malaria and their determinants in a rural population of northern Ethiopia.

Methods: The study was conducted in the district of Samre Saharti, Tigray, northern Ethiopia. A structured questionnaire collecting socio-demographic and malaria-related KAP information was administered to the mothers from a representative sample of households.

Results: A total of 1652 questionnaires were available for analysis. Most of the respondents (92.7%) were able to mention at least one symptom of malaria. Mosquito as a cause of malaria was recognized by nearly half of the respondents (48.8%). Most of the households had a bed net (85.9%). To have a literate person at home, to belong to the lowland stratum, to have received some type of health education and to own a radio were associated with the knowledge of malaria. A strong association remained between living in the lowland stratum, to own a radio and to live close to the health post and the use of ITN. Being a housewife, lack of health education and to live further than 60 minutes walking distance to the health post were related to a delay on treatment finding.

Conclusion: This study has identified some aspects which the MCP might need to improve. The knowledge about malaria transmission should be strengthened. Promotion of literacy and participation in health education are vital components in terms of malaria knowledge and practice. Issues related to geographical location and accessibility to health post should be also carefully examined.

Keywords: *malaria*; *knowledge*; *attitude*; *practice*; *Tigray*; *Ethiopia*

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Despite significant efforts to control malaria in Ethiopia since the 1950s, the disease remains one of the top public health problems in the country. An estimated 68% (50 million people) of the population lives in areas at risk of malaria. Malaria was reported as the primary cause of health problems in 2004–2005 accounting for 17% of out-patient visits, 15% of hospital admissions and 29% of in-patient deaths (1). Most of malaria cases (60%) in Ethiopia are caused by *P. falciparum* and the remainder by *P. vivax*.

The national Malaria Control Program (MCP) has developed a strategic plan with the national goal to reduce the overall burden of the disease by 25% by the year 2005 and by 50% by the year 2010. The national strategy consists of three main strategies: early diagnosis and prompt treatment; selective vector control and epidemic prevention and control (2).

In order to ensure the implementation of these strategies, Ethiopia has initiated a series of changes in its malaria control policy. In July 2004, the first line antimalarial drug for uncomplicated falciparum malaria was changed from Sulfadoxine-pyrimethamine (SP) to artemisinin-based combination therapy (ACT) with the then only currently available fixed combination therapy: Artemether-Lumefantrine (AL) (3). In response to the country's unmet health care needs, the government in the same year (2004) made the decision to strengthen and expand the primary health care level by launching the Health Service Extension Program (HSEP). This program is designed to achieve significant basic health care coverage in the country over five years through the provision of a staffed health post to serve every 5,000 people. By 2009, more than 15,000 health posts are expected in the rural subdistricts locally known as *kebeles*. These health posts basically deal with health preventive aspects except for malaria which includes the treatment as well (4). At this level, AL, chloroquine and quinine are distributed free of charge after diagnosis with

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the rapid diagnostic tests (RDTs) which should be available all year round. If there is not, diagnosis is clinically conducted. Finally, the MCP has included the free distribution of Insecticide Treated Nets (ITNs). The Ministry of Health of Ethiopia aims to reach 100% ITN coverage in the year 2010 (5).

An understanding of how these strategies reach the population together with the identification of the main determinants that influence protective behaviors are required to monitor and evaluate the progress of the malaria control efforts. This is a key element in order to achieve the Goal 6, 'to halt and begin to reverse the incidence of malaria and other major diseases,' of the Millennium Development Goals (MDGs). While few studies have been conducted in Ethiopia regarding this issue (6–8), there is a need to focus this type of studies locally since the political, cultural, socioeconomic conditions and access to health services might differ among regions. This study was prompted to increase the availability of data necessary to support and guide the new malaria control policies regionally. The aim of this study was to examine the knowledge, attitude and practice (KAP) regarding malaria and their determinants in a rural population of northern Ethiopia.

Materials and methods

Study area

The study took place in Tigray regional state, northern Ethiopia. Tigray is divided into 47 woredas (districts) which are grouped into six zones. Tigray has approximately 4.3 million inhabitants, most of them (81.2%) living in rural areas. The dominating religion in the region is Orthodox Christian (95.5%). In Tigray, 95% of the population is Tigrayan and their language, Tigrigna, is the working language in the region. The majority of the population works with agriculture. Famine and drought regularly strikes the region. Malaria epidemics occur during planting and harvesting, decreasing the workforce when it is needed the most. Further consequences of malaria in the region are loss of income, low school attendance, increased workload for health facilities and treatment costs. As in the rest of Ethiopia, malaria transmission in Tigray is very seasonal and occurs mainly below 2,200 meters above sea level (masl). About 78% of the population is at risk of malaria (9).

The health system in Tigray is essentially the same as in the rest of Ethiopia, with primary health care units (PHCUs) on the grass root level. There are five zonal hospitals, six district hospitals and one referral hospital in Mekelle, the capital. In 2006, 28% of all the patients treated in the regions' health facilities were malaria patients. Malaria was the number one diagnosis for out-patient cases, admissions and deaths in the same year. Previous efforts to control the problem have included insecticide residual spraying (IRS) and environmental management. Since 2005, distribution of ITNs has gradually replaced the use of IRS.

The study was conducted in the district of Samre Saharti, located in the north of the region. This district was chosen for logistic reasons. The district is divided into 19 Tabias (subdistricts) and further into 64 Kushets (villages). Samre Saharti has an estimated population of 120,000. Two main eco-epidemiological zones can be distinguished: the lowland comprising villages between 1,500 and 1,812 masl and the highland, between 1,812 and 2,200 masl. More than half of the villages in the Tigray region belong to these kind of zones. The district includes one district health center, four nucleus health centers, and 14 health posts. Population has free access to malaria diagnosis and treatment at all levels. Nearly 70% of the district consists of areas with seasonal or prolonged malaria transmission.

Data collection

A cross-sectional design was used. The study was restricted to the two main eco-epidemiological zones: the low and highlands. The number of villages in the former stratum was 18, and 21 in the latter. A multistage random sampling procedure was used to select a representative sample of households. Calculation of sample size gave a requirement of 840 households per stratum. Thirty clusters were selected in each stratum, randomized to different Kushets, with probability proportional to the number of inhabitants. Twenty-eight households were selected randomly from each cluster.

The field work was conducted in April–May 2007. Twenty-one high-school graduates who were trained for two days were the enumerators and data collection was completed within five survey days.

A structured questionnaire comprising 60 questions was developed. Mothers were the target respondents, because they are the primary care givers at home. The questionnaire included three parts. The first part elicited socio-demographic details (age, ethnic group, marital status, educational level, female occupation, husband's occupation and living conditions). The second part investigated knowledge about malaria transmission, treatment and prevention, and risk perception of the disease. The third section paid attention to prevention and treatment practices of the respondents.

The questionnaire, in Tigrigna, took approximately 30 minutes to administer. Respondents were interviewed in their own homes. The questionnaire was piloted in one community of the area. Results were discussed and some

questions modified. Informed consent was obtained from all study participants.

Data analysis

Data from all the questionnaires were coded, entered and cleaned using Epi Info 6.04. Data were analyzed using SPSS 10/11. Frequencies and proportions were used for the descriptive analysis of the data. Three dependent variables were developed to include the following aspects: (i) malaria knowledge (a score was created with four variables: to correctly mention three or more symptoms of malaria, to correctly mention the cause of malaria and to affirm that malaria can be cured and prevented), (ii) malaria prevention practice (use of ITN during the appropriate season – all year around plus after rainy season) and (iii) malaria treatment practice (to seek for medical treatment within 24 hours of the disease onset). Associations between participants characteristics and positive malaria related KAP were analyzed using X^2 test. Logistic regression was applied to further analyze the relationships between significant socio-demographic factors in the bivariate analysis ($p < 0.05$) and the various aspects of the women's knowledge and practice about malaria. Correlations of participants' knowledge and practice were also explored.

Table 1. Socio-demographic characteristics of the participants, Samre Saharti district, Tigray, Ethiopia, 2007

Variable	$n = 1,652$	(%)
Marital status		
Married	1,319	(79.8)
Widowed	186	(11.3)
Other	147	(8.9)
Religion		
Christian	1,634	(98.9)
Other	18	(1.1)
Respondents' occupation		
Farmer	922	(55.8)
Housewife	585	(35.4)
Other	145	(8.8)
Husband's occupation		
Farmer	1,274	(96.6)
Other	45	(3.4)
Education (years)		
No schooling	11	(0.7)
1	1,496	(90.6)
2–6	133	(8.1)
>6	12	(0.79
Possession of radio	519	(31.4)
Health post in the village	1,456	(88.1)

Results

Socio-demographic characteristics

A total of 1,680 questionnaires were administered in both strata. Due to some missing data, 1,652 questionnaires (840 in the highland stratum and 812 in the lowland stratum) were available for analysis (Table 1).

The mean age of the respondents was 36.9 (SD ± 12.48) years and ranged from 18 to 98 years of age. Most of them were married (79.8%) and Christian orthodox was the predominant religion (98.9%). Over half of the

Table 2. Malaria related knowledge, attitudes and practices of participants in Samre Saharti district, Tigray, Ethiopia, 2007

Variables	$N = 1,652$	(%)
Knowledge		
Malaria symptoms		
Shivering	1,222	(74.0)
Body pain	923	(55.9)
Fever	908	(55.0)
Headache	470	(28.5)
Causes of malaria		
Mosquito bites	807	(48.8)
Sleeping outside	522	(31.6)
Other	282	(17.0)
Malaria can be cured	1,531	(92.7)
Malaria can cause death	1,088	(65.9)
Malaria can be prevented	1,234	(74.7)
How can malaria be prevented		
Environmental management	1,015	(82.3)
ITN	570	(46.2)
IRS	192	(15.6)
Prophylaxis	193	(15.6)
Attitudes		
Malaria as the most serious health problem	1,434	(86.8)
Practice		
Households with bednet	1,419	(85.9)
Seasonal use of ITNs		
Rainy season	729	(44.1)
After rainy season	805	(48.7)
Dry season	162	(9.8)
All year	301	(18.2)
Who uses the bednet		
Underfives	194	(11.7)
Pregnant	16	(1.0)
Others (father/mother/youth/elderly)	947	(60.6)
All	713	(43.2)
Help sought when malaria in the family	486	(94.4)
Within the first 24 hours	156	(32.1)
At a public health facility	477	(98.1)

participants (55.8%) considered themselves as farmers and 35.4% stated housewife as their main occupation. Most of their husbands were farmers (96.6%). The average family size was 5.31 (SD ± 2) and the average number of children under five years of age per household was 1.04 (SD ± 0.9).

The majority of the respondents had not finished primary school (99.3%). The mean number of persons who could read and write in the family was 1.5 (SD ± 1.27) and the proportion of families with no one who could read and write was 22.0%.

To the question whether the respondent or her husband had had any health education, 65.6% answered affirmatively. Most of the women (88.1%) indicated that there was a health post in their village, being the mean walking distance to the health posts 70.5 minutes (SD ± 67.0).

Malaria knowledge, attitudes and practices

Malaria related knowledge, attitudes and practices of the participants are summarized in Table 2. Shivering was the most frequently reported malaria symptom (74.0%), followed by body pains (55.9%) and fever (55.0%). Most of the respondents (92.7%) were able to mention at least one symptom of malaria and 65.3% could mention three symptoms or more.

Mosquito as a cause of malaria was recognized by nearly half of the respondents (48.8%). Almost all the respondents (92.7%) believed that malaria can be cured and pointed modern medicine as the adequate treatment (96.4%). Most of the respondents, 65.9%, believed that malaria can cause death while 23.4% did not. Though the majority of participants (74.7%) believed that malaria is a preventable disease, 15.6% considered the opposite and 9.7% did not know. Environmental management (82.3%) and impregnated bed nets (46.2%) were the most commonly mentioned preventive strategies (Table 2).

When asked the respondent to list the three most serious health problems in their subdistrict (Tabia), 86.8% mentioned malaria. Most of them, 70.4%, put malaria first on their list, 12.8% as second and 3.8% as the third problem. The second most common health problem to be on the list was cough, 49.8%.

Thirty-two percent identified mothers as more likely to get malaria, 23.4% said children under five years of age but only 1.8% identified the pregnant woman as a risk group for getting malaria. More than 30% of the respondents correctly identified September, October, November separately as peak malaria transmission months.

The mean number of ITNs per household as stated by the respondent was 1.72 (±0.98). Most of the households had a bednet (85.9%). Almost all of the respondents said they have at least one ITN and got it from the government (99.4%). More than half (56.0%) of the respondents said that they have enough ITNs to protect their family.

The mean number of months the respondents used ITNs was 6.35 (SD ± 3.27) per year. Forty-four percent used their ITNs during rainy season, 48.7% after the rainy season and 18.2% all year round. Forty-three percent answered that all family members used the ITNs, 30% said only the mother, 17% said only the father and 11% said only children under five years of age. Approximately one-third of participants (33.1%) mentioned the use of ITNs correctly, both in terms of season (all year around and after rainy season) and family members included (all).

Around one-third (31.2%) of the respondents stated that at least one family member had suffered from malaria since the beginning of the last major transmission season (September 2007). The most common family member who had suffered from malaria during the same period was the mother (39.6%) followed by the youths (33.8%), the father (19.2%) and child under five (18.3%). In the majority of the malaria cases (94.4%), help was sought. Among those, approximately a third (32.1%) looked after help within one day. Almost all the respondents (98.1%) said that their family member suffering from malaria sought modern treatment at a public health care facility. Tablets were mentioned as the treatment taken by 82.1% of the patients. Most of the respondents (92.9%, $n = 448$) answered that the treatment was successful.

Determinants of KAP

Younger age among respondents, having a literate person at home, belonging to the lowland stratum, to have received some type of health education and owning a radio were significantly associated with the malaria knowledge score used in this study. Similar findings, except for receiving health education and distance to the health post, were observed when the dependent variable was the use of ITN during the right season. To be a housewife, not to receive health education and living further than 60 minutes walking to the health post were factors associated to a delay in treatment seeking within the first 24 hours of the illness onset (Table 3).

The malaria knowledge score was associated with the use of ITN (OR: 2.6; 95%CI: 2.09–3.22) but not with seeking treatment within the first 24 hours (OR: 1.11; 95%CI: 0.73–1.70).

Table 4 shows the results of the logistic regression analysis. After adjusting for possible confounding factors, several variables (to have a literate person at home, to belong to the lowland stratum, to have received some type of health education and to own a radio) were associated with the knowledge of malaria score. A strong association remained between living in the lowland stratum and the use of ITN; to own a radio and to live

Table 3. Factors associated with malaria knowledge and practice of malaria in Samre Saharti district, Tigray, Ethiopia, 2007. Bivariate analysis showing proportions and statistical significant *p*-values

	High malaria knowledge score[a]	Use of ITN (after rain + all year)	Seeking treatment within first 24 hours
Age (yrs)[b]			
18–24	67.6	63.8	28.1
25–34	70.0	69.2	31.3
35–44	70.4	68.7	35.9
45–54	65.9	65.5	29.8
>55	58.4*	56.9*	32.4
Marital status			
Married	68.4	66.8	31.4
Widow	66.4	65.3	35.4
Religion			
Christian	67.9	66.3	32.3
Other	72.2	77.8	16.7
Education			
2–8 years	69.7	69.7	37.5
0–1 year	67.8	66.2	31.6
Female occupation[b]			
Farmer	67.1	64.1	35.6
Housewife	67.2	69.1	23.8
Other	76.2	66.3	46.3**
Husband's occupation			
Farmer	68.0	66.5	51.5
Other	68.0	66.2	34.3
Children under five			
Yes	69.3	67.8	31.5
No	65.8	65.6	33.5
Person who can read			
Yes	71.0	68.0	31.8
No	57.1**	60.9*	33.3
Strata			
Low	73.5	75.6	30.9
High	62.6**	57.6**	34.0
Health education			
Yes	73	68.1	35.7
No	58.5**	63.4	25.0*
Radio			
Yes	73.8	72.1	34.4
No	65.3**	63.9**	30.7
Health post			
Yes	68.5	66.4	32.6
No	63.8	67.0	24.1
Distance (minutes)			
<60	66.8	70.8	40.0
= >60	69.5	64.3**	26.6**

[a]Score 0–4; low score:0–2; high score: 3–4.
[b]Test for trend.
*$p < 0.05$; **$p < 0.01$

close to the health post were also statistically significant. Finally, being a housewife, lack of health education and to live further than 60 minutes distance walking to the health post continued to be factors associated to a delay on treatment finding.

Discussion

This study has revealed a relative good knowledge about malaria by this rural female population of northern Ethiopia. Most of the women could recognize at least one classic symptom of malaria (92.7%) and thought malaria is a preventable and curable disease. Similar results were found in a similar study conducted among women in another region of the country some years ago (6).

The role of mosquitoes in malaria transmission was recognized by 48.8% of respondents, which was lower than that reported in studies from other subSaharan African countries (10, 11). In Ethiopia, knowledge about malaria transmission has ranged from 17.3 to 63% (6, 12). Though formal education has been discussed as a possible explanation of a better knowledge about the cause of malaria (6), it seems not to be the case given the low educational level in this population. External factors to the women such as to have a person at the house that is literate, to participate in health education, to own a radio or to live in the lowland region were more important in this study. This may indicate the importance of different educational strategies when attempting to communicate health information about malaria. The better knowledge about malaria in those women living in the lowland area might suggest a stronger presence of the MCP in that area. Knowledge was found to be strongly associated with a seasonal adequate use of ITNs which illustrate the capital role that health education plays regarding prevention practices.

Most of the participants pointed modern medicine as their treatment election. This results contrast findings from other African countries where traditional medicine use plays a major role (13). In this study the use of health posts as first choice for treatment (94.4%) and the perceived success of the treatment (93.3%) were very high which might reflect issues of accessibility and quality in the health facilities. Important variations in health seeking behavior regarding malaria treatment in different countries have been identified recently (13). The MCP in the region of Tigray has successfully developed a wide-scale regional coverage serving a significant proportion of the rural population at risk which might explain the high use of a public health care facility as first choice of health care (14).

Most of the households (85.9%) had a bednet which had been distributed by the government. This implies that the campaign of the Ministry of Health to reach 100% ITN coverage by 2010 is being successfully implemented. The MCP recommends the use of ITNs all year round

Table 4. Factors associated with malaria knowledge and practice in Samre Saharti district, Tigray, Ethiopia, 2007. Logistic regression analysis showing the adjusted OR for all variables and their 95% confidence intervals (95% CI)

	Malaria knowledge score[a] Adjusted OR (95% CI)	Correct use of ITN Adjusted OR (95% CI)	Seeking treatment within first 24 hours Adjusted OR (95% CI)
Age (yrs)			
18–24	1.00	1.00	NA[b]
25–34	1.19 (0.85–1.68)	1.41 (1.00–1.98)	
35–44	1.20 (0.85–1.71)	1.40 (0.99–1.98)	
45–54	1.09 (0.74–1.60)	1.22 (0.83–1.79)	
>55	0.92 (0.60–1.42)	0.96 (0.62–1.49)	
Female occupation			
Farmer	NA	NA	1.00
Housewife			0.57 (0.37–0.88)
Other			1.86 (0.78–4.46)
Person who can read			
Yes	1.51 (1.17–1.95)	1.17 (0.90–1.52)	NA
No	1.00	1.00	
Strata			
Low	1.68 (1.35–2.08)	2.39 (1.92–2.97)	NA
High	1.00	1.00	
Health education			
Yes	1.85 (1.48–2.31)	NA	1.63 (1.05–2.54)
No	1.00		1.00
Radio			
Yes	1.35 (1.06–1.72)	1.34 (1.05–1.70)	NA
No	1.00	1.00	
Distance to health post			
<60 min	NA	1.37 (1.09–1.72)	1.57(1.05–2.35)
= >60 min		1.00	1.00

[a]Score 0–4; low score:0–2; high score: 3–4.
[b]NA: not applicable.

but with high emphasis to peak transmission season. While a large proportion of the population (66.9%) was using the ITN during the appropriate season (all year plus after rainy season), only one-third of respondents (33.1%) mentioned that all family members did so. This is an issue where the local malaria control program should concentrate more of its efforts. Being a resident in the lowland stratum and to own a radio were two independent contributing factors to the appropriate use of ITNs. The role of radio broadcasting health messages and a possible greater focus of the MCP in the lowland compared to the highland area should be taken into consideration by the malaria program coordinators.

Approximately a third (32.1%) of patients seek treatment within 24 hours of the onset of the illness. This is similar to a recent Ethiopian study where 28% of children reported with malaria received antimalarial treatment within the first day (15). While not possible to distinguish in this study if the patients were children/adults, the proposed target of at least 80% of febrile children suspected to have malaria having access to treatment within 24 hours of the illness onset seems to be distant (16). The MCP recommends that people should have access to a health post within less than one hour walking. While distance has been associated in other studies with access to a health facility (17), the role of participation in health education in this study should be stressed. Reasons why housewives tend not to look for treatment during the first 24 hours remains unclear and it should be further explored.

Limitations of the study design and the methods of data collection might create some potential for biases in this study. The cross-sectional design gives information about a certain point of time. Answers might have been varied in different malaria seasons. Data collection relied on information given by the interviewees. Practices such

as presence and use of ITN or treatment seeking practices could not be verified.

While international initiatives such as the MDGs are welcome, global targets will never be achieved unless attention is paid to local contexts. This study has identified some aspects which the MCP might need to improve. Malaria knowledge has shown to be an important factor for prevention practices. Specifically the knowledge about malaria transmission and the use of ITN as a malaria prevention method should be strengthened. Promotion of literacy and participation in health education have revealed themselves as vital components in terms of malaria knowledge and practice. Issues related to geographical location, highland vs. lowland, and accessibility to health post should also be carefully examined.

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References

1. CSA. The Ethiopian Demographic and Health Survey 2005. Addis Ababa: Central Statistical Agency; 2006.
2. FmoH. National strategic plan for going to scale with coverage and utilization in Ethiopia, 2004–2007. Addis Ababa: Ministry of Health; 2004.
3. FmoH. Malaria diagnosis and treatment guidelines for health workers in Ethiopia, 2nd ed. Addis Ababa: Ministry of Health; 2004.
4. FmoH. Health extension programme in Ethiopia. Addis Ababa: Ministry of Health; 2007.
5. FmoH. HSDP III. Health sector strategic plan. Addis Ababa: Ministry of Health; 2005.
6. Yeneneh H, Gyorkos TW, Joseph L, Pickering J, Tedla S. Antimalarial drug utilization by women in Ethiopia: a knowledge, attitudes, practice study. Bull World Health Organ 1993; 71: 763–72.
7. Adera TD. Beliefs and traditional treatment of malaria in Kishe settlement area, southwest Ethiopia. Ethiop Med J 2003; 41: 25–34.
8. Tilaye T, Deressa W. Community perceptions and practices about urban malaria prevention and control in Gondar Town, northwest Ethiopia. Ethiop Med J 2007; 45: 343–51.
9. THB. Tigray health profile 2005/2006. Mekelle: HMIS Unit, Tigray Health Bureau; 2006.
10. Vundule C, Mharakurwa S. Knowledge, practices, and perceptions about malaria in rural communities of Zimbabwe: relevance to malaria control. Bull World Health Organ 1996; 74: 55–60.
11. Govere J, Durrheim D, la Grange K, Mabuza A, Booman M. Community knowledge and perceptions about malaria and practices influencing malaria control in Mpumalanga Province, South Africa. South African Med J 2000; 90: 611–6.
12. Deressa W, Ali A, Hailemariam D. Malaria-related health-seeking behaviour and challenges for care providers in rural Ethiopia: implications for control. J Biosoc Sci 2008; 40: 115–35.
13. Williams HA, Jones CO. A critical review of behavioral issues related to malaria control in sub-Saharan Africa: what contributions have social scientists made? Soc Sci Med 2004; 59: 501–23.
14. Ghebreyesus TA, Witten KH, Getachew A, Yohannes AM, Tesfay W, Minass M, et al. The community based malaria control programme in Tigray, northern Ethiopia. A review of programme set-up, activities, outcomes and impact. Parassitologia 2000; 42: 255–90.
15. Deressa W, Ali A, Berhane Y. Maternal responses to childhood febrile illnesses in an area of seasonal malaria transmission in rural Ethiopia. Acta Tropica 2007; 102: 1–9.
16. World Health Organization. African summit on roll back malaria. Abuja, Nigeria, 2000.
17. Buor D. Analysing the primacy of distance in the utilization of health services in the Ahafo-Ano South district, Ghana. Int J Health Plan Manag 2003;18: 293–311.

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