

## Original Article

# Insecticide-treated nets usage and malaria episodes among boarding students in Zaria, northern Nigeria

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### Abstract

**Background:** Despite malaria being the largest public health problem in Africa South of Sahara with over one million associated deaths each year, there has been little progress in its prevention/control during the past decades. Therefore, this study was conducted to determine the knowledge, attitude, use of insecticide-treated nets (ITNs), and the prevalence of malaria episodes among boarding secondary school pupils in Zaria, Nigeria.

**Methods:** A multi-stage sampling technique was used to sample five (5) secondary schools within Zaria, from which six classes (JSS 1 – 3 and SS 1- 3) of respondents were then randomly selected. Structured, closed-ended self-administered questionnaires were used to collect information on demographic characteristics, knowledge, attitude, and use of ITNs, reasons for non-use and malaria episodes in last 12 months.

**Results:** A total of 150 students from the five (5) boarding secondary schools were interviewed, majority were in the age group 15–17 (53.3%) with a mean ( $\bar{x}$ )  $\pm$  SD of  $16.8 \pm 0.8$  years. Males were 60% and females 40% of respondents. Majority of the respondents (87.3%) knew about and had actually seen an ITN; only 43.3% were current users. Most of the current users of ITN noticed a significant reduction in malaria episodes in the last 12 months. This was statistically significant ( $P=0.004$ ). Cost and availability were reasons cited by non-ITN users.

**Conclusion:** There is urgent need on the part of all the three tiers of Government for public health awareness campaigns through information, education and communication (IEC) to create positive ITN culture and usage. It is also suggested that ITN usage among boarding school pupils should be incorporated into school health service.

**Keywords:** Boarding schools, ITN use and malaria episodes, Nigeria, students

### Résumé

**arrière-plan:** malgré le paludisme est la plus grand problème de santé en Afrique au sud du Sahara avec plus d'un million associé de décès chaque année, sa prévention a été peu de progrès contrôlé au cours des dernières décennies /. C'est pourquoi cette étude a été menée à déterminer les connaissances, attitude, utilisation de moustiquaires insecticide traité et de la prévalence des épisodes de paludisme parmi l'embarquement des écoles secondaires à Zaria, au Nigéria.

**méthodes:** technique d'échantillonnage de plusieurs utilisée pour l'échantillon cinq (5) les écoles secondaires au sein de Zaria, depuis les six (6) classes (JSS 1-3 et SS 1-3) des répondants ont été sélectionnés puis au hasard. Structurée, fermées questionnaires auto-administrés ont servi à recueillir des informations sur caractéristiques démographiques, connaissances, attitude et l'utilisation de moustiquaires imprégnées filets [MII], raisons d'épisodes de non utilisation et le paludisme dans 12 derniers mois.

**résultats:** au total, une centaine de et cinquante (150) étudiants depuis les cinq (5) d'embarquer des écoles secondaires ont été interrogés, la majorité étaient dans le groupe d'âge 15-17 (53.3 %) avec un  $\pm$  moyenne ( $\bar{x}$ ) SD de  $\pm 0.8$  ans. Les garçons étaient 60 % et les femelles 40 % des répondants. Majorité des intimes (87,3 %) étaient au courant et avait réellement vu une MII; seulement 43.3 % étaient des utilisateurs actuels. La plupart des utilisateurs actuels de MII remarqué une importante réduction de la malaria épisodes dans les 12 derniers mois. c'était statistiquement significative ( $P = 0,004$ ) . Coût et disponibilité étaient raisons placés par les MII les utilisateurs.

**conclusion:** il est urgent sur la partie de tous les 3 niveaux du gouvernement de campagnes de sensibilisation de santé publique par le biais d'informations, l'éducation et communication [IEC] pour créer les MII positive la culture

et l'utilisation. C'est aussi suggéré que l'utilisation de MII parmi pensionnat les élèves devraient être intégrées à service de santé scolaire.

**Mots clés:** des écoles privées Les élèves, utilisent les MII et le paludisme épisodes, Nigeria

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## Introduction

Malaria has reached, a global crisis now kills at least one million people each year, about 3000 a day, and 9 out of 10 cases occur in Africa south of Sahara. It also kills a child every 30s.<sup>[1]</sup> Malaria has many negative effects on its victims; on productivity for example, it worsens the poverty of African nations by preventing adults from working, as patients can be ill for 5-20 days at a time. Malaria prevents children from learning and the cost of malaria control and treatment drains African economies.<sup>[2]</sup> It is unfortunate that the cheapest malaria drug, chloroquine is rapidly losing its pharmacological effectiveness in almost all endemic countries. Similarly, in some parts of the world, strains of malaria have developed resistance to the four leading anti-malarial drugs.<sup>[1]</sup> Consequently, strategic plans for rolling back malaria have to be developed. These include the use of insecticide-treated nets (ITNs) in many African countries, especially by the more vulnerable group---pregnant women and children. ITNs are a practical malaria control tool with proven efficacy that are easy to use and are currently the only viable option in malaria prevention in many African countries. The target population of this study was selected because they are mostly children (a vulnerable group), between the ages of 13 and 18, and are boarding in Secondary schools in Zaria, Nigeria (an endemic area). These children need protection from the scourges of malaria, which can lead to sickness absenteeism and loss of valuable academic time required for intellectual development.

## Materials and Methods

The study was undertaken in Zaria and Sabon Gari Local Government Areas in Kaduna State of Nigeria, where the five boarding secondary schools were located.

Zaria has a tropical continental climate with a rainfall pattern that is typical of tropical guinea savannah. It has distinct wet and dry seasons and mean annual rainfall of about 1,075 mm. There are five main settlements in Zaria: Zaria City (the traditional city), Tudun Wada, Sabon Gari, Hanwa and Samaru with a total population of over 1,490,000.<sup>[3]</sup>

The list of the schools was obtained from 1991 Census Population of Kaduna State.<sup>[3]</sup> In each school, structured questionnaires with close-ended questions were self-administered in order to collect data on demographic characteristics, knowledge attitude, and use of ITNs, reasons for non-use and malaria episodes in the last 12 months. Respondents were given 30 min training on how to properly complete the questionnaires in order to ensure accuracy and correct answers to the questions. At the end of the exercise, the hostels in all the five schools were physically inspected for environmental cleanliness---clear drainages, mosquito breeding sites, presence/absence of nets in the windows etc. Permission to carry out the research was obtained through written communication to the Principals of the respective schools and informed consent of the study participants. Data were analyzed using the SPSS statistical software package. Statistical methods used included frequency.

## Results

A total of 150 students from the five boarding secondary schools (30 each) were interviewed. Majority (53.3%) were in the age group 15-17 with a mean ( $\bar{x}$ )  $\pm$  SD of  $16.8 \pm 0.8$  years. Thirty-two percent (32%) were in the age range of 18-20 years, as shown in Table 1. Sex distribution showed that males were 60% and females 40%, respectively, giving a sex ratio of 1.5. Majority of the respondents (87.3%) knew about and had actually seen an ITN. Most of respondents also knew and correctly identified the vulnerable group targeted for ITN use. Only 43.3% are current ITN users. Sex distribution of current users showed males (38.9%) and females (50%), respectively, [Tables 2-4]. Most of the current users of ITN reported a marked reduction in frequency of clinical episodes of malarial attack. Users of ITN reported 74 episodes of malaria compared to 168 episodes among non-ITN users in the last 12 months. This was statistically significant ( $\chi^2=25.5$ ,  $df=1$ ,  $P=0.004$ ) [Table 5, Figure 1].

Reasons given by non-users included among others were cost, availability of ITNs, heat, and inconvenient to sleep under it.

The school environment was quite neat, but a

**Table 1: Demographic characteristics of respondents**

| Age group                     | Frequency | %     |
|-------------------------------|-----------|-------|
| 12-14                         | 18        | 12.0  |
| 15-17                         | 80        | 53.3  |
| 18-20                         | 48        | 32.0  |
| 21-23                         | 4         | 2.7   |
| Total                         | 150       | 100.0 |
| Mean age (x) ± SD= 16.8 ± 0.8 |           |       |
| Gender characteristics        |           |       |
| Males                         | 90        | 60    |
| Females                       | 60        | 40    |
| Total                         | 150       | 100   |

**Table 2: Knowledge on insecticide-treated nets**

| Knowledge             | Frequency | %     |
|-----------------------|-----------|-------|
| Knew and seen ITN     | 131       | 87.3  |
| Knew but not seen ITN | 13        | 8.7   |
| Don't know/seen ITN   | 6         | 4.0   |
| Total                 | 150       | 100.0 |

ITN: Insecticide-treated net

lot needs to be done to maintain environmental aesthetics of the hostels.

## Discussion

Malaria continues to be a major public health problem in many endemic countries and is one of the major causes of morbidity and mortality in sub-Saharan Africa. It is estimated that malaria causes about 300–500 million clinical cases, and 1.5–2.7 million deaths globally each year, with 80–90% of the clinical cases and one million deaths occurring in Africa alone.<sup>[4]</sup>

In Nigeria, malaria accounts for more than 60% of clinic attendance with over 500 million episodes occurring each year.<sup>[5]</sup> In 2002 alone, 2.6 million cases and 4,092 deaths from malaria were recorded in the country.<sup>[6]</sup> Records on the use of mosquito nets date back to the sixth century B.C. They have been used for decades as protection against nuisance/harmful insects, dust and roof debris falling on sleepers as well as for privacy.<sup>[4]</sup> However, the application of insecticides to bed nets (mosquito nets) was first used by Russian troops during the Second World War.<sup>[7]</sup>

The potential epidemiological usefulness and public health benefits of ITNs for protection against malaria was reconsidered in the 1980s with the advent of the photo stable synthetic pyrethroids.<sup>[4]</sup>

The current WHO initiatives in malaria control such as roll back malaria (RBM) emphasizes the use of ITNs and environmental management to reduce

**Table 3: Distribution of respondents by usage of ITN**

| Usage         | Frequency | %     |
|---------------|-----------|-------|
| Current users | 65        | 43.3  |
| Non-users     | 85        | 56.7  |
| Total         | 150       | 100.0 |

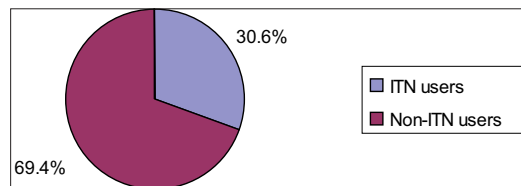
**Table 4: Distribution of current users and non-users of insecticide-treated net by sex**

| Users     | Male       | Female   | Total |
|-----------|------------|----------|-------|
| Usage     | 35 (38.9%) | 30 (50%) | 65    |
| Non-usage | 55 (61.1%) | 30 (50%) | 85    |
| Total     | 90         | 60       | 150   |

**Table 5: Showing the relationship between ITN use and reported episodes of malaria among students**

| Malaria episodes last 12 months | ITN usage status     |                  |
|---------------------------------|----------------------|------------------|
|                                 | Current users (N=65) | Non-users (N=85) |
| 1-4                             | 42                   | 19               |
| 5+                              | 23                   | 66               |

$\chi^2 = 25.5$ ,  $df = 1$ ,  $P = 0.004$ , ITN: Insecticide-treated net



**Figure 1:** Distribution of outcome according to ability to do relevant investigations

the vector population as key strategies for malaria prevention and control in sub-Saharan Africa.<sup>[8,9]</sup>

The most promising and yet most tasking of the WHO strategies for malaria control is the provision and use of ITNs, which has been described as an important and popular tool for malaria control programme.<sup>[10]</sup> They are, therefore, seen as one of the main tools of achieving RBM's objective of halving the world's malaria burden by the year 2010. It also calls for a 30-fold increase in the purchase and use of ITNs in Africa.<sup>[11]</sup>

The findings from this study revealed that knowledge and awareness of ITN among secondary school students was high (87.3%). They are also aware of the vulnerable group that is being targeted for ITN use. However, usage of ITN among respondents was very low (43.3%). When this number was extrapolated among the entire population of boarding students, the figure of current users was even lower. Again, assuming this was projected to the entire community of Zaria, the numbers of households using an ITN will be quite insignificant. This agrees with the study done at Kuje Area Council, Abuja where net use was

found to be 32.9%.<sup>[12]</sup> Even though it has been stated that ITN implementation in some communities in Nigeria has been very effective.<sup>[13]</sup> Also, most of the current users (74) reported a marked reduction in malaria episodes compared to non-ITN users (168). This was statistically significant ( $P=0.004$ ). Cases of malaria episodes among ITN users may not be unconnected with improper use and/or torn nets.<sup>[14]</sup> This is not surprising as studies have demonstrated the advantages of sleeping under ITNs. Apart from providing physical barrier against mosquito bites, ITNs are known to have mass killing effects and to protect against a wide range of vector-borne diseases and reduce childhood mortality by about 20% in Africa.<sup>[11,14-16]</sup> The cost of ITN, like cost of many public health goods continues to raise serious concern.

In this study, most of the non-users (71.3%) the reason cited was cost. Even though the cost of ITN has been described as low<sup>[17]</sup> its price ranges from N500–N2000 (US\$3.91–US\$15.63) which in Nigeria is still very high in view of the fact that more than 70% of Nigerians are currently living below the poverty line of less than US\$1 per day.<sup>[18,19]</sup> This is further compounded by low per capita Federal government expenditures on health at US\$2.<sup>[19]</sup> The issue of cost of ITN found in this study agrees with the findings in other national and international studies.<sup>[12,14,16,20]</sup>

### Study limitations

The study has not investigated the knowledge of net re-treatment and its efficacy among students. Since repeated washing of the nets makes them lose potency. However, it is likely that this will not affect the findings of this study as the nets do not easily lose the chemicals and the respondents did not cease using them.

### Conclusion

Knowledge and awareness, of ITNs was quite high among the respondents, sadly, the reverse was the case in terms of current usage. As malaria scourge is still a very serious public health problem in the country, there is need for increased public awareness campaigns through information, education and communication (IEC) by posters, leaflets, etc. To meet the RBM target and millennium development goals (MDGs) on malaria, all three tiers of Governments need to make ITNs available, affordable, and sustainable. ITN usage among boarding school pupils should be incorporated into school health service.

Finally, there is need to ensure efficient and effective distribution networks for easy access.

### Recommendations

A major problem, though not considered in this study is the issue of re-treatment of ITNs and their efficacy.

There is also the issue of consistent and regular net usage, as during the peak season of malaria, people are keen to use the nets to avoid bites but they may not use them consistently at other times. All these problems need to be addressed.

Generally, like other public health programmes is the issue of ITN sustainability. If a community is supplied with ITNs and taught how to use them, will people continue using the nets, purchasing the insecticide for re-treatment and replacing old/torn nets when necessary?

Finally, it has been noted that most clinicians maintained that their job was to treat malaria and not to control mosquitoes.<sup>[22]</sup> This is very worrisome. Therefore, all members of the health team should know more about ITNs and be in a position to encourage their use.

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