

Challenges of Malaria Control in Peri-Urban Communities of High Endemicity

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Abstract: The study was aimed at investigating malaria prevalence and interventions in three sub-urban communities in Ijebu North Area of Nigeria. This is because the challenge for malaria control had been mainly a failure to study the socio-cultural aspects of various strategies of the past. Rapid diagnostic tests and questionnaire survey were conducted. The overall prevalence was 65% with a significant difference ($p < 0.05$) in prevalence between male and female sexes. Prevalence recorded by village was highest at Abata (94.7%). Malaria prevalence variation (12.5-89.9%) among the various age groups was statistically significant ($p < 0.05$). Low prevalence was recorded in pregnant women (5.82%) and 68.9% in children. Only 2.2% of the respondents claimed to use the recommended first line drugs while 9.5 and 5.8% used insecticide treated nets ITNs and insecticide spray respectively as intervention. Thirty nine percent of respondents (pharmacists) reported accessibility to and affordability of first line drugs by patients; 50% claimed Sulphadoxinepyrimethamine [SPs] was in highest demand and 11% claimed equal demand. Malaria infection was high in the communities under study while treated malaria cases at the public health centers were low. The status of insecticide treated nets and curtains were low in usage and insignificant. Community empowerment resulting in the need to provide good quality drugs close to homes, as much as possible cannot be over emphasized as people depended more on autotherapy with bought drugs from local drug vendors or natural therapy with herbal concoctions.

Keywords: Age prevalence, first-line drugs, insecticide treated nets, malaria, sex prevalence

INTRODUCTION

Malaria in humans is a unique parasitic infection caused by four species of protozoan parasite: *Plasmodium falciparum*, *P. vivax*, *P. malariae* and *P. ovale*. *P. falciparum* transmitted by the *Anopheles* mosquito is responsible for most deaths and the severe forms of the disease (James and Miller, 2000; WHO, 2000). Malaria has been an enormous, widespread and major public health menacentropical and subtropical regions (WHO, 1998; Gyapong and Garshong, 2007; Centre for Disease Control and Prevention, 2009). Globally malaria claims 1.7 to 3.0 million lives and 300-500 million people contract the disease each year (Sharma, 1999; James and Miller, 2000).

There are serious concerns about neglect of socio-cultural factors now accepted to have contributed significantly to the failure of early malaria control efforts of the formal health system in sub-Saharan Africa. In many endemic countries like Nigeria, it should be noted that the effectiveness of Home Management of Malaria (HMM) programme of WHO/TDR and the formal health system challenged by the prevailing socio-cultural issues pose a major obstacle to achieving the expected outcome of the interventions. According to the Nigerian Federal Ministry of Health (FMoH) Report, the commonest cause of outpatient consultation in all age categories and a major cause of morbidity and mortality in all

parts of Nigeria is malaria (FMOH, 1983; 2005). Malaria infections are treated by the use of anti-malarial drugs such as quinine or artemisinin derivatives. Drug resistance is increasingly common and the prophylactic drug treatments are often too expensive for most people living in endemic areas. However, malaria prevalence can be reduced by preventing mosquito bites with mosquito nets and insect repellants or by mosquito control measures such as spraying insecticide inside houses and draining stagnant water where mosquitoes lay their eggs. Malaria control intervention programmes have a central structure of anti-mosquito measures combined with identification and treatment of infected individuals. Therefore, treatment also has to be readily available and accessible.

Identifying with the diminishing effectiveness of chloroquine and pyrimethamine-sulfadoxine, James and Miller (2000) considered malaria a re-emerging disease majorly on the basis of spread of drug-resistant parasite strains, the decay of health care infrastructure and difficulties in implementing and maintaining vector control programmes in many developing countries. Yet, replacement drugs are costly and may not be acceptable for use in understaffed clinics because of the need to monitor compliance.

The prompt and adequate treatment was advocated by WHO as an essential measure to reduce the mortality due to malaria (WHO, 1993a; Pagnoni, 2007; Centre for Disease Control and Prevention, 2009).

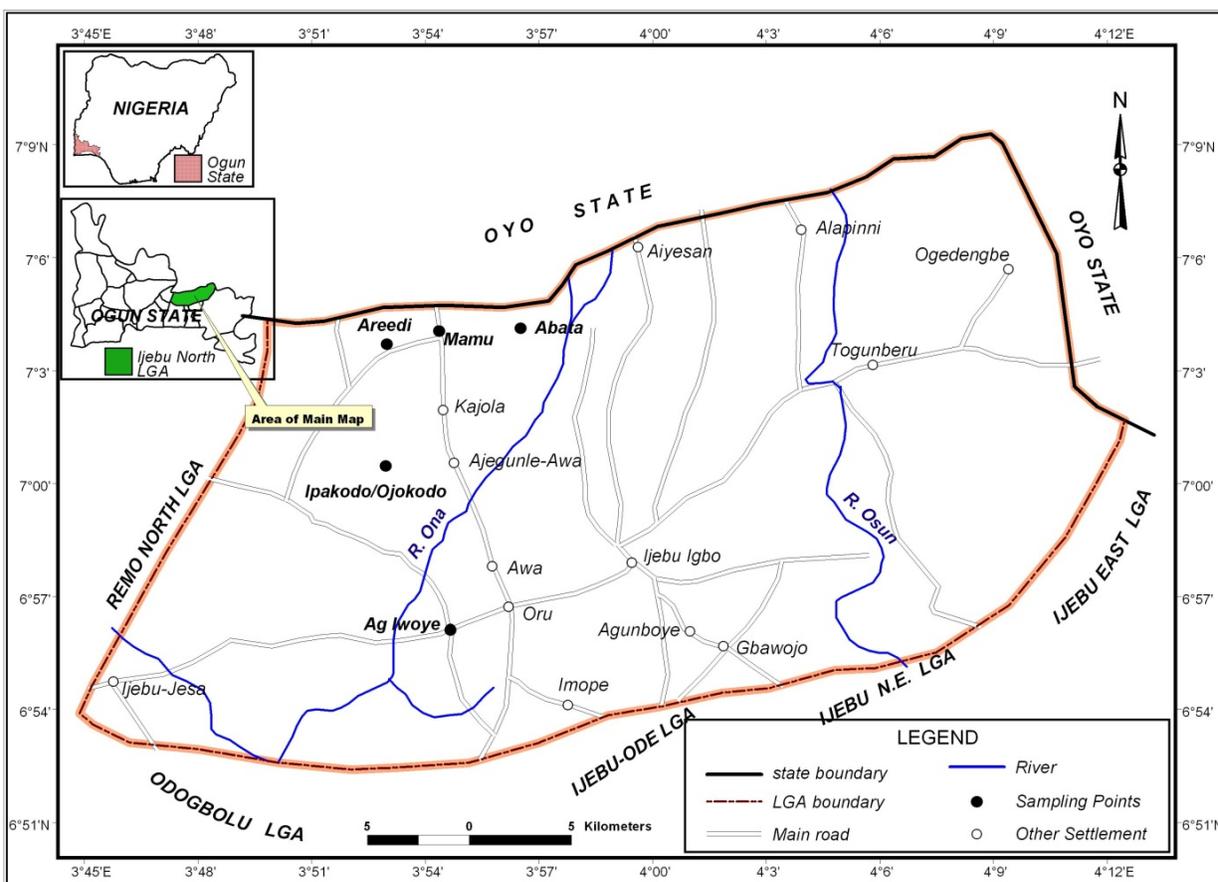


Fig. 1: Ijebu-north local government area showing the sampling locations

According to WHO (1998) the vast majority of deaths occur among young children in Africa, especially in remote rural areas with poor access to health services. At the RBM summit in Abuja, African Heads of state agreed that 60% of malaria episodes will be appropriately treated within 24 h of onset of symptoms by year 2005. Hence the need to empower communities to recognize and promptly treat malaria and adopt Artemisinin based Combination Therapy (ACT) as first-line treatment for malaria.

This study was designed to determine the status of malaria among a mobile population group coming under a vulnerable high risk group which also comprises of infants, young children and pregnant women. The knowledge and status of ACT at the peri-urban farm settlements, the use of Insecticide Treated Net (ITN)/Long Lasting Insecticide Treated Net (LLITN) and insecticide spraying and the availability of good-quality drugs close to the communities were assessed. The main focus was to determine the impact of malaria control as a public health activities in sub urban localities close to the 2015 focus of the Global Malaria Action Plan (2009) to eliminate malaria as a global health concern.

MATERIALS AND METHODS

Study area: Ijebu North of Ogun State falls within the equatorial belt of Nigeria with rain forest vegetation and consists of woody plants, that is, trees, shrubs and climbers with exposed and overlaid type of structure. Annual rainfall in the region is between 1500-2000 m while temperature ranges of about 22.5 to 25°C occur in July and 27 to 27.5°C in January and the relative humidity is over 95% during the rainy season.

This study was carried out in three different villages around the forest: Ojokodo/Ipakodo area, Abata and Areedi communities and two health centers; Ibiye and Mamu Primary Health Centres (PHC) located at Ago-Iwoye and Mamu township respectively (Fig. 1). The village communities had generally low standard of living with no basic social amenities such as health facilities, road network drainage and electricity. The major occupation in these villages was farming and inhabitants were mainly Hausa, Yoruba, Tiv and Igbo ethnic groups.

The villages had been part of Federal Government and World Health Organization Programmes for the control of guinea worm and onchocerciasis in endemic villages for the past 5 years before this study.

Ethical issues: Clearance to undertake this study was obtained from the Local Government secretariat, Ijebu-Igbo and the health authorities. Communities' head and Head teachers were also consulted to assist with obtaining individual informed consent of volunteers in the study.

Study design and questionnaire administration: The randomized cross-sectional study involving different age categories was carried out between February and April 2009. Standard structure and pretested questionnaire were administered to 137 volunteers from Abata, Areedi and Ojokodo/Ipakodo areas. The questionnaires were designed to obtain from participants information on history of malaria episodes and ability to recognize malaria, use of and accessibility to recommended first line drugs for malaria treatment and other methods of interventions adopted. Participants were assisted in completing the questionnaire where necessary. Pharmacy store owners at Ago-Iwoye and Mamu located few kilometers (between 5 and 17 km) away from the villages were interviewed orally.

Rapid diagnostic procedure: Rapid diagnostic test kit manufactured by Orchid Biomedical System, Verma G09-403722, India was used to examine blood sample for *Plasmodium* parasites using the manufacturer's guidelines. The kit works on the principle of immunochromatographic methods capturing *Plasmodium* antigen in the blood against its specific antibody in the buffer. Using the finger prick method of blood collection, 5 μ L of blood was obtained from each participant with the loops provided in the test kits. Each blood test setup, properly identified, had a control pink line indicator to confirm the validity of each slide.

Data analysis: Prevalence of infection by sex, age group and location were calculated and tests of significance were done by chi-square and t-test methods.

RESULTS

Prevalence status: Sixty-five of all screen blood sample (137) were positive for malaria parasites. Infection rate categories by sex, age group and location of the participants are presented in Table 1. The difference observed between male and female sexes infected by *Plasmodium* parasite was significant ($t_{87} = 1.98, p < 0.05$). Children aged 10 years and below had the highest number of examined people (89.9%) that were infected by *Plasmodium* parasites. The least proportion of examined people that were infected (12.5%) was among the 31 to 40 years age category. The prevalence rates among the various age groups (Table 1) showed significant differences in variation ($X^2 = 9.4885, p < 0.05$).

Table 1: *Plasmodium* parasites relative infection rates

Indices	Number examined	Number positive	Prevalence (9%)
Sex			
Male	49	40	81.6
Female	88	49	55.7
Total	137	89	65.0
Age group			
<10	79	71	89.9
11-20	24	12	50.0
21-30	23	5	21.7
31-40	8	1	12.5
41-50+	3	1	33.3
Location			
Areedi/Aje	47	28	59.6
Ipakodo/ojokodo	49	38	77.6
Abata	19	18	94.7
Ibipe PHC	22	5	22.7

Table 2: *Plasmodium* infection among the high risk group

Group	Number examined	Number positive	Prevalence (%)
Children <10 years	79	71	68.93
Pregnant women	24	6	5.82
Total	103	77	74.75

There were significant differences, $X^2 = 7.815, p < 0.05$, in the rate of infection in people screened among the villages and the health center. Abata subjects were mostly infected and expectedly Ibipe health center subjects were least infected.

High risk group screening showed malaria parasite prevalence among the children was significantly higher (68.93%) than that recorded among the pregnant women (Table 2).

Questionnaire screening outcomes:

Knowledge of malaria transmission: Few of the respondents (5.1%) were ignorant of malaria and its causes while 36.5% of respondents were not aware that mosquitoes transmit malaria parasites. However, a significant proportion, 58.4% already had awareness of mosquito involvement in malaria transmission.

Access to first line drug for malaria: The investigations from the registered pharmacy stores within Ago-Iwoye, the university town revealed that various anti-malaria drugs were available for sale; artemisinin derivatives, Sulphadoxinepyrimethamine derivatives, artemether, lumenfantrine, sulphadomethapyrazine, pyrimethamine, amodiaquine and halofantrine. Thirty nine percent reported that artesunate was in highest demand while 50% of the pharmacists claimed that Sulfadoxinepyrimethamine, (SPs) had the highest demand. Only 11% reported that both artemisinin and SPs had equal rate of demand.

The assessment of treatment seeking behavior and ability to recognize malaria promptly showed that the use of first line drugs for malaria had the lowest proportion (2.2%) among the screened participants in the present study (Fig. 2). The highest proportion of

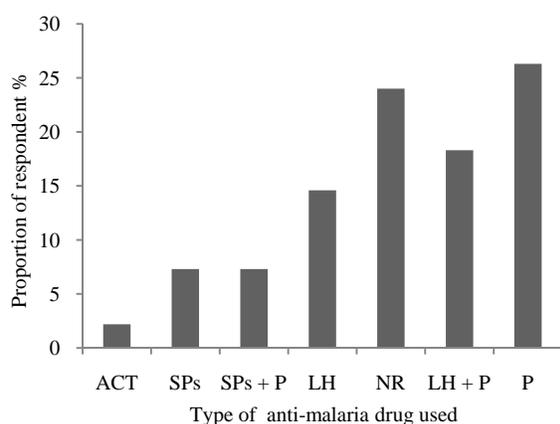


Fig. 2: Usage preference of anti-malaria drugs. ACT: Artemisinin derivative; SPs: Sulphadoxinepyrimethamine derivatives; P: Paracetamol; LH: Local herbs; NR: No response

respondents, 26.3% claimed to use paracetamol when feverish. Twenty four percent did not respond confidently either because they were not aware of what they were treated for or did not remember the name of drugs sold to them by drug vendors who visited the villages or at pharmacy stores/chemist shops visited.

Use of insecticides treated nets and other malaria control interventions: Out of 137 respondent, 9.5% used mosquito net (either insecticides impregnated or not) the remaining 90.5% claimed not to have ITNs or confessed that the ITNs given to them at the urban PHC were sold.; 3.7% prevented mosquito bites with the usual window netting; 5.8% reported the use of cover cloth or blankets; 36.5% used mosquito coil and 5.8% used insecticides spray. (1.5%) combined the use of insecticides and mosquito net while 0.7% reported they use kerosene-palm oil mixture as mosquito repellent cream or various smoke types as deterrents. However, a large number, 36.5% responded that they used nothing against mosquito bites.

Assessing status of morbidity due to malaria: Retrospective study of medical records obtained from Mamu and Ibipec PHCs from October 2008 to February 2009 showed a total of 32 reported malaria cases. Out of 132 visits to the public health care facilities. Other common reported cases included fever, diarrhea and wound dressing. Various drugs such as amalar, arthemeter combined with with SPs, artesunate combined with camodiaquine, chloroquine^R combined with SPs as well as coartem^R were available at the PHCs for patients to buy. The drugs were given free to pregnant women when recommended by medical personnels. Further report obtained showed that free ITNs and LLITNs were distributed by UNICEF and Non-Governmental Organizations (NGO) between late

2008 and early 2009 throughout the local government area but was not sufficient to get to the remote villages. An earlier pre-survey conducted by the health workers at the PHC at Ago-Iwoye on the usage of the distributed bed nets showed between 80 and 90% usage particularly by nursing mothers and pregnant women.

Comparison based on the number of persons diagnosed positive for malaria in the present study which recorded few cases of physical illness or fever, majority were asymptomatic and the number of reported cases of malaria in the health centres showed a difference in the prevalence of malaria.

DISCUSSION

Malaria control in sub-Saharan Africa has become an integral part of the health reform process over the recent years (WHO, 1998; Masala *et al.*, 1999). Anti-malaria interventions in developing countries in need of assistance thus attracted the support of donor community like the United Nations System agencies, the World Bank, NGOs and the Public-Private sectors.

The World Health Organization, WHO (1999) reported that tropical African countries are areas of high malaria transmission and according to Wongsrichanalai *et al.* (2007), malaria eradication was never considered a feasible objective in tropical Africa. Peri-urban malaria prevalence status observed in this study was significantly high despite concerted effort at reaching target populations with prompt diagnosis and treatment of malaria within 24 h of the onset of symptoms. One may be tempted to state that the hope for national priority in the fight against malaria remains a desire to be accomplished.

Nigeria as one of the countries that adopted the Roll-Back Malaria (RBM) programme actually evolve primary health care system and multiple-preventive measures in the fight against malaria. Control initiatives could be under critical assessment due to the low socio-economic status and lack of proper health education at individual and community levels, these are major obstacle to effective malaria control and are predominant features in the study area. The high prevalence rate recorded in this study could have resulted from the close proximity of mosquito breeding sites to the houses. The breeding sites resulted from water usage activities like storing of water for domestic purposes, soaking cassava for several days in the production of local staple food (fufu) occur all over the study area particularly at Abata which recorded the highest prevalence of infection.

A further justification is the low population coverage of ITN and curtains and individual variation in the usage. A few that received a free ITN each, sold them to the urban dwellers who already appreciate the value in the prevention of mosquito bites.

Peri-urban malaria needs to be totally integrated into what culminates into national parasitic diseases control programme. In spite of obstacles posed by unplanned development (Masala *et al.*, 1999) weak health facilities, financial resources and adequate health personnel, malaria control in the urban cities still enjoys sector-wide approach for health sector development (The World Bank, 1998).

The significant difference ($p < 0.005$) in the rate of infection observed among the male and female sexes could be attributed to chance and other factors not considered in this study. However, higher outdoor activities of the male folks involved in subsistence farming, thereby spending more time on the farm settlement located in the forest than women who spend most time at the home base should also explain this variation in prevalence by sex. The male subjects tended to have more contact with mosquitoes and are therefore more susceptible to infection. Furthermore, studies have shown that the female have better immunity to malaria disease and a variety of other parasitic disease attributed to genetic and hormonal factors (Mandel and White, 1984). There is also the possibility of women being more health care enlightened than men, as a result of attendance at clinics at one time or the other for ante or post natal visits.

Among the high risk category in this study, children were more affected and there is a reported (Syafuruddin *et al.*, 2009) low immunity among children which explains this observation. In addition adequate medical care is available for pregnant women who receive intermittent anti-malaria treatments during antenatal care services.

The age related rate of infection with drastic decrease in prevalence as the age increases (Table 1) shows there must be a level of acquired immunity to malaria as explained by Syafuruddin *et al.* (2009). This may further explain why Abata recorded the highest prevalence because participants in the study at Abata were primary school children, most of whom were under 10 years of age.

The risk of malaria attacks is lower as one gets older and higher when transmission increases (Greenwood, 1997a, b). There is a high prevalence of asymptomatic malaria in this study area, because individuals screened for malaria parasites were apparently not sick and were not complaining of fever relapse at the time of investigation. This obviously is a confirmation of high level of transmission going on. The implication of this high prevalence of asymptomatic malaria infections could not totally be unconnected with the personal protection: Self-administered therapy with drugs like paracetamol or some herbal concoction that give temporary relief reducing fever (WHO, 1993b; Brandts *et al.*, 1997), host factor: genetic susceptibility and acquired immunity (Syafuruddin *et al.*, 2009) and volunteer health

worker and drug vendors offering free consultation and drugs for sale.

The issue of prompt diagnosis and treatment within 24 h of onset of fever may be a problem for the peri-urban communities as there appeared to be tolerance of parasitaemia among children particularly among the study group at Abata.

These present observations suggest the need for identification of the protective immunological mechanism and any local intervention such as traditional and natural therapies or prophylaxis in use, among these population groups in the rationale of the RBM programme.

The next important issues in the number of cases treated for malaria in the two PHCs. The low level of average malaria cases monthly suggests that malaria control intervention in terms of accessibility to ITNs and LLITNs availability and accessibility to recommended first line anti-malaria drugs was to some extent effective within the townships compared to the remote villages where interventions are lacking and a significant 36.5% actually claim not using anything to prevent infection. It could also confirm the fact that most episodes of malaria may not be reported but treated outside the formal health system in the developing world as suggested by Foster (1995). The ability to recognize malaria on the basis of fever and the rate of asymptomatic malaria pose a risk to malaria transmission status in the peri-urban localities.

CONCLUSION

The observations from the present study implied the need for an intensive and longitudinal collection of clinical data, to aid the understanding of how health policy would be evidence-based. The Global Malaria Action Plan (2009) to eliminate malaria as a global health concern by year 2015 and eliminate all malaria transmission within some countries by the same deadline would only be a dream if poverty and proper sanitation in endemic countries and localities like the peri-urban study area not checked. Reaching 80% of households with sufficient ITN by 2010 required that proper education should first be given to the people in respect of the disease and its prevention before control interventions which are malaria treatment, mosquito nets usage and vector control can be put into effective use.

The present study shows a long way to go in achieving the Roll Back Malaria programme two years post the set target year, peri-urban malaria remains a threat to public health.

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