

Community participation in malaria epidemic control in highland areas of southern Oromia, Ethiopia

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Abstract

Background: Satisfactory strategies for the timely and effective control of malaria epidemics have not yet been established in epidemic-prone areas. A devastating malaria epidemic occurred in mid 2000 in four districts of Borena Zone in Oromia Regional State.

Objective: To assess and highlight the importance of community participation particularly that of village malaria workers (VMWs) in the control of malaria epidemics.

Methods: Epidemic-affected peasant associations (PAs) were initially identified from each of the affected districts. One VMW residing in the PA was selected, and training on health education, diagnosis of suspected malaria cases and treatment by Sulfadoxine-Pyrimethamine (SP), referral of severe cases, source reduction of mosquito breeding sites, registration and reporting of treated cases, consumed antimalarials, registration of deaths and assessment of the overall status of the epidemic in their particular PAs was given for three days.

Results: One hundred twenty-four epidemic affected PAs were identified by the study, that and 115 VMWs were deployed to control the epidemic. A total of 72,998 suspected malaria patients were treated by VMWs using SP. Only 11,994 clinical cases of malaria were treated by ordinary health workers at field levels from June–August 2000. A total of 1,323 deaths were reported both by health professionals and the VMWs. Five hundred sixty eight confirmed malaria cases were treated during out patient consultations at Hagere Mariam Hospital during the three month period. In addition, 191 admitted malaria patients and 36 malaria deaths were identified from the Hospital during the June–August 2000 epidemic. The case fatality rate and proportionate mortality ratio for malaria were 20.8% and 90.9% in August, respectively, in the Hospital.

Conclusion: Although health professionals of various categories were mobilized, the epidemic covered wide geographical areas and caused high morbidity and mortality within a short period of time. Therefore, mobilizing of the necessary human and material resources, particularly the community itself is extremely important in the control of malaria epidemics. [*Ethiop.J.Health Dev.* 2005;19(1):3-10]

Introduction

Malaria mainly affects young children and pregnant women in highly endemic areas where immunity is high among most adults. This contrasts with the case of areas of low to moderate endemicity where all age groups are affected by the disease due to the presence of little or no immunity. The latter areas are generally described as highlands and highland-fringes with unstable malaria patterns primarily because of the low and fluctuating levels of transmission experienced by local communities. In such areas, the disease causes severe epidemics characterized by high morbidity and mortality (1-2). Ethiopia is one of the countries of the world that are most affected by malaria epidemic, due to its varying topographical and climatic features, particularly its highlands and highland-fringe areas that are at a special risk of severe epidemics (3-4).

The occurrence of malaria epidemics has been well established in Ethiopia since the 1930s and 1940s. The most devastating and well-recorded epidemics of malaria occurred in 1958 in most of the highlands of the country with an estimated three million cases and 150,000

reported deaths (5). Ever since, numerous major periodic epidemics of different magnitudes have occurred at intervals of 5-8 years (6-8). Nevertheless, the cyclic trends of the epidemics have recently changed to more frequent and widespread scenarios with varying effects in similar or various parts of the country (3). Malaria is generally an epidemic disease in the country owing to its short peak of transmission during the months, September–December, that follow summer rains and the relatively long duration of low transmission during the dry season (January–May), resulting in a low level of acquired immunity by the community (3, 7-8).

In a similar way, the occurrence of malaria epidemics in Oromia Regional State has become more common particularly in recent years due to environmental and climatological factors that include chloroquine-resistant falciparum malaria, high population movements and the expansion of agro-industrial developments and irrigation schemes in malarious areas (3, 8-9). The most notable recent epidemic of malaria in Oromia, although not well documented, was the one that caused high mortality in most highlands from April to November of 1988. Also in

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1991-92, 1995-96 and 1998-99, different parts of Oromia were severely beaten by malaria epidemics which were associated with high mortality (8-10). In most cases, these epidemics were not detected early and of timely contained due to low community awareness, poor surveillance and reporting systems, poor communication systems, and inaccessibility problems.

Indoor residual spraying with DDT was extensively employed in malaria control programs during the early 1970s and 1980s (8, 11). However, with the change in the control program and the adoption of a global malaria control strategy, it has been used more selectively to prevent the occurrence of epidemics (12-13). The coverage of such spraying is, however, very limited and malaria epidemics that caused a high toll of morbidity and mortality have continued to occur. In addition, early diagnosis and effective treatment at health care facilities and occasionally at field levels has also been a cornerstone strategy for malaria epidemic control.

However, recently, the shortage of health professionals, particularly experts on vector control and malaria epidemic management, (14) and the erratic supply of antimalarial drugs have been the major challenges to malaria epidemic control (15). Until 1991, malaria diagnosis and treatment in Ethiopia was rendered mainly through health care facilities. However, most people living in rural areas of the country have limited access to basic health services. Taking these facts into consideration, early diagnosis and treatment strategy at the village level conducted by community health workers (CHWs) was adopted in the 1990s, which has now become an integral component of the malaria control program in the country (8, 16).

Different strategies and approaches have been tried and implemented to control malaria at the community level (16-20). However, no satisfactory strategy has yet been established for an effective and timely control of epidemic malaria. Therefore, devising simple, but effective innovative strategies for malaria epidemic control, particularly in rural communities, study with the reinvigorated global efforts to roll back malaria is highly necessary. The purpose of this is, therefore, to highlight the importance of village malaria workers (VMWs) in the control of malaria epidemics in Borena Zone of the Oromia Regional State. It describes the effects of the epidemics in four districts (*weredas*) and how it was contained by community participation. This report would serve as a baseline for examining the encroachment of malaria into the highlands where it had not been a major problem, and indicates the need for improved epidemic early warning and detection systems.

Methods

Epidemic sites and population

Severe malaria epidemics have occurred between June and August, 2000 in four districts (*weredas*) in Borena Zone of the Oromia Regional State, Ethiopia. Borena is one of the 13 zones of Oromia with an area covering 69,373 km², and administratively divided into 12 districts. Population statistics for the year 2000, based on the 1994 census estimate, indicate that 1,700,003 people live in Borena Zone with females comprising 49%, and a rural population of about 91% (21). The altitude ranges from below 1000 to above 2200 metres above sea level, sloping towards the southern part of the zone. The zone is located in the southern part of Oromia with the lowland districts bordering Kenya in the south and the Ethio-Somali Regional State in the south-east.

The main rainy season extends from June-August in the highlands and highland-fringes to October-December in the lowlands. However, during 1997-2000 there had been a severe shortage of rainfall throughout the zone. Famine and drought were the main problems during these years, resulting in a significant loss of livestock and human life. Of the 12 districts in the zone, six are located in the lowlands, comprise 527,000 (31%) of the total population, four in the highland fringe areas and the remaining two that comprise an estimated 296,157 (17.4%) of the population of the zone are in the cold highland malaria free areas (21).

The four malaria epidemic affected districts; namely: *Hagere Mariam*, *Adola-Wadera* (here after referred to as *Adola*), *Oddo Shakkiso* (here after referred as *Shakkiso*) and *Galan Abaya*, are located in the north western part of the zone and cover an area of 16,293 km² (23.48% of the zone) and had a total population of 876,846 (51.6%) in 2000. These four districts are mainly located between 1500 and 2000 metres above sea level, linking the lowland and highland areas, and represent the most malaria epidemic-prone areas of southern Oromia. The dominant ethnic group in the epidemic affected districts is the Oromo ethnic group. The people of there are as mainly engaged in subsistence farming and cattle rearing.

Malaria is the most common disease in Borena Zone with frequent occurrences of epidemics both in the past and present. The transmission is seasonal and normally peaks during September-December after the summer rainy season. Although not well recorded and documented, malaria epidemics of variable degrees had affected Galan Abaya, Shakkiso and Adola districts during 1997-99 (9). However, there has not been evidence of malaria epidemics from Hagere Mariam District prior to 2000. During the mid of 2000, a malaria epidemic of

unexpected, intensity flared up throughout most of the densely populated highland areas of Borena Zone. Coupled with famine and severe starvation, it caused high morbidity and mortality among the already predisposed population. The four highland fringe districts that are inhabited by over 800,000 people were also severely affected by the epidemics, and morbidity and mortality were reported in many areas of the districts.

Health care facilities

Health services delivery service in the epidemic affected districts is provided by one hospital (Hagere Mariam), one health center (Adola), 23 health stations, six health posts that belong to the Oromia Health Bureau (OHB) and three private clinics. With 100 beds, Hagere Mariam Hospital is the largest medical center in Borena Zone and serves as a referral center for most patients in the zone. Although another private hospital owned by the Laga Denbi Gold Mining Project is located in Shakkiso District, it primarily serves the employees of the company, and the indigenous community has very limited access to it. Most of the health facilities are confined to urban areas. In addition, the existing facilities are inadequately equipped with the necessary facilities, medical equipment and manpower. Peripheral health facilities such as health stations and health posts that have health workers, numbering from one to three are not equipped with laboratory facilities and diagnoses and treatments are provided based on the clinical signs and symptoms of malaria. It was under such circumstances that another innovative and alternative approach with particular emphasis on the involvement of VMWs way devised and implemented in mid 2000 to control the epidemics of malaria in four districts of Borena zone.

Selection and training of VMWs

The peasant associations (PAs) affected by the malaria epidemic were initially identified from each of the four epidemic affected districts through discussions and meetings with health personnel, district administrators, PA leaders, key informants, and the community at large. The community recruited one volunteer VMW residing in the area. Who was deployed for each of the PAs, except in Galan Abaya District where one VMW was assigned to work for one or two PAs. The requirements for the selection of VMWs were literacy (reading and writing), willingness to serve the community trustfully including conducting house to house visits without payment, and willingness to report to health services and district administration offices to submit weekly and progress reports, and to receive antimalarial drugs. The community, on their part had agreed to cover the costs required for transportation and other expenses of the VMWs.

Training on health education, diagnosis of suspected malaria cases and treatment with Sulfadoxine-Pyrimethamine (SP), referral of severe cases, source

reduction of mosquito breeding sites, registration and reporting of treated patients, registration of deaths and assessment of the overall status of the epidemics in their particular PA was given for three days. A special registration form prepared in the local language was developed for documenting morbidity and mortality. The main responsibilities of the VMWs generally included: (i) diagnosis and treatment of uncomplicated malaria cases with SP; (ii) referral of severely ill patients; (iii) community mobilization on environmental management and health education on malaria transmission, prevention, control and the importance of early diagnosis and treatment, and (iv) weekly reporting of their performances.

Treatment of malaria patients by VMWs and drug distribution

The dose of SP used for the treatment of malaria cases is a single oral dose given as 25 mg/kg body weight sulfadoxine and 1.25 mg/kg pyrimethamine, but for ease of administration, a dosage based on the patient's age was used according to the national guideline was used (22). During this epidemic control exercise, SP was the first-line treatment employed for uncomplicated malaria cases handled by community health workers (CHWs). Strict instruction was given for all VMWs to never sell the drugs, and to administer all medications to the patient under supervision. Although patients were expected to come to the home of the VMW, it was not uncommon for the also VMWs to visit severely ill patients in their homes.

Adequate supplies of antimalarial drugs and other necessary resources were guaranteed at Hagere Mariam Hospital for further distribution to peripheral health centers. SP was made available at all peripheral health care facilities and VMWs were given the drugs for distribution to malaria affected communities in their respective PAs. In addition, health workers at the peripheral health service facilities were involved in the control of the epidemics by treating patients at the field level through outreach programs. One health worker was designated from each health service facility to coordinate all epidemic monitor activities and to distribute and control the utilization of antimalarial drugs in each district. Mass drug administration and chemoprophylaxis were not instituted. Likewise, indoor residual spraying with DDT was not initiated due to the wide geographical area coverage of the epidemics and due to fear of high logistical requirement and resource consumption that would otherwise be used by the campaign for the treatment of patients at field sites.

Supervision and monitoring of VMWs

Two senior experts from OHB, and one expert from Borena Zone were primarily engaged in the overall coordination, supervision and control of the epidemics. The PA administrators and community leaders played

instrumental roles in the control and monitoring of the overall epidemic control activities including the follow-up and encouragement of VMWs. They were also responsible for replacing the VMWs when they were no longer giving satisfactory services. Supervision was done through frequent visits to each VMW and PA by supervisors and coordinators. The supervision had multiple advantages: to meet with and review the VMW's activities, to re-supply them with SP, and to make discussions with the residents of the PA and key informants about the status of the epidemic control. All VMWs were supposed to submit their report to their respective health services on a weekly basis. Finally, they were given the SP required for the next working week. In situations where the VMW has never come to the health services for report submission and review meeting, the supervisors and coordinators also attempted to determine the cause of absence.

In addition to the reports by the VMWs, routine data on deaths, admissions and out-patient attendances before, during and after the epidemic were collected from registers in Hagere Mariam Hospital and Adola Health Center. Reports of clinical malaria received from peripheral health stations and health posts were partly collected, but not used in this report owing to their incompleteness and lack of consistency. The data compiled from the reports of VMWs and records of

hospital and health centers were analyzed and used in the preparation of this report.

Results

A preliminary analysis of the local situation through discussions and meetings with health workers, local administrators and at large by the community at large revealed 124 (51.45%) epidemic affected PAs from a total of 241 PAs in the affected four districts in the Borena Zone (Table 1). Climatic changes coupled with drought and famine were the major factors identified as major causes of the epidemics. The epidemic started during May-June 2000 in Hagere Mariam District after an unusual heavy rainfall followed by months of fairly high temperature. The rain stopped for about two months and it was during this time that the epidemic occurred. It was speculated that the epidemic in Hagere Mariam District vastly spread to the surrounding districts with highlands and highland-fringe areas. The proliferation of mosquito breeding sites coupled with warm and high temperature was thought to be the determinant factor for the occurrence of the epidemics. Particularly, in Shakkiso District where the gold mining is under way both by a private organization and where an unknown number of migrants come to work in the mines from different parts of the country, a lot of excavation works holding water bodies suitable for mosquito propagation were observed.

Table 1: Total population, affected PAs and number of NMWs involved in the control of malaria epidemics in Borena Zone, 2000

Name of the district	Area in km ²	Total population	Total PAs	No. of affected PAs (%)	No. of VMWs
Hagere Mariam	6183	472171	98	56 (57.14)	56
Adola	2640	161410	66	22 (33.33)	23
Shakkiso	4080	110237	41	22 (53.66)	22
Galan Abaya	3390	133028	36	24 (66.67)	14
Total	16293	876846	241	124 (51.45)	115

Health professionals of various categories and resources were mobilized for the control of epidemics. A total of 11,994 clinical malaria cases were also treated at field levels and 261 deaths from all-causes were reported by health workers from June to August, 2000, with the highest number of death reports obtained from Hagere Mariam District (Table 2). In addition, blood slides were collected and examined at Hagere Mariam Hospital during the months from May – July. Out of 307 blood slides collected from febrile patients attending the hospital in May 2000, 107 (35.0%) were microscopically confirmed to have malaria with 88.8% of them having *Plasmodium falciparum*. Similarly, in June and July, 205

and 248 blood slides were collected and examined, giving a 27.3% and 62.5% slide positivity rate, respectively. During these months, *P. falciparum* was found to have contributed to 87.5% and 76.1% of all the positive malaria cases, respectively. Likewise, out of 20 blood slides collected in the field in rural Hagere Mariam District, 65% were positive for malaria predominantly *P. falciparum*. The slide positivity rate was extremely high during July, indicating the severity of the epidemics. The health workers in Galan Abaya District could not do an out reach program, as the malaria epidemic in this district occurred after the detection of epidemics in Hagere Mariam and other districts.

Table 2: Clinical malaria cases treated and deaths reported by health workers at field level during malaria epidemic control in Borena Zone, 2000

Name of the district	No. of clinical malaria treated by health workers				No. of deaths reported by health workers			
	Jun	Jul	Aug	Total	Jun	Jul	Aug	Total
Hagere Mariam	2380	2634	150	5164	51	60	10	121
Adola	a	3900	1121	5021	a	36	9	45
Shakkiso	a	1525	279	1804	a	66	29	95
Total	2380	8059	1550	11994	51	162	48	261

a No report of treated malaria cases and deaths by health workers at field level

One hundred and fifteen volunteer VMWs were involved in the treatment of febrile patients with signs and symptoms suggestive of malaria, as well as for the mobilization of communities for early treatment and environmental management activities. A significant number of febrile patients were treated by the VMWS in August 2000. A total of 72,998 patients were treated, with 55.7%, 20.7%, 11.6% and 11.9% being from Hagere Mariam, Galan Abaya, Adola and Shakkiso districts, respectively (Table 3). In addition, 1062 deaths were reported by VMWs, with 42.3% and 33.2% from Hagere Mariam and Shakkiso Districts, respectively. All these

deaths occurred during August in all the PAs supervised by the VMWs, but it is very difficult to attribute all these deaths to malaria. Deaths during July and September were not reported by VMWs, mainly due to the less severity and magnitude of mortality compared to those that occurred in August. The age and sex of the febrile patients treated by health workers and VMWs was not used for analysis due to the incompleteness of available data related to these variables. However, it was observed that all age groups and both sexes were invariably affected by the disease.

Table 3: Clinically treated cases of malaria and deaths reported by VMWs during the first and latter two weeks of August, Borena Zone, 2000

Name of the district	Clinical cases of malaria treated by VMWs			Deaths reported by VMWs		
	1-15 August	16-31 August	Total	1-15 August	16-31 August	Total
Hagere Mariam	19792	20880	40672	300	149	449
Adola	2580	5869	8449	12	a	12
Shakkiso	2754	5978	8732	353	a	353
Galan Abaya	4691	10454	15145	132	116	248
Total	29817	43181	72998	797	265	1062

a No report of deaths by VMWs from PAs in the affected districts

A record review of Hagere Mariam Hospital and Adola Health Center for the year 2000 revealed a high magnitude of malaria cases treated at the out patient departments. Of 10,458 out patient consultations male at Hagere Mariam Hospital during the year, 1,864 (17.8%) were found to be due to malaria (Table 4). About 90% of the out patient cases of malaria were treated based on clinical signs and symptoms of the disease, while 88% of the 189 microscopically confirmed malaria cases were due to *P. falciparum*, the remaining 12% being due to *P. vivax*. A total of 1,232 patients were admitted to the hospital during the year, 560 of whom (45.5%) were due to malaria (Table 4). Among the admitted malaria cases, 77.2% were due to *P. falciparum*, 19.8% were unspecified cases and 3% were due to *P. vivax*. Of 196 deaths reported from all-causes in Hagere Mariam Hospital during the same year, 110 (56%) were attributed to malaria, up to 90% in August. Of the total malaria deaths, 68.2% were due to falciparum malaria, while the rest were not specified. The case fatality rate (CFR) for

malaria at the hospital also showed a significant increase from 17.1% in June to 31.4% in December (Table 4). Deaths due to malaria were observed among all age groups and both sexes.

During the same year, a total of 7,799 outpatient consultations were recorded at Adola Health Center (650 per month), of which 1,025 (13.2%) were due to malaria. The proportion of malaria outpatient attendants was 20.6% in June, 14.7% in July, 29.5% in August, 23.6% in September and 14.7% in October. Likewise, the malaria admission rate in the health center was very high. For example, among the 251 admissions reported in the health center during the year, 147 (58.6%) were due to malaria. Thus, the malaria attributed admission rate was 45.5% in May, 66.7% in June, 60% in July, 83.3% in August, 85.7% in September and 18.2% in October. Three malaria related deaths were reported in the health center from a total of eight deaths during the year.

Table 4: All-causes and malaria specific out-patient consultations, admissions and deaths at Hagere Mariam Hospital, 2000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
All OPD cases	595	809	880	1077	130	100	620	834	792	820	842	889	10458
Malaria OPD ^a cases	49	91	183	283	209	197	134	237	197	128	101	55	1864
Malaria cases (%)	8.2	11.3	20.8	26.3	16.1	19.7	21.1	28.4	24.9	15.6	12.0	6.2	17.8
All admissions	117	35	87	107	106	84	69	144	142	125	112	104	1232
Malaria admissions	39	16	37	37	26	41	54	96	87	62	30	35	560
Malaria admission (%)	33.3	45.7	42.5	34.6	24.5	48.8	78.3	66.7	61.3	49.6	26.9	33.6	45.5
All deaths	12	5	13	18	11	16	26	22	24	18	16	15	196
Malaria deaths	8	5	4	7	3	7	9	20	17	12	7	11	110
PMM ^b (%)	66.7	100	30.8	38.9	27.3	43.8	34.6	90.9	70.8	66.7	43.8	73.3	56.1
Malaria CFR ^c (%)	20.5	31.3	10.8	18.9	11.5	17.1	16.7	20.8	19.5	19.4	23.3	31.4	19.6

a=Out-patient department, b= Proportionate Malaria Mortality c= Case Fatality Rate

Discussion

This study demonstrates that malaria epidemic with a resulting high morbidity and mortality is a major health problem in rural communities and serves in quantifying the impact of the disease. The magnitude of severe malaria cases admitted to Hagere Mariam Hospital and Adola Health Center with their corresponding high number of deaths was saddening. Malaria proportionate mortality and case fatality rates were extremely high. Of the 196 total deaths recorded in Hagere Mariam Hospital, 110 (56.1%) were due to malaria, which could have been due to the rapid progression of the disease and/or because of the delay in seeking the appropriate treatment. This shows that the disease still continues to pose serious threats to a considerable proportion of people in the rural areas of Ethiopia.

In highlands or areas with low to moderate endemicity characterized by short seasonal transmission rates, the proportion of sick people with fever and positive blood film for malaria is expected to be higher than the 30-40% figures for the normal transmission seasons (23) and above 70% for the malaria epidemics. In malaria endemic areas that do not have laboratory facilities, the treatment of malaria is based on clinical signs and symptoms of the disease, particularly the occurrence of fever or a history of fever (13, 22). The assumption is that all patients with febrile illnesses are considered to be due to malaria, and efforts should be made to improve the clinical diagnosis and treatment of malaria.

Climatic changes coupled with drought and famine were the major factors involved in the occurrence of the epidemics in Borena Zone. Unusually heavy rainfall followed by high temperature was considered as the cause of the epidemics. Changes in weather conditions also probably played major roles as causes for the most severe of malaria epidemics in Ethiopia. Studies have demonstrated that an abnormal increase in minimum temperature is very likely to lead to malaria epidemics in the highlands, but rainfall determines the risk of epidemics in the lowlands (3). Further more, malaria epidemics in specific years are associated with specific

geographical areas. The main cause of the 1958 epidemic was suggested to be unusually high rainfall that was followed by abnormally high temperature and humidity (5). It has been observed that above average temperature and rainfall are the most important climatic conditions preceding malaria epidemics in Ethiopia, and improved malaria epidemic forecasting using both meteorological and morbidity data has been suggested as feasible and important for improved control of the epidemic (24). Accordingly, the new national guidelines for malaria epidemic prevention and control in Ethiopia stressed the importance of meteorological, entomological and morbidity information for forecasting and early detection of epidemics (4).

Although great attention has been given to the forecasting and early detection of malaria epidemics in Ethiopia, frequent occurrence of malaria epidemics, particularly in the highland and highland-fringe areas, have been observed since the late 1980s (3, 8, 24). Mortality due to malaria epidemics in 1998 was very high; with 7,783 deaths occurring out of 222,992 clinical cases in west and east Gojjam Zones between September and December (25). The major cause of the epidemics was infection with *P. falciparum*. From 1986-93, 68% of the total malaria cases reported in Ethiopia from 48 epidemic episodes were due to *P. falciparum*, while most of the remaining were due to *P. vivax* infections (3).

But, none of the malaria epidemic reports demonstrated or examined how the epidemics were detected and controlled. Little attention has been given to the control, documentation and examination of the effects of the epidemics. The control of malaria epidemics in most parts of Ethiopia has been traditionally tackled merely by drugs mobilizing health professionals for treatment at both health care facilities and field levels. The mobilization of health workers alone is not only insufficient to control epidemics when malaria outbreaks cover wider geographical areas, but it also incapacitates the already overwhelmed health services. Under such situations, mobilization of community volunteers to

provide antimalarial appears to be a promising alternative.

CHWs have recently played an active role in malaria treatment and prevention activities in different countries. In Ethiopia, early diagnosis and treatment at the village level by CHWs was introduced in the early 1990s (16). This initiative is now accepted as an important means of intensifying malaria control in all malarious areas of the country. The OHB currently initiated the training and deployment of unpaid VMWs for malaria treatment in selected rural malarious areas that do not have health care facilities. Although VMWs have been in existence for a long time (16, 18, 26), attempts have never been made to document their major role in the control of malaria epidemics. Unlike causes of low malaria transmission, participation communities during epidemics is extremely high. The communities assume greater importance as VMWs during malaria epidemics as a means of reducing morbidity and mortality caused by the disease through the rapid and effective treatment of malaria. One of the major reasons for the success of VMWs in malaria epidemic control is the commitment of the community and local administrative bodies in supporting them, the supervision made in the field by health workers and the personal satisfaction they derive from being able to help their own people.

In areas where *P. falciparum* is the main cause for the occurrence of the epidemics and where the disease is sensitive to the available antimalarials, the timely administration of the drug will undoubtedly reduce malaria morbidity and mortality. VMWs played a leading role in the control of malaria epidemics that occurred in Borena Zone. After the containment of the epidemics in September, most VMWs continued to serve the community until December 2000. Many of them who developed an interest in malaria control were reselected by OHB to serve as CHWs. The experiences and lessons learnt from this intervention could also be applicable in rural communities-living residing in similar malaria epidemic-prone areas.

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