J Vector Borne Dis 48, September 2011, pp. 133–137

Insecticide-treated bednet ownership and utilization in Rivers State, Nigeria before a state-wide net distribution campaign

C.I. Tobin-West[1] & B.A. Alex-Hart[2]

[1]*Department of Preventive and Social Medicine;* [2]*Department of Paediatrics, University of Port Harcourt, Nigeria*

ABSTRACT

Background & objectives: Malaria presents a huge health and economic burden to families living in malaria endemic areas. The use of insecticide-treated nets (ITNs) is one of the global strategies in decreasing the malaria burden on vulnerable populations. The use of ITNs reduces clinical malaria by over 50% and all cause mortality in children by 15–30% when the overall population coverage is >70%. This study was aimed at establishing the level of household insecticide-treated bednet ownership and utilization in Rivers State, Nigeria before a state-wide scale-up distribution campaign.

Study design: A descriptive, cross-sectional study was carried out in the Rivers State in November 2008 among household heads or their proxies to serve as a pre-intervention baseline for the scale-up distribution of insecticide treated bednets in the state. The households were selected by a multi-staged sampling technique: first stage being the selection of Local Government Areas (LGAs) from Senatorial districts, second stage the selection of communities from LGAs and final stage the selection of households. Data were collected using a questionnaire adapted from the WHO/FMoH and analyzed using the Epi-Info version 6.04d statistical software package. Hypothesis tests were conducted to compare summary statistics at 95% significance level.

Results: A total of 811 household heads or their proxies were interviewed. Their age ranged between 20 and 70 yr, with a mean of 47.96 ± 4.39 yr. The study showed that although 552 (68.1%) of the households owned bednets, only 245 (30.2%, 95% CI=27.1–33.5) of them owned long-lasting insecticidal nets (LLINs). Similarly, only 37.2% of those who owned ITNs slept under them the night preceding the survey.

Conclusion: Household ITN ownership and utilization were low in the state. Incorporating behavour change communication package as part of the ITN distribution intervention is advocated to increase ITNs utilization in the state.

Key words Insecticide-treated net ownership and usage; Nigeria; Rivers State

INTRODUCTION

Malaria is a recognized public health problem globally, accounting for about 300 million clinical cases yearly in health facilities worldwide[1]. It also accounts for more than one million deaths annually, with majority of the deaths occurring in sub-Saharan Africa[1]. Malaria is known to be both a disease of poverty and a cause of poverty. Poor families living in malaria endemic areas are said to spend close to 25% or more of their annual income on prevention and treatment[2]. Malaria has also been estimated to account for up to 40% of public health expenditures and a decrease of the gross domestic products of many African countries by as much as 1.3% annually[3]. In Nigeria, it is responsible for a huge economic loss of about 132 billion naira (US $ 880 million) annually from cost of treatment, loss of man-hours, school absenteeism and other indirect costs[4]. Reducing malaria burden, therefore, will contribute to the attainment of the millennium development goals, especially those related to reduction in malaria deaths and poverty, while improving education, maternal and child health.

The use of insecticide treated nets (ITNs) is one of the global strategies in decreasing the burden of malaria[2]. ITNs are known to kill mosquitoes and have proven repellent properties that reduce the number of mosquitoes that enter the house[5]. They are estimated to be twice as effective as untreated nets and offer over 70% protection when compared with no nets[5]. They have also been found to reduce clinical malaria by over 50% and all cause mortality in children aged 0–59 months by 15–30% when the overall population coverage is >70%, thus, underscoring the benefits of mass effect of net ownership and usage[6, 7].

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 bednets use by 2005 for pregnant women and children aged <5 yr[3]. This target was subsequently raised

by the WHO to 80% by 2010[8].

However, access to nets has remained poor across many African countries[1]. Of the 34 African countries reporting to Roll Back Malaria Programme in 2005, only one had achieved the target of 60% coverage among under fives[1]. This low coverage, therefore, prompted the intervention by various development partners and stakeholder organizations aimed at increasing bednet use. This study was the part of a bednet pre-intervention baseline by the Rivers State Ministry of Health aimed at establishing the level of household bednet ownership and utilization in Rivers State, Nigeria before a state-wide scale-up campaign.

MATERIAL & METHODS

Study area

Rivers State is one of the 36 states of Nigeria, located in the oil rich Niger Delta region of southern Nigeria. The state consists of huge rain forest vegetation, with several creeks and rivers that favour the breeding of mosquitoes. It has a population of about 5.2 million people belonging to about 20 ethno-linguistic groups, prominent among them are the Kalabaris, Okrikas, Ogonis, Ekpeyes, Ikwerres, Ogbas and Engenes. Administratively, the state has 23 Local Government Areas (LGAs) embedded in three Senatorial districts with each district having 7–8 LGAs. Overall, the state is composed of 1580 communities. The people are mainly engaged in subsistence farming, fishing and trading. Communicable diseases notably malaria, diarrhoeal diseases and acute respiratory infections constitute the greatest burden on health. In recent years, however, there has been a rising trend in the prevalence of non-communicable diseases in the state. Diabetes mellitus, hypertension, anaemia, cancers and stress related disorders top the list of these diseases. The health care delivery system is organized in three levels; primary, secondary and tertiary. The primary health care system that is responsible for care for the majority of the people is weak, with dilapidated infrastructure and poorly motivated work force. However, there are visible attempts being made by the government in recent times to improve the health infrastructure in the state.

Design and sampling

A descriptive, cross-sectional study was carried out in November 2008 to serve as a pre-intervention baseline for the distribution of insecticide-treated bednets in the state. A minimum sample size of 718 was determined for the study using the formula[9]; $n = Z^2pq/d^2$, where, n = Minimum sample size, Z = Normal standard deviate 1.96 at 95% confidence level, p = Prevalence of household net ownership of 11.8%[10], q =1-p, d = Error margin of 3.5%, with adjustments made for a Design Effect (DEFT) =2 and non-response rate of 10%.

A multi-stage sampling technique was employed to select the study sample. The first stage was the selection of one LGA from each of the Senatorial districts made up of 7–8 LGAs by simple random sampling. The next stage was the selection of communities from each of the chosen LGA. This was also done by using simple random sampling which entailed listing of the communities in each of the LGA and randomly selecting five in other to broaden the spread of the sample. The final stage was the selection of households in each community. This was equally done by simple random sampling using a generated list of all *de facto* resident households in each community. A total of 90–100 households per community was selected for the study. The first household interviewed in each community was determined by the data collectors assuming a central location in the community and spinning a bottle to decide the direction from which the first house and household was chosen. After that, the next household was the consecutive household and so on, until the sample size was attained. In each household, the head or proxy was interviewed by trained health workers using questionnaires adapted from the WHO/FMoH on malaria baseline information. Where necessary, local languages were used to elicit information from the household heads. Information obtained was cross-checked for consistency and analyzed using the Epi-Info version 6.04d statistical software package. Hypothesis tests were conducted to compare summary statistics at 95% significance level.

Ethical considerations

Permission to carry out the study was granted by the Institutional Committee of the Rivers State Ministry of Health and verbal consent of all participating household heads was obtained after full explanation of the purpose of the study and the declaration that they were at liberty to decline participation or withdraw at any point in the course of the interview.

RESULTS

A total of 811 household heads or their proxies were interviewed. Their age ranged between 20 and 70 yr, with a mean of 47.96 ± 4.39 yr. Most of them 77.9%; (95% CI=74.9–80.7) were married and had formal education. Also, majority (83.5%) were gainfully employed or involved in one form of income generating activity or the other (Table 1).

Table 1. Socio-economic status of heads of households included in the study

Variable	Frequency (n=811)	Percentage	95% CI
Age (yr)			
20–29	86	10.6	8.6–12.9
30–39	134	16.5	14–19.1
40–49	240	29.6	26.5–32.9
50–59	178	21.9	19.1–24.9
60–69	110	13.6	11.3–16.1
70–79	63	7.8	6–9.8
Marital status			
Single	34	4.2	2.9–5.8
Married	632	77.9	74.9–80.7
Divorced	86	10.6	8.4–12.7
Widow	59	7.3	5.6–9.3
Educational status			
No formal education	66	8.1	6.4–10.2
Primary education	343	42.3	38.9–45.8
Secondary education	287	35.4	32.1–38.8
Post secondary education	115	14.2	11.9–16.8
Occupation			
Unemployed	134	16.5	14.0–19.3
Skilled worker	157	19.4	16.7–22.3
Farming/Fishing	259	31.9	28.7–35.3
Trading	79	9.7	7.8–11.9
Civil servant	182	22.4	19.6–25.5

Our study showed that although 552 (68.1%) of the households owned bednets, less than half, 44.4% (95% CI=40.3 – 48.5) of this number owned LLINs, while the rest 169 (30.6%) were in possession of untreated/ordinary nets and re-treatable nets 138 (25%) respectively. Of those with re-treatable nets, only 42 (30.4%) had re-treated them in the past six months, while the rest showed their inability to re-treat their nets on lack of skills to do so (39.3%) or did not know where to get the re-treatment kits (31%). The main sources of bednets in the communities were the health facilities as part of the antenatal care package for pregnant women (52.5%), and those obtained during house-to-house immunization campaigns (36.1%). However, persons who slept under the bednets a night preceding the survey constituted only 37.2%, and the most important reason for non-utilization of the nets among those who had them was the complaints of excessive heat associated with the nets (Table 2).

Table 2. Mosquito bednet ownership and use in households

Variable	Frequency (n=811)	Percentage	95% CI
Mosquito bednet ownership			
None	259	31.9	28.7–35.3
One	303	37.4	34.0–40.8
Two	187	23.1	20.2–26.1
Three	41	5.1	3.6–6.8
More than three	21	2.6	1.6–3.9
Types of mosquito nets available in households (n=552)			
Untreated/ordinary nets	169	30.6	26.8–34.4
Re-treatable nets	138	25	21.4–28.6
LLINs	245	44.4	40.3–48.5
Re-treatment of bednet in the last 6 months (n=138)			
Yes	42	30.4	22.9–38.8
No	84	60.9	52.2–69.1
Don't know	12	8.7	4.6–14.7
Reasons for non-treatment of bednets (n=84)			
Forget	12	14.3	7.6–23.6
Cannot afford insecticide	6	7.1	2.7–14.9
Do not know where from to buy insecticide	26	31	21.3–41.9
Do not known how to treat mosquito nets	33	39.3	28.8–50.6
Others	7	8.3	3.4–16.4
Source of mosquito nets in households (n=552)			
Health facility	290	52.5	48.3–56.8
Immunization campaigns	199	36.1	32–40.2
Purchased	61	11.1	8.6–13.9
Others	2	0.4	0–1.3
Persons who slept under mosquito net last night (n=653)			
Yes	243	37.2	33.5–41.1
No	410	62.8	59–66.5
Reasons for not sleeping under bednet last night (n=410)			
Not comfortable because of hot and humid conditions	283	69.0	64.3–73.5
Not effective	92	22.4	18.5–26.8
Husband/wife objection	21	5.1	3.2–7.7
Others	14	3.4	1.9–5.7

DISCUSSION

People living in malaria endemic areas have demonstrated good knowledge of the deleterious effects of malaria, including effects on pregnancy and children <5 yr[11,12]. However, this knowledge has not always translated to appropriate malaria prevention practices such as the ownership and utilization of insecticide-treated

bednets[1,13]. Our study observed a seemingly low level of ITN ownership by households, which can partly be explained by the fact that the major sources of bednets were the health facilities during antenatal care attendance by pregnant women and those distributed free of charge during house-to-house immunization campaigns for children. While these figures show low level of coverage, they were, however, higher than the national average of 17% for any bednet and 8% for at least one ITN[13]. They also appeared better than 0.1 to 28.5% ownership reported by Korenromp *et al*[14] in 69 regions in 12 African countries. The implication of poor household ownership of ITNs recommended target of 80% coverage for pregnant women and children <5 yr of age by the National Malaria Control Programme may not be achieved, and most importantly the mass effect experienced in the reduction of malaria morbidity and mortality when ITN coverage is >70% will be missed[6–8]. Furthermore, other benefits which include a decreased risk of malaria attacks for children not sleeping under a net, but living within 0.6 to 1.5 km areas with 80–96% net coverage will also be missed[15,16]. Mass effect of ITNs has been attributed to the combined insecticidal power of all nets in a definable area. This power may, however, be reduced if most of the nets are not LLINs or when >50% of the re-treatable ITNs were not regularly re-treated according to the recommended intervals as was observed in our study[15,16].

Our study further showed that only one-third of those who owned bednets slept under the net during the night preceding the survey, thus, highlighting the alarming gap between net ownership and utilization. The most common reason, however, given for not using the nets was stated as suffocation or hot condition due to lack of proper air circulation in the net. This reason has largely been attributed to the hot tropical climate of the sub-Saharan African region and agrees with findings from other studies done in different African countries where low bednet utilization has been reported[17–19]. Although it has also been pointed out that bednets distributed free of charge as part of malaria control interventions in our study were found less likely to be used than nets purchased[20].

It is obvious from the foregoing that there exists some disconnect between malaria control service provision and its utilization. We, therefore, propose the inclusion of behaviour change communication (BCC) package as part of bednets distribution scale-up campaigns at the community level, to narrow the gap between bednet ownership and utilization. BCC for malaria includes the basic components of information, education and communication (IEC) on malaria, but focuses on key individual and group behaviours that needs to be changed like bednet utilization, through participatory engagement of communities with emphasis on community-identified end actions in regard to ITN utilization.

REFERENCES

1. *Roll Back Malaria: world malaria report 2005*. Geneva: World Health Organization 2005; p. 5–85.
2. Roll Back Malaria Fact sheet No. 94. Geneva: World Health Organization. Available from: *http://www.who.int/mediacentre/factsheets/fs094en*.
3. The Abuja declaration and the plan of action: an extract from the African summit on Roll Back Malaria, Abuja. Geneva: World Health Organization 2000. Available from: *http://www.rbm.who.int/docs/abuja_declaration_final.htm*.
4. Anti-malaria treatment policy. Abuja: Federal Ministry of Health 2005; p. 4–36.
5. Curtis CF, Jana-Kara B, Maxwell CA. Insecticide treated nets: impact on vector populations and relevance of initial intensity of transmission and pyrethroid resistance. *J Vector Borne Dis* 2003; *40:* 1–8.
6. Choi HW, Breman JG, Teutsch SM, Lius S, Hightower AW, Sexton JD. The effectiveness of insecticide impregnated bednets in reducing cases of malaria infection: a meta-analysis of published results. *Am J Trop Med Hyg* 1995; *52:* 377–8.
7. Eisele TP, Lindblade KA, Wannemuehler KA, Gimnig JE, Odhiambo F, Hawley WA, *et al*. Effect of sustained insecticide-treated bednet use on all-cause child mortality in an area of intense perennial transmission in western Kenya. *Am J Trop Med Hyg* 2003; *73:* 149–56.
8. *The global strategic plan 2005–2015*.Geneva: WHO 2005. Available from: *http://www.rollbackmalaria.org/forumV/docs/gsp_en.pdf* [accessed on April 8, 2011].
9. Campbell MJ, Machin D. *Medical statistics: a common sense approach,* II edn. London: John Willey and Sons Ltd 1996; p. 1–56.
10. Nigeria Demographic and Health Survey 2003. Maryland, USA: National Population Commission/ORC Macro 2004; p. 144–50.
11. Njoroge FK, Kimani VN, Ongore D, Akwale WS. Use of insecticide-treated bednets among pregnant women in Kilifi district Kenya. *East Afr Med J* 2009; *86*(7): 314–22.
12. Chukwuocha UM, Dozie INS, Onwuliri COE, Ukaga CN, Nwoke BEB, Nwankwo BO, Nwoke EA, Nwaokoro JC, Nwoga KS, Udujih OG, Iwuala CC, Ohaji ET, Morakinyo OM, Adindu BC. Perceptions on the use of insecticide treated nets in parts of the Imo River Basin, Nigeria: implications for preventing malaria in pregnancy. *Afr J Reprod Health* 2010; *14*(1): 117–28.
13. Nigeria Demographic and Health Survey 2008. Calverton, Maryland: National Population Commission and ICF Macro 2008.
14. Korenromp EL, Miller J, Cibulskis RE, Kabir Cham M, Alnwick D, Dye C. Monitoring mosquito net coverage for malaria control in Africa: possession *vs* use by children under 5 yr. *Trop Med Int Health* 2003; *8:* 693–703.
15. Howard SC, Omumbo J, Nevill C, Some ES, Donnelly CA, Snow RW. Evidence for a mass community effect of insecticide-treated bednets on the incidence of malaria on the Kenya coast. *Trans R Soc Trop Med Hyg* 2000; *94:* 357–60.
16. Miller JM, Korenromp EL, Nahlen BL, Steketee R. Estimating the number of insecticide-treated nets required by African households to reach continent-wide malaria coverage targets. JAMA 2007; *297:* 2241–50.

17. Nuwaha F. People's perceptions of malaria in Mbarara, Uganda. *Trop Med Int Health* 2002; *7:* 462–70.
18. Ordinioha B. The use of insecticide-treated bednet in a semi-urban community in south Nigeria. *Niger J Med* 2007; *16:* 223–6.
19. Eisele TP, Keating J, Littrell M, Larsen D, Macintyre K. Assessment of insecticide-treated bednet use among children and pregnant women across 15 countries using standardized national surveys. *Am J Trop Med Hyg* 2009; *80:* 209–14.
20. Baume CA, Marin MC. Intra-household mosquito net use in Ethiopia, Ghana, Mali, Nigeria, Senegal and Zambia. Are nets being used? Who in the household uses them. *Am J Trop Med Hyg* 2007; *77:* 963–70.

Correspondence to: Dr C.I. Tobin-West, Department of Preventive and Social Medicine, University of Port Harcourt, Nigeria.
E-mail: tobin3000@yahoo.com

Received: 30 May 2011 *Accepted in revised form:* 28 July 2011