Impact of home management of *Plasmodium falciparum* malaria on childhood malaria control in sub-Saharan Africa

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**Abstract.** In sub-Saharan Africa almost all of the malaria deaths occur in children below five years of age and these deaths occur within 48 hours of onset of symptoms. Consequently, the home management of malaria (HMM), was introduced to ensure early recognition of and prompt and appropriate response to malarial illness in children within the home or the community. In this report the impact of HMM in childhood malaria control in sub-Saharan Africa was reviewed using relevant publications identified through a Medline Entrez-Pubmed and Google search. There was convincing evidence from the studies reviewed that HMM played a contributory role in reducing progress to severe malaria and overall childhood mortality. The major challenges to the implementation of HMM included failure of caregivers to complete a full course of antimalarial drug, provision of financial motivation to community drug distributors, non-adherence of health workers to recommendations on the use of antimalarial drugs, limited acceptance, possible adverse outcomes, and long term sustainability of HMM. With increased political will and commitment of all stakeholders as well as the mobilization of additional and substantial resources for implementation by the global community, the Abuja declaration of halving mortality from malaria in African may be attained in the nearest future.

**INTRODUCTION**

Malaria remains the most complex and overwhelming health problem, facing humanity with 300 to 500 million cases and 1 to 3 million deaths per year (WHO, 2000). Malaria is a disease known to be associated with poverty and underdevelopment, and is a major scourge in the vast majority of tropical and subtropical regions of the world. Sub-Saharan Africa is the most affected region where about 90% of all malaria deaths in the world today occur largely because the majority of infections are caused by *Plasmodium falciparum*, the most dangerous of the four human malaria parasites. In addition, high malaria transmission intensity, limited access to adequate treatment, increasing parasite resistance to affordable and safe medicines (chloroquine, sulphadoxine-pyrimethamine and amodiaquine); increasing vectors resistance to widely used insecticides, delayed care-seeking and inappropriate treatment at home or at community level, are some other major causes for this deleterious situation (Ajayi *et al.*, 2008a, 2008b; Tiono *et al.*, 2008; WHO, 2008; Hopkins *et al.*, 2007). Furthermore, the greatest burden of malarial disease and death is borne by poor people in the poorest countries of sub-Saharan Africa, whose populations also have the least access to interventions against the disease (WHO, 2005a). The reported number of malaria outpatients increased steadily from 3.2 million in 2001 to 8.4 million in 2006 in the countries of the WHO African Region, and hospital admissions for malaria in these countries doubled from 1 million to 2.2 million over the same period, and malaria
deaths rose from 100,504 to 258,548 (Rowe et al., 2006; Sharp et al., 2007; WHO, 2003, 2005a, 2005b, 2005c, 2008).

In sub-Saharan Africa almost all of the malaria deaths occur in children below five years of age and this translates to the child mortality of nearly 1 million each year (DFID, 2004; Hopkins et al., 2007; WHO, 2008). Indeed, every 30 seconds a child dies of malaria, a death toll of about 3000 children every day in the sub region (WHO, 2003, 2008). The consensus view of recent studies and reviews is that malaria causes at least 20% of all deaths in children under 5 years of age in Africa (Rowe et al., 2006; Gyapong & Garshong, 2007; Hopkins et al., 2007; Sharp et al., 2007). It was noted that in year 2000 nearly all (94%) of the deaths due to malaria in children were in areas with high intensity transmission in the central regions of Africa and two thirds (68%) of these deaths occurred in rural areas with high intensity transmission, and a quarter (26%) were in urban areas with high intensity transmission (Snow et al., 2001; 2003, 2004; Omumbo et al., 2004; Omubo & Snow, 2004; Rowe et al., 2006). Kakkilaya (2006) noted that in endemic and hyperendemic areas, the parasite rate increases with age from 0 to 10% during first three months of life to 80 to 90% by one year of age and the rate persists at a high level during early childhood. In areas of low endemicity, where the immunity is low, severe infection occurs in all age groups including adults and the morbidity and mortality due to malaria in children tend to be very high in these areas. Severe falciparum malaria has been shown to be the commonest cause of death in infants and children in areas endemic and hyperendemic for malaria. Inadequate immunity results in rapid increase in the parasite count and development of complications; furthermore, delay in diagnosis and treatment also contributes to the mortality (Miller et al., 2002; Dzeing-Ella et al., 2005; Kakkilaya, 2006).

Up to eighty percent of the childhood deaths due to *P. falciparum* malaria occur during the first 24 hours following admission (Schellenberg et al., 1999; Breman, 2001; WHO 2002; DFID, 2004; Idro et al., 2006). The acquisition of malaria immunity is closely linked to the level of transmission and severe *P. falciparum* infection is very rare after the age of 5 years in highly endemic areas (Newton & Krishna, 1998; Murphy & Breman, 2001; Dzeing-Ella et al., 2005; Rowe et al., 2006). Since the majority of children who die from malaria do so within 48 hours of onset of illness, the early use of effective antimalarial medicines in or near the home was thought to be able to reduce the burden of malaria in endemic areas. This acknowledged time element is critical to saving children’s lives in Africa, and reducing severe malaria morbidity and mortality in non-immune older children and adults in other regions of the world (Newton & Krishna, 1998; Baume, 2002; Were, 2004).

Despite the established fact that a strong health-care delivery system would ideally be able to provide early, reliable diagnosis and appropriate, prompt and effective treatment, most people at highest risk of malaria, particularly in rural areas in sub-Saharan Africa, live outside easy geographical reach of health facilities, and their access to curative and diagnostic services is, therefore, limited (Foster, 1995; Salako, et al., 2001; WHO, 2005a). Consequently, the malaria control programmes in various countries of sub-Saharan Africa have sought to make treatment available as near to the home as possible, whether in the community or in the home itself (Gyapong & Garshong, 2007; Hopkins et al., 2007). This strategy of community-based management of malaria cases which is referred to as the home management of malaria (HMM), was designed to ensures early recognition of and prompt and appropriate response (treatment) to malarial illness in children under five years of age within the home or the community (Sirima et al., 2003; Were, 2004; WHO, 2005a; Tiono et al., 2008). In the Abuja Declaration of April 2000, African Heads of State resolved to support scaling-up of the malaria interventions, which form the core of the Roll Back Malaria (RBM) strategy, aimed at halving mortality from malaria particularly in African children by 2010 (Abuja, 2000; WHO, 2002, 2004, 2005, 2008).
The objective of this report therefore was to review the impact of the home management of malaria which is one of the major strategies designed to accomplish the Abuja declaration with respect to childhood malaria control in sub-Saharan Africa. This is with the view to assessing progress made so far, and highlighting the need for the development of appropriate public health policy on the prevention, care, prompt treatment, and support activities in light of the epidemiological importance of *P. falciparum* malaria and its impact on child well-being in sub-Saharan Africa. To achieve this, a total 134 publications was retrieved from the Medline Entrez-Pubmed search as of November 2008 for the review. Additional publications were obtained via the Google search. References from selected publications were also used to identify additional relevant literature for the review.

**Burden of childhood malaria in Sub-Saharan Africa**

It is pertinent to state that childhood mortality remains unacceptably high in sub-Saharan Africa despite a better understanding of pathophysiology and management of childhood malaria (Marsh et al., 1995; Miller et al., 2002; Rowe et al., 2007; Roca-Feltrer et al., 2008). Countries such as Burkina Faso, Chad, Niger, Mali and Nigeria recorded more than 8 childhood deaths per 1000 in the year 2006 (Table 1) (WHO, 2008). There were an estimated 881 000 (610 000–1 212 000) deaths worldwide in 2006 due to malaria of which 90% were in the African Region and an estimated 85% of deaths occurred in children under 5 years, but the proportion is much higher in the African (88%) than in other regions (WHO, 2008). Eighteen countries which account for 90% of deaths due to malaria in the African Region include Malawi, Zambia, Guinea, Chad, Mozambique, Côte d’Ivoire, Angola, Cameroon, Mali, Ghana, Burkina Faso, Kenya, Niger, United Republic of Tanzania, Ethiopia, Uganda, Democratic Republic of the Congo, and Nigeria (WHO, 2008). Children in areas with very high malaria transmission in sub-Saharan Africa have been shown to record the highest admission parasite densities and proportion of patients with life threatening features (Idro et al., 2006; Abdalla et al., 2007; Bassat et al., 2008; Eliades et al., 2006; Mabunda et al., 2008). According to Roca-Feltrer et al. (2008) an estimated 545 000 (uncertainty interval: 105 000–1 750 000) children under the age of 5 in SSA experienced an episode of severe malaria for which they were admitted to hospital, while a total of 24 000 (interquartile range: 12 000–37 000) suffered from persistent neurological deficits as a result of cerebral malaria and the number of malaria fevers associated with high parasite density in under-5s in SSA in 2000 was estimated as 115 750 000 (uncertainty interval: 91 243 000–257 957 000).

Kazembe et al. (2007) indicated that malaria endemicity is an important risk factor for child mortality and confirmed the effects of bio-demographic and socio-economic variables (maternal education, maternal age, birth order and place of residence) on infant and child mortality. The profound consequences that one or more episodes of malaria may have on a child’s subsequent health and development are often unrecognized or inadequately managed (WHO, 2002; Korenromp et al., 2004; Ringsted et al., 2006). The high, early and repeated exposure to malaria results in low haemoglobin levels and a high proportion with severe anaemia (Snow et al. 1994; Greenwood, 1997; Snow et al., 1999; Reyburn et al., 2005). Although nutritional deficiencies, hookworm infection, and HIV all predispose to anaemia in children, evidence suggests that, in endemic countries, malaria is one of the most important factors (WHO, 2002; Dzeing-Ella et al., 2005; Mabunda et al., 2008). It has been estimated that severe malarial anaemia causes between 190 000 and 974 000 deaths each year among children < 5 years (Murphy & Breman, 2001). Although blood transfusion may be life-saving in this situation, it also exposes children to the risk of HIV and other blood-borne diseases (WHO, 2002).

It is estimated that African children have between 1.6 and 5.4 episodes of malarial fever each year, a figure that varies according to geographical and epidemiological
circumstances (Murphy & Breman, 2001). Under conditions of high transmission children are exposed to a high number of infectious bites and develop correspondingly high parasite densities (Slutsker et al., 1996). The sequestration of such high parasite loads in cerebral vessels may be responsible for initiating pathological mechanisms that may result in seizure disorders (Gimenez et al., 2003). Comparisons between different types of malaria parasites provided further evidence to suggest that \textit{P. falciparum} parasites may be epileptogenic (Wattanagoon et al., 1994). The frequency of severe malarial anaemia, seizures both simple and repeated, and impaired consciousness as manifestations of severe malaria in children under 5 years of age increase with rising transmission intensity and parasite load, thus heavy \textit{P. falciparum} malaria parasitaemia may be important in the development of seizures, severe anaemia and impaired consciousness (Idro et al., 2006).

Cerebral malaria attributable to \textit{P. falciparum} infection is a very common occurrence amongst children in malaria endemic areas and is estimated to affect 575,000 children in sub-Saharan Africa every year and is among the deadliest forms of malaria, with an average estimated mortality rate of 18.6% (Murphy & Breman, 2001; John, 2007). Neurologic effects of malaria have been studied in subjects who have recovered from cerebral malaria. Such studies have revealed psychological as well as neurologic sequelae including learning disabilities among post-cerebral malaria subjects (Meremikwu et al., 1997; Holding et al., 1999; Boivin, 2002). Idro et al. (2007) reported neurological involvement in nearly 50% of children with acute falciparum malaria in Kenya which manifested as seizures, agitation, prostration, and impaired consciousness or coma. They further noted that factors independently associated with neurological involvement included past history of seizures, fever lasting 2 days or less, delayed capillary refill time, metabolic acidosis, and hypoglycemia with mortality being higher in children with the neurological involvement. A number of reports have indicated that children who had falciparum malaria neurological involvement and those who succumb to cerebral malaria but survive are often left damaged (John, 2007; Idro et al., 2007). In fact it is reported that approximately 7% of children who survive cerebral malaria are left with permanent neurological problems including weakness, spasticity, blindness, speech problems and epilepsy (WHO, 2002; Carter et al., 2005a; Hunt et al., 2006; Boivin et al., 2007). In most parts of sub-Saharan Africa the plight of such children is compounded by the limited availability of specialized educational provision and equipment. Consequently opportunities for subsequent learning, and for attainment of independence, are compromised even further (Carter et al., 2005a, 2005b, 2006; WHO, 2002). Holding et al. (1999) had earlier provided evidence which suggests that some children who appear to have made a complete neurological recovery from cerebral malaria may develop significant cognitive problems (attention deficits, difficulty with planning and initiating tasks, speech and language problems), which can adversely affect school performance. This condition reduces social interaction, increases learning difficulties, leading to poor development (Fernando et al., 2003). Recurrent infections can leave the child listless and with a poor appetite. Recurrent episodes of malaria in the child are likely to result in the loss of a substantial amount of time from school. Preliminary data from Sri Lanka suggest that multiple attacks of uncomplicated malaria per se have a deleterious effect on school performance, and that this is independent of both school absenteeism and socioeconomic circumstances (Fernando et al., 2003).

In endemic regions of sub-Saharan Africa the childhood malaria case-fatality rate greater than 0.6% has been recorded (Table 1) (WHO, 2008). As most deaths from malaria occur in the first 24 hours of admission, this highlights the need for early recognition and treatment of the most severely ill children (WHO, 2002). This is a key RBM strategy and is based on the widespread recognition that untreated \textit{P. falciparum} malaria contributes both directly and indirectly to death,
Prompt treatment with effective antimalarial therapy is essential and African leaders have committed to ensuring that 80% of malaria episodes are adequately treated within 24 hours of onset of symptoms by 2010 (WHO/RBM, 2005). Other benefits of early treatment include reduction of malaria associated anaemia, reduction in debilitation and the days off work or school leading to increased school attendance, productivity and hence economic growth (Fernando et al., 2003; Were, 2004). Early diagnosis and classification of severe malaria would therefore allow appropriate management, including basic adjunctive therapy such as to prevent hypoglycaemia, and better use of scarce health care resources and together these improvements could contribute to a reduction in the intractably high mortality due to the disease (Dzeing-Ella et al., 2005). However, treatment of malaria is challenged by inadequate health-care infrastructure in many parts of Africa (Kager, 2002). Health facilities are often resource-limited, and access to care may be limited by distance, fees, inadequate staffing, and lack of essential medicines (Foster, 1995). The worst malaria situations occur in remote rural areas and among marginalised poor populations, ethnic minorities, and forest dwellers in sub-Saharan Africa (Were, 2004).

**Justification for home management of malaria**

In an effort to address the malaria scourge and reduce the resultant high childhood mortality in Africa, the African Heads of State had adopted the access to prompt and effective treatment for at least 60% of those

<table>
<thead>
<tr>
<th>Country</th>
<th>Malaria cases</th>
<th>Malaria deaths</th>
<th>Malaria case-fatality rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>1 872 000</td>
<td>17 000</td>
<td>0.91</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>3 791 000</td>
<td>25 000</td>
<td>0.69</td>
</tr>
<tr>
<td>Cameroon</td>
<td>2 767 000</td>
<td>18 000</td>
<td>0.65</td>
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<tr>
<td>Chad</td>
<td>2 533 000</td>
<td>17 000</td>
<td>0.67</td>
</tr>
<tr>
<td>Cote D'Ivoire</td>
<td>3 928 000</td>
<td>18 000</td>
<td>0.46</td>
</tr>
<tr>
<td>Congo DR</td>
<td>14 815 000</td>
<td>90 000</td>
<td>0.61</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>2 073 000</td>
<td>25 000</td>
<td>1.20</td>
</tr>
<tr>
<td>Ghana</td>
<td>3 935 000</td>
<td>21 000</td>
<td>0.53</td>
</tr>
<tr>
<td>Kenya</td>
<td>NA</td>
<td>18 000</td>
<td>NA</td>
</tr>
<tr>
<td>Madagascar</td>
<td>234 000</td>
<td>1 800</td>
<td>0.77</td>
</tr>
<tr>
<td>Malawi</td>
<td>4 528 000</td>
<td>11 000</td>
<td>0.43</td>
</tr>
<tr>
<td>Mali</td>
<td>2 610 000</td>
<td>22 000</td>
<td>0.84</td>
</tr>
<tr>
<td>Mozambique</td>
<td>4 470 000</td>
<td>15 000</td>
<td>0.34</td>
</tr>
<tr>
<td>Niger</td>
<td>3 590 000</td>
<td>30 000</td>
<td>0.84</td>
</tr>
<tr>
<td>Nigeria</td>
<td>34 096 000</td>
<td>219 000</td>
<td>0.63</td>
</tr>
<tr>
<td>Senegal</td>
<td>391 000</td>
<td>8 700</td>
<td>2.20</td>
</tr>
<tr>
<td>Uganda</td>
<td>6 353 000</td>
<td>39 000</td>
<td>0.61</td>
</tr>
<tr>
<td>Tanzania</td>
<td>5 469 000</td>
<td>31 000</td>
<td>0.57</td>
</tr>
<tr>
<td>Zambia</td>
<td>2 083 000</td>
<td>12 000</td>
<td>0.58</td>
</tr>
</tbody>
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NA = Data not available
Source: WHO 2008
suffering from malaria as one of the goals in reducing the malaria burden for the vulnerable population in Africa (Abuja, 2000). However, Tiono et al. (2008) noted that this goal in the context of the limited coverage of the population by health facilities in most of the malaria endemic countries particularly in sub-Saharan Africa seems quite ambitious and difficult to achieve. This development therefore justifies the introduction of the HMM with the view to providing prompt and effective treatment of malaria episodes to those who need it close to their homes and this represents one of the major strategies that could contribute to achieve this goal (WHO, 2005a).

In Africa when a child is sick of malaria or other childhood illness, the choice of treatment is greatly influenced by the access that individuals have to health care (McCombie, 1996). Snow et al. (1992) had noted that the determinants of treatment-seeking behaviour in Africa are the distance to be travelled, the cost of care, care providers’ attitudes, time spent at the facilities and the overall availability of the services and medicines. As a result of inadequate public health care facilities in most malarious areas of sub-Saharan Africa and the very poor access to such health facilities when available, individuals have resorted to self-medication through the unregulated private and informal sector in a bid to treat childhood malaria. Consequently, taking their children to health centres is the last thing that mothers consider when a sick child has failed to respond to home treatment or the condition is exceptionally severe (Deming et al., 1989; Ruebush et al., 1995; Foster, 1995). It is estimated that fewer than 20% of children with malaria in endemic areas are treated in formal health-care settings (Breman, 2001). Generally, it is the mothers who identify fever in their children and provide presumptive treatment. Studies in Ghana, Mali, Nigeria and Zambia have shown that as many as 90% of children with fever are treated at home (Salako et al., 2001; Baume, 2002; WHO/RBM, 2005).

A number of recent studies conducted in sub-Saharan Africa have provided evidence to prove that HMM can improve the ineffective self-medication practices that are very common in malaria-endemic countries; these studies recognized HMM as an integral part of an overall malaria case management strategy aiming to improve access to treatment for malaria in areas with limited access to health facilities and if correctly implemented it can enhance the early identification of malaria and appropriate treatment, especially in children under five years of age, in the home (Malik et al., 2006; Dada & Omokhodion, 2007; Gyapong & Garshong, 2007; Tiono et al., 2008; Hopkins et al., 2007; Nsabagasani et al., 2007; Nsungwa-Sabiiti et al., 2007; Ajayi et al., 2008a, 2008b, 2008c, 2008d; Mumuni & Nyanchongi, 2008). In Uganda Nsabagasani et al. (2007) demonstrated that the community appreciates the contribution of home based management of fever which is an important prerequisite in the strengthening of HMM. Another study from Uganda reported that under home based management of fever including malaria, starting treatment within 24 hours of symptoms onset and taking treatment for the recommended three days duration was associated with a lower perceived treatment failure and caregiver’s perceived treatment outcome was better in HMM compared to alternative informal sources of treatment (Malimbo et al., 2006). Because HMM will benefit the poor and has proven effective in reducing child mortality, morbidity, reports have indicated that it has gained acceptance among rural mothers and spreads across sub-Saharan Africa (Sirima et al., 2003; Källander et al., 2003; Källander et al., 2006; Ajayi et al., 2008a).

Thus, medicine shops or vendors, retail shops and left-over medicines are often the first and even the only response to treatment at the onset of symptoms (McCombie, 1996). Reasons for preferring shops include greater geographical accessibility, shorter waiting times, longer opening hours, greater confidentiality and lower costs (Brugha & Zwi, 1998). Unfortunately, the quality of treatment in these settings is often sub-standard because in most cases poor quality drugs and inadequate treatment are administered. Mothers and caregivers only
usually visit a health centre or hospital after the illness has failed to respond to several drugs and ineffective self treatment. This practice increases morbidity and mortality in addition to contributing to possible emergence of drug resistance in sub-Saharan Africa (WHO, 2002).

To reduce the morbidity and mortality of childhood malaria and the development of drug resistance the World Health Organization developed a strategy which includes, as one of its main components, the early diagnosis and appropriate treatment of malaria (WHO, 1993). Since many childhood deaths from malaria occur within 48 hours of onset of symptoms, it was recommended that antimalarial drugs be given at home to all febrile children (WHO, 1993). This strategy was expected to have optimal impact if appropriate treatment were to be given early. Consequently there arose a need for mothers and community members to be trained to recognise malaria and respond appropriately (Kidane & Morrow, 2000; Sirima et al., 2003). This is the basis for the introduction of the HMM. HMM is therefore an integral part of malaria case management within the overall RBM strategy and is particularly relevant to ensuring effective care for non-immune people at risk of malaria, such as children under five years of age in high-transmission situations (WHO, 2005a).

It has been shown that interventions designed to improve HMM through training of providers and pre-packaging of antimalarial medicines had the lowest cost, compared with other malaria control strategies such as chemoprophylaxis, indoor residual spraying, and use of insecticide-treated nets (ITNs) (Goodman et al., 1999; 2000). Thus in recent years the WHO through the Tropical Disease Research (TDR) has funded several studies on HMM in Africa with the intention of developing a strategy to increase access to effective antimalarial treatment close to the home, thereby addressing the failure of the formal health system in many endemic countries of the sub-region to deliver effective treatment promptly to those in need (Gyapong & Garshong, 2007).

The home management of malaria strategy
The strategy of HMM aims to improve the ineffective self-medication practices that are very common in malaria-endemic countries; its overall goal is the early recognition and prompt and appropriate response to malarial illness, especially in children under five years of age, in the home or community. It therefore, empowers communities to respond to malaria illness using effective, good-quality antimalarial medicines through community involvement (WHO, 2005a). The antimalarial medicines used for HMM usually come in the form of a pre-packaged drug, defined as a course of treatment in a sealed primary packaging, the treatment being composed of individual doses in easily identifiable subunits and conforms to WHO guidelines on the technical specifications for pre-packaging antimalarial medicines in compliance with good manufacturing practice requirements (WHO, 2005b).

According to WHO (2004, 2005a), the four components of the HMM strategy include: (i) ensuring that there is an effective communication strategy for behaviour change to enable caretakers recognize malaria illness early and take an appropriate action; (ii) ensuring that community drug or service providers have the necessary skills and knowledge to manage malarial illness; (iii) ensuring availability and access to effective good quality preferably pre-packed antimalarial medicines at the community level close to the home as possible; (iv) ensuring that there is good mechanism for supervision and monitoring of the community activities.

A number of successful childhood malaria intervention studies have been conducted in sub-Saharan Africa using the HMM strategy. One prominent factor that was a key to the success of these interventional studies was the adoption of enhanced communication strategy in the training of mothers, primary care givers including community health workers and community drug providers to enhance their ability to recognize symptoms of malaria and give appropriate early and prompt treatment (Pagnoni et al., 1997; Marsh et al., 1999;
Kidane and Morrow, 2000; Ajayi et al., 2008a, 2008b; Tiono et al., 2008). In these interventional studies the key areas that were addressed in all the communication strategy included: the link between mosquitoes and malaria; the risk of malaria for young children and pregnant women; how to recognize uncomplicated malaria and danger signs; what actions to take in cases of uncomplicated malaria or those with severe malaria; the importance of prompt and complete treatment; where to get or purchase good-quality, approved medicines; and where to go in case of danger signs or if there is no improvement.

A major tool usually used was a treatment guideline which was developed using participatory approach involving mother trainers and community members. Pictorial illustrations of some common clinical features of uncomplicated and complicated malaria, the steps to take for the different types of presentation of malaria and the correct dose and regimen of appropriate treatment according to the age of the child were used and usually presented as cartoons. The studies all attest to the fact that majority of treatment for malaria take place in the home with drugs bought from local drug vendors. They also provided evidence for the effectiveness of community-based approach to malaria treatment. The World Health Organization noted that after training, the trained individuals usually passed the information on to other community members, so giving the programme community ownership (WHO, 2005a). Implementing HMM is however, recognized as a huge task and requires the total commitment of all stakeholders and the members of the local community concerned. It has been shown that a core working group or team that included all stakeholders (key ministry of health (MOH) departments, academic and research institutions, drug and other regulatory authorities, the Medicine manufacturing Industry, Private and Informal health providers, Professional organizations, NGOs, Mass media, bilateral and global development agencies and Donor organizations), was useful in terms of advocacy, planning, and implementation of the HMM programme that would likely be successful (WHO, 2005a; Gyapong & Garshong, 2007).

It is pertinent to state that the overall success of HMM is to a large extent dependent on the implementation within the overall framework of the national health policy on community or primary health care, guided by the overall policy on malaria case management and treatment. A reasonable financial base is also a major requirement especially with the involvement of larger network of delivery points and the number of people who will use the services. It is also very important to Integrate all stages of the process of developing HMM, from the planning stage to the stage of reaching the community, into other health programmes thereby reducing duplication, cost, time, and provide consistency in methods and messages (WHO, 2005a).

The challenges of home management of malaria

In sub-Saharan Africa indigenous tradition and culture influence the pattern of care for the sick, consequently the practices of malaria home management vary greatly in different situations and generally there is limited programme experience to influence good practice (Gyapong & Garshong, 2007; Ajayi et al., 2008a, 2008d). Furthermore in the rural areas where the impact of malaria scourge is most prominent the low literacy level of the populace generated a lot of concern in the early period of the introduction of HMM (Deming et al., 1989; Foster, 1995; WHO, 2004; Hopkins et al., 2007). Distributors who are not fully literate represented the greatest challenge: a significant amount of time was invested in training such people and monitoring them when drugs were dispensed (WHO, 2004; Gyapong & Garshong, 2007). There was thus opposition to improving HMM because of concerns that indiscriminate use of antimalarials by the so-called “illiterate population” could lead to increased antimalarial drug resistance and mothers were thought to be unable to comply with
the complicated diagnosis and dosing schedule that proper treatment requires (WHO, 2004). However it is now generally accepted that, with appropriate training and using pre-packaged drugs, mothers, community health workers and other local care givers can recognize fever, and administer prompt, appropriate treatment. Consequently efforts were made in various malaria intervention programmes to improve HMM. These interventions were however not without some major challenges. These include failure of caregivers to complete a full course of antimalarial drug, provision of financial motivation to community drug distributors CDDs, non-adherence of health workers to recommendations on the use of antimalarial drug, limited acceptance, possible adverse outcomes, performance of supervision, and hence, long term sustainability of HMM (Mwenesi, 2003; Batega, 2004; Nsungwa-Sabiiti et al., 2004; Falade et al., 2006; Wasunna et al., 2008).

Despite the existence of these challenges associated with HMM in sub-Saharan Africa, HMM was shown to be both feasible and effective in ensuring prompt access to appropriate treatment in the African region especially in the most remote areas. Thus the scaling-up of the programme became a very attractive option and was recommended by the WHO based on the report on the evidence, experience, and lessons learned in scaling up HMM in Burkina Faso, Ghana, Kenya, Nigeria, Uganda and Zambia (WHO, 2004). The challenges of scaling up implementation of HMM – expanding beyond small geographical areas and/or controlled conditions – are however peculiar and enormous. According to WHO (2004), Some of the practical challenges of large-scale implementation of HMM include: the increasing ineffectiveness of commonly available and relatively cheap drugs for treating malaria; developing community ownership and sustainability of community volunteers through provision of incentives; ensuring that severely ill children are rapidly referred and appropriately treated; referral facilities are often very few, provide inadequate service and poor-quality care, and are mistrusted; reluctance to scale up HMM; and the renewed fears that actively promoting home treatment of malaria will encourage inappropriate drug use and accelerate the development of drug-resistant parasites.

In an effort to stem the worsening morbidity and mortality due to drug resistant malaria, many countries in sub-Saharan Africa have changed their malaria treatment policy from chloroquine (CQ) or sulfadoxine-pyrimethamine (SP) to artemisinin based combination therapy (ACT) in line with the WHO recommendation (WHO, 2001). However, while wide deployment of ACT at the community level through HMM has the potential to greatly reduce malaria related mortality and severe morbidity, such implementation has not actively taken off in many sub-Saharan African countries due to substantial economic and public health issues (Ajayi et al., 2008c). Although more than 25 countries in Africa have now adopted HMM with ACT in their malaria control programmes only a few have succeeded in implementing the strategy in some selected districts (Mumuni & Nyanchongi, 2008).

The major concerns centre on the effective use of ACT at the community level, and the fact that the parasitological cure rate that is achieved with ACT in the context of HMM, when dispensed by community medicine distributors (CMDs) and used unsupervised by caregivers at home, has not been properly elucidated (D’Alessandro et al., 2005; Ajayi et al., 2008c). Another concern about the wide-scale use of ACTs by the CHWs/CMDs is the possibility of over-prescription of the drug, leading to wastage and possibly increasing the risk of emergence of resistance (D’Alessandro et al., 2005; Pagnoni et al., 2005). A multi-country study conducted in Ghana, Nigeria and Uganda confirmed that HMM with ACT can work as with chloroquine, unfortunately the study revealed that even under optimal trial conditions a significant proportion of caregivers (about 40%) did not adhere to ACT treatment (Ajayi et al., 2008d). In addition to this, there are reports of failure to provide
adequate storage conditions to ensure drug stability in the community—a condition which could reduce the efficacy of ACT and also facilitate the emergence of drug resistance (Ajayi et al., 2008c).

The role of home management of malaria in malaria intervention
Despite the high morbidity and mortality rate of malaria in sub-Saharan Africa, there is an increasing body of evidence suggesting that the burden of malaria has been decreasing over the past decade and continues to do so in some sub-Saharan African countries (Gosling et al., 2008). The countries where this decline has been reported in recent times include Eritrea (Nyarango et al., 2006), Guinea Bissau (Rodrigues et al., 2008), Kenya (Okiror et al., 2007), Tanzania (Schellenberg et al., 2004), Mozambique, South Africa and Swaziland (Sharp et al., 2007). It was argued that presumptive treatment of fever cases as malaria which is a component of HMM strategy may have played a role in reducing transmission of malaria by the prophylactic effect of antimalarials and their widespread use (Gosling et al., 2008).

Some studies conducted in parts of sub-Saharan Africa have indicated that HMM helped in the reduction of childhood malaria burden (Kindane & Morrow, 2000; Yeboah-Antwi et al., 2001; Sirima et al., 2003). An earlier report from Liberia showed that there was an increase in the availability of antimalarial drugs in the homes after three years of intervention, and there was a reduction in childhood mortality rate by 28% compared with baseline (Becker et al., 1993). More recently, Unger et al. (2006) observed that without any malaria control intervention, the population cure rate was 8.4% with home treatment, but was 13% if access to timely treatment were improved as in Kenya. Hopkins et al. (2007) noted that findings from Burkina Faso suggested that HMM decreased the proportion of severe malaria cases, while another study from the same country showed a decrease in the risk of progression to severe malaria. In Uganda it was observed that following an intervention which consisted of volunteers educating mothers and providing a 3-day course of pre-packaged chloroquine plus sulfadoxine/pyrimethamine tablets, free of charge, for the treatment of under-five fevers, an assessment of the intervention effect indicated 13.5% improvement in the accumulated proportion of patients (1) treated, (2) treated within 24h of illness onset, (3) treated with the recommended antimalarials, (4) treated at an adequate dosage and (5) treated for the correct duration (Nsungwa-Sabiiti et al., 2007). Studies have shown that early and effective treatment at the community level, through training of community resource persons or mothers, and providing them with pre-packed antimalarial drugs, reduced progress to severe malaria by more than 50% in Burkina Faso (Sirima et al., 2003) and overall childhood mortality by 40% in Ethiopia (Kidane & Morrow, 2000). It was therefore noted that appropriate use of antimalarials—through provider and community training and pre-packaging of the drugs—provides opportunities to control an increasingly chaotic component of the informal health sector in many setting of sub-Saharan Africa and may reduce drug resistance (WHO, 2004). Furthermore it has been shown that targeting retailers, either through short training workshops or distribution of information, education and communication materials through existing medicine suppliers, improved knowledge and practices on appropriate use of antimalarial drugs by more than four-fold amongst trained retailers (Marsh et al., 1999).

In a recent study conducted in Burkina Faso, Tiono et al. (2008) investigated the potential fall-out of HMM on the work burden at the peripheral health facilities level and observed that the increase in the number of malaria cases treated at the community level was associated with a reduction of the overall workload at health facility level. In the study, the health facility attendance rate was lowered by 43% in the intervention arm, with most malaria cases being treated in the community. This finding has as important public health implication with respect to the
limited workforce in formal health facilities in sub-Saharan Africa. Thus, the precious time saved could be used by the health staff, for other curative or preventive activities, or to allow a longer nurse-patient contact time, a factor known to be associated with correct management of patients, and higher adherence by caregivers (Rowe et al., 2000).

Although HMM has been shown to play a contributory role in the reduction of malaria burden in many parts of Africa, conclusions regarding the impact of HMM on morbidity and mortality endpoints are actually mixed (Hopkins et al., 2007). In Kenya, an earlier investigation conducted in a perennial transmission area showed no obvious effect of the intervention (Spencer et al., 1987a, 1987b), while another investigation done in the Democratic Republic of Congo showed a decrease in malaria morbidity but no impact on mortality (Delacollette et al., 1996). However, in a randomized trial conducted in Ethiopia which investigated mortality endpoint a benefit was demonstrated (Kidane & Morrow, 2000). Hopkins et al. (2007) noted in their systematic review on the impact of HMM on health outcomes in Africa that data showing an impact of community-based programmes on malaria morbidity are also relatively sparse. Only one study showed a decrease in malaria prevalence and incidence (Delacollette et al., 1996), and one demonstrated a decreased risk of progression to severe (essentially cerebral) malaria (Sirima et al., 2003). It is therefore very obvious that more studies are required to substantiate the health benefit of home- and community-based presumptive treatment of febrile children with pre-packaged antimalarials in HMM programmes is likely to increase delivery of effective drugs, and improve the timing, adherence, and dosing of treatment. Many interventions to improve adherence to correct dose of antimalarial drug at home level have been demonstrated to be effective (Marsh et al., 1999; Kidane & Morrow, 2000; Ajayi et al., 2008a). Providing safe and effective malaria treatment demands that the public sector takes stewardship role in formulating up-to-date malaria treatment policies and also establish strong health systems to cater for diagnostic evaluation and management of referred cases (Were, 2004). Any intervention to improve management of sick people at the community level should ideally be part of a larger package that includes improving quality of care at facilities and improvements of health systems (Winch et al., 2005). This can only materialize when sufficient commitment and resources are channelled into the health sector by the governments of sub-Saharan African countries. The need to mobilise additional and substantial resources for implementation by the global community in partnership with the endemic countries cannot be overstated. It is hoped that with sustained effort from all stake holders the Abuja declaration of halving mortality from malaria in Africa may be attained in the nearest future.

CONCLUSION

Evidence from studies in sub-Saharan Africa has shown that presumptive treatment of febrile children with pre-packaged antimalarials in HMM programmes is likely to increase delivery of effective drugs, and improve the timing, adherence, and dosing of treatment. Many interventions to improve adherence to correct dose of antimalarial drug at home level have been demonstrated to be effective (Marsh et al., 1999; Kidane & Morrow, 2000; Ajayi et al., 2008a). Providing safe and effective malaria treatment demands that the public sector takes stewardship role in formulating up-to-date malaria treatment policies and also establish strong health systems to cater for diagnostic evaluation and management of referred cases (Were, 2004). Any intervention to improve management of sick people at the community level should ideally be part of a larger package that includes improving quality of care at facilities and improvements of health systems (Winch et al., 2005). This can only materialize when sufficient commitment and resources are channelled into the health sector by the governments of sub-Saharan African countries. The need to mobilise additional and substantial resources for implementation by the global community in partnership with the endemic countries cannot be overstated. It is hoped that with sustained effort from all stake holders the Abuja declaration of halving mortality from malaria in African may be attained in the nearest future.

REFERENCES


