

## Review Article

# Utilization of insecticide treated nets against malaria among pregnant women in Southern Nigeria

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## ABSTRACT

Malaria remains one of the most important causes of maternal and child morbidity and mortality in sub-Saharan African, despite the availability of effective intervention. Pregnant women are susceptible to symptomatic malaria due to the invasion of the placenta by Plasmodium. There are public health endeavours in promoting use of insecticide treated nets (ITNS), but there is dearth of data on effectiveness of such endeavour. This narrative review looks briefly at the historical background of use of ITNS against malaria, Government policy and program evaluation process on free ITNS for vulnerable groups, relevance of knowledge in use of insecticide treated nets among pregnant mothers, and the role of attitude and practice on effective use of ITNS in prevention of malaria. There is evidence that relatively few people in high-risk regions access and use ITNS. The low utilization of ITNs attributable to perceived cost, inability to adjust to size of the beds, and side-effects heat and ventilation when slept under it.

**Keywords:** Insecticide treated nets, Malaria, Pregnant women, Prevention, Public health

## INTRODUCTION

Malaria increases the risk of adverse pregnancy outcomes for mother, the fetuses and newborns.<sup>1</sup> The prevalence of malaria is on the increase globally with sub-Saharan African being the worst hit. There are about 300-500 million clinical cases per year with 80% occurring in Africa. It is responsible for one million deaths per year, majorly due to falciparum and 90% of which are in Africa. Most of the deaths occur in children under five living in sub-Saharan Africa, where at least 20% of child deaths are due to malaria.<sup>2-4</sup>

Malaria causes a variety of adverse consequences in pregnant women due to the invasion of the placenta by Plasmodium. It increases the risk of adverse pregnancy outcome for the mother, the factors and the newborn, such as maternal anaemia, Intrauterine Growth Retardation (IUGR) and the delivery of low birth weight

infants. Malaria poses an enormous burden on the world's population, with 216 million cases and 655, 000 deaths attributable to this mosquito-transmitted parasite in 2010 alone. The burden is largely borne by Africa where 91% of deaths occurred, with pregnant women, their unborn babies and children under five years of age most at risk of infection and adverse outcomes.<sup>5</sup>

The Roll Back Malaria (RBM) has identified under-five children and pregnant women as one of the highest risk groups for malaria, and one of the strategies set to fight malaria in this group is to increase utilisation of mosquito nets.<sup>6</sup> In Nigeria, 1 in 5 children suffers from one episode of severe malaria before the age of 5 years, more than one-third of Paediatric admission and one-third of hospital deaths are due to malaria infection.<sup>7</sup> This development made government to focus their attention for building up vector control programme based upon selective springing, personal protection method,

including insecticide treated nets (ITNS) that can be carried out by the communities.<sup>8</sup>

The recent world malaria report which indicated that Nigeria accounts for a quarter of all malaria cases in 45 malaria-endemic countries in Africa, clearly shows the challenge of malaria in Nigeria. While there are reports of up to 50% reduction in malaria episode and deaths in some African countries between 2000 and 2006, reports from Nigeria has not shown any significant reduction, especially with regards to malaria in pregnancy.<sup>2,4,8</sup> The reasons adduced for change in malaria prevalence in other countries were good surveillance and high intervention coverage.<sup>4,9</sup>

The WHO's RBM initiative launched in 1998 was targeted at the prevention and management of malaria during pregnancy using ITNS, among other measures<sup>10</sup>. The evidence for the efficiency of ITNS in preventing malaria infection and its consequences in pregnancy is strong as reported in a Cochrane review in 2009 and in a more recent meta-analysis, which examined malaria-preventing in pregnancy datasets from different African nations.<sup>11</sup>

As a result of the established efficacy of ITNS in malaria prevention, African heads of governments at the Abuja summit in 2000 set a target of achieving 60% coverage of bed nets to use by 2005 for pregnant women and children aged 5 years. This target was subsequently raised by the WHO to 80% by 2010.<sup>12</sup> However, there is evidence from studies that have attributed the failure to use the ITNS to low coverage of health centres, especially in the vast majority of rural communities, cultural preferences, low income, lack of awareness about the benefits of ITNS.<sup>13</sup> Compliance with the use of ITNS has been very distinct in sub-Saharan Africa. In Nigeria, only 5% of women utilise ITNS despite government policy of free insecticide-treated nets for vulnerable groups.<sup>14</sup>

Use of mosquito nets by pregnant women is an important strategy to prevent malaria morbidity and to reduce the negative effects of malaria on pregnancy and pregnancy outcomes. The 2013 national demographic health survey reported that 18 percent of pregnant women slept under a mosquito net, 10 percent of women slept under an ITN, and 16% slept under a long-lasting insecticide nets (LLIN). Use of all three types of nets slightly higher in urban areas than in rural areas. Despite the slight increase in utilization in ITNS, it fall short of the roll back malaria (RBM) set targets of malaria control under the RBM initiative such as at least 60% people at risk of malaria, (especially young children and pregnant women) benefit from ITN and minimum of 60% of pregnant women would have access to effective preventable treatment.<sup>3</sup>

What then is responsible for the low utilisation? The aim of this study will be to assess the knowledge, attitude and utilisation of ITNS among pregnant women in Sagbama community in south Nigeria, with a view to determining

the extent of coverage and levels of utilization among pregnant women in the rural population. Perhaps, it is pertinent the put in point format the problems and questions as well as potential significance of public health attention

## STATEMENT OF THE PROBLEM

Prevalence of malaria in pregnancy has been reported to be on the increase globally with sub-Saharan African being the worst hit with its attendant complications.<sup>7</sup> Use of insecticide treated nets in pregnancy has remained poor in spite of increased health education and awareness campaign by government agencies.<sup>14</sup> Potential gap in the knowledge, attitudes and practices of pregnant women on the use of insecticide- treated nets effective to sustain the control of malaria in pregnant women in Sagbama has yet to be evaluated.

## RESEARCH QUESTIONS

The researcher will pose the following research questions to guide the study.

- What extent does the knowledge on malaria illness influence the use of insecticide treated nets among pregnant women?
- To what extent does attitude towards malaria prevention influence the use of ITNS?
- What are the factors that influence the utilisation of ITNS?
- To what extent does effective use of insecticide-treated net contribute to the sustainable control of malaria among pregnant women?
- What is the Government policy and program evaluation process on free insecticide treated nets (ITNS)?

## SIGNIFICANCE OF PUBLIC HEALTH EVALUATION

Given the above research questions are pending, the findings of this narrative review will be beneficial to program development, implementation or evaluation applicable to researchers and health evaluators as well as in (1) management of health care facilities; (2) Government and stakeholders of maternal and child health; and (3) mothers of childbearing age and caregivers.

## SIGNIFICANCE AND THEORETICAL FRAMEWORK OF EVALUATION

The study will be informed by the behavioural change theories centred on the health action process approach (HAPA) which is psychological theory of health behaviour change developed by Schwarzer.<sup>15</sup> Health behavioural change refers to a replacement of health behaviour such as sedentary behaviour by health exchanging behaviours such as physical exercise. Health

behavioural change theories are designed to examine a set of psychological constructs that explain what motivates people to change and how they take preventive action. The model identifies various factors such as intenders and actors who want to improve their relapse preventive skills. Failure then, they should be prepared for particular high risk situations in which lapses are imminent. Preparation can be exercised by teaching them to anticipate such situations and by acquiring the necessary levels of perceived recovery self-efficacy.<sup>16</sup> Therefore, in the context of malaria prevention among pregnant women and the new borne babies, the behavioural change wheel of both the producers, suppliers and users of ITNS need to be objectively evaluated.

**NARRATIVE REVIEW**

**Historical background of use of insecticide treated nets (ITNs) against malaria**

Mosquito nets treated with insecticide – known as insecticide treated nets (ITNS) or bed nets – were developed in the 1980s for malaria prevention. Fact sheet from the World Health Organization has been cited that ITNs are estimated to be twice as effective as untreated nets.<sup>17</sup> The African Summit in Roll Back Malaria was held in Abuja, Nigeria on the 25<sup>th</sup> of April 2000, committed the continent to an intensive effort to have the malaria mortality for Africa's people by 2010, through implementing strategies and activities for Roll Back Malaria as agreed at the summit. This includes at least 60% of those suffering from malaria have prompt access to and are able to correctly use, affordable and

appropriate treatment within 24 hours of the onset of symptoms; at least 60% of those at risk of malaria, particularly children under five years of age and pregnant women, and benefit from the most suitable combination of personal and community protective measures such as insecticide treated mosquito nets and other interventions; at least 60% of all pregnant women who are at risk of malaria; especially those in their first pregnancies, have access to chemoprophylaxis or presumptive intermittent treatment.<sup>18</sup>

**Government policy and program evaluation process on free ITNS for vulnerable groups**

The Abuja target of increasing the proportion of people under ITNs to 60% by the year 2005, as one of the measures for malaria control in Africa, has generated an influx of resources for malaria control in several countries in the region. A national household survey conducted in 2005 by the Malaria Control Programme in Nigeria assessed the progress made with respect to ITN ownership and use among pregnant women and children less than five years of age since 2000. The survey was the first nationally representative study of ITN use assessing progress towards the Abuja target amongst vulnerable groups. Over a five-year period, Nigeria has succeeded in achieving only 2.8% of the 60% expected coverage for under-five children with insecticide-treated nets. Although this is a non-negligible achievement considering the situation of 0%, this progress is much too slow, if the target set for 2010 are to be achieved (Table 1). Therefore, puts a prerogative on a more concerted effort by the malaria control body.<sup>19</sup>

**Table 1: Timelines of ITNS in Nigeria.**

	1980s	1998	2000	2005	2010
ITNS development	█				
WHO program of Roll Back Malaria strategy		█			
African Summit in Roll Back Malaria strategy			█		
Free ITNS for vulnerable groups - 2.8% coverage				█	
Free ITNS for vulnerable groups - 60% target*					█

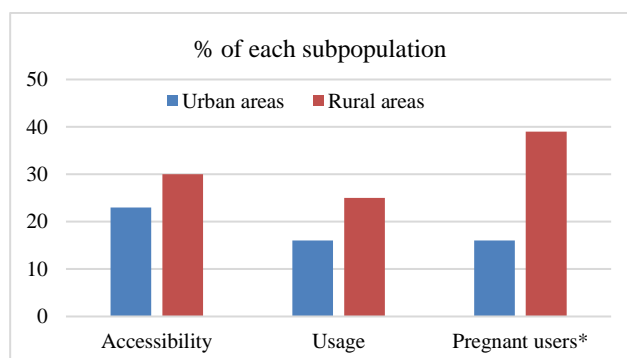
The use of ITNs in areas with stable malaria reduced the incidence of uncomplicated episodes by 50% compared to areas where nets were not used, and 39% compared to areas where the nets were untreated.

ITNs also impacted on severe malaria, parasite prevalence, high parasitaemia, splenomegaly and improvement in haemoglobin levels of children. A reduction 27% in child mortality was also demonstrated in an ITN social marketing programme in Tanzania. This overwhelming evidence of the efficacy of utilisation of ITN was the basis of its adoption as one of the four global RBM strategies for malaria control.<sup>19</sup>

WHO, stated that impressive results in Kenya were achieved by means of the new WHO recommended a strategy which shows, that free mass distribution of long-lasting insecticidal nets is a powerful way to quickly and dramatically increase coverage, particularly among the poorest people.<sup>20</sup> Previously, guidelines from the World Health Organization focused primarily on providing insecticide treated mosquito nets for use by children under five years old and pregnant women. However, recent studies have shown that by expanding the use of these nets to all people in targeted areas, increased coverage and enhanced protection of vulnerable groups can be achieved, while protecting all community

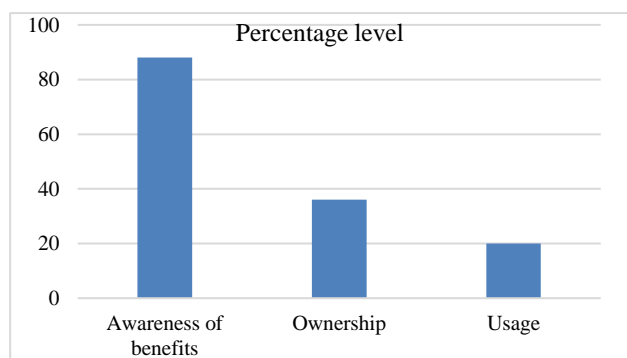
members. In areas of high transmission of malaria, where young children and pregnant women are the most vulnerable, the WHO now recommends making their protection the immediate priority while progressively achieving full coverage.

To curtail the increasing prevalence of malaria, Nigeria adopted the WHO recommendation to provide ITNs free of charge at the point of distribution to all persons at risk for malaria. This is particularly imperative as the indices of household usage are poor among pregnant women and ironically worse in urban cities compared to rural areas (Figure 1).<sup>21</sup> It is also imperative given the reported observation that level of awareness does not seem to translate into ownership, and that there are owners of ITNS who may not be using it (Figure 2).<sup>6</sup> It will be necessary to investigate the outlook of the indices in the Niger Delta vis-à-vis riverine areas such as Sagbama South local government area in Bayelsa State.



\*'previous night' of a survey

**Figure 1: Previously report indices of ITNS usage per household.<sup>21</sup>**



**Figure 2: Level of awareness, ownership and usage of ITNS.<sup>6</sup>**

**Relevance of knowledge in use of insecticide treated nets among pregnant mothers**

According to Ankomah, Adebayo Pregnant women who listened to mass media campaigns were more likely to adopt strategies to protect themselves from malaria.<sup>22</sup> It further stated that behaviour change communication messages that are aimed at promoting not use and

antenatal attendance are necessary for combating malaria. One of the strategies of the Nigerian National strategic plan for malaria is to create awareness on prevention of malaria in pregnancy through the use of ITNS, among others.<sup>22</sup>

Atenchong and Ozims revealed that knowledge of the use of mosquito's bed nets (MBNs) as a preventive measure against malaria had no significant effect on actual use of the net by the study population.<sup>23</sup> It, therefore, suggested that government should increase its effort at improvising the awareness of the benefits of ITNS use and ensure free distribution accompanied by participating approach.

In a study carried out in Delta State revealed that malaria is harmful to the mother and her unborn child was not significantly associated with the use of ITN.<sup>24</sup> The study identified a major challenge such as accessibility and affordability of ITNS by pregnant women and therefore suggests that strategies should be developed to close the gap between the acquisition of ITNS and its consistent utilisation. Several studies suggest that perceived malaria risk and knowledge of malaria are important determinants of bed nets ownership and usage.<sup>25</sup>

**Role of attitude and practice on effective use of ITNS in prevention of malaria**

Mosquito nets are often used where malaria or another insect-borne disease are common, especially as a tent-like covering over a bed. For effectiveness, it is important that the netting does not have holes or gaps large enough to allow insects to enter. It is also important to "seal" the net properly because mosquitoes can "squeeze" through improperly secured nets. Because an insect can bite a person through the net, the net must not rest directly on the skin. Mosquito netting can be hung-over beds from the ceiling or a frame, built into tents or installed in windows and doors.<sup>26</sup>

The RBM global partnership promotes the use of ITNS for everyone at risk of malaria, especially children and pregnant women. ITNS reduce human-vector contact by physical excluding vector mosquitoes, killing them of their land on it or repelling them, thereby driving them from the vicinity of the sleeper.<sup>25</sup>

Ezeama, Ezeamah revealed that although there was a high awareness about ITNS, the use of ITNS was low.<sup>14</sup> Experiences of excessive heat and fear of the chemical used in treating the nets are major constraints. The study concluded that intensive public enlightenment to dispel the misconception about fear of the chemical used in treating the net, excessive heat and availability of ITNS may encourage the usage among pregnant women.<sup>14</sup>

One of the major breakthroughs of recent years is the increased awareness that mosquito nets treated with insecticide give a much higher degree of protection against malaria. When properly used, ITNS can reduce

malaria transmission by at least 60% and child deaths by 20%.<sup>27</sup>

According to Augustincic, Petkovic strategies to increase the ownership and use of ITNs to prevent malaria, is to find ways of ensuring that people who need them own and hang them properly.<sup>28</sup> They must be treated with enough insecticide. Considering that the insecticide-treated bed nets cost money, it is important to find ways of ensuring that people who need them own them. Even when people own bed nets kept may not always use them properly. They must also hang properly and be treated with enough insecticide.<sup>28</sup>

According to WHO, to keep the mosquitoes and other insects out, users should be sure to tuck the bottom of the net under the mattress or let it hang so that it touches the ground all around.<sup>18</sup> It further stated that washing treated net always removes insecticide. It is, therefore, necessary to treat the nets again after it has been washed three times or at least once a year even if it is not washed.

## CONCLUSION

Attempts to prevent malaria through anti-malaria drugs and insecticides are threatened due to the emergence and spread of drug-resistant malaria parasites and insecticides resistant vector mosquitoes. This together with the increasing incidence of the disease heightened the need for the use of ITNS as one control method. The proper use of ITNS can reduce mortality mostly among children. However, there is evidence that relatively few people in high-risk regions access and use them. Similarly, studies have attributed the failure to use the ITNs to the following: it is perceived to be expensive, not hanged due to the size of the beds, net too small, a cause of heat and lack of enough air when slept under it. Contended that the low coverage of health centres, especially in the clear majority of rural communities, cultural preferences, low income, lack of awareness about the benefits of ITNS, low staffing levels, poor infrastructure and limited demand creation efforts have hampered progress, as well as the high levels of poverty in the communities. As government and other sponsoring agencies intensify efforts to create easier access to ITNS, the extent to which the general population residing in high-risk areas own and utilise this medical commodity remains unknown.

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