Use of Trained Women in Training Caregivers in Home Management of Malaria in Rural Communities of Enugu, Nigeria.

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Abstract

Background: *The economic loss due to malaria in Africa is in excess of twelve billion U.S dollars per year (WHO, 2008). Nigeria with an estimated population of 167 million, bear a greater malaria burden than any other country in the world (Onwujekwe et al, 2000). In Nigeria, malaria is a major cause of morbidity and mortality, and is responsible for 30% of childhood mortality, 11% of maternal mortality, and more than 60% of outpatient visits in clinics and hospitals (Onwujekwe et al, 2000). The disease has also impacted negatively on the nation's economy, to the extent that Nigeria loses about 132 billion Naira annually to the disease (Onwujekwe et al, 2000) This situation calls for a global concerted effort towards the management and control of malaria [WHO, 2008; WHO 2007]. In Enugu State, particularly in the rural areas, the scourge of malaria remains high (Onwujekwe et al, 2000), and this study intends to use RMMs, to deliver the multi-lateral intervention strategies in the home management of malaria.*

Methods: *Data collection and editing was done manually to detect omission and ensure uniform coding. Data entry and analysis was done using SPSS statistical package version 15. Frequency tables and cross-tabulations were generated. Chi-square test of statistical significance, McNemar chi square test, student t-test, and multivariate analysis using binary logistic regression were used in the analysis and the level of significance was at a p-value of less than 0.05.*

Results: *A significantly higher proportion of the home caregivers in the intervention group, had good knowledge, (91.2), good attitude, (67.2), and also good practice, (74.4), as compared with those in the control group, who had good knowledge, (0.5%), good attitude, (3.7%), and also poor practice, (1.9%). (χ^2=712.435, p<0.001). Also, a higher proportion of the home caregivers in the intervention group, (74.4%), had good practice of home management of malaria after the intervention period of six months when compared with the home caregivers in the control group, (χ^2=479.758, p<0.001).*

Conclusion: *Effective management of malaria is very important in reducing the burden of malaria and this could be guaranteed if role model mothers are regularly trained and incorporated in home management of malaria especially in the rural area where the burden of malaria is high and health workers are fewer*

Keywords: *HMM; Caregivers; Malaria; LLIN*

1. Introduction

Malaria remains one of the major public health problems worldwide (Onwujekwe et al, 2000). An estimated 90% of 300–500 million cases per year worldwide occur in sub Saharan Africa [WHO, 2008; WHO 2007]. Children and pregnant women bear the greater burden of the disease, though no age group is spare [WHO, 2006; WHO, 2011; WHO, 2004]. The disease,

malaria when it affects an immune-compromised or mal-nourished individual is always severe. Attempts at curtailing the devastating effects of malaria in Africa have been punctuated by many obstacles [WHO, 2004), including rapid development, spread of vector resistance to residual insecticides, and parasite resistance to clinically useful drugs [Bell et al, 2007; Rolland et al, 2006; Abdel-Humeed, 2009; Sirima et al, 2003]. Other obstacles include lack of adequate and effective alternative drugs that are acceptable, safe, affordable and available [Bell et al, 2007; Lubell et al, 2007]. Poorly managed health services in most African countries have also limited the effort to combat the disease [Pagoni et al, 2004; Green & Kreuter, 2005].

The World Health Organization, (WHO), has advocated for expansion and acceleration of malaria control efforts using integrated or multilateral approach [WHO, 2008; WHO, 2007]. This approach involves prompt diagnosis using rapid diagnostic test and effective drugs such as Arteminisin Combination Therapy (ACT) [Bell et al, 2007]. Environmental management geared towards vector control with use of insecticide treated bednets (Green & Kreuter, 2005), prescription of preventive anti-malaria therapy like sulfadoxine-pyremethamine to pregnant women, infant, and children under five years, and prompt treatment of patient within 24 hours at home, (home management) [Dada & Omokhakodion, 2007; Ajayi et al, 2008].

The concept of Role Model Mothers, (RMMs), in delivering home-based management of malaria has been used in some parts of Africa, including Nigeria [Kidane & Morrow, 2000; Yakubu, 2010]. The RMMs are trained mothers that serve as local outreach resource persons. In Tigray, Ethiopia, trained mothers had been used in clinical trial and the result showed a reduction in malaria infection (Kidane & Morrow, 2000). The Global Fund for Malaria grant in Nigeria, through the principal recipient, the Yakubu Gowon Center, gave fund to scale-up activities of Roll Back Malaria, (RBM), in 2006 (Khalid et al, 2009). Part of the fund was used for community mobilization and training of RMMs in 12 selected states of Nigeria, including Ebonyi and Imo States. The RMMs were trained to distribute Long Lasting Insecticide Treated Nets, (LLINS), and ACT drugs in those selected states.

The evaluation reports from Ebonyi State, showed that RMM activities resulted in increased use of ACT, and LLINs, with a resultant reduction in the morbidity and mortality due to malaria in Ebonyi State [WHO, 2011; WHO, 2005; WHO, 2004]. In south-west, Nigeria, trained mothers were used to distribute LLINs and ACT, there was reduction in malaria infection [Ajayi et al, 2008]. In Enugu, south-east Nigeria, the trained mothers impacted positively on the knowledge, attitude, and practice of home caregivers' home management of malaria (Uneke, 2009).

Statement of Research Problem

Despite several years of research and concerted efforts at control of malaria, the realization of malaria-free world remains a mirage (WHO, 2005). The prevalence of the disease continues to increase in many parts of the world (WHO, 2004). An estimated three billion people live in malaria endemic areas (WHO, 2004). The global annual incidence ranges between three to five hundred million clinical cases with a death toll of between two to three million [WHO, 2005; WHO, 2004]. Malaria accounts for 10% of Africa's disease burden, causing the greatest suffering and impoverishment among the people (WHO, 2011).

The economic loss due to malaria in Africa is in excess of twelve billion U.S dollars per year (WHO, 2008). Nigeria with an estimated population of 167 million, bear a greater malaria burden than any other country in the world (Onwujekwe et al, 2000). In Nigeria, malaria is a major cause of morbidity and mortality, and is responsible for 30% of childhood mortality,

11% of maternal mortality, and more than 60% of outpatient visits in clinics and hospitals (Onwujekwe et al, 2000). The disease has also impacted negatively on the nation's economy, to the extent that Nigeria loses about 132 billion Naira annually to the disease (Onwujekwe et al, 2000). This situation calls for a global concerted effort towards the management and control of malaria [WHO, 2008; WHO, 2004]. In Enugu State, particularly in the rural areas, the scourge of malaria remains high,[1] and this study intends to use RMMs, to deliver the multi-lateral intervention strategies in the home management of malaria.

Rationale for the Study

The successes of the role of the RMMs in the home management of malaria are well documented in Ethiopia, Sudan and Burkina Faso [Yakubu, 2010; Hueto et al, 2007; Khalid et al, 2009; Sirima et al 2003]. In south-west Nigeria, evaluation of the home management of malaria have been carried out with successes [Ajayi et al, 2008; Kager, 2002], and similar success stories abound in south-east Nigeria (Hopkins et al, 2007). Despite these previous studies, there is still a high prevalence of malaria especially in the rural areas of Enugu State (Myarango et al, 2006) and this means that the scourge of malaria is still high in this area.

This high prevalence of malaria in the rural areas of Enugu State, may be due to the poor attitude and practices of the rural dwellers [Uzochukwu et al, 2003; Onwujekwe et al, 2006; Myarango et al, 2006]. Also, the high prevalence can be attributed to the poor knowledge of home caregivers and the sick people, as well as the estimated high cost of travel, and long distance to formal health facilities [Hopkins et al, 2007; Onwujekwe et al, 2008; Onwujekwe et al, 2005; Uzochukwu et al, 2003]. This work is not assessing the use of RMMs in the distribution of LLINs and ACT to the people like in previous studies but the focus in this study is in using the trained mothers (RMMs), to demonstrate to the caregivers on how to manage malaria at home with hope of improving the home caregivers' knowledge, attitude and practice (KAP), in the home management of malaria.

The home management of malaria in this study will include use of LLINs, Intermittent Preventive Therapy, (IPT), use of Rapid Diagnostic Test, (RDT), for malaria, treatment of uncomplicated malaria with ACT and referral of serious malaria cases to formal health centres for better treatment.

Justification for the Study

A number of recent studies conducted in sub-Saharan Africa have provided evidence to show that home management of malaria (HMM) can improve the ineffective, self-medication practices that are very common in malaria endemic countries [Malik et al, 2006; Gyapon & Garshong, 2007; Chuma et al, 2011; Akinleye et al 2007]. Also, these studies recognized the HMM as an integral part of the overall malaria case management strategy, with the aim of improving access to treatment for malaria in areas with limited access to health facilities. This strategy can also enhance the early identification of malaria and the initiation of appropriate treatment, especially in children under the age of five [Myarango et al, 2006; Malik et al, 2006; Gyapon & Garshong, 2007; Chuma et al, 2011].

In Ethiopia and Eriteria, it was demonstrated that the community appreciated the contributions of home based management of fever, by the home caregivers which was a pre-requisite in the strengthening of HMM [Yakubu, 2010; Malik et al 2006]. Despite the growing evidence on the benefit of home management of malaria, the available records on the burden of malaria is not encouraging and this calls for more work to ensure prompt malaria treatment at home. This study is going to assess multilateral approach in home management of malaria using trained

mothers to educate caregivers and this will add to the pool of evidence needed by the policy makers for a better implementation of HMM in Enugu State and beyond.

General Objectives

To assess the use of role model mothers in home management of malaria in rural communities of Enugu State, Nigeria.

Specific Objectives are:

1. To assess home care givers' knowledge on management of malaria in rural communities of Enugu State, Nigeria
2. To assess home care givers' attitude on home management of malaria in rural communities in of Enugu State, Nigeria
3. To assess the home care givers' practice on home management of malaria in rural communities of Enugu State, Nigeria.

Scope of the Study

The study was focused on the effect of knowledge, attitude and practice on home management of malaria within among communities in Enugu State, Nigeria.

Literature Review

2.1 The Burden of Malaria

Malaria illness imposes great burden on the society as it has adverse effects on the physical, mental and social wellbeing of the people as well as economic development of the nation (Gies et al, 2009). About 90% of all malaria death in the world today occurs in sub-Saharan Africa.[42,43] People living in unstable areas of malaria are vulnerable to highly seasonal transmission and to malaria epidemic (Adedotun et al, 2010), while in areas of stable malaria transmission, very young children and pregnant women are the population groups at highest risks for malaria morbidity and mortality (Adedotun et al, 2010).

2.1.2 Burden of Malaria on African Health System

In malaria-endemic countries in Africa, about 60% of all out-patient clinic visits are attributed to malaria, and most diagnoses are made clinically [Ajayi et al, 2008; Oreagba et al, 2005; WHO, 2005]. In the same countries, between 20% and 50% of all hospital admissions are as a result of malaria. The high case-fatality rates are due to late presentation, inadequate management, and unavailability of, or stock-outs of effective drugs (Oreagba et al, 2005). Malaria is also a major contributor to deaths among hospital in-patients (Oreagba et al, 2005). This high burden of malaria may partly be as a result of misdiagnosis, since many health facilities lack the needed laboratory capacity to diagnose malaria. Also, it is often difficult clinically to distinguish malaria from other infectious diseases [Talisuma & Meya, 2010; Yasuoka et al, 2010]. Regardless of these shortcomings, malaria is still responsible for a high proportion of public health expenditure on curative treatment [Talisuma & Meya, 2010; Yasuoka et al, 2010], hence a substantial reduction in the burden of malaria, will free up available health resources, facilities and health workers' time, to tackle other health problems.

2.1.3 Burden of Malaria on the Poor

Poor people are at increased risk of becoming infected with malaria [Chirdan et al, 2008; FMOH, 2011]. Child mortality rates are known to be higher in poorer households, and malaria is responsible for a substantial proportion of these deaths [Iriemenam et al, 2011; Ndo et al, 2011]. A study in Uganda, revealed that the burden of malaria was highest in the group of people that were classified as the poorest (Adedotun, 2010). Also, another study in Cameroon, found that whereas the cost of treating malaria was just 1% of the income of the rich, it was

about 34%, of the income of the poor households (WHO, 2004). Furthermore, studies in Burkina Faso, and Uganda showed that malaria was a direct cause of poverty in the society [Idro et al, 2006; Adedotun et al, 2010].

The direct economic costs of malaria are enormous, and these costs are taken up by the poor countries, who unfortunately have fewer resources (Hopkins et al, 2007). A study has shown a correlation at the country level between the rate of economic development and the burden of malaria, indicating that malaria is an important constraint on economic progress [Uzochukwu et al, 2003; Onwujekwe et al, 2006]. The loss of growth in countries with endemic malaria is estimated to be as high as 1.3% per annum, with an estimated loss of US$12 billion in productivity due to malaria occurrence in Africa annually [Chuma et al 2010; RBM, 2001]. This burden, was why African Heads of State, and Government, gathered in Abuja, Nigeria on 25th April, 2000, to discuss and devise effective strategies to reduce the malaria burden [Onwujekwe et al, 2008; Uzochukwu et al, 2003; Uzochukwu et al, 2006]

The need to reduce the burden of malaria has also attracted the attention of the international community [Onwujekwe et al, 2008; Uzochukwu et al, 2003; Uzochukwu et al, 2006; Myarango et al, 2006]. The control of malaria is now on the political agenda of several of the world's wealthiest countries, making it possible for the creation of the Global Fund to fight HIV/AIDS, Tuberculosis and Malaria [Uzochukwu et al, 2006; Myarango et al, 2006; Malik et al, 2006; Gyapong and Garshong, 2007]. These global efforts against malaria are now being coordinated by the Role Back malaria, (RBM), partnership and major donor foundations, such as the Bill and Melinda Gates Foundations [Onwujekwe et al, 2008; Uzochukwu et al, 2003; Uzochukwu et al, 2006].

2.2 Home Management of Malaria (HMM)

Home management of malaria is based on the assumption that adequate treatment for malaria, delivered at home by mothers soon after the appearance of symptoms, will result in a reduction in malaria morbidity and mortality, and also with a very low cost-effective ratio [Chirdan et al 2008; FMOH, 2011; Iriemenam et al, 2011]. Several studies have also shown that home based management of malaria can improve treatment compliance [Ajayi et al, 2008, Chirdan et al 2008]. A randomized controlled trial in Ethiopia, revealed a reduction in child mortality after an intervention to encourage prompt and adequate home treatment of cases of malaria [Yakubu, 2010].[22]

To improve treatment of uncomplicated malaria at the household level, a strategy has been designed and introduced in several provinces of Burkina Faso since 1994 (Erhun, 2005). As part of the strategy, health personnel and members of the community were trained to use pre-packed anti-malarial drugs that were supplied to health centers and villages (Erhun, 2005). This intervention yielded positive results. In south-west Nigeria, there was a reduction in the prevalence of malaria using trained mothers in home management of malaria (Ajayi et al, 2008), and similar results were obtained in south-east Nigeria (Hopkins et al, 2007).

The strategy of HMM aims to improve the ineffective self-medication practices that are very common in malaria-endemic areas (WHO, 2005). Its overall goal is the early recognition, prompt and appropriate response to malaria illness especially in children under five years of age, in the home or community [Ajayi et al, 2008, Chirdan et al 2008; FMOH, 2011]. It therefore, empowers communities to respond to malaria illness using effective good quality anti-malaria medicine through community involvement [WHO, 2005; Alax et al, 2003]. The anti-malaria medicines used for HMM usually come in the form of a pre-packed drugs, defined

as a course of treatment in a sealed primary packaging, the treatment being composed of individual dose in easily identifiable sub-unit, and conforms to WHO guidelines on technical specification for pre-packaging anti-malaria medicines in compliance with good manufacturing practice requirements (WHO, 2005).

According to WHO, the five components, of HMM strategy include (WHO, 2005)

- **i.** Ensuring that there is an effective communication strategy for behaviour change to enable caregivers recognizes malaria illness early and take appropriate action.
- **ii.** Ensuring that commonly consumers or service providers have the necessary skills and knowledge to manage malaria illness.
- **iii.** Ensuring availability and access to effective good quality preferable pre-packed anti-malaria medicine at the community level close to the home as possible.
- **iv.** Supervision and monitoring of the community activities.
- **v.** Using the same service provider in distribution of insecticide treated bed nets and carrying simple malaria test using rapid diagnostic testing, (RDT).

To ensure that all individuals suffering from malaria have prompt access to effective treatment through HMM, policy actions to address the multiple barriers of access should be designed, and should include broad interventions to invigorate Home Management of Malaria, and ensure that both the consumers and home caregivers factors are critically examined [WHO, 2005; Alax et al, 2003].

2.3 Consumer Factors in the Implementation of Home-Based Malaria Management

Successful implementation of home based management of malaria depends a lot on the socio-cultural and economic background of the consumers [Hopkins et al, 2007; Onwujekwe et al, 2008; Uzochukwu et al, 2003; Uzochukwu et al, 2006]. The factors are related to affordability, acceptability and availability, and these factors interact to influence access to prompt and effective treatment [Hopkins et al, 2007; Chuma et al, 2010]. Regarding affordability, about 40 percent of individuals who engaged in self-treatment, and 42 percent of those who visited a formal health facility reported not having enough money to pay for treatment [Onwujekwe et al, 2008; Uzochukwu et al, 2003; Uzochukwu et al, 2006; Myarango et al, 2006]. The individual adopted coping strategies, including borrowing money and getting treatment on credit in order to access care [Hopkins et al, 2007; Chuma et al, 2010]. Other factors influencing affordability were seasonality of illness, income sources, and transport costs [Hopkins et al, 2007; Uzochukwu et al, 2006].

The acceptability factors included the provider patient relationship, patient expectations, beliefs on illness causation, perceived effectiveness of treatment, distrust in the quality of care, and poor adherence to treatment regimens [Hopkins et al, 2007; Uzochukwu et al, 2006]. Other barriers identified were opening hours of the health facility, location of the health facility, and also attitude of the health provider [Hopkins et al, 2007; Uzochukwu et al, 2006]. It has been noted that subsidizing the anti- malaria drugs, insecticide treated nets, diagnostic test, and re-training of community health providers as well as embarking on social marketing would play significant roles in the revitalization of Home Management of Malaria. Also, a community entry would be a cornerstone for the successful implementation of home-based management of malaria [WHO, 2005; Talisuma et al, 2010; Chanda et al, 2011].

2.4 Health Education and Implementation of HMM

One of the strategic thrusts of the reform process in the health sector as developed by the Federal Ministry of Health is in improving consumers' awareness, and also ensuring community involvement [Onwujekwe et al, 2006; Uzochukwu et al, 2003]. These include the

designing of communication programmes, and also the building of capacities in basic communication skills aimed at increasing the consumer knowledge, and awareness to better health, and rights to quality care, and information on health [Onwujekwe et al, 2006; Uzochukwu et al, 2003]. Health education generally is an aspect of social science that draws from the biological, environmental, psychological, physical and medical sciences, to promote health behavior, prevent disease, disability and premature death through education driven voluntary behavior change activities [Talisuma et al, 2010; Chanda et al, 2011].

Health education is needed for both the providers, home caregivers, and consumers, especially for the rural dwellers of the country to improve their knowledge, attitudes, skills, and behavior towards the implementation of HMM [Ajayi et al, 2008, Daboar et al, 2010; Chirdan et al 2008; FMOH, 2011]. Evidence from recent studies attest to this fact, that health education is essential for improvement in knowledge, attitude and practice of home caregivers in home management of malaria [Daboar et al, 2010; Chirdan et al 2008]. For example, there was a significant increase in the proportion of home caregivers who correctly recognized that mosquitoes were the cause of malaria in a study in rural Nigeria [Daboar et al, 2010]. Another study in Nigeria also showed that individual empowerment through health education of women remarkably influenced the efforts at malaria control [FMOH, 2011].

Knowledge, Attitude and Practice, (KAP), studies on malaria have been carried out in various parts of sub-Saharan Africa, with positive results from home caregivers with respect to malaria control, and these findings were directly related to the individual's educational empowerment and also the participation of the community [Chanda et al, 2011]. Also review articles in sub-Saharan Africa stressed the importance of capacity building, and home caregiver's participation so as to achieve positive KAP on malaria prevention, diagnosis and treatment at home [Talisuma et al, 2010; Hopkins et al, 2007; Chanda et al, 2011]. All these emphasize the relevance of health education in the implementation of home management of malaria [Daboar et al, 2010; Chirdan et al 2008; FMOH, 2011].

2.5 The Role of Role Model Mothers in Home Management of Malaria (HMM)

The African Heads of State meeting in Abuja, Nigeria on Roll Back Malaria adopted the effective treatment of malaria at home as one of the strategies for malaria control in Africa [Hopkins et al, 2007; Mukanga, 2011]. In most parts of sub-Saharan African, the public health infrastructure is inadequate to fully meet existing needs [Onwujekwe et al, 2006; Uzochukwu et al, 2003]. A potentially effective method is to achieve an early, appropriate and low cost treatment of malaria at home through the use of community health workers, (like the Role Model Mother; RMM). The RMM approach is used within the framework of the home-management of malaria by WHO in Africa [Talisuna et al, 2010; Mukanga, 2011].

The RMMs would be better than most other members of the household in recognizing the symptoms of malaria, dispensing appropriate medications, and ensuring compliance to treatment, and also in providing a reliable referral point when treatment fails, and for complicated malaria cases [Uzochukwu et al, 2003; Fawole & Oneaso, 2008]. This may serve to increase the coverage and equity of service delivery at low cost Uzochukwu and colleagues in their study emphasized on the need to realize the potentials of the community health assistants [Uzochukwu et al, 2003], hence the call that the scope of work of the community health assistants to also include the management of diarrhea [Uzochukwu et al, 2003; Fawole & Oneaso, 2008].

Health service delivery programme using minimally-trained mothers have increasingly been established in many countries both in large-scale and small-scale with varying goals and degrees of success. The concept of trained mothers like the RMMs have been established in the USA, Asia and Africa under the umbrella term community health workers. They are usually selected, trained and allowed to work in the communities in which they live. RMM have played an important role in malaria prevention, diagnosis and treatment in many different settings for more than 35 years. Their use has the potential to increase the number of patients receiving anti- malaria drugs, and also increases the correct administration of such drug regimen in the home. In Gambia, Ethiopia, Democratic Republic of Congo and Cambodia, the use of these RMMs have helped in a reduction in malaria mortality [WHO, 2005; Talisuma et al, 2010; Chanda et al, 2011; Fernando et al, 2005].

The success with the wide scale use of community directed distributor (CDS) of invermectin within the framework of community-directed treatment with invermectin shows that the trained mother, (RMM), strategy is feasible and could be scaled-up as long as it is properly developed using the preferences of the communities in programming and with active community involvement in all aspect of the intervention [Uzochukwu et al, 2003; Onwujekwe et al, 2006]. For successful implementation of home-based management of malaria (HMM) using trained mothers (RMM), health education is needed [FMOH 2011; Hopkins et al, 2007]. The trained mothers (RMM) are expected to impact their newly acquired information on health to the caregivers (person responsible for providing health care at the household level) [Daboar et al, 2010; Hopkins et al, 2007].

2.6 Home Caregivers' Knowledge, Attitude and Practice on HMM

Home caregiver is an individual, such as a parent, foster parent, grandparent, or head of household, who attends to the health needs of a child or dependent adult [Onwujekwe et al, 2000; Adepoju et al, 2005]. Malaria control activities in Nigeria are planned and implemented through the Primary Health Care, (PHC), system [Onwujekwe et al, 2000; Adepoju et al, 2005]. However, use of health centres, as the first resort for malaria management has been shown to be low in many African studies including Nigeria [Rogerson et al, 2000; Kwabe et al, 2013; Oguonu et al, 2005; Kerele et al, 2011; Uzochukwu et al, 2004]. It is estimated that only about 20% of malaria episodes are treated in the formal health facilities, while about 80% of cases are treated at home, or through self-medications [Uzochukwu et al, 2004; Amoran 2013].

Reasons necessitating such home treatments includes, difficulty with access to health facilities, poverty, poor attitude of health workers, and also cultural beliefs. These short comings encourage treatment of malaria at home with drugs purchased from shops by home caregivers [HERFON, 2006; WHO, 2009; Uzochukwu et al, 2004; Amoran, 2013]. These treatments by home caregivers are usually incorrect and sub-optimal [Uzochukwu et al, 2004; Amoran 2013]. The reasons for low performance on home management of malaria by home caregivers are poor knowledge, poor attitude and poor practice at the home in the management of malaria. In addition, socio-demographics characteristics as well as cultural beliefs also do play some roles [Hlongwana et al, 2009; Deressa et al 2003; Amoran 2013].

The lack of knowledge by home caregivers is supported by researches in malaria endemic countries of sub-Saharan Africa [Oreagba et al, 2004; Njama et al, 2011; Fatungase et al, 2012]. The level of knowledge of home management has a direct relationship with practice and attitude, though attitude may take a longer time to change. Helping home caregivers to overcome the poor knowledge to prompt and effective management of malaria is of particular importance in sub-Saharan Africa (Amoran 2013) Ajayi et al. (2008) in their study reported a

statistical significant increase in the correct use of chloroquine from 2.6% at baseline to 52.3% after an intervention using RMMs when compared with mothers in control group (Adedotun et al, 2010). Also, China achieved a 95% reduction in malaria incidence between 1970 and 1990 following the launch of its National Malaria Control Programme (Tambe et al, 2013).

In south-west Nigeria, the lack of knowledge by home caregivers is supported by the results of a study in which 3.9% of the home caregiver knew the correct cause of malaria at baseline, after intervention, the proportion moved to 97.0% (Fatungase et al, 2012). This poor baseline knowledge is also in conformity with other similar studies conducted in rural areas in Nigeria, and also other endemic countries where level of knowledge of home caregivers was generally low Programme [Prosper & Egenti, 2013; Fatungase et al, 2012; Adedotun et al, 2010; Tambe et al, 2013]. These findings differ from one study in the urban area, where literacy levels are expected to be high, in which case 82% of the home caregivers correctly related mosquito bite to malaria (Amoran, 2013). This improved practice in the home management of malaria after intervention was similar to other studies carried out to improve home treatment practices of home caregivers in other endemic countries in sub-Saharan Africa [Rowe et al, 2004; Lim et al, 2012].

Methodology

The Study Area

The study was carried out in two rural LGAs (Local Government Areas) in Enugu State, Nigeria. Nkanu West and Igbo-Etiti LGAs, of which Nkanu West was designated as the intervention area while Igbo-Etiti served as the control. Agbani is the headquarter of Nkanu West LGA, and it is about 15 kilometres from the state capital, Enugu. With reference to the national population census of 2006, Nkanu West LGA has a population of 146,695people within an area of 225sq km. Its indigenous people are Igbo and predominantly Christians, however few practice traditional religion, and they are mainly farmers and petty traders.

Igbo-Etiti LGA has it's headquarter at Ogbede, which is about 30 kilometres from Nsukka urban. It has a population of 208,333 people within total area of 195 sq km. The people are also of Igbo ethnic nationality and are predominantly Christians with few traditionalists also. The distance between Nkanu West and Igbo-Etiti LGAs is approximately 150 kilometers.

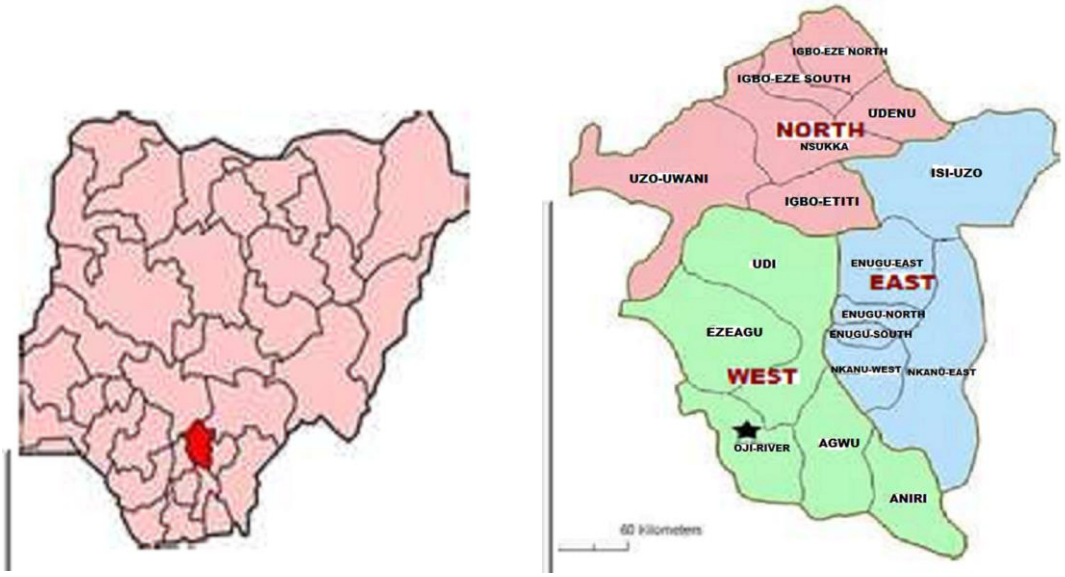
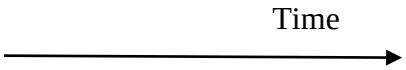


Figure 1: *Map showing Enugu State and Study Site*

Study Design and Population

This is a community based quasi-experimental study with a separate control group. Two rural communities in Enugu state were involved in the study, Amuri community, in Nkanu West LGA, which served as the intervention community and Ezi-Ukehe community in Igbo-Etiti LGA, which served as the control community.

The design is as depicted below



Intervention community Q_1 - - - - - - - - - X - - - - - - - - - - - - Q_2

Control community Q_3 Q_4

where Q_1 and Q_3, are outcome values of interest at baseline in the intervention and control groups respectively, X signifies the intervention, which is the training of home caregivers in the intervention community only, and the broken lines signifies the absence of randomization of the study participants.

The population of the study consisted of married men and women in both communities who met the inclusion criteria. The study population were in two groups, the first were the Role Model Mothers (RMMs). Apart from meeting the inclusion criteria, these were specifically married women, and were endorsed by the community for the purpose of playing that role. They were randomly selected from a list that was submitted by the community. In both the intervention and control groups, eight RMMs were randomly selected from a list of twelve women. These RMMs were responsible for the training of the home caregivers. The home caregiver is an individual, such as a parent, foster parent, grandparent, or head of household, who attends to the health needs of a child or dependent adult.

Inclusion Criteria for Role Model Mothers

1. They must have been resident in the community for at least one year.
2. The person must be respected and trusted by the community.
3. Willingness to serve.
4. Must be married with children.
5. Must obtain consent from the husband (if the husband is alive).

Exclusion Criteria for Role Model Mothers

1. Women with nursing/medical training were not included.
2. Women that are actively involved in politics were not included.
3. Women that work in primary health centers were excluded.

Inclusion Criteria for Caregivers

1. Willingness to participate in the study.
2. Must have at least a child or dependent adult in the household.

Exclusion Criteria for Caregivers

1. Caregivers with nursing/medical training were not included.

Sample Size Determination

The minimum sample size for the study (home caregivers), was determined using the formula for comparison of two independent groups, [91]

$$n = \frac{2(Z\alpha + Z\beta)^2 \Pi(1 - \Pi)}{\triangle^2}$$

Where

n = minimum sample size per group
Zα = standard normal deviate corresponding to level of significance of 0.05 = 1.96
Z_β = standard normal deviate corresponding to power of 1-β, where β = 0.2 = 0.84
Л = the proportion of mothers in a sample for household survey based on compliance rate with treatment guideline, (52%), from an intervention study on the home management of malaria using community medicine distributor [Daboer et al, 2010].
$\triangle_{44}$ = the expected difference between the intervention and control groups, which is set at 0.10

$$n = \frac{2\,(1.96 + 0.84)^2 \times 0.52 \times 0.48}{(0.10)^2} = 391$$

Assuming a non-response of 10%, gives a minimum sample size of 432
However, 860 home caregivers, 430, each in the intervention and control groups were involved in the study.

Table 1: Socio-Demographic Characteristics of the Home Caregivers

Variable	*Intervention n=430 N (%)*	*Control n= 430 N (%)*	χ^2	*p value*
Age of respondents				
Mean± SD (years)	38.6±10.4	39.1±11.1	-0.632*	0.527
Age groups in years				
20-29	82 (19.1)	79 (18.4)	0.886	0.829
30-39	147 (34.2)	158 (36.7)		
40-49	99 (23.0)	90 (20.9)		
50- 59	102 (23.7)	103 (24.0)		
Sex				
Female	213 (49.5)	219 (50.9)	0.167	0.682
Male	217 (50.5)	211 (49.1)		
Education of respondents				
Primary education	259 (60.2)	260 (60.5)	0.005	0.944
Secondary education	171 (39.8)	170 (39.5)		
Occupation of respondents				
Trader	203 (47.2)	184 (42.8)	6.547	0.088
Farmer	134(31.2)	142 (33.0)		
Civil servant	91 (21.2)	94 (21.9)		
Unemployed/ housewife	2 (0.5)	10 (2.3)		
Socio-economic status				
Poorest	110 (25.6)	116 (27.0)	0.245	0.970
Very Poor	107 (24.9)	104 (24.2)		
The Poor	106 (24.7)	103 (24.0)		
Least Poor	107 (24.9)	107 (24.9)		

The above table shows the socio-demographic characteristics of the home caregivers in the intervention and control groups. The socio-demographic characteristics of the home caregivers

were similar in the intervention and control groups. The mean age of the home caregivers in the intervention group was 38.6±10.4, and it was comparable with that of the control group which was 39.1±11.1, (student t= 0.632, p=0.527). Also, the highest proportion of the home caregivers in both the intervention and control groups were in the age group, 30-39 years. All the home caregivers in the intervention and control groups were of the Igbo ethnic nationality, were married, and were also Christians. Majority of the home caregivers in both the intervention and control groups had primary education, and the difference in proportions for the educational attainment of the home caregivers was not found to be statistically significant, (χ^2=0.005, p=0.944). Majority of the home caregivers in the intervention and control groups were traders, and with the least proportion of them being unemployed/housewives. The difference in proportions for the occupational status of the home caregivers in the intervention and control groups was not found to be statistically significant, (χ^2=6.547, p=0.088).

Table 2: Knowledge of Home Management of Malaria by Home Caregivers

	Pre-Experiment				Post-Experiment			
Variable	**Intervention (n=430) N (%)**	**Control (n=430) N (%)**	**χ^2**	**p value**	**Intervention (n=430) N (%)**	**Control (n=430) N (%)**	**χ^2**	**p value**
	Correct knowledge	**Correct Knowledge**			**Correct Knowledge**	**Correct knowledge**		
Awareness of long lasting insecticide treated nets	390 (90.7)	386 (89.8)	0.211	0.646	405 (94.2)	388 (90.2)	4.678	0.031
Confidence in using long lasting insecticide treated nets	46 (10.7)	36 (8.4)	1.348	0.296	307 (71.4)	37 (8.6)	353.198	<0.001
Pregnant women benefit from use of long lasting insecticide treated nets	362 (84.2)	364 (84.7)	0.035	0.851	388 (90.2)	360 (83.7)	8.048	0.005
Infants benefit from use of long lasting insecticide treated nets	362 (84.2)	358 (83.3)	0.137	0.712	394(91.8)	357 (83.0)	14.383	<0.001
Children benefit from use of long lasting insecticide treated nets	378 (87.9)	394 (91.6)	3.241	0.072	418 (97.2)	392 (91.2)	14.355	<0.001
Sulphadoxine-pyremethamine is used for IPT	50 (11.6)	50 (11.6)	FT	1.0	324 (75.3)	51 (11.9)	352.412	<0.001
IPTp prevents against malaria in pregnancy	80 (18.6)	82 (19.1)	0.030	0.862	338 (78.6)	77 (17.9)	317.228	<0.001
IPT is also used for infants	30 (7.0)	26 (6.0)	0.306	0.580	300 (69.8)	24 (5.6)	377.231	<0.001

IPT is also used for in children	44 (10.2)	42 (9.8)	0.052	0.820	308 (71.6)	42 (9.8)	340.897	<0.001
IPTp can prevent low birth weight	34 (7.9)	44 (10.2)	1.410	0.235	256 (59.5)	48 (11.2)	220.129	<0.001
Policy is to test all cases of fever before treatment	32 (7.4)	26 (6.0)	0.666	0.415	274 (63.7)	35 (8.1)	288.525	<0.001
Rapid diagnostic test is used to diagnose malaria	396 (92.1)	402 (93.5)	0.626	0.429	421 (97.9)	398 (92.6)	13.548	<0.001
Knowledge of danger signs of severe malaria	52 (12.1)	52 (12.1)	FT	1.0	357 (83.0)	55 (12.8)	424.949	<0.001
Artemisinin combination therapy is the first line of drug for malaria	400 (93.0)	390 (90.7)	1.555	0.212	414 (96.3)	390 (90.7)	11.002	0.001
Artemisinin combination therapy should be taken with food (fatty food, milk)	40 (9.3)	52 (12.1)	1.753	0.225	314 (73.0)	47 (10.9)	340.340	<0.001
Policy exists to treat fever within 24 hours	156 (36.3)	134 (31.2)	2.518	0.113	344 (80.0)	136 (31.6)	203.986	<0.001
Knowledge of referral of severe malaria	168 (39.1)	167 (38.8)	FT	1.0	267 (62.1)	160 (37.2)	53.254	<0.001

The Pre-experiment section of the above table shows the baseline knowledge of the home management of malaria for home caregivers in the intervention and control groups. None of the seventeen variables used to assess the knowledge of the home caregivers on home management of malaria showed a statistically significant difference between the two groups. A very high and also comparable proportion of the respondents in the intervention group, (90.7%), and those in the control group, (89.8%), had the awareness of long lasting insecticide treated nets. Also, a higher proportion of the home caregivers in the control group were aware that children benefit from use of long lasting insecticide treated nets, and this difference in proportion was not found to be statistically significant, (χ^2=3.242, p=0.072). The same proportions of the home caregivers in the intervention and control groups were aware that sulphadoxine-pyremethamine is used for intermittent preventive treatment for malaria in pregnancy. Also, same proportions of the home caregivers in the intervention and control groups were aware of the danger signs of severe malaria. The variable that had the least proportion of home caregivers with good knowledge by the home caregivers was the awareness of use of SP for IPT for infants, with 7.0% of home caregivers in the intervention group, and 6.0% in the control group having a good knowledge. High proportions of the home caregivers, (93.0% in the intervention, and 90.7% in the control group), were aware that Arteminisin combination therapy is the first line of treatment for malaria, and the difference in proportion was not found to be statistically significant, (χ^2=1.555, p=0.212).

The Post-experiment section of the above table shows the post intervention knowledge of malaria by home caregivers in the intervention and control groups. All the seventeen knowledge variables showed statistically significant difference between the intervention and control groups. About nine out of ten of the home caregivers in both the intervention and control groups had awareness of long lasting insecticide treated nets at the post intervention phase, and the difference in proportion for the two groups was found to be statistically significant, (χ^2=4.678, p=0.031). A higher proportion of the home caregivers in the intervention group, (75.3%), had a good knowledge of use of SP for IPTp, when compared with those in the control group, (11.9%), and the difference in proportion was found to be statistically significant, (χ^2=352.412, p<0.001). Also, a significantly higher proportion of the home caregivers in the intervention group, (63.7%), as compared with those in the control group, (8.1%), were aware of a policy to test all cases of fever before treatment. A significantly higher proportion of the home caregivers in the intervention group, (83.0%), after educational intervention acquired knowledge on knowing the danger signs of severe malaria as compared with their counterparts in the control group, (12.8%), who did not have any intervention, but also had a good knowledge of the danger signs of severe malaria, (χ^2=424.949, p<0.001). High proportions of the home caregivers in both the intervention and control groups, were aware that rapid diagnostic test can be used for the diagnosis of malaria, and the difference in proportion of the home caregivers was found to be statistically significant, (χ^2=13.548, p<0.001).

Table 3: Attitude of Home Caregivers on Home Management of Malaria

	Baseline						Post-Intervention					
Variable	**Intervention (n=430)**		**Control (n=430)**		**χ^2**	**p value**	**Intervention (n=430)**		**Control (n=430) N (%)**		**χ^2**	**p value**
	Positive N(%)	**Negative N(%)**	**Positive N(%)**	**Negative N(%)**			**Positive N(%)**	**Negative N(%)**	**Positive N(%)**	**Negative N(%)**		
Pregnant woman should sleep under long lasting insecticide treated nets	38 (8.8)	392 (91.2)	24 (5.6)	406 (94.4)	0.211	0.646	311 (72.3)	119 (27.7)	20 (4.7)	410 (95.3)	415.911	<0.001
Infants should sleep under long lasting insecticide treated nets	46 (10.7)	384 (89.3)	34 (7.9)	396 (92.1)	1.348	0.296	318 (74.0)	112 (26.0)	32 (7.4)	398 (92.6)	394.087	<0.001
Children should sleep under long lasting insecticide treated nets	42 (9.8)	388 (90.2)	36 (8.4)	394 (91.6)	0.035	0.851	313 (72.8)	117 (27.2)	34 (7.9)	396 (92.1)	376.062	<0.001
Long lasting insecticide treated nets prevent air circulation in the net and its chemical harmful	12 (2.8)	418 (97.2)	5 (1.2)	425 (98.8)	0.137	0.712	263 (61.2)	167 (38.8)	8 (1.9)	422 (98.1)	350.344	<0.001
Will approve use of SP as IPTp for pregnant women in your household	18 (4.2)	412 (95.8)	20 (4.7)	410 (95.3)	3.241	0.072	375 (87.2)	55(12.8)	22 (5.1)	408 (94.9)	583.010	<0.001
Will approve use of SP as IPT for infants in your household	32 (7.4)	398 (92.6)	30 (7.0)	400 (93.0)	FT	1.0	297 (69.1)	133 (30.9)	30 (7.0)	400 (93.0)	351.760	<0.001
Will approve use of SP as IPT for children in your household	44 (10.2)	386 (89.9)	40 (9.3)	390 (90.7)	0.030	0.862	280 (65.1)	150 (34.9)	38 (8.8)	392 (91.2)	292.215	<0.001
Use of SP in pregnant women will cause fetal death	36 (8.4)	394 (91.6)	24 (5.6)	406 (94.4)	0.306	0.580	344 (80.0)	86 (20.0)	24 (5.6)	406 (94.4)	486.391	<0.001
Permit malaria testing in your household	28 (6.5)	402 (93.5)	20 (4.7)	410 (95.3)	0.052	0.820	321 (74.4)	109 (25.3)	22 (5.1)	408 (94.9)	433.567	<0.001

Blood for malaria testing will be used for ritual or sold	6 (1.4)	424 (98.6)	10 (2.3)	420 (97.7)	1.410 0.235	316 (73.5)	114 (26.5)	10 (2.3)	420 (97.7)	462.575	<0.001
Willingness to use ACT as first line of treatment for your household	422 (98.1)	8 (1.9)	422 (98.1)	8 (1.9)	0.666 0.415	428 (99.5)	2 (0.5)	424 (98.6)	6 (1.4)	FT	0.178

Table 3, shows the baseline attitude of the home caregivers on home management of malaria in the intervention and control groups. None of the eleven variables that were used to assess the attitude of the home caregivers on home management of malaria showed any significant statistical difference in the intervention and control groups. The variable that had the highest proportion of respondents with positive attitude was the willingness of the home caregivers to use arteminisin combination therapy as the first line of treatment for malaria in their households, (intervention and control groups, 98.1%). Also, the variable with the least positive attitude among the home caregivers in the intervention and control groups was on whether blood collected for tests for malaria could be used for rituals or be sold, (intervention, 1.4%; control, 2.3%). A higher proportion of the home caregivers in the intervention group, (6.5%), had a positive attitude in permitting malaria testing in their household, when compared with their counterparts in the control group, (4.7%), but the difference in proportion was not found to be statistically significant, (χ^2=2.580, p=0.108). Same proportion of home caregivers in the intervention and control groups had a positive attitude in the willingness to use Arteminisin combination therapy as first line treatment for malaria in their households.

Table 8, above shows the post intervention attitude to home management of malaria by home caregivers in the intervention and control groups. The only variable that was used to assess the attitude of home caregivers to home management of malaria that was not found to be statistically significant at the post intervention phase was the willingness of the home caregivers to use ACT as first line treatment for malaria, in which, (99.5%), of the home caregivers in the intervention group, as compared to 98.6%), in the control group a good attitude. A significantly higher proportion of the home caregivers in the intervention group will permit malaria testing in their household before commencing treatment for all cases of fever.

Table 4: Practice of Home Caregivers on Home Management of Malaria

	Baseline				Post-Intervention			
Variable	**Intervention (n=430) N (%)**	**Control (n=430) N (%)**	**χ^2**	**p value**	**Intervention (n=430) N (%)**	**Control (n=430) N (%)**	**χ^2**	**p value**
	Good Practice	**Good Practice**			**Good Practice**	**Good Practice**		
Insist that pregnant women in your household sleep under long lasting insecticide treated nets	290 (67.4)	286 (66.5)	0.084	0.772	338 (78.6)	288 (67.0)	14.677	<0.001
Insist that infants in your household sleep under long lasting insecticide treated nets	122 (28.4)	128 (29.8)	0.203	0.652	309 (71.9)	126 (29.3)	155.784	<0.001
Insist that children in your household sleep under long lasting insecticide treated nets	86 (20.0)	94 (21.9)	0.450	0.502	289 (67.2)	102 (23.7)	163.996	<0.001
Proper hanging of the long lasting insecticide treated nets	32 (7.4)	36 (8.4)	0.255	0.613	320 (74.4)	36 (1.4)	386.594	<0.001

Insist pregnant women on your household use SP as IPTp	78 (18.1)	72 (16.7)	0.291	0.590	328 (76.3)	70 (16.3)	311.324	<0.001
Insist infants on your household use SP as IPTp	56 (13.0)	62 (14.4)	0.354	0.552	0 (0.0)	60 (14.0)	64.500	<0.001
Insist children on your household use SP as IPTp	22 (5.1)	22 (5.1)	FT	1.0	0 (0.0)	30 (7.0)	31.084	<0.001
Approve of blood testing for malaria before treatment for fever	28 (6.5)	14 (3.3)	4.906	0.027	410 (95.3)	24 (5.6)	693.065	<0.001
Use Artemisinin combination therapy as first line treatment for malaria	334 (77.7)	360 (83.7)	5.046	0.025	424 (98.6)	354 (82.3)	66.054	<0.001
Commence medical attention within 24 hrs of onset of fever	336 (78.1)	350 (81.4)	1.412	0.235	407 (94.7)	344 (80.0)	41.698	<0.001
Refer serious cases of malaria to a health facility for proper management	356 (82.8)	336 (78.1)	2.959	0.085	422 (98.1)	336 (78.1)	82.267	<0.001

The Baseline section of Table 4, shows the baseline practice of home caregivers on home management of malaria in the intervention and control groups. A high proportion of the home caregivers in the control group, (83.7%), and also those in the intervention group, (77.7%), had a good practice in the use of artemisinin combination therapy as first line treatment for malaria, and the difference in proportion was found to be statistically significant, (χ^2=5.046, p=025). A low, and also, significantly higher proportion of the home caregivers in the intervention group, (6.5%), as compared with the control group, (3.3%), had a good practice of approving blood testing for malaria, for cases of fever before treatment, (χ^2=4.906, p=0.027). A high, but comparable proportions of the home caregivers in the intervention group, (67.4%), as compared with those in the control group, (66.5%), had a good practice of insisting that pregnant women in their households sleep under long lasting insecticide treated nets.

The Post-Intervention section in the above table shows the post intervention practice of home management of malaria by home caregivers in the intervention and control groups. All the eleven variable that were used to assess the practice of home caregivers on home management of malaria were found to be statistically significant at the post intervention stage. However, for two variables, a higher proportion of the home caregivers in the control group had good practices when compared with those in the intervention group. The variables are, the home caregivers insisting that infants in their households use SP for IPT, (χ^2=64.500, p<0.001), and also that children in their households use SP for IPT, (χ^2=31.084, P<0.001). A significantly higher proportion of the home caregivers in the intervention group, (76.3%), will however insist on use of SP for IPTp, as compared with (1.4%), in the control group. Also, a higher proportion of the home caregivers in the intervention group, (94.7%), will commence medical treatment within 24 hours of onset of fever, as compared with 80% of home caregivers in the control group who will also commence treatment, (χ^2=41.698, p<0.001).

Table 5: Proportion of caregivers with good knowledge, attitude, and practice

	Pre-Experiment				Post-Experiment			
Variable	**Intervention (n=430) N (%)**	**Control (n=430) N (%)**	**χ^2**	**p value**	**Intervention (n=430) N (%)**	**Control (n=430) N (%)**	**χ^2**	**p value**
	Correct knowledge	**Correct Knowledge**			**Correct Knowledge**	**Correct knowledge**		
Good Knowledge [≥60%]	4 (0.9)	2 (0.5)	FT	0.452	392 (91.2)	2 (0.5)	712.435	<0.001
Poor Knowledge [<60%]	426 (99.1)	428 (99.5)			38 (8.8)	428 (99.5)		
Good Attitude [≥60%]	20 (4.7)	12 (2.8)	2.077	0.150	289 (67.2)	16 (3.7)	375.323	<0.001
Poor Attitude [<60%]	410 (95.3)	418 (97.2)			144 (32.8`)	414 (96.3)		
Good Practice [≥60%]	4 (0.9)	6 (1.4)	0.405	0.525	320 (74.4)	8 (1.9)	479.758	<0.001
Poor Practice [<60%]	426 (99.1)	424 (98.6)			110 (25.6)	422 (98.1)		

The Pre-Experiment section if shows baseline scoring, and classification of knowledge, attitude, and practice of home caregivers in the intervention and control groups. There was no statistical significant difference in the proportion of home caregivers who had good knowledge, good attitude, and good practice on home management of malaria in the intervention and control groups at the baseline level. A higher proportion of the home caregivers in the intervention group, (4. 7%), had a good attitude on home management of malaria, when compared with their counterparts in the control group, (2.8%), and this difference in proportion was not found to be statistically significant, (χ^2=2.207, p=0.150). Also, low and comparable proportions of the home caregivers in the intervention group, (0.9%), had a good practice on home management of malaria when compared to the home caregivers in the control group, (1.4%), and this difference in proportion was not found to be statistically significant, (χ^2=0.405, p=0.525).

Table 11, shows the proportion of home caregivers with good knowledge, attitude, and practice in the intervention and control groups. A significantly higher proportion of the home caregivers in the intervention group, had good knowledge, (91.2), good attitude, (67.2), and also good practice, (74.4), as compared with those in the control group, who had good knowledge, (0.5%), good attitude, (3.7%), and also poor practice, (1.9%). (χ^2=712.435, p<0.001). Also, a higher proportion of the home caregivers in the intervention group, (74.4%), had good practice of home management of malaria after the intervention period of six months when compared with the home caregivers in the control group, (χ^2=479.758, p<0.001).

Discussion

A high proportion of home caregivers in the intervention group, (90.7%), and in the control, (89.9%), were aware of long lasting insecticide treated nets. This finding is higher than that obtained from a study carried out in rural south-west Nigeria on effect of health education intervention on home management of malaria where the proportions that were aware of long lasting insecticide treated nets were 75% in intervention area and 71% in control. The finding was however similar to that of a study done in Cambodia where the proportion of home caregivers with knowledge of LLINs was 92.0%, at the pre-intervention stage (Lim et all, 2012). This high proportion of home caregivers in both study areas may be attributed to free donation of LLINs and malaria campaign by the State Ministry of Health. After intervention, there was a change from 90.7% to 94.2%, in the intervention group, while there was no change in control area. This finding is in conformity with a study on rural communities of Nigeria on intervention practices among nursing mothers where the proportion was 87.4% after intervention (Amoran, 2013).

Home caregivers' confidence in hanging the LLINs properly was low in both groups: 10.7%, in intervention and 8.4% in control area. The finding was lower than that from a study in urban areas of south-west, Nigeria, where the proportion that could hang LLINs was 16.7% (Adedotun et al, 2012). This low percentage of home caregiver might be due to lack of training on how to hang LLINs properly. Interestingly, after intervention, there was remarkably improvement in proportion of home caregivers that knew how to hang LLINs from 10.7% to 71.4% in intervention area, while there was no recorded change in the control group. This finding is similar to a study in rural communities of Anambra state, Nigeria where effect of free ACT and LLINS were conducted and there was 81% improvement after intervention, also with other researchers locally and internationally [Prosper & Egenti, 2013; Lim et al, 2012].
In the study, a high proportion of home caregivers in intervention and control groups, 84.2% and 84.7% respectively, knew that LLINs helped to prevent mosquito bites in pregnant women. This finding was similar to a study in rural Cambodia where the proportion that also knew that

LLINs helped to prevent mosquito bites in pregnant women was 92% [Lim et al, 2012].[114] This high proportion of the home caregivers who were aware of the usefulness of LLINs for pregnant women in the prevention of malaria could be attributed the various health messages on the electronic media, sponsored by the State Ministry of Health and the Roll Back Malaria partners that focused on the importance of LLINs.

Also, there are strong emphases on malaria prevention in the health talks given to pregnant women during antenatal care and this is usually followed with free distribution of LLINs to the pregnant women. After intervention, there was a change from 84.2% to 90.2% in intervention group while there was no recorded change in the control group. The finding is similar to other researchers locally and internationally [Prosper & Egenti, 2013; Lim et al, 2012]. Also, a high proportion of the home caregivers in the intervention, (85%), and control group, (88%), were aware of the benefit of LLINs in preventing malaria in infants at baseline. This finding is similar to a study carried out in rural Thailand on maternal influence on the use of impregnated bed nets in the protection of infantile where the proportion of respondents, that had good knowledge on benefit of LLINs in preventing mosquito bites in infants was 76.4% (Tambe et al, 2013). After intervention, there was a recorded degree change in intervention group for infant and children, 7.6% and 9.31% respectively. The finding is similar to other researchers [Prosper & Egenti, 2013; Lim et al, 2012].

On awareness of use of intermittent preventive therapy to prevent malaria in pregnancy, (IPTp), both study groups recorded a low proportion of home caregivers who were aware, 18.6% in intervention and 19.1% in control. This finding is similar to research carried out in Ibadan, southwest Nigeria on perception and practices of malaria prophylaxis among primary health providers where the proportion was 16.4% at baseline [Fawole & Oneaso, 2008]. The finding did not reflect the effect of free donation of SP by government, and another reason might be due to inadequate education of the home caregivers on importance of IPTp-SP to pregnant women.

After intervention, the proportion changed in intervention group from 18.6% to 78.6%, however no change was observed in control group. The finding is similar to a study conducted in Burkina Faso on placental malaria and low birth weight in pregnant woman where the proportion was 61.4% (Tiono et al, 2009). The study revealed that the proportion of home caregivers who knew that IPT is given to infant was low in both study areas: 7.8% in intervention arm and 6.0% in control. The finding is in contrast to study in Gambia on a trial of intermittent preventive treatment and home based malaria management in rural children where the proportion that was aware of IPTc was high (Sesay et al 2001).

Although WHO advocated the use of SP for malaria prevention in pregnant women and infants, they are still considering its benefit in children. Nigeria at present has no policy guiding the use of sulphadioxine pyremethamine as IPTc for malaria in infant and children. After educational intervention, the proportion of home caregivers who knew about IPT use on infant increased to 69.8%, with no recorded change in control area. The study revealed also at baseline, there was a high proportion of home caregivers in both arms of the study, 92.9% in intervention area and 93.5% in control area that knew that RDT could be used to test malaria. The finding is similar to study conducted in rural Cambodia on promoting community knowledge and action of malaria control in rural area where the proportion was 85% at baseline (Lim et al, 2012), and is lower to finding in Zambia districts on community case management of malaria using ACT and RDT where the proportion was 75% at baseline (Chanda et al, 2011).

The high proportion could be attributed to highly subsidized RDT given at both formal medical clinics and non-formal medical clinics, and could equally be attributed to campaign by government to test all cases of fever before treatment. After intervention, the proportion changed from 92.9% to 97.9% but no change was recorded in control areas. The finding is similar to other researchers.[56,59,114] In the study also, a low proportion of home caregivers knew the danger signs of malaria: 12% in intervention area and 12% in control. The finding is in contrast to the study in Northern Ghana on manifestation and outcome of severe malaria in children where the proportion was 66.9% at baseline (Mockenhaupt et al, 2004). After intervention the proportion changed from 12% to 83.3% in intervention area but no change was recorded in control area.

The awareness that ACT is used as first line drug for malaria was high in both areas: 93.0% in intervention and 90.7% in control area. The finding is similar to study carried out in rural Cambodia where 80% was reported. This high proportion of home caregivers observed may be due to the ban on use of chloroquine for treatment of malaria by Federal Government and also the distribution of free ACT to clients at the primary health care level. After intervention, there was a change from 93.0% to 96.3%, in the intervention group while there was no recorded change in control. The finding is similar to a study conducted in Anambra State, Nigeria on effect of free ACT and LLINs in rural communities where proportion was 87.5% after intervention (Prosper & Egenti, 2013).

The policy to treat all cases of fever within 24 hours of commencement of fever was low in both areas of the study: 36.3% in intervention and 31.2% in control group. The finding is in contrast to a study in Ogun State, south-west Nigeria on effect of health education intervention on the home management of malaria among the caregivers of children aged under 5years where the finding was 72.9% (Fatungase et al, 2012). The reasons for delay were both lack of knowledge and socio-economic factors. After intervention, proportion moved from 36.3% to 80% in intervention, no record was made at control area.

The baseline knowledge score for all variables used to assess knowledge was low in both areas: 0.9% for intervention and 0.5% for control group. After intervention, the score for all variables used to assess knowledge changed from 0.9% to 91.2% in intervention area but no remarkable change was recorded in control area. The finding is similar to a study on rural communities in Nigeria on intervention practices among nursing mothers where the knowledge score was 2.8% at baseline and after intervention it was 51.6% (Amoran, 2013).

The baseline attitude for home caregivers was low in many of the variables used to test attitude: Reasons being that attitude and belief takes a longer time to change, unlike knowledge. In the study, 8.8% of home caregiver in intervention, and 5.6% of in control group will allow pregnant women to use LLINs in their household. The finding is similar to another research conducted in Uganda where the attitude of the caregivers was poor (Njama et al, 2003). This poor attitude could be linked to belief that circulation of air within the net is poor and chemical impregnated in the net is harmful. However, after intervention, the proportion of home care givers in intervention area increased to 72.3%.

On the same hand, the proportion of home caregivers that allowed infants to use LLINs, was low in both study areas, 10.7% in intervention and 7.9% in control groups.
The finding is similar to a study in rural Thailand where the proportion of home caregivers were very low (Sri-aroon et al, 2002). After intervention, the proportion increased from 10:7% to 72.3% in intervention group but no change was observed in control group. The finding is in

conformity with the study in remote areas of Philippines, where the proportion became high after intervention (Bell et al, 2007).

The study revealed also that approval for use of IPT on pregnant women showed low percentage in both arms: 4.2% in intervention arm and 4.7% in control. The finding is similar to a study in Gambia where the proportion was 12.4% (Sesay et al, 2001). After intervention, the proportion changed from 4.2% to 87.2% in intervention area but no change was recorded in control area. The finding is similar to other researchers [Sisey et al, 2006; Dicko et al, 2008; Sesay et al, 2001].

The study also revealed that attitude of home caregivers to allow blood testing, in both area of the study was poor: 6.5% in intervention area and 4.7% in control arm. The finding is similar to a study conducted in rural districts of Zambia where baseline result was poor (Chanda et al, 2011). On practice, the proportion of home caregivers insisting that pregnant women should use LLINs was good in both areas, 67:4% in intervention and 66.5% in control area. The finding is similar to another study in Cambodia where 84.5% was recorded (Hasegawa et al, 2013). The practice or utilization of products or services is directly related to knowledge.

The free distribution of LLINs may influence the utilization (practice). After intervention, the proportion of home caregivers that insisted that pregnant women should use LLINs, changed from 67.4% at base line to 78.6% after intervention. The finding is similar to other researchers [Prosper & Egenti, 2013; Lim et al, 2012]. The proportion of home caregivers that accepted they could properly hang LLINs was low in both areas: 7:4% in intervention and 8.4% in control area. The study is similar to a study in South East Asia (Hasegawa et al, 2013).

From the study, the proportion of home caregivers who insisted that pregnant women should use SP was low: 18.0% in intervention area and 10.7% in control area. The finding is similar to a study conducted in Blantyre, Malawi where practice was low before intervention (Rogerson et al, 2000). The low practice might be due to inadequate knowledge. After intervention, the proportion changed from 18.1% to 76.3% but no change was recorded in control area. The finding is similar to a study in Burkina Faso (Tiono et al, 2009).

Home caregiver practice of allowing infant to use SP was low in both areas of study: 13.0% in intervention area and 14.4% in control. The finding is similar to a study conducted in Gambia (Sesay et al, 2001). This low level might be due to absence of a policy in Nigeria at present on the use of SP. After intervention, the 13.0% in intervention area dropped to 0.0% while no change was recorded in control area. The finding is in contrast to studies in Senegal and Gambia [Cisse et al, 2006; Sesay et al, 2001], where proportion of caregivers using SP for malaria prevention in children was high. The change may be due to the absence of policy in Nigeria on use of SP for malaria prevention in children and infants.

The practice of testing cases of fever before treatment by home caregivers was poor at baseline for both areas: 6.5% intervention and 3.3% in control group. The finding was similar to a study in Zambia where the proportion was low (Chanda et al, 2011). After intervention, the proportion changed from 6.5% to 95.5% in intervention area but no change in control area. The finding was similar to a study conducted in Cambodia where the proportion was 85%. The proportion of home caregivers who used ACT as first line drug for malaria was high in both areas: 77.7% in intervention area and 83.7% in control area. The finding is similar to studies in Zambia and Cambodia [Chanda et al, 2011; Lim et al, 2012].

After intervention, the proportion change from 77.7% to 98.6% but no change was recorded in control areas. The finding is similar to other studies [Chanda et al, 2011; Lim et al, 2012]. The proportion of home caregivers who commenced treatment of fever within 24 hours was high, 78.1% in intervention and 81.4% in control area. The finding is similar to a study in Ogun State, Nigeria where proportion was 72.9% (Fatungase et al, 2012). After intervention, there was change in proportion of home caregivers in intervention area from 78.1% to 94.7% but no change was recorded in control area.

The finding is similar to other researchers [Njama et al, 2003; Fatungase et al, 2012; Hasegawa et al, 2013]. Also, the practice of referral of serious cases for proper management by home caregivers was high in both areas: 82.8% in intervention and 78.1% in control area. The finding is lower to a study in Ogun state, Nigeria where the proportion was 52.2% (Fatungase et al, 2012), and the finding is similar to a study in Cambodia where it was 84%. After intervention, the proportion changed from 82.8% to 98.1% but no change was recorded in control area. The total score of good practice was low at base line, 0.9% for intervention area and 1.4% for control. After intervention, it became 74.4% but no change was recorded in control area.

There were certain factors that had association with acquisition of knowledge from the study, age, educational level and socio-economic class, showed significant association with knowledge of home management of malaria by home caregivers. Home caregivers in 20-29 years were 3 times less likely to have good knowledge when compared to those in 50 years and above. This finding is similar to a study carried out in rural Cambodia (Lim et al, 2012) where older people had better knowledge and also a study in southwest Nigeria on factors associated with use of guidelines in home management of malaria among children in rural communities where age was found to be associated with knowledge. Age is directly related to experiences and exposures and these would lead to better knowledge. This finding was also similar to a Zambian study (Chanda et al, 2011). On educational level, those with primary education were 4 times more likely to have good knowledge than those with secondary education. This finding is in contrast with a study in rural south-west Nigeria (Kerele et al, 2011), and other researchers [chand et al, 2011; Hasegawa et al, 2012; Lim et al 2012]. Education is directly associated with good knowledge, so people with higher education is expected to have better knowledge.

The study revealed that those in very poor quartiles of socio-economic class where 4 times more likely to have good knowledge on home management of malaria when compared with respondents in the least poor quartile of socio-economic class. Also respondents in the poorest quartile were about 3 times more likely to have good knowledge when compared with the least poor. The finding is similar to a study in south-east, Nigeria on socio-economic differences and health seeking behavior for the diagnosis and treatment of malaria (Uzochukwu & Onwujekwe 2004).

On practice, age, educational level and socio-economic class had significant association with practice of home management of malaria. The respondents in age group of 20-29 years were about 4 times more likely to have good practice when compared with those in more than 50 years of age. The finding is in contrast to a study in rural south-west Nigeria (Hasegawa, 2013), and also in Zambian study (Chanda et al, 2011). Practice is directly related to knowledge; better knowledge goes with good practice.

On education, the respondents with primary education were 1.4 times less likely to have good practice of management of malaria when compared with those with secondary education. The finding is similar to a study in rural south-west Nigeria[104] and with other researchers[59,114]. On

socio-economic class, respondents on poorest quartile were 3 times more likely to have good practice when compared with least poor. The finding is similar to study carried in south-east Nigeria (Uzochukwu & Onwujekwe 2004).

The poor like to minimize cost and maximize benefit. The better practice of home management of malaria will allow them to have more benefit at little cost.
The RMMs were all married and have stable relationship except one widow in each group. The ages, education and other socio-demographic characteristics variables in the study were almost equally distributed in the intervention group and control group. From this study, the role model mothers' pre-training knowledge, attitude and practice on home management of malaria were poor and after training, there were improvements in the good knowledge, good attitude and also good practice of the role model mothers in the intervention group. These improvements after training of role model mother showed adequacy in training and competence of the role model mothers to disseminate information on home management of malaria to home caregivers. This finding is similar to other researchers locally and internationally [Ajayi et al, 2008; Yakubu, 2010; Hopkins et al, 2007; Mukanga et al 2007].

Conclusion

There were significant improvements on home caregivers' knowledge, attitude and practice of home management of malaria using role model mothers. Effective management of malaria is very important in reducing the burden of malaria and this could be guaranteed if role model mothers are regularly trained and incorporated in home management of malaria especially in the rural area where the burden of malaria is high and health workers are fewer.

Recommendations

At the end of the study, these recommendations that are based on the findings are proffered.

1. There is need for regular training of role model mothers as local resource persons by the government, professional bodies and non-governmental organizations in order to improve the diagnosis and management of malaria at home by home caregivers.
2. The government, the management of the health facilities, professional bodies and non-governmental organizations alike should help in the provision of malaria drugs, rapid diagnostic tests and long lasting insecticide treated nets for practice of home management of malaria.

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