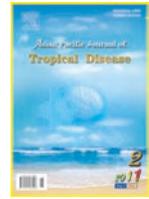




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## Impact of a decade-long anti-malaria crusade in a West African community

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## ABSTRACT

**Objective:** To assess the rate of utilization of long lasting insecticide treated bed nets (LLINs) which is one of the cardinal components of the program, a decade-long antimalarial campaign under the roll back malaria (RBM) initiative. **Methods:** The study was carried out between October and December 2009 and cross-sectional in nature involving adult women in Otukpo town and environs. Households were selected using systematic sampling methods where all the adult women in each household were interviewed. Relevant information such as age, marital status, occupation, utilization of LLINs and reasons for non-utilization were obtained. Data obtained were analysed using analysis of variance (ANOVA) and regression coefficient. **Results:** Almost 100% (3154) of the respondents could associate malaria fever with mosquito bite although other causes were also mentioned. The overall any bed net utilization in Otukpo town was found to be 58.3% (1849). LLINs utilization was found to be 23.3% (739). 35.0% (1110) used untreated bed nets while 41.7% (1322) had no bed net. Positive predictors for LLINs utilization were increasing educational levels, increasing wealth index and presence of an under five child, while lower wealth index and cultural beliefs negatively contributed to LLINs utilization. **Conclusions:** The RBM program in the community has failed to yield the desired results. Efforts should be intensified towards addressing the socioeconomic, cultural, literary and logistic factors in order to reach this goal.

### 1. Introduction

Malaria no doubt has continued to occupy the centre stage of the global health community over a considerable period of time<sup>[1]</sup>. While the disease may have been conquered principally in the western hemisphere, the same cannot be said in most parts of tropical and subtropical parts of the world<sup>[2]</sup>. At present the disease accounts for over a million deaths globally each year, and from 1804 when the world's population clocked one billion to date, malaria is estimated to have contributed to at least 205 million deaths more than the entire combined population of present-day Brazil, Germany and Ghana<sup>[3]</sup>. This is in addition to another probable conservative 250 million deaths caused by

the disease since 5000 BC when the disease is believed to already have been in existence<sup>[1,4]</sup>. About 35% of the present global approximately 7 billion inhabitants are still at risk of going down with malaria any day with attendant medico-social consequences<sup>[5]</sup>.

In the year 2000, African heads of state and government converged at Abuja, the Nigeria's capital city, to renew commitment towards eradicating malaria from the continent with the birth of 'roll back malaria' (RBM) program. Consequently the year 2000–2010 was declared as malaria decade. Some of the cardinal components of the RBM initiative were introduction of insecticide treated bed nets (ITNs) principally for all pregnant women and children under five years, intermittent malaria treatment and prophylaxis, home management of malaria, introduction of artemisinin combined therapy (ACT) as well as massive health education campaigns among others<sup>[6]</sup>.

Ten years have just rolled by while at the expiration of

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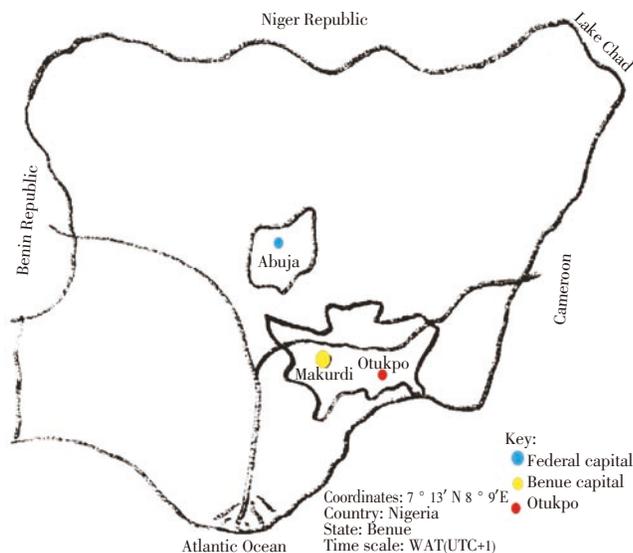
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the malaria decade, a survey of malaria prevalence carried out among communities still showed a high prevalence[7,8]. Evaluation of the rate of implementation of some of the key components of the RBM initiative among communities becomes necessary. This would avail policy formulators and implementers with the score card on the RBM program in individual communities and hence determine the quantum of efforts needed to inject into the program so as to drive it to a logical conclusion[9]. Giant leaps in the current war against malaria have severally been reported in African communities where a measurable level of success was achieved in the rate of ownership and utilization of ITNs[10]. It is against this background that an assessment of the rate and patterns of utilization of ITNs was carried out in Otukpo town, a near-year round malaria endemic settlement in Northern Nigeria.

## 2. Materials and methods

### 2.1. Study area

The study was carried out in Otukpo, a semi-urban community in Benue state of north-central Nigeria. It is located in the Savannah zone between latitude 7.20 N and longitude 8.12 W, and latitude 7.30 S and longitude 8.20 E with annual rainfalls of about 1 650 mm from April to October. Based on the 2006 population census, it is estimated that there are 600 000 inhabitants in the town. At least 95% are of Idoma ethnic group while the remaining 5% is shared among the Ibos, Yoruba, Tiv, Hausa and Igede ethnic groups (Figure 1).



**Figure 1.** Geographical location of Otukpo on the map of Nigeria.

### 2.2. Procedure

The study was carried out between October and December 2009. Five major parts of the town comprising Ogwonu Igbolafa, Ukpu, GRA, Sabon geri and Oweto were selected to

cut across ethnic, socioeconomic, and religious backgrounds of the inhabitants. Interviewers were trained on the art of questionnaire administration and subsequently recruited for the study. Households were selected using systematic sampling methods in which one after another household in each direction faced by the interviewers was recruited into the study. Informed consent was obtained as individual or group, oral or written, depending on the literacy levels of the subjects. All the data of subjects were processed anonymously. This study was approved by the Ethics Committee of College of Health Sciences, Benue state University, Makurdi (August 19, 2009). Central locations in each part of the town were arbitrarily chosen. Adult women 18 years and above in each household were individually interviewed as well as those encountered in the direction of movement on utilization of long lasting insecticide nets (LLINs). These mosquito bed nets were coated with polyester-based permethrin. Adult women were chosen for the study due to the significant role they play at home in determining type and quality of healthcare either as caregivers to themselves, their children or grand children as well as to their spouses. Semi structured questionnaires with both closed and open ended questions were either self or interviewer administered to the respondents to obtain the information[11].

Information such as age, educational level, occupation, marital status, knowledge about malaria, reasons for utilization or otherwise of LLINs and factors influencing their decisions were obtained. Focused group discussions and in depth discussions on myths and cultural practices surrounding utilization or otherwise of LLINs were also carried out because it was possible to assemble more than 10 adults in any location of the city. This qualitative data were used to strengthen the quantitative data obtained from the questionnaires. The DILO (a day in the life of villagers) was adopted whereby the team designated to collect data in each locality worked only from morning to evening[12]. A minimum work was required from each team member but if they were moving in the town they were free to make use of any events (*e.g.* a febrile child, death, social gathering, *etc.*)

Principal component analysis was used to develop wealth indices for the households based on ownership of durable assets including radio, television, telephone, refrigerator, bicycle, motorcycle/scooter and car/truck. Ownership coded as 0 or 1 and missing cases were excluded. The households were then divided into socio-economic quartiles based on their scores. Cronbach's alpha was then calculated to test consistency-reliability[13].

### 2.3. Statistical analysis

Data obtained were analysed using Epi Info 6 statistical software. Pearson's *Chi* squared test or Mantel-Haenszel was used to determine the association with a *P*-value of  $\leq 0.05$  accepted as significant. Fisher's exact test was calculated for

borderline significance and for cells with counts less than five. Regression, analysis of variance (ANOVA) and Kruskal Wallis tests were used to compare association of multivariate parameters among the study population.

### 3. Results

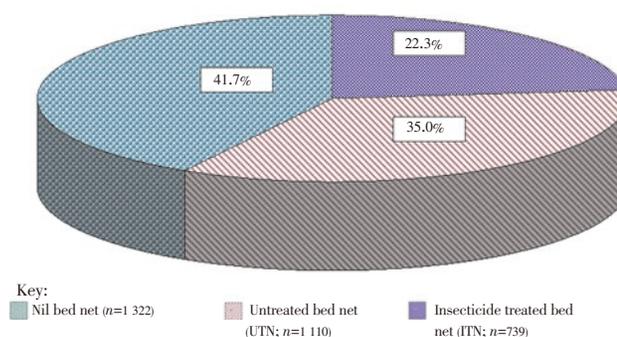
From the 3 385 questionnaires administered, 3 293 (97.3%) were returned of which 3 171 (96.3%) were correctly filled. The age range of the respondents was 18 and 83 years with a mean age of 38.5 years and a bimodal age of 27 and 34 years. Malaria was generally referred to as Osuala by inhabitants of the community. Those aware of the existence of malaria were 99.5% (3 155). Among these 36.7% (1 158) did not consider malaria as a serious disease of public health importance. Almost 100% (3 154) of the respondents could associate malaria fever with mosquito bite although other causes were also mentioned. 99.6% (3 142) of the disease mentioned that fever was the commonest symptom while febrile convulsions were generally not considered as symptoms of malaria. About 83.5% (2 648) of the respondents knew the mode of transmission with at least one method of prevention and one correct drug for its treatment. The remaining 16.5% (523) had faint, cloudy or absent knowledge about the disease.

The overall any bed net utilization in Otukpo town was found to be 58.3% (1 849). LLIN utilization was found to be 23.3% (739). 35.0% (1 110) used untreated bed nets (UTNs) while 41.7% (1 322) had no bed net (Figure 2).

Analysis of age distribution pattern of the respondents and utilization of LLINs showed that one percent of those aged less than 20 years and 0.0% of those aged 80 years and above utilized LLINs. There was no significant association with age

(Table 1).

Among the occupations of the respondents there was a significant association between non-utilization of LLINs or any bed net at all with petty traders, farmers, artisans and applicants compared with the other professions ( $P < 0.05$ ) (Table 1).



**Figure 2.** Rate of utilization of LLIN among women in Otukpo ( $n=3 171$ ).

A breakdown of the number of bed nets per household showed that of the 1 221 households studied 46.5% (568) had no bed net of any type; 18.3% (51), 28.1% (78) and 53.6% (149) of the households had three or more, two, and one LLINs, respectively. The main compelling factor for multiple bed nets possession per households was more of family size ( $P < 0.05$ ) than economic (Figure 3).

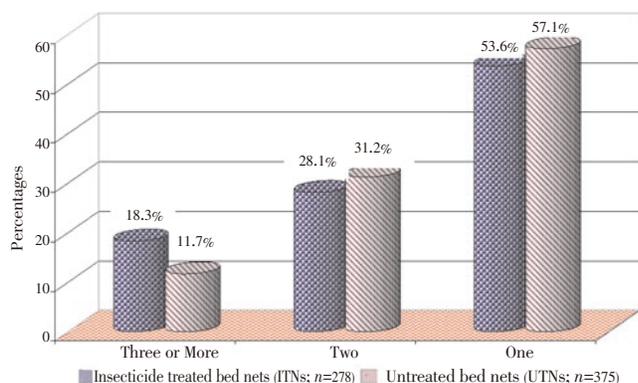
Based on aggregate family income, 6.4% (71), 32.6% (283), 29.7% (179) and 35.0% (206) of those in the first, second, third and fourth quartiles utilized LLINs. There was proportionate increase in LLIN utilization with the increase in quartiles ( $PCQ=36.00$ ,  $AS=0.33$ ,  $Min=0.25$ ,  $CI=95%$ ). The quality of housing including window and door netting also influences level of LLIN utilization (Table 2).

**Table 1**

Age and occupational distribution pattern in relation to LLIN utilization among women in Otukpo ( $n=3 171$ ) [ $n$  (%)].

Parameters		Uses ITN	Uses UTN	Nil	Total
Age interval (years)	$\leq 20$	3 (1.0)	107 (34.5)	300 (64.5)	310 (100.0)
	21–30	178 (22.6)	265 (33.7)	343 (43.6)	786 (100.0)
	31–40	286 (29.2)	296 (30.2)	397 (40.6)	797 (100.0)
	41–50	203 (39.5)	108 (21.0)	203 (39.5)	514 (100.0)
	51–60	38 (13.1)	178 (61.6)	73 (25.3)	289 (100.0)
	61–70	25 (12.0)	100 (47.8)	84 (40.2)	209 (100.0)
	71–80	6 (9.0)	42 (62.7)	19 (28.3)	67 (100.0)
	$\geq 80$	0 (0.0)	14 (82.4)	3 (17.6)	17 (100.0)
Occupation	Petty trading*	53 (14.0)	223 (59.2)	101 (26.8)	377 (100.0)
	Civil servant	177 (79.8)	28 (12.6)	17 (7.6)	222 (100.0)
	Farming*	106 (6.6)	550 (34.2)	954 (59.2)	1 610 (100.0)
	Military/Paramilitary	54 (88.5)	4 (6.6)	3 (4.9)	61 (100.0)
	Artisan*	29 (34.9)	37 (44.6)	17 (20.5)	83 (100.0)
	Applicant*	238 (34.5)	232 (33.7)	219 (31.8)	689 (100.0)
	Health worker	27 (75.0)	7 (19.4)	2 (5.6)	36 (100.0)
	Business	41 (75.9)	8 (14.8)	5 (9.3)	54 (100.0)
	Others	11 (39.3)	14 (50.0)	3 (10.7)	28 (100.0)
	Unclassified	3 (27.3)	7 (63.6)	1 (9.1)	11 (100.0)

Pearson's  $R=0.287$ ,  $ASE=0.197$ ,  $*P < 0.05$ ;  $\chi^2$  (Mantel–Haenszel)=10.66–41.31,  $df=2$ .



**Figure 3.** Number of bed nets per household among inhabitants of Otukpo.

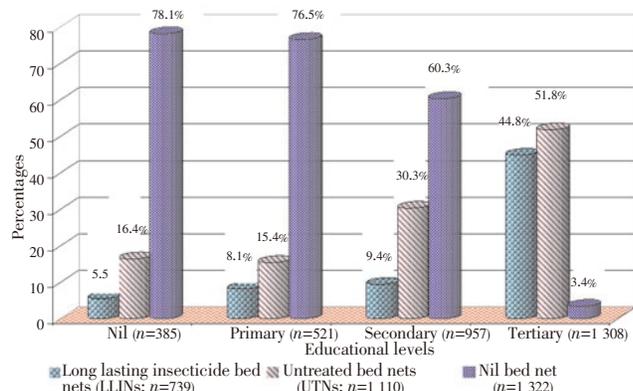
**Table 2** Utilization of LLINs in relation to economic strengths among women in Otukpo (n=3 171) [n (%)].

Quartiles	ITNs	UTNs	Nil	Total
First	71 (6.4)	117 (10.5)	923 (83.1)	1 111 (100.0)
Second	283 (32.6)	333 (38.3)	253 (29.1)	869 (100.0)
Third	179 (29.7)	335 (55.6)	89 (14.7)	603 (100.0)
Fourth	206 (35.0)	325 (55.3)	57 (9.7)	588 (100.0)

PCQ=36.00, df=33, AS=0.33, Min=0.25, CI=95%.

Analysis of the educational level of the respondents in relation to LLIN utilization showed that 5.5% (21), 8.1% (21), 9.4% (90) and 44.8% (586) of those with nil, primary, secondary and tertiary education utilized LLINs. There was direct correlation between LLIN utilization or any type of net with increase in educational levels (F= 0.000) (Figure 4).

The common reasons advanced for non utilization of LLINs among the respondents include lack of awareness of its existence, lack of funds to procure it and where to procure it. Knowledge about the chemical composition of the LLINs and its workability was scarcely known in the community even among those who possessed it while only 1.0% (34) of the interviewed had correct knowledge about its workability (Table 3).



**Figure 4.** Utilization of insecticide treated bed nets in relation to educational levels among women in Otukpo. SST=8.00, df=3, MST=0.000, F=0.000.

Among the 426 under five children documented, 43% (183) utilized LLINs while 22.8% (97) utilized UTNs, 34.2% (146) used no net. There was direct correlation between having

an under five child and utilization of any bed net (SST=896293.50, df=4, MST=896293.50, F= 0.015).

**Table 3** Reasons for non-utilization of LLINs among women in Otukpo [n (%)].

Reasons*	Frequency
Unaware of its existence	213 (16.1)
Does not know where to procure it	474 (35.8)
Lack of funds to procure it	556 (42.1)
Does not believe in its efficacy	194 (14.7)
Traditional malaria control methods are better	206 (15.6)
Causes discomfort	177 (13.4)
Others	36 (2.7)
Nil	103 (7.8)

\*= Respondents were allowed to list more than one reason.

A review of marital status of the respondents and utilization of LLINs showed that 11% (134) singles, 27.8% (453) married and 46.8% (152) separated or divorced women utilized LLINs. There was direct correlation between experience of marriage and LLIN utilization (SST=296202.667, df=2, MST=148101.333, F=0.042).

There was a general willingness among residents of the community to use bed nets if made available to them.

#### 4. Discussion

The level of awareness about malaria among adult women in Otukpo town was found to be over 99.0% while 83.5% knew about transmission, prevention and treatment of the disease. The overall bed net utilization of any kind was found to be 58.3%. 23.3% utilized LLINs, 35.0% utilized UTNs while 41.7% had no bed net. Positive predictors for bed net utilization were increasing educational levels, rising wealth index, presence of under five children and positive history of marriage (P<0.05). On the other hand factors that reduced bed net utilization were cultural beliefs, low educational levels, low wealth index and ignorance.

The 23.3% LLIN utilization found in the present study falls short of the hitherto projected target of RBM program which is at least 80% by May 2010 that marks the 10th anniversary of the RBM initiative. This then casts doubt on the possibility of attaining the 100% bed net coverage by the year 2015 in the community therefore sustaining the present disease load[14,15]. The low LLINs utilization coverage in the present study compares well with findings from a similar study in Mozambique[16] where 17.5% LLIN utilization was reported, and in Tanzania[17] where the rate of coverage was less than 20% as well as in Sierra Leone where LLINs utilization was found to be less than 17%. Also the low utilization of LLINs in other parts of Nigeria such as less than 12% in Ibadan and its environs[18] and average utilization of 10.1% from more than six states across the nation poses serious challenge towards attaining millennium development goal (MDG) on malaria prevention and control[19,20].

The high level of awareness about the cause and

transmission of malaria and the low utilization of bed nets along with various reasons proffered by the respondents such as 16.1% who were unaware of the facility, 35.8% who did not know where to procure it, and the 14.7% that did not believe in its efficacy show that knowledge about the disease has not sufficiently influenced attitude towards its control. Health education need to be intensified and re-defined in the community incorporating the peoples' value systems, culture and traditional beliefs in order to affect the desired attitudinal changes<sup>[21,22]</sup>.

Educational and economic factors were found to significantly influence LLINs utilization in the community. While elementary and primary school curricula should be designed to accommodate the basic concepts of malaria control and prevention, adult formal and vocational education should as well be strengthened and malaria control should be adequately incorporated into the program. Some of the MDG funds for malaria control could be deployed to offer incentives towards the success of adult mass literacy campaigns<sup>[23]</sup>.

However, the findings from the present study are different from that of Mboera *et al* in Tanzania where effective utilization of LLINs among children was accompanied by a near 100% reduction in malaria cases<sup>[24]</sup>; Pullan *et al* in Uganda, where LLINs utilization was found to be a routine in most households with low malaria incidence<sup>[25]</sup>; and Sievers *et al* in Rwanda where implementation of community-based malaria control programme with increased distribution of LLINs brought down malaria sharply in the community<sup>[26]</sup>. Similar feats associated with LLINs utilization were also documented in Bangladesh<sup>[27]</sup>. Logistic support to weak African institutions saddled with the responsibility of actualising the RBM target and that of the MDGs could be strengthened by the multinational key players in these projects. This could thoroughly, in addition to making funds and LLINs available, assist in the orderly and equitable distribution of the facility in both rural and urban communities most in need<sup>[28]</sup>.

Government should facilitate the delivery of LLINs from the donor agencies and also contribute towards more procurement of them. These should be freely and equitably distributed to the communities in need and also adequately educate the people on the benefits of its correct use<sup>[29–37]</sup>. Furthermore, comprehensive community-based malaria control programme should be instituted in the community taking into cognizance the cherished cultural and traditional values of the people in fashioning out the key and relevant intervention areas for timely results<sup>[38,39]</sup>.

Also, community health educators should be recruited along with other volunteers and should be adequately equipped with necessary working tools like bicycles and motorcycles to assist in house to house distribution of LLINs in the community based on the actual needs of each household. This would collapse most of the socio-economic barriers preventing free accessibility to this tool in the

community. These personnel should in addition educate the people at the grass root level on the impact of malaria on the community, other methods of malaria prevention and control and also emphasize the usefulness of LLINs in the ongoing malaria prevention programme<sup>[16]</sup>.

In conclusion, the present study has shown that the decade-long RBM initiative in Otukpo town has failed to achieve the desired goals. Although the level of awareness about malaria is generally high, adequate knowledge about its control and rate of utilization of LLINs is still low. Illiteracy, economic factors, cultural beliefs as well as a poor implementation of the RBM initiative in the community are prominent contributory factors. The present malaria control programme in the community should therefore be reviewed with the aim of addressing the social, economic and cultural contributory factors so as to bring the community back to the mainstream of global anti-malaria crusade.

### Conflict of interest statement

We declare that we have no conflict of interest.

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