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Review

The current trends in integrated prevention and control of malaria. A case study of some Nigerian communities

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Malaria is holoendemic in Nigeria and responsible for great mortality and morbidity. Fortunately, the burden of malaria is being reduced through effective case management and vector control measures, including the use of insecticide-treated bed nets (ITNs) and indoor residual insecticide spraying (IRS). So also, choosing the right antimalarial treatment is crucial for effective management of uncomplicated infections. The World Health Organization (WHO) recommends (ITNs) and IRS as effective vector control measures with prompt treatment of confirmed cases with artemisinin-based combination therapies (ACTs). ITNs are now distributed freely to vulnerable groups in Nigeria. IRS is considered as one of the major vector control interventions used in Nigeria today. However, these methods have limitations in their usage. ACTs are used in treating malaria in Nigeria like in most African countries. Health education is also an effective tool that helps improve health in developing nations. Knowledge, attitude and practices (KAP) is the educational diagnosis of a community and is essential for control programmes. These integrated management approach has been said to be the best for malaria control.

Keywords: Malaria, Insecticide treated nets, Indoor residual spraying, Artemisinin derivatives, Nigeria.

INTRODUCTION

Nigeria is the most populous country in Africa (169 million; Nigeria population commission) and the hardest hit by malaria in the entire globe (WHO Global malaria report, 2010). Fifty percent of all malaria cases occur in only five of the world's countries. Nigeria has the unenviable distinction of placing first –making up 23% of all reported cases (Onwuka, 2012).

Malaria is a serious tropical parasitic disease in Nigeria. The most vulnerable groups being children aged 0-five years and pregnant women. The Nigerian Minister of health claimed that malaria reduces the country's Gross Domestic Product (GDP) by 1% annually (Nigerian Vanguard, 2012). This review looks at the current trends in the battle against malaria by use of Insecticide treated nets (ITNS), Indoor residual spraying (IRS), health education and use of Artemisinin combination therapies (ACTS).

Insecticide treated nets (ITNs)

In Africa, malaria-carrying mosquitoes typically bite between dusk and dawn. A net hung over the sleeping area prevents mosquitoes from biting. When that net is treated with insecticide, it provides greater protection by repelling mosquitoes and killing those that land on it. It thus provides physical and chemical barrier to the mosquitoes.

The insecticides used to treat the nets have been approved for safety and efficacy by the WHO. In Nigeria

Table 1. Source: policy for the implementation of insecticide treated nets in Nigeria .9pp

Generic name	Trade name	Manufacturer
Alphacypermethrin SC	*Alcypernet Fendona*	Cyanamid/BASF
Deltametrin SC and Tablets	*K-Othrine KO tab*	Bayer
Efofenfrox EW	*Vectron*	Mitsui
Permetrin EC	*Perepel Imperator*	Avensis
Cyfluthrin EW	*Solfac EW*	Bayer
Lambdacyhalothin CS	*icon , Iconet*	Zeneca, Syngenta

insecticides approved by WHO pesticide evaluation scheme WHOPES and National agency for food, drug administration and control (NAFDAC) are used for ITNs in Nigeria.

ITNs have been shown to reduce all-cause mortality in children under five by about 20 percent and malarial illnesses among children under 5 and pregnant women by up to 50 percent. Until a few years ago, ITNs required re-treatment with insecticide about every six months to maintain their effectiveness. The use of ITNs has been known to reduce childhood mortality by 18% in sub Saharan Africa (WHO, 2007).

Newer, long-lasting ITNs have the insecticide bound to the netting material during production, which enables them to maintain their full protective effect through at least 20 washes, which is estimated to be about three years of regular use. (www.pmi.gov). Two such nets that have passed WHO approval and in the market are the Olyset net with permethrin insecticide and Permanet with deltamethrin insecticide.

Nigeria demonstrated its commitment in rolling back malaria by hosting the Roll Back Malaria Africa summit in Abuja, Nigeria in April,25 2005. They also declared that 60% of children and pregnant women should sleep under nets by 2005. ITNs are now distributed freely to vulnerable groups in Nigeria. However, it has its limitations in its usage in Nigeria.

In a study by Ordinioha (2012) in Rivers State, south – south Nigeria, net ownership does not always translate to use; with factors such as low mosquito activity and high night time temperature capable of reducing use to as low as 20%. Low mosquito activity has particularly been noted to be a very important deterrent to ITNs use in several communities in Nigeria, where the net is predominantly used for mosquito nuisance control and not malaria control. The study also showed that a large number of the nets were not hanged, improperly deployed and unoccupied. Reasons given were torn nets, forgetfulness and tiredness. Although, this is consistent with the findings in several other communities in Nigeria.

In a study by Oyedeji et al (2009) on the use of ITNs among children aged 3months to 13 years in south western Nigeria .The prevalence of the use of ITNs was 1%. The major reasons why ITNs were not used was because of ignorance, unavailability, use of alternative barrier methods and financial constraints. The alternatives were insect sprays, mosquito repellant coils, screened doors and windows and topical cream agents. Mothers also complained of lack of freedom of access and exit thus making the tool a cumbersome daily exercise and fear of their child developing allergy.

Indoor Residual Spraying (IRS)

IRS is a highly effective method of malaria control recommended by the World Health Organization. Unfortunately it remains underutilized in sub-Saharan Africa (WHO Global Malaria programme (2010). IRS, a proven and highly effective malaria control measure, involves the coordinated, timely spraying of the interior walls of homes with insecticides. Mosquitoes are killed when they rest on those walls. Sprayed houses are protected for about 4 to 10 months, depending on the insecticide used and the housing construction. While previously the WHO had recommended IRS only in areas of sporadic malaria transmission, in 2006 it began recommending IRS in areas of endemic, stable transmission as well.

IRS is considered as one of the major vector control interventions used in Nigeria today. Pilot trials have been carried out in 2006 in Epe Local Government Area in Lagos State, Barkin-Ladi in Plateau State and Damboa in Borno State using three different insecticides namely Lambdacyhalothrin, Alpha Cypermethrin and Bifenthrin all of which are synthetic pyrethroids. The evaluation report of the IRS pilot trial by a WHO external consultant recommended that the intervention be scaled up in the country. Further IRS pilot trial using two insecticides namely Deltamethrin and Bendiocarb were carried out in Remo North LGA in Ogun State, Barkin-Ladi in Plateau State and Madagali LGA in Adamawa State. In a study in Iba Local Council Development Area, Lagos, 86% of residents believed IRS was effective and 87% claimed they rarely had malaria again after the intervention (Ajose, 2012).The country has now poised to scale up IRS intervention throughout the ecological zones.

WHO has approved 12 insecticides it considers effective and safe for use in IRS, including DDT. The choice of insecticide depends on its registration status in

country, the housing construction (e.g., mud, brick, or wood), the duration of the malaria transmission season, and susceptibility of local *Anopheles* mosquitoes to the insecticide (www. pmi.gov).

Classes of Insecticides approved by WHO for IRS

Organochlorine; DDT.
Organophosphates: Fenitrothion Malathion and Pirimiphos-methyl: Carbamates: Propoxur and Bendiocarb
Pyrethroids: Alpha-cypermethrin, Cyfluthrin, Deltamethrin Etofenprox, Lambda-cyhalothrin, Bifenthrin

Pyrethroid insecticides are reportedly more acceptable since they do not leave visible residues on the walls.

Health education, Knowledge, attitudes and practices (KAP)

Health education is the profession of educating people about health. It can be defined as the principle by which individuals and groups of people learn to behave in a manner conducive to the promotion, maintenance, or restoration of health.

The Joint Committee on Health Education and Promotion Terminology of 2001 defined Health Education as "any combination of planned learning experiences based on sound theories that provide individuals, groups, and communities the opportunity to acquire information and the skills needed to make quality health decisions (WHO , 2001).

WHO(2004) defined Health Education as "comprising of consciously constructed opportunities for learning involving some form of communication designed to improve health literacy, including improving knowledge, and developing life skills which are conducive to individual and community health.

Education for health begins with people. It hopes to motivate them with whatever interests they may have in improving their living conditions. Its aim is to develop in them a sense of responsibility for health conditions for themselves as individuals, as members of families, and as communities. In communicable disease control, health education commonly includes an appraisal of what is known by a population about a disease, an assessment of habits and attitudes of the people as they relate to spread and frequency of the disease, and the presentation of specific means to remedy observed deficiencies.

Health education is also an effective tool that helps improve health in developing nations. It not only teaches prevention and basic health knowledge but also conditions ideas that re-shape everyday habits of people with unhealthy lifestyles in developing countries. This type of conditioning not only affects the immediate recipients of such education but also future generations will benefit from improved and properly cultivated ideas about health that will eventually be ingrained.

KAP studies measure the knowledge, attitude and practices of a community. It is the educational diagnosis of a community which eventually is essential for control programmes. The knowledge of malaria is the understanding, which affects the attitude which is the preconceived ideas and feelings which culminates in practices, the way they demonstrate this knowledge and attitude by their actions. KAP is simply then awareness tailored to the need of a community.

KAP on malaria studies have being carried out in various communities in Nigeria focusing on different age groups i.e School children and students (Okwa et al (2011), adolescents (Okwa and Ibidapo, 2010), Occupation i.e artisans and Traders (Okwa et al 2011) educated i.e academic staff (Okwa et al 2012).

In a study by Lasisi (2012), on KAP among secondary school students in Lagos, there was adequate KAP about malaria although few (1%) were still attributing the disease to the sun. Fifty percent of the students reported school absenteeism, 70% use bed nets but 80% believed that proper drainage in the environment will best reduce mosquitoes.

Use of Artemisinin derivatives

Artemisinin also known as ***Qinghaosu*** (Chinese): and its derivatives are a group of drugs that possess the most rapid action of all current drugs against *Plasmodium falciparum* malaria. Artemisinin was first used as herbal treatment for parasitic infections and Malaria in China. Now, it comes in water soluble form (Artesunate) and Fat soluble form (Artemether).

Treatments containing an artemisinin derivative (artemisinin-combination therapies, (ACTs) are now standard treatment worldwide for *P. falciparum* malaria. The starting compound artemisinin is isolated from the plant *Artemisia annua*, sweet wormwood, a herb employed in Chinese traditional medicine. Use of the drug by itself as a monotherapy is explicitly discouraged by the World Health Organization, as there have been signs that malarial parasites are developing resistance to the drug. Therapies that combine artemisinin with some other antimalarial drug are the preferred treatment for malaria and are both effective and well tolerated in patients.

In a study by Ekundayo (2012) in Lagos, Nigeria public health care practitioners had more knowledge on the use of ACTs than private health practitioners. There was poor adherence to WHO antimalarial treatment guidelines

by the health practitioners in both sectors. Meremikwu et al (2007) and Umar et al (2011) also reported that few health care practitioners adhere to national and WHO guidelines such as when not to take ACTs during pregnancy and childhood.

According to Palafox et al (2009), more than 200 brands of ACTs in the Nigerian market can be bought over the counter. Artemether –lumefanthrine combination was the most prescribed with trade name Coartem. This was followed by LonartDS. Other ACTs with this combination found in use were Combisunate, Coatal forte, Artemef, Lumartem and Co-artesunate. The artemether – amodiaquine combination found in use were Winthrop and Anate. Dihydroartemisinin –piperaquine combination included P.alaxin and Waipa. Artemether – mefloqiuine combination found was Artequin.

Artemisinin enhances efficacy and has the potential of lowering the rate at which resistance emerges and spreads. Despite being recommended by WHO since 2001, overall deployment of ACTs has been slow. Limiting factors are high cost, limited knowledge and public awareness on the concept of combination therapy (CT) and ACTs in particular, limited knowledge on safety of ACTs in pregnancy, operational issue such as inappropriate drug use, lack of suitable drug formulations, lack of post-marketing surveillance (PMS) systems, and the imbalance between demand and supply (Mutabingwa 2005).

CONCLUSION

It has been projected that by the end of 2012, 300,000 Nigerians would have been killed by malaria (Onwuka, 2012). This figure represents 10% of the yearly total on the African continent. An integrated management approach is said to be the best for malaria control, therefore needs greater attention. The challenge is to eradicate mosquitoes completely and this is a long shot. ITNs and IRS remains strategic interventions in malaria control and part of the integrated malaria vector control approach.

IRS is an efficacious and effective malaria control intervention to reduce malaria transmission rapidly, and reduce malaria morbidity and mortality by 50% at an affordable cost in Nigeria.

ITNs are however considered as the most efficacious of all the currently feasible interventions for malaria control in Africa. Its cost-effectiveness in preventing malaria-related morbidity and mortality is incomparable and is generally found to be easier to implement and better accepted by the local communities than most other control measures (Ordinioha, 2012).

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