# A Pilot Study to Evaluate Malaria Control Strategies in Ogun State, Nigeria

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**Abstract**

With limited evidence of decreases in malaria-related mortality and morbidity, and nearly half the time to the 2010 deadline of Roll Back Malaria (RBM) targets now past, we conducted this study to assess the awareness, accessibility and use of malaria control strategies among at-risk groups within the context of RBM in Nigeria. It was a descriptive, cross-sectional pilot study of 34 registered women attending antenatal clinics and 34 mothers of children less than five years old, using a questionnaire in a malaria holo-endemic community of Ogun State, Nigeria. Results showed that 14.7% and 16.2% of all respondents interviewed were aware of the home management of malaria (HMM) program (17.6% of mothers of children under five years vs. 11.8% of pregnant women) and the change in policy on malaria treatment (23.5% of mothers of children under five years vs. 8.8% of pregnant women) respectively. Younger respondents knew more about HMM than older ones ($p$ <.05). Most (63.2%)

of the 68 respondents (64.7% of mothers of children under five years vs. 61.8% of pregnant women) interviewed knew about insecticide treated nets (ITNs); however, only 22.1% were using the treated material. Reasons given by those not using ITNs included: they did not know about ITN prior to the interview (43.3%), they had no money (41.5%) and they did not know where to get it (7.6%). Only 5.8% of mothers of children less than five years old, and none of the pregnant women, had taken the new combination drug. Eight (23.5%) of the 34 pregnant women interviewed knew about intermittent preventive treatment of malaria for pregnant women (IPT), while two (25.0%) of these eight women had received a preventive treatment dose. The results of this pilot study showed that efforts need be intensified to make adequate information and materials relating to the different malaria control strategies more available and accessible at the community level to achieve and sustain the RBM goals, both in Ogun State and in Nigeria in general. However, a larger study is needed to provide more generalized findings.

## Introduction

Malaria is a life-threatening parasitic disease transmitted by female anopheles mosquitoes. Most malaria infections, particularly in sub-Saharan Africa, are caused by *Plasmodium falciparum*. It is a major cause of death and threatens 2.4 billion people, or about 40% of the world's population living in the world's poorest countries (WHO 2000a). Pregnant women and their unborn babies as well as children under five years of age are most vulnerable to malaria. At least 300 million acute cases of malaria in people of all ages are reported globally each year, and approximately 100 million episodes of malaria occur among children under five years of age. More than one million deaths are attributable to the disease annually (WHO 2000a).

In areas of Africa with stable malaria transmission, such as Nigeria, infection during pregnancy is estimated to cause as many as 10,000 maternal deaths each year, 8–14% of all low-birth-weight babies and 3–8% of all infant deaths. In Nigeria, malaria prevalence is as high as 80–85% and is the most common cause of outpatient visits to health facilities. With a case mortality rate ranging from 8–12.5% in infants and children, malaria accounts for 30% of child mortality in the country and is consistently recorded as one of the five leading causes of childhood mortality (Akpan 1996; Ekanem, 1996; UNICEF/National Population Commission [NPC] 1998). It is responsible for about 300,000 deaths each year among children, particularly those under five years of age in remote rural areas with poor access to health services (Akpan 1996; WHO 1998a; 1998b; WHO 2000a; Diallo et al. 2001; Hamel et al. 2001; Kelley et al. 2001; WHO/UNICEF 2003).

Typically, malaria produces fever, headache, vomiting, loss of appetite and other flu-like symptoms (Akpan 1996; Ekanem 1996). However, severe consequences of malaria include anemia, premature delivery, low-birth-weight babies, increased risk of neonatal death, neurological problems, epilepsy and impaired cognitive development (Brewster et al. 1990; Marsh 1992; Warrell 1992; Slutsker et al. 1994a; 1994b; Holding et al. 1999). These compromise the health and development of children in particular in the malaria-endemic regions of the world.

Despite decades of significant input of resources and efforts at control, malaria is still highly endemic and has remained a major public health problem alongside HIV/AIDS and tuberculosis in both rural and urban communities of sub-Saharan Africa including Nigeria (UNICEF 2004). In 1998 the World Health Organization (WHO) initiated the Roll Back Malaria (RBM) Programme, making available a number of key evidence-based and cost-effective malaria control interventions. The goal of the RBM program is to halve malaria deaths worldwide by 2010 (Nabarro and Tayler 1998). The RBM thrust, however, conforms with the ongoing health sector reform (HSR) initiative in Nigeria. Its first phase of implementation, from 2004 to 2007, seeks to ensure that the health of citizens is guaranteed (Federal Ministry of Health 2005).

Key RBM interventions include the home management of malaria (HMM), with emphasis on early and appropriate treatment of malaria, particularly for children less than five years old; intermittent preventive treatment (IPT) of malaria for pregnant women; insecticide-treated nets (ITNs) and, recently, recommended use of artemisinin-based combination therapy (ACT) in place

of chloroquine and sulfadoxine-pyrimethamine, which are failing due to increasing parasite resistance (WHO 2001; Attaran et al. 2004).

In the Abuja Declaration of April 2000, African heads of state at the African summit on RBM resolved to support the RBM strategy to have at least 60% of populations at risk of malaria sleep under ITNs by 2005. Furthermore, 100% of at-risk populations would have prompt access to affordable and appropriate treatment by 2010. These at-risk populations are mainly pregnant women and children less than five years old (TDR News 2000; 2002; WHO 2004). Since 2001, subsequent to the 2000 Abuja Declaration, the Nigerian Government has been proactively promoting RBM interventions such as ITNs through the NetMark initiative, a United States Agency for International Development (USAID)–funded regional public-private partnership (UNICEF/Federal Ministry of Health 2002). Similarly, the change in the country's national policy on malaria treatment, recommending the combination of artemether and lumefantrine (Coartem®), and artesunate and amodiaquine in place of chloroquine, was effected in 2004.

Results of the 2003 Nigeria Demographic Health Survey showed that only 2.2% of households (1.0% urban and 2.9% rural) had at least one ITN. The percentage ranged from 0.3% in the South-West to 3.9% in the North-Central region. Results further showed that the percentage of pregnant women who slept using an ITN prior to the study was 1.3% (0.4% urban and 1.6% rural) (NPC and ORC Marco, 2004). The survey reported that 1.0% of pregnant women attending antenatal clinics received IPT (2.0% urban and 0.6% rural). IPT use ranged from 0.2% in the South-East to 1.3% in the South-South (NPC and ORC Marco 2004).

With limited evidence of decreases in malaria-related mortality and morbidity, and nearly half the time to the 2010 deadline past (Attaran et al. 2004), the need to assess the impact of the interventions is imperative. Knowledge of how socio-behavioural, economic, political and health-system factors affect and are affected by disease patterns and disease control efforts is important for identifying future needs and opportunities for improved control of diseases (WHO 2000b). In this regard, we assumed that the socio-economic and demographic characteristics of people in the community, particularly pregnant women and mothers of children less than five years old, will significantly determine their awareness, access to and use of malaria control strategies. The objectives of this pilot study were to (1) investigate the use of ITNs among pregnant women and children less than five years old, (2) examine the availability of IPT for pregnant women, (3) find out which antimalarials are in use in the community and (4) assess the home management of malaria among mothers of children less than five years old. We believe that this preliminary study will provide relevant insights to guide a large-scale study to provide important information to support the RBM thrust in Nigeria and other malaria-endemic countries.

## Methods

### Study Area

The study was carried out in August 2006 in Ijebu-Igbo, a malaria holo-endemic community in the rainforest of Ijebu North local government area (LGA) of Ogun State, South-West Nigeria. The LGA is one of 20 in Ogun State. It is predominantly a Yoruba-speaking community and had an estimated population of 206,923 in 2005, based on the projections of the 1991 national population census in Nigeria (INLG 1997; Omikunle 1999). In 2005, an estimated 18.7% and 21.9% of the Ogun State population were children less than five years old and women of childbearing age (15–49 years), respectively (NPC 2002). Basic social amenities like roads, water, health facilities and educational institutions abound in the LGA. Health facilities in Ijebu North LGA include a general hospital, Primary Healthcare Centres (PHCs), health clinics, health posts and private clinics. Patent medicine sellers (PMSs) also abound in the LGA (INLG 1997; Omikunle 1999).

### Study Design

This was designed as a descriptive, cross-sectional pilot study of the awareness, accessibility and use

of the malaria control strategies within the context of RBM among at-risk groups in Ogun State. It entailed both clinic and household surveys in which registered women attending antenatal clinics and mothers of children less than five years old were interviewed.

## Data Collection Procedures

A sample size of 61 but approximated to 64 was calculated using the table for a minimum sample size estimate for a population survey with 95% confidence interval (Lemeshow et al. 1990). The sample size was calculated using the formula:

$$n = \frac{Z^2\, p(1\text{-}p)}{d^2}$$

where $n$ = sample size, $Z = 1.96$, $p = 0.80$, $d = 0.10$

$$n = 1.96^2\, \frac{[0.80(1\text{-}0.80)]}{0.10^2} = 61$$

However, of the 79 women (38 mothers of children under five years vs. 41 pregnant women) approached and offered opportunity to participate in the surveys, a total sample size of 68 respondents was actually interviewed. This comprised of 34 pregnant women and mothers of children less than five years old respectively. Overall, the response rate was 86.1% (89.5% for mothers of under five children vs. 82.9% pregnant women). The non-response bias experienced with some of the participants, particularly the pregnant women, could be attributed to a time factor. Many of the pregnant women, for example, were impatient to be interviewed as they were in a hurry to leave the clinic immediately after being attended to at the antenatal clinic.

An exit method of interview was adopted in administering the questionnaire. Respondents to the clinic survey were selected using the systematic random sampling method (Neuman 1994; Moser and Kalton 1997). The clinic register of pregnant women with appointments on antenatal clinic days during the survey period was used as the sampling frame in randomly selected health facilities (two public and two private clinics). The women were interviewed as they left the antenatal clinics. Respondents for the household survey were selected using a combination of simple random and systematic sampling methods (Neuman 1994; Moser and Kalton 1997). The sampling frame for the household survey was a list of all enumeration areas (EAs) based on the delineation exercise for the study LGA in preparation for the 2006 national population and housing census in Nigeria obtained from the NPC.

Interviewer-administered semi-structured questionnaires were used in the clinic and household surveys. Three trained interviewers administered the questionnaires. Interviewers were trained together under the same conditions prior to the survey and were closely supervised and monitored by the principal investigator.

The main contents of the questionnaires were questions on background characteristics of the respondent, such as age, religion, level of education, marital status and nature of occupation. Other sections of the questionnaire probed the respondent's knowledge and perception of the mode of malaria transmission, signs and symptoms of malaria, prevention and treatment of malaria at the household and individual levels, knowledge of ITN and its use, and antimalarials in use for malaria treatment. Moreover, the respondent's health-seeking behavioural pattern with emphasis on knowledge, attitude, perception and practices of home management of malaria for children less than five years old and availability of IPT for pregnant women, and the extent of ITN use in malaria prevention in the home by these two categories of the study population were probed.

We obtained the informed consent of study participants after explaining the purpose of the study and the benefits, risks and discomforts in participating. Participants' informed consent in the form of signature or thumbprint was obtained to signify their willingness to participate in the clinic and

household surveys before we enlisted them. Those who could neither read nor write were asked to thumbprint their consent form in the presence of a witness.

### Data Analysis

Completed questionnaires were first edited for clarity, completeness and uniformity in responses to questions. Codes were then assigned to all responses to questions, using a prepared coding guide to facilitate data entry. Thereafter, coded data were entered into the computer and analyzed using the EpiInfo 6.04a software (Centers for Disease Control and Prevention 1994).

Associations between relevant variables in the quantitative analysis were determined using the analysis of variance (ANOVA) and chi-square test at 95% level of significance. ANOVA was used in showing the relationship between measurements of the mean and variance of each subgroup under study. This helped in providing information needed to determine if the difference between the two was significant, while the chi-square test was used to determine whether subpopulations of respondents differed in their knowledge, access to and use of malaria control strategies relative to their socio-economic and demographic characteristics.

## Results

### Background of Respondents

Thirty-four (50.0%) of the respondents were pregnant women and 34 were mothers of children less than five years old. Their ages ranged from 18 to 38 years, with an average of 25 and 27 years among the pregnant women and mothers of children less than five years old, respectively. Most (83.8%) were married, while others were never married (10.3%), separated (4.4%) and divorced (1.5%). A high level of literacy was reported among the respondents as 100.0% had formal education: primary (33.8%), secondary (50.0%) and tertiary (16.2%). Of the 68 respondents, 41.2% were artisans and 30.9% were traders. Others were unemployed (7.4%), formally employed (5.9%), housewives (5.9%), students (5.9%) and farmers (2.9%).

### Respondents' Perceived Causes and Signs/Symptoms of Malaria

Results showed that most respondents knew the causes of malaria, as summarized in Figure 1. Signs and symptoms of malaria that respondents mentioned are displayed in Figure 2. Most (66.2%) respondents seek appropriate healthcare outside the home within 24 hours of onset of malaria signs or symptoms. A further 27.4% seek care between 24 and 48 hours, and 5.9% reported they usually seek care after 48 hours. Preventive measures respondents take against malaria range from clean surroundings (47.1%), residual home spraying with insecticides (23.5%), use of window/door net (7.4%), eating at the right time (5.9%), taking herbs (4.4%), avoiding stress (4.4%) and taking home drugs (2.9%) to using ITNs (2.9%). However, 1.5% were indifferent. Statistical tests showed that factors such as respondents' age, education and occupation had no significant relationship with their awareness and perception of the causes and signs/symptoms of malaria ($p > .05$).

### Respondents' Awareness of, Access to and Use of HMM, ACTs, ITNs and IPT

Table 1 shows that only 14.7% and 16.2% of respondents were aware of the home management of malaria (HMM) program (17.6% of mothers of children under five years vs. 11.8% of pregnant women) and the change in policy on malaria treatment using antimalarials (23.5% of mothers of children under five years vs. 8.8% of pregnant women) respectively. Conversely, 85.3% and 83.8% were not aware of the HMM program and change in policy on malaria treatment. Statistical tests using ANOVA showed that more of the respondents who knew about HMM were younger, with a mean age of 23.3 years, compared with 26.7 years for those who did not know about HMM ($p < .05$). The respondents' level of education had a direct association with their awareness of the change in antimalaria drug policy, as presented in Table 2 ($\chi^2 = 8.39$, $df = 2$, $p < .05$).

**Figure 1. Perceived causes of malaria among respondents**

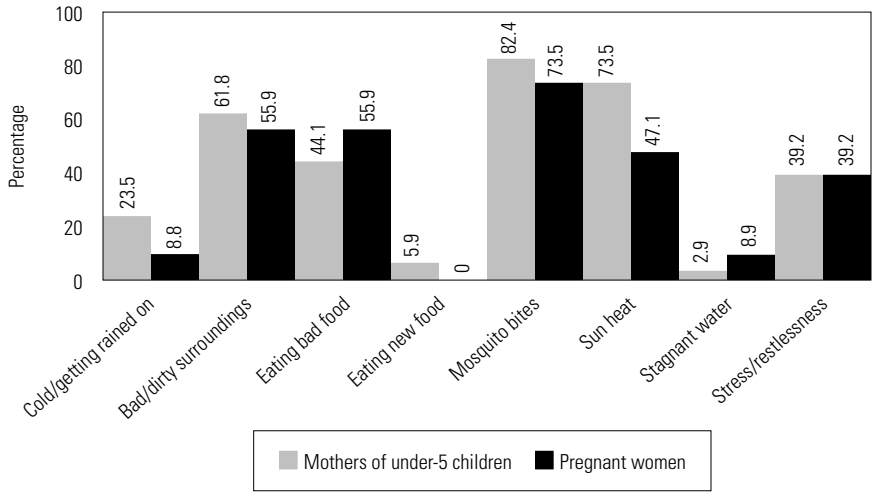
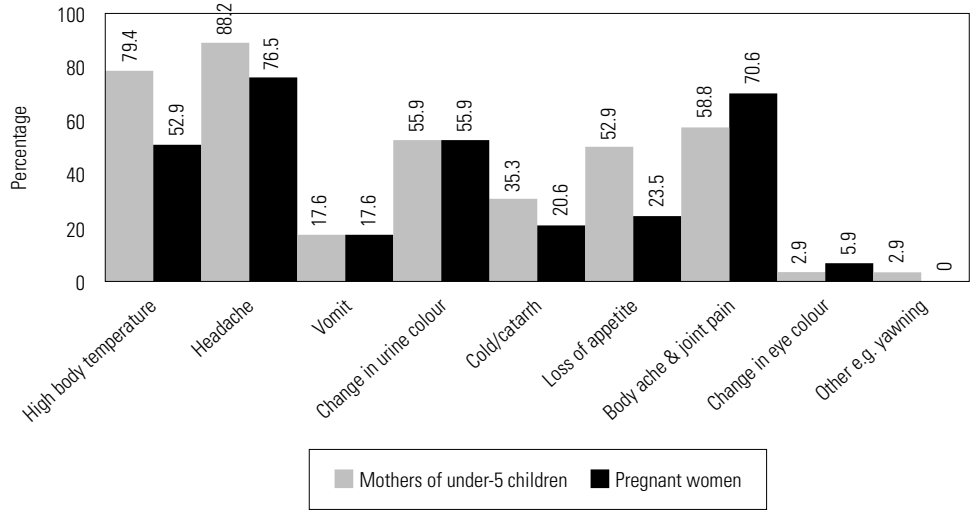



**Figure 2. Signs/symptoms of malaria mentioned by respondents**




Half (50.0%) of the 68 respondents reported that they take home drugs to treat malaria following onset of signs/symptoms, whereas 25.0% go straight to the hospital for appropriate treatment, 14.7% use a herbal remedy and 7.4% visit patent medicine sellers; 2.9% of respondents were undecided.

Results presented in Table 3 show that only one of 68 respondents (1.5%) mentioned ACTs when asked to name three antimalarials they preferred taking for malaria treatment when they or any member of their household had malaria. Results showed that an average respondent prefers taking analgesics with paracetamol for malaria treatment.

When respondents were asked whether they have ever taken ACTs, only two (5.8%) of the 34 mothers of children less than five years old said they had taken the new combination drug, while 94.2% had never taken ACTs. None of the pregnant women had taken ACTs.

On ITNs, most (63.2%) of the 68 respondents (64.7% of mothers of children under five years

vs. 61.8% of pregnant women) interviewed knew about them. In contrast, only 22.1% were actually using the treated material. Respondents' level of awareness and use of ITN is displayed in Table 4. Of 15 respondents who reported that they use ITNs, six (40.0%) reported getting the treated nets free of charge from government hospitals in 2003, and five (33.3%) and four (26.7%) bought the treated nets from pharmacy and wholesale shops, respectively. Reasons given by the 53 respondents not using ITNs included the following: they did not know about ITN prior to interview (43.3%), they had no money (41.5%), they did not know where to get it (7.6%), and 7.6% were indifferent. When asked who they deemed fit to use the nets in their respective households if an insecticide-treated net were freely provided for each household they belong, respondents mentioned the following: self and young children (25.0%), self and grown-up children (22.1%), grown-up children (22.1%), self and spouse (14.7%), self only (10.3%) and young children (2.9%). Two percent were undecided.

**Table 1. Respondents' awareness of HMM and change in policy on antimalaria drugs**

| Awareness of HMM | Mothers of Children under Five Years | | Pregnant women | | Total | |
|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % |
| Yes | 6 | 17.6 | 4 | 11.8 | 10 | 14.7 |
| No | 28 | 82.4 | 30 | 88.2 | 58 | 85.3 |
| Total | 34 | 100.0 | 34 | 100.0 | 68 | 100.0 |
| **Awareness of Policy on Change in Antimalaria Drugs** | | | | | | |
| Yes | 8 | 23.5 | 3 | 8.8 | 11 | 16.2 |
| No | 26 | 76.5 | 31 | 91.2 | 57 | 83.8 |
| Total | 34 | 100.0 | 34 | 100.0 | 68 | 100.0 |

**Table 2. Respondents' awareness of policy on change in antimalaria drugs**

| Level of Education | Are you aware of policy on change in antimalaria drugs? | | | | | |
|---|---|---|---|---|---|---|
| | Yes | | No | | Total | |
| | Number | % | Number | % | Number | % |
| Primary | 2 | 8.7 | 21 | 91.3 | 23 | 100.0 |
| Secondary | 4 | 11.8 | 30 | 88.2 | 34 | 100.0 |
| Tertiary | 5 | 45.5 | 6 | 54.5 | 11 | 100.0 |
| Total | 11 | 16.2 | 57 | 83.8 | 68 | 100.0 |

Among the pregnant women interviewed, only eight (23.5%) knew about IPT. Seven (87.5%) of the eight knew about the benefits of the preventive treatment dose, but only two (25.0%) had received a preventive treatment dose. The two women were among those attending private clinics for antenatal care.

## Discussion

Respondent's knowledge of the signs/symptoms of malaria and their perception of dirty surroundings and mosquito bites as predisposing factors to malaria infection is encouraging. However, it is

disturbing that many had misconceptions about the causes of malaria, as evident in Figure 1, and a few misconstrued "yawning" as a sign/symptom of malaria, as shown in Figure 2. This suggests an urgent need to strengthen educational programs on malaria that emphasize the causes and signs/symptoms of the infection. We believe that improved knowledge will empower people in endemic communities to take preventive measures against malaria. Also, knowing how to adequately diagnose malaria at the onset of the signs/symptoms, as emphasized in the WHO's home management of malaria initiative, will help reduce malaria-related mortality and morbidity (WHO, 2004).

**Table 3. Preferred drugs for malaria treatment among respondents**

| Drug of Choice | Mothers of Children under Five Years | | | Pregnant Women | | |
|---|---|---|---|---|---|---|
| | 1st Choice | 2nd Choice | 3rd Choice | 1st Choice | 2nd Choice | 3rd Choice |
| Chloroquine | 3 (8.8%) | 7 (20.6%) | 2 (5.8%) | 4 (11.8%) | 4 (11.8%) | 4 (11.8%) |
| Other antimalarials | 7 (20.6%) | 7 (20.6%) | 5 (14.7%) | 1 (2.9%) | 5 (14.7%) | 4 (11.8%) |
| ACTs | - | - | 1 (2.9%) | - | - | - |
| Analgesics with paracetamol | 18 (52.9%) | 16 (47.1%) | 13 (39.2%) | 18 (52.9%) | 12 (35.3%) | 8 (23.5%) |
| Antibiotics | - | 1 (2.9%) | 2 (5.8%) | - | - | - |
| Herbs | 6 (17.6%) | 1 (2.9%) | 1 (2.9%) | 8 (23.5%) | 3 (8.8%) | 1 (2.9%) |
| Undecided | - | 2 (5.8%) | 10 (29.4%) | 3 (8.8%) | 10 (29.4%) | 17 (50.0%) |
| Total | 34 (100.0%) | 34 (100.0%) | 34 (100.0%) | 34 (100.0%) | 34 (100.0%) | 34 (100.0%) |

**Table 4. Awareness and use of ITNs among respondents**

| | Mothers of Children under Five Years | | Pregnant Women | | Total | |
|---|---|---|---|---|---|---|
| | Aware | Use | Aware | Use | Aware | Use |
| Yes | 22 (64.7%) | 7 (20.6%) | 21 (61.8%) | 8 (23.5%) | 43 (63.2%) | 15 (22.1%) |
| No | 12 (35.3%) | 27 (79.4%) | 13 (39.2%) | 26 (76.5%) | 25 (36.8%) | 53 (77.9%) |
| Total | 34 (100.0%) | 34 (100.0%) | 34 (100.0%) | 34 (100.0%) | 68 (100.0%) | 68 (100.0%) |

The age of respondents influenced their awareness of the HMM program and how soon they sought appropriate professional care outside the home, particularly for their febrile children less than five years old. The women's experience may play a major role in this context. Older women tended to stay home 24 to 48 hours or more, relying on their wealth of experience in child care. Conversely, younger ones tended to seek early appropriate care for their children from health workers outside the home within 24 hours of onset of febrile conditions. Efforts therefore need be intensified in health education relating to HMM, with emphasis on the importance of seeking early appropriate care outside the home for febrile children after 24 hours of home-based treatment if the child's febrile condition does not improve, as emphasized by the WHO (2004). These education efforts should target more of the older women with children less than five years old. Effectively communicating this information will involve languages and tools that are meaningful to these women in a socio-cultural context.

Results presented in Table 1 showed respondents' poor chemotherapeutic practices for malaria treatment. Most respondents take analgesics to treat malaria, rather than antimalaria drugs. This finding is similar to results reported by Salako et al. (2001) and Nsimba and Rimoy (2005) in studies

on home management of malaria in mothers of children less than five years old in rural communities of Nigeria and Tanzania, respectively. It implies that people tended to neglect the real cause of illness by taking analgesics rather than antimalarials. This could be attributed to the fact that more than three quarters of all malaria cases are first treated at home with drugs purchased from small local drug shops, without the advice of a health professional as reported by earlier studies (Foster 1995; Breman 2001; Mash et al. 2003; Muller et al. 2003; Guyatt and Snow 2004; Kofoed et al. 2004). The need for health education programs in the community is urgent. Programs should advocate behavioural change at the individual, household and community levels by promoting the importance of appropriate malaria treatment and by emphasizing the health consequences of inappropriate treatment (Nsimba and Rimoy 2005) and of analgesics abuse (Hering-Hanit et al. 2001; Le Jeunne 2001; Takase et al. 2005). Schools and health facilities could be used as complementary effective channels for this health education. Advocating behavioural change in this regard is important, going by Kasl and Cobb's (1966) definition of early and appropriate treatment of illness as a behaviour.

Awareness of malaria control strategies, particularly HMM and the change in antimalaria drug policy, as well as the actual use of ITN and IPT use reported by study respondents, are far below expectations, given the length of time the HMM and ITN programs have been implemented. It needs emphasizing that the low proportion of ITN use presented in Table 4, for example, is well below the target of 60% of populations at risk of malaria expected to be sleeping under ITNs by 2005, as set at the Abuja Malaria Summit in April 2000 (TDR News 2000; 2002). Moreover, it is unfortunate that with barely four years to the end of the 2001–2010 United Nations decade to roll back malaria, most respondents reported that they either couldn't afford ITNs or did now know where to get the treated materials. Poor awareness of ACTs among respondents perhaps explains the low use of the WHO-recommended combination drugs in the study community.

Based on these preliminary results, efforts need be intensified to make the different malaria control strategies more available, accessible and affordable in communities where malaria is holoendemic. This is important if the country is to achieve appreciable success in the targets of the 2001–2010 United Nations decade to roll back malaria (Nabarro and Tayler 1998; TDR 2000; 2002) and the Millennium Development Goals (MDGs) (NPC 2005).

To realize these goals, the need to re-appraise the distribution chains of information and materials for RBM interventions in the country is urgent. Community-based organizations such as the Co-operative Thrift & Credit Union and faith-based and women's groups could be encouraged to collaborate and participate in RBM activities. We believe that this will complement government efforts in achieving a wider and effective reach to the grassroots as emphasized by Alnwick (2000). This approach has been successfully implemented in other health programs such as HIV/AIDS, particularly in the area of improving access to care and treatment (UNAIDS/WHO 2002), and in outreach programs on adolescent reproductive and sexual health (Senderowitz 1997; 2000; James-Traore et al. 2001). Moreover, the routine immunization of children less than five years old under the National Programme on Immunisation offers a promising opportunity for promotion and delivery of a number of RBM interventions such as ITNs and IPT, as demonstrated by Schellenberg et al. (2001) in Tanzania.

It is also important for RBM program managers to understand the mindset and environment of the people, such as their level of awareness, attitude to ITN use and ability to pay for ACTs, in order to minimize any gap between planning at the government level and utilization by the people at the grassroots. To bridge the gap between program planning and utilization, we need to embrace more community involvement and participation in planning and implementing these malaria control strategies.

There is a need for regular monitoring and evaluation of the activities revolving round the RBM program in the country. We suggest that outcome-based (changes in the population's knowledge, attitude and practice to malaria and use of malaria interventions) and impact-based (mortality and morbidity) indicators be evaluated regularly at the local, state and national levels.

The main limitation of this pilot study is the small sample size from one part of Nigeria. A larger

study with adequate sample size to represent the geo-political zones of the country is therefore needed to provide better and more generalized findings. Nonetheless, the limitation does not undermine the validity of the study's findings. Given the widespread concerns about the limited evidence of decreases in malaria-related mortality and morbidity, the results of the preliminary study may be useful as a baseline for malaria control improvement efforts with the aim of meeting the targets of the RBM initiative in the country by 2010.

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