

Full Length Research Paper

An evaluation of the use of insecticide treated bed nets among children presenting with malaria at a Nigerian health facility

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The use of insecticide treated nets has been advocated for the prevention of the vector borne transmitted disease (malaria) by the World Health Organization and UNICEF for more than a decade now through the roll back malaria (RBM) program. In spite of this, malaria continues to significantly impact negatively on the health of Nigerian children, thus signifying no reduction in the transmission of the disease. This makes it desirable to obtain answers to some pertinent questions on the transmission of malaria such as, is the insecticide treated net preventive strategy recommended by the RBM being used, or is it ineffective? We therefore conducted this study in order to determine what proportion of children infected with malaria are using treated nets and the reasons for non-use among the non-users, with a view to generating ideas that will improve the use of this tool. Consecutive children presenting with malaria at the out patient unit of the State Hospital Osogbo, South west Nigeria, between July 1st and September 30th 2006 were studied. A total of 300 children made up of 158 boys and 142 girls were studied. The age range was 3 months to 13 years and the mean age was 2.3 years \pm 0.1. Of the 300 children seen, 3 (1.0%) used insecticide treated nets, 14 (4.7%) used alternative barrier methods and the remaining 283 (94.3%) used none of the specified methods. The 4 alternatives used are untreated bed nets (8 subjects), insecticide sprays (4), mosquito repellent coils (1) and topical repellent creams (1). The reasons given by the remaining 283 children who failed to use any barrier methods were ignorance, unavailability, cost, considered unnecessary, cumbersome to use, refusal of child to sleep under the nets and allergy to the net in 240 (84.8%), 16 (5.7%), 11 (3.9%), 10 (3.5%), 1 (0.4%), 19 (0.4%) cases, respectively. Three (1.1%) parents gave no reasons. Maternal education was associated with greater use of insecticide treated bed nets $\chi^2 = 9.77$, $P = 0.04$, $df = 4$ (Williams criterion likely ratio applied). It is concluded that there is a need to enlighten the public concerning the use of insecticide treated nets. The treated nets also have to be made available and affordable in order to ensure that the nets get to households. Maternal education also improves the rate of use of this intervention.

Key words: Home based malaria, prevention, children, strategies.

INTRODUCTION

Malaria is of important public health concern in Nigeria especially because of its impact on child and maternal health (Orimadegun et al., 2007). It is responsible for close to 5 billion infections per annum worldwide and

approximately 3 million deaths. Africa accounts for 90% of this burden (Breman et al., 2004). Children under five are vulnerable to severe attacks of malaria because of their lack of immunity. The disease is mainly transmitted by the bite of an infected female anopheline mosquito in man. In a minority of cases, it can be transmitted through blood transfusion or acquired congenitally. It is thus expected that preventing bites from malaria laden

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Table 1. Age and sex distribution of the children.

Age group	Sex		Total
	Male	Female	
3 months – 5 years	138	116	254
> 5 – 10 years	17	24	41
> 10 – 13 years	3	2	5
Total	158	142	300

mosquitoes will reduce malaria transmission significantly.

The recognition of the unacceptable morbidity and mortality arising from malaria in Africa and the availability of evidence-based cost effective interventions led to the formation of the roll back malaria (RBM) initiative in 1988. The RBM movement aims to halve deaths attributable to malaria by 2010 and halve it again by 2015 by the use of 3 tools; Insecticide treated bed nets, effective artemisin based anti-malarial combination therapy and the use of insecticides which have also been documented to be cost effective interventions (Narasimhan and Attaran, 2003). However, the African malaria report for the year 2003 published by the WHO and UNICEF admitted that “Roll back malaria is acting against a background of increasing malaria burden” (www.rbm.int/amd2003/-amr2003/amr_toc.htm).

Malaria remains a common disease of children in Osogbo, South west Nigeria. The extent to which the three elements of the RBM program are available for use in the homes of Osogbo children for their protection is unknown. Insecticide treated nets are expected to prevent most cases of malaria transmission because they pose both chemical and mechanical barriers to the disease vector. The present study seeks to determine whether children currently presenting with childhood malaria at the out patient clinic in Osogbo are making use of insecticide treated nets.

MATERIALS AND METHODS

This was a prospective study in which consecutive children with proven malaria, seen between July 1st and 30th September 2006 were studied. The study was conducted at the outpatient unit of the State Hospital, Osogbo, South western Nigeria. The subjects studied were those whose parents gave consent. In cases where the subjects were old enough to give consent, their consent was obtained. Malaria was diagnosed in these patients based on the clinical features of fever and presence of asexual ring forms of malaria parasites in the blood films of the patients. All neonates and children transfused a month prior to the study were excluded in order to exclude cases of congenital and transfusion malaria, respectively.

Information was obtained from mothers or their surrogates by means of a questionnaire. Details obtained included the age and sex of the patient. The educational statuses of the mothers were also obtained. Information was also obtained concerning whether or not the subjects used insecticide treated nets at all. Also, the reasons for not using insecticide treated nets were sought among those that did not use it. The patients were examined clinically and

investigated to detect asexual ring forms of malaria parasites in their blood film. Packed cell volume and other investigations were carried out when indicated. The subjects at presentation were classified as having severe malaria if they presented with a life threatening complication such as cerebral malaria, severe anaemia, febrile convulsions, hyperpyrexia or hypoglycemia amongst others. The diagnosis of severe malaria was made on the basis of the presence of these life threatening complications in addition to a positive blood smear for malaria parasites. Subjects without life threatening complications were classified as having non-severe malaria.

The educational attainments of the mothers were classified into three classes based on Oyedeji et al. (1996) method. Mothers with post secondary school training such as ordinary diploma, higher national diploma, undergraduates, graduates, postgraduates were classified as class 1. Mothers with primary six, uncompleted secondary school training, commercial school certificate and equivalents were grouped as class 2. All mothers with no formal education or below primary six completed education were grouped as class 3.

Results were expressed as descriptive statistics. The data were analyzed with Pearson's Chi-square (χ^2). The method of analyses used were range, mean, standard deviation, simple percentages and ratios. Yates correction was applied when necessary and P values of <0.05 were considered significant.

RESULTS

The population studied

A total of 300 children were studied. There were 158 boys and 142 girls giving a male to female ratio of 1:1. The ages of these children ranged between 3 months and 13 years and the mean age was 2.3 years \pm 0.1. Of the 300 children, the greater majority 254 (84.7%) were aged between 3 months and 5 years compared with the remaining 46 (15.3%) with their ages ranging between > 5 years to 13 years. All the children that used insecticide treated nets were below 2 years of age. The age and sex distribution of the children studied is shown in Table 1.

Mode of presentation

Two hundred and sixty (86.7%) children presented with non-severe malaria while 40 (13.3%) presented with severe malaria. Among the children with severe malaria, severe anaemia and febrile convulsions were the most common manifestations of the severity seen among the subjects studied. The pattern of presentation among the children with severe malaria is shown in Figure 1.

Use of insecticide treated nets

Out of the 300 children seen, 3 (1.0%) used insecticide treated nets, while 14 (4.7%) used alternative barrier methods and the remaining 283 (94.3%) used neither insecticide treated nets nor alternative barrier methods. Of the alternatives used by the 14 children, 8 (57.1%) used untreated bed nets, 4 (28.6%) insecticide sprays, 1

Table 2. Relationship between the mothers' educational status and the use of insecticide treated nets.

Educational class Of the mother	Number (%) of mothers using treated nets	Number (%) of mothers not using untreated nets	Total number of mothers in the class
Class I	2 (12.5)	14 (87.5)	16
Class II	1 (0.8)	132 (99.2)	133
Class III	0 (0.0)	151 (100.0)	151
Total	3	297	300

$\chi^2 = 9.77$, $P = 0.04$, $df = 4$ (Williams criterion likely ratio applied).

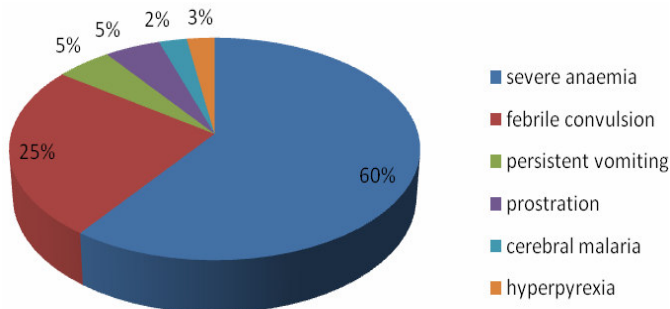


Figure 1. The presentation among the 40 children with severe malaria manifestation.

(7.1%) mosquito repellent coils and 1 (7.1%) topical mosquito repellent. The reasons given by the 283 who did not use insecticide treated nets or any form of barrier method to vector borne malaria transmission were ignorance concerning the efficacy of insecticide treated bed nets by 240 (84.8%), unavailability of the nets by 16 (5.7%), the high cost of the nets by 11 (3.9%) and a feeling that the nets were unnecessary by 10 (3.5%). The remaining 3 respondents gave 1 (0.4%) reason each which is that the exercise of getting in and out of under the net on a daily basis was too cumbersome, the child refused to sleep under the net probably due to fear and a feeling of the parent that their child was allergic to the treated bed nets. Three mothers (1.1%) gave no reasons. Amongst the 16 parents who responded that treated bed nets were unnecessary, 10 felt so because they lived in houses protected by window and door nets.

Education status of mothers

Sixteen (5.3%) mothers were in class 1, while 133 (44.3%) were in class 2 and 151 (50.3%) in class 3. The differences among 2 (12.5%) of the 16 mothers in class 1 who used treated nets compared with 1 (0.8%) of the corresponding children of the 133 mothers in class 2 and the corresponding none of the children of the 151 mothers in class 3 were statistically significant ($\chi^2 = 9.77$, $P = 0.04$, $df = 4$ [Williams criterion likely ratio applied]). Table 2 shows the education status of the mothers.

DISCUSSION

The 1% rate of use of insecticide treated bed nets found in our present study is extremely poor. Our value is similar to the less than 2% figure obtained for children sleeping under nets at Mali, Madagascar and the Gambia by the African malaria report for the year 2003 and the corresponding 0 to 16% obtained from households in some Sub-Saharan African countries (www.rbm.int/amd2003/amr-2003/amr_toc.htm; Korenromp et al., 2003). However in another study in the Gambia, 77% of under fives were reported to be sleeping under treated bed nets following the national impregnated bed net programme, which achieved an 83% net treatment rate (www.rbm.int/amd2003/amr2003/amr_toc.htm).

The present study also shows that the groups mostly affected by malaria fever are those under the age of 5. This is due to the fact that children in this age group are yet to develop immunity against malaria, thus predisposing them to severe malaria, which constituted 13.3% of cases in this study. It is hence necessary to protect children from malaria. Insecticide treated nets and insecticides are effective tools recommended by the RBM movement for this prevention (Yamey, 2004). A Cochrane review has concluded that the use of insecticide treated nets has been associated with a reduction as high as 18% in childhood mortality rate in Sub-Saharan Africa (World Health Organization, 2007). It is therefore desirable to see to the use of bed nets widely disseminated and used among the paediatric age group, especially children under the age of 5. The major reasons identified for not using treated bed nets in the present study are because of ignorance, unavailability, the use of alternative barrier methods and financial constraints. Less than 5% of the population studied used alternatives. The alternatives to the treated nets used in the present study such as insecticide sprays, mosquito repellent coils or topical agents are technically tasking. If one considers the fact that they need to be administered on a daily basis, compliance may be a problem and they may be more expensive on the long run compared with treated nets. When using treated nets all that is required of the user is to slip in and out from under the nets on a daily basis or as required, while most of the other alternatives demand some daily procedures that may initially produce an uncondusive environment for the mosquitoes and

people. Compared with insecticides only, the insecticide treated nets have the advantage of providing a physical and chemical barrier to the malaria vector. On the other hand, untreated nets provide only physical barriers to mosquitoes, thus untreated bed nets are not as effective as treated nets or insecticides when used individually (World Health Organization, 2007; Jones, 2002).

The majority of children who failed to use insecticide treated nets did so because of ignorance on the part of their parents concerning this tool. Also, unavailability of treated nets by those who desired to procure them was also quite common. Previous studies have shown that there is a high level of lack of awareness concerning this tool and poor distribution coverage of treated nets in African communities (Osero et al., 2005; Miller et al., 2007). In a way unavailability of the nets and ignorance by the populace may be inter-twined because wide dissemination makes a product popular which leads to awareness thus, consequently facilitating the use of the product. Another major problem some parents have is the cost of procuring the treated nets. This has been well described in previous studies (Osero et al., 2005; Molyneux and Nantulya, 2004; Noor et al., 2006). Good maternal education has been found to have a positive influence on the utilization of the preventive tools for malaria, the type of employment secured, financial security and ultimately the ability to procure treated nets (Noor et al., 2006). However, the educational status of more than half of the studied mothers in this present study was poor.

Less than 5% of the population of mothers studied stated that their reasons for not using treated nets was because they did not see them as a necessity as some of them stated that they had window and door nets which they felt was effective. In addition some elitist mothers complained that the bed nets restricted freedom of access and exit when necessary thus making the use of the tool a cumbersome daily exercise. Finally a mother complained of her child's refusal to sleep under the net because of her fear of the child developing a reaction to the treated net. The minority of subjects with uncommon reasons though few, describe a peculiar situation in which the end user is uncomfortable or has found the preventive tools short of being user friendly.

It is concluded that in order to circumvent these problems, the Ministry of Health and other appropriate authorities need to make the populace aware of the importance and use of the treated nets through the mass media and other means of communication. The international community, governmental and non-governmental agencies also have an important role to play by providing

the treated nets or subsidizing the cost of production and making them available and affordable to the end users especially in resource poor communities and families. Efforts should also be directed at making all the commonly used preventive tools more user friendly.

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