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Kertas Asli/*Original Articles*

Factors Associated with Non-utilization of Freely Acquired Insecticide-treated Nets (ITNs) in a Rural Agrarian Community of North-Western Nigeria

(Faktor Berkaitan Ketidakgunaan Kelambu Berubat Percuma dalam Kalangan Masyarakat Petani Luar Bandar di Barat Daya Nigeria)

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ABSTRACT

Nigeria ranks among countries with the highest burden of malaria. In an effort to achieve the aim of the Roll Back Malaria Programme of scaling up ITN use, the Nigerian Government distributed free ITNs to many households in the country. However, several factors were associated with non-utilisation of the ITNs. This cross-sectional descriptive study was conducted to assess such factors in Gimba village, a rural community of Kaduna State, Nigeria. It was conducted during Community Diagnosis practical field posting of trained final year medical students of Ahmadu Bello University, Nigeria, in July 2012. An interviewer-administered questionnaire was used to collect data from all households in the community. Multivariate logistic regression analysis was done using STATA (Version 11. Stata Corporation, 2009). Most of the households own at least, one freely acquired ITN (82%). However, in 40.8% of such households, no member slept under an ITN the night before the survey. Farmers were more unlikely to use an ITN compared to non-farmers (RR = 1.89; 95% C.I = 0.78 –2.91). Instead of ITN, some farmers use "otapiapia" a cheap, unpatented, locally made pesticide for controlling mosquitoes. Also, respondents with low scores on malaria risk perception were more unlikely to use an ITN compared to those with high scores (RR = 1.08; 95% C.I = 0.94 – 1.23).The result indicated that several factors were associated with non-utilization of freely acquired ITNs. It is recommended that ITN distribution should be accompanied by Health Education on Malaria.

Keywords: Factors, Non-utilization, freely acquired, ITNs, Gimba Nigeria

ABSTRAK

Nigeria adalah di kalangan negara yang mempunyai kedudukan yang tinggi bagi beban penyakit malaria. Dalam usaha untuk mencapai program pengurangan penyakit malaria melalui penggunaan kelambu berubat, kerajaan Nigeria telah mengedarkan kelambu berubat percuma kepada kebanyakan isi rumah di negara. Walau bagaimanapun beberapa perkara adalah berkait rapat dengan ketidakgunaan kelambu berubat. Kajian rentas deskriptif ini telah dijalankan untuk menilai faktor tersebut di Gimba yang merupakan sebuah perkampungan luar bandar di negeri Kaduna, Nigeria. Ia telah dijalankan semasa kerja lapangan kepaniteraan diagnosis komuniti pelajar perubatan tahun akhir Universiti Ahmadu Bello, Nigeria pada julai 2012. Temu bual menggunakan borang kaji selidik digunakan untuk mengumpul data daripada masyarakat setempat. Analisis "Multivariate logistic regression" dijalankan menggunakan STATA (Versi 11. Stata Corporation 2009). Kebanyakan isi rumah memiliki sekurang-kurangnya satu kelambu berubat percuma (82%). Walau bagaimanapun, dalam 40.8% isi rumah tersebut, tiada seorangpun ahli rumah yang tidur menggunakan kelambu tersebut pada malam sebelum tinjauan dibuat. Para petani didapati kurang cenderung menggunakan kelambu berubat berbanding bukan petani (RR = 1.89; 95% C.I = 0.78 –2.91). Sebaliknya petani menggunakan "otapiapia" iaitu sejenis pestisida yang murah dan tidak dipaten untuk mengawal nyamuk. Juga, responden dengan skor persepsi risiko malaria yang rendah kurang cenderung menggunakan kelambu berubat berbanding dengan mereka yang mempunyai skor yang lebih tinggi (RR = 1.08; 95% C.I = 0.94 – 1.23). Hasil keputusan telah menunjukkan beberapa faktor adalah berkait rapat dengan ketidakgunaan kelambu berubat. Adalah disyorkan pengagihan kelambu berubat disertai dengan pendidikan kesihatan berkaitan malaria.

Kata kunci: Faktor, Ketidakgunaan, Pemberian percuma, Kelambu berubat, Gimba, Nigeria

INTRODUCTION

Malaria is a parasitic infection that causes so much morbidity and mortality world-wide and is of great public health significance ,especially in poor regions of the world, such as in Sub-Saharan Africa. Globally, about 3.3 billion people are at risk of malaria infection and it is responsible for between 300 and 500 million infections each year with about 1 million deaths (World Health Organization 2008; World Health Organization 2002). Sub-Saharan Africa accounts for 90% of global malaria cases and most of the cases occur among women and children (World Health Organization 2002).

World Health Organization ranked Nigeria, a Sub-Saharan African country, first among countries with the highest burden of malaria, on the basis of malaria incidence and mortality rates. Malaria is endemic throughout Nigeria, where it accounts for about 60 percent of outpatient visits, and 30 percent hospitalisations (Federal Ministry of Health and National Malaria Control Programme 2009).

In view of the malaria statistics mentioned above , it is therefore imperative that appropriate measures are needed for its prevention and control. Presently, Insecticide Treated Nets (ITNs) are one of the main tools in use for combating malaria, along with other interventions such as prompt and effective treatment, use of intermittent preventive treatment (IPT) among pregnant women and spraying houses with insecticides. Pyrethroids are the insecticides in ITNs (Centers for Disease Control and Prevention 2012) and the largest manufacturer of ITNs in Africa is AtoZ Corporation, in Arusha, Tanzania. Insecticide-treated nets are effective in reducing malaria-related morbidity and mortality and it is estimated that they reduce child mortality by 17% and clinical episodes of malaria by 50% among users (Roll Back Malaria Partnership 2005; Lengeler 2004).

In 2002, the World Health Organization's Roll Back Malaria programme (and other partners like the World Bank, the US President's Malaria Initiative (PMI), the Global Fund to Fight AIDS, Tuberculosis and Malaria) adopted ITNs as key malaria preventive tools and aims to scale up coverage and use of ITNs to at least 80% among young children and pregnant women by 2015 (The US President malaria initiative 2006, Grabowsky 2008). This is all in an effort to reduce global malaria cases by 75% from 2000 levels and to reduce malaria deaths to near zero (World Health Organization 2010).

The initial strategy for ITN distribution targets the vulnerable groups (pregnant women and under – five children) while the current strategy targets all at risk individuals of all ages and population groups (mass distribution). In Nigeria, the mass distribution is supplemented by routine distribution through antenatal clinics.

Despite the global efforts of the Roll Back Malaria Programme and its partners in distributing ITNs, the utilisation of ITNs is still low in many malaria endemic countries of African like Ghana, Nigeria, Senegal, Zambia, Kenya, Ethiopia and Democratic Republic of Congo whereby usage of available nets ranged between 15-50% (Ndjinga and Minakawa 2010; Githinji et al. 2010; Baume & Marin 2007; Baume et al. 2009). For example in an interventional study in Kenya, ITNs were distributed to all households but it was found out that 30% of the distributed ITNs were not used the night before the study and the main reason given for non use was that it generates heat (Alaii et al. 2003). Another example is in Niger Republic, where only 33% of available nets were used the night before a survey (Thwing et al. 2008).

As noted by Baume, Reithinger and Woldehanna (2009), there were only few studies that explored reasons or factors associated with non-utilization of ITNs. Pulford et al. (2011) conducted a review of the few published literature on reasons for non-use of available mosquito nets and the following reasons were mentioned by non users "Discomfort, primarily due to heat, and perceived (low) mosquito density were the most widely identified reason for non-use. Social factors, such as sleeping elsewhere, or not sleeping at all, were also reported across studies as were technical factors related to mosquito net use (i.e. not being able to hang a mosquito net or finding it inconvenient to hang) and the temporary unavailability of a normally available mosquito net (primarily due to someone else using it)".

To achieve the aims of Roll Back Malaria programme, the Nigerian Federal Ministry of Health and Non-Governmental Organisations distributed ITNs free of charge to all age groups in many households in Nigeria, especially rural areas. However, several factors were associated with non-utilisation of the freely acquired ITNs. This study was therefore conducted to assess the factors associated with non utilization of freely acquired ITNs among residents of Gimba village, a rural agrarian community in Soba Local Government area of Kaduna State, Nigeria. A rural area was selected for the study because globally, rural areas are a major challenge for disease control. Thus, understanding such factors from a rural setting is important for successful malaria control.

METHODOLOGY

A cross-sectional descriptive study conducted during community diagnosis posting of final year medical students of Ahmadu Bello University, Zaria, from 25th June 2012 to 20th July 2012.

The study was conducted in Gimba community, a rural settlement in Soba Local Government area of Kaduna state, North-western Nigeria. It is located between latitude 11.00 to 11.06 N and longitude 7.54 to 7.58E. It is 30 kilometres from Zaria town. The village has a total population of 4,160 people and one primary health centre (Department of Community Medicine 2012). Farming is the major occupation and the farmers use a cheap, locally made, unpatented , organophosphate pesticide formulation

called “otapiapia”. The effectiveness of this mosquito repelling pesticide is questionable since its chemical constituents is unknown (PAN 2007; Akunyili 2007). However, occasionally, it may contain some concentrations of Dichlorvos (Musa et al. 2010).

All household heads in the community were interviewed (total population study). Data was collected by final year medical students using a structured interviewer administered questionnaire in which respondents were asked about their socio-demographic profiles; household malaria preventive practices such as mosquito net usage and insecticide use; household practices regarding treatment of presumptive malaria like place of treatment and cost of treatment. Repeated visits for questionnaire administration were conducted to households where the head was not met at first or previous visit. The questionnaire was pretested on 42 randomly selected Household heads in Yakasai Village, a community with similar characteristics with the study area.

Malaria knowledge was assessed by asking 13 questions related to the causes, symptoms, prevention and treatment of malaria. A score of 1 point was assigned to each correct response and the maximum possible score was 13 points. The mean score was 7. Respondents that scored points below the mean score were considered as having poor knowledge of malaria while those that scored points above the mean score were considered as having good knowledge of malaria.

Malaria risk perception of respondents was assessed based on 9 questions that explored respondents’ perceived exposure to malaria; their perceived susceptibility to it and their perceived severity of malaria. A score of 1 point was assigned to each correct response and the maximum possible score was 9 points. The mean score was 5. Respondents that scored points below the mean score were considered as having low risk perception of malaria while those that scored points above the mean score where considered as having high risk perception of malaria.

Appropriate entry permission to conduct the study was sought from Soba Local Government Area, Kaduna State and from Gimba community leaders. An informed verbal consent was given by the respondents. Ethical clearance for the study was obtained from Ahmadu Bello University Teaching Hospital’s ethical committee. After the data collection, all completed questionnaires were checked properly for any error and edited. The data obtained were cleaned and multivariate logistic regression analysis was done using STATA (Version 11. Stata Corporation 2009). The association between variables and non-use of available ITN was evaluated using relative risk regression. Adjusted estimates are not presented because there was no differences between unadjusted and adjusted risk estimates, which indicates that confounding by the measured variables is unlikely to be biasing the results. Results are presented in tabular form.

RESULTS

A total of 686 (100%) questionnaires were returned within the period of the study. Responses were received from all the 686 Household heads interviewed. The ages of the respondents ranged from 15 to above 92 years.

As shown in Table 1, 32.1% of the respondents were aged between 30 to 39 years. Most of the respondents (69.7%) were farmers; had only Quranic education (57%); had only one wife (56.1%) and between one to five children (54.2%). As shown in Table 2, majority of the households (81.8%) own a mosquito net. Out of this proportion, 32.6% own only one mosquito net while 44.6% own only two mosquito nets. A majority of the households received the nets free of charge from hospitals or NGOs. Only 13.7% purchased their mosquito nets from either health workers

TABLE 1. Socio-demographic profile of respondents

Variable	Frequency (n = 686)	Percent (%)
Age (years)		
< 20	6	0.9
20-29	162	23.6
30-39	220	32.1
40-49	158	23
50-59	80	11.7
60-69	36	5.2
70-79	15	2.2
80-89	8	1.2
90-99	1	0.1
Level of Education		
None	9	1.3
Quranic	391	57
Informal	16	2.3
Primary	108	15.8
Secondary	111	16.2
Tertiary	51	7.4
Number of wives		
One	385	56.1
Two	251	36.6
Three	35	5.1
Four	10	1.5
None	5	0.7
Number of children fathered		
None	54	7.9
1-5	372	54.2
6-10	171	24.9
11-20	75	10.9
21-30	12	1.8
31 and above	2	0.3
Occupation		
None	11	1.6
Farming	478	69.7
Petty trading	59	8.6
Artisan	68	9.9
Businessman	18	2.6
Civil servant	52	7.6

TABLE 2. Household ownership and use of ITNs

Variable	Frequency	Percent (%)
Household possession of mosquito net(s)		
Yes	561	81.8
No	125	18.2
Number of nets owned by household		
One	183	32.6
Two	250	44.6
Three to six	117	20.9
Seven or more	11	1.9
Source of mosquito net(s)		
Purchased from health workers	54	7.9
Obtained free from hospital or NGOs	456	67.8
Purchased from market	40	5.8
Others	2	0.3
Sleeping under net by household member(s) The night before survey		
Yes	375	66.9
No	186	33.1
Use of other household malaria prevention practices		
Environmental sanitation	218	31.8
Local insecticide (Otapiapia)	226	32.9
Modern insecticides	73	10.6
Others	27	3.9
Nothing	142	20.7

or market. Most of the households that own a net (66.9%) claim that a member of the household slept in a net the night before the survey. Other methods used in preventing malaria include use of a locally made pesticide "otapiapia" by a significant proportion of the households (32.9%). Only 10.6% of the households use modern insecticides, while 20.7% of the households do not use any method for malaria prevention (excluding mosquito net use).

As shown in Table 3, There was a statistically significant association between the following and non-utilization of freely acquired ITNs: (1) Farming occupation ($p = 0.04$); (2) Low risk perception of malaria ($p = 0.026$); (3) Poor malaria knowledge ($p = 0.011$); (4) Non attendance of ANC by housewife ($p = 0.031$); (5) Non-formal education of household head ($p = 0.012$) and (6) Owning only one ITN ($p = 0.007$).

Farmers were 1.2 times more unlikely to use freely acquired ITNs compared to non-farmers (95% C.I = 0.78-1.91). Instead of ITN, some farmers (32.9%) use "otapiapia" a cheap, unpatented, locally made pesticide for controlling mosquitoes. Household heads with low risk perception of malaria were 1.08 times more unlikely to use freely acquired ITNs compared to those with high risk perception (95% C.I = 0.94-1.23). Pregnant housewives that do not attend antenatal clinic were 2.13 times more unlikely to use freely acquired ITNs (95% C.I = 1.82-2.86) compared to those who attend antenatal clinics. Household heads that have no formal education were 1.57 times more unlikely to use freely acquired ITNs compared to those who have formal education (95% C.I = 1.06-1.98). Household heads

TABLE 3. Multivariate analysis of predictors of non-utilization of freely acquired ITNs

Variable	Used ITN n (%)	Did not use ITN n (%)	RR (95% C.I)	p
Occupation of HH				
Farming (RG)	79 (34.6)	149 (65.4)	1.20 (0.78-1.91)	0.004
Non-farming (CG)	96 (65.3)	80 (54.4)		
Malaria risk perception score of HH				
High score (CG)	222 (52)	110 (48)		
Low score (RG)	109 (48)	119 (51.9)	1.08(0.94-1.23)	0.026
ANC attendance by pregnant wife				
Yes (CG)	44 (86.3)	7 (13.7)		
No (RG)	11 (34.3)	21 (65.6)	2.13 (1.82-2.86)	0.031
Type of education of HH				
Formal (CG)	173 (68.9)	78 (31.1)		
Non-formal (RG)	159 (51.3)	151 (48.7)	1.57 (1.06-1.98)	0.012
Malaria knowledge of HH				
Good (CG)	262 (83.2)	53 (16.8)		
Poor (RG)	38 (15.4)	208 (85.6)	1.86 (0.76-2.33)	0.011
Number of ITN(s) owned by household				
One (RG)	57 (31.1)	126 (68.9)		
Two & above (CG)	165 (43.6)	213 (56.4)	1.22 (1.01-1.63)	0.007

RR= Relative Risk C.I = Confidence Interval HH = Household Head
RG = Risk Group CG = Comparison Group n = Sample Size

that have poor knowledge of malaria were 1.86 times more unlikely to use freely acquired ITNs (95% C.I = 0.76-2.33) compared to those who have good knowledge of malaria. Households that have one freely acquired ITN were 1.22 times more unlikely to use it (95% C.I = 1.01-1.63) compared to those that have more than one ITN.

DISCUSSION

A significant proportion of the respondents (43.2%) had no formal education. It is due to the low primary school enrolment in the northern part of Nigeria. For example, as of 1975-1976 when most of the respondents were of primary school age, the proportion of primary school enrolments in the Northern Nigeria was just 26.5%, while between 1985-1986, it was 34.3% (Yakubu 1996). This low level of Western education could have contributed to the non utilization of freely acquired ITNs some among respondents.

The average number of children per household alone was 5. This puts the average household size in the community above the national figure of 4.6 for rural Nigerian communities (NPC and ORC Macro 2009). The possible explanation for this is that some of the respondents have more than one wife (polygamy) because the respondents were predominantly muslims.

In regards to ITN ownership, majority of the households claim to own an ITN (82%). However, in a large proportion of the households (40.8%), no household member slept under an ITN the night before the survey. Statistical analysis shows that several factors were responsible for non utilization of the ITNs like being a farmer by occupation, having low risk perception of malaria, having poor knowledge of malaria, non-attendance of antenatal care by a pregnant housewife, lack of formal education by respondents, and possession of only one ITN by a household.

The possible explanation for the above findings is that farmers tend to use "otapiapia" instead of ITN probably because they feel more comfortable sleeping "freely" without a net over their heads since ITN use was associated with some inconvenience (Toe 2009) and discomfort (Njoroge et al. 2009; Klein et al. 1995); or they are familiar with the readily available otapiapia and have more faith in its effectiveness than ITNs; or they have shortage of ITNs per household since majority of the households (77.6%) own either one or two nets while average household size was six. Another possible explanation is the relatively high cost of modern insecticides like Raid, Baygon, and Sheltox, which cost between N400-N1000 (US$2.6-US$6.5) while "otapiapia", which is packaged in small transparent 5-10 ml bottles, costs between N20-N40. This is not surprising, considering the economic status of the household heads. This could explain the higher proportion of respondents that use "otapiapia" in the study area as compared to the 10.6% figure obtained in the urban city of Makurdi in Nigeria (Jombo et al. 2010).

Low risk perception of malaria among respondents was another reason for non utilization of freely acquired ITNs. This finding is similar to that of Chukwuocha et al. (2010) in Imo River Basin, Nigeria, where low risk perception of malaria among adolescent girls was associated with non utilization of ITNs.

Poor knowledge of malaria among respondents was another reason for non utilization of freely acquired ITNs. This finding is similar to that of Adonga (2005) in Ghana where poor knowledge of malaria was associated with non utilization of ITNs. It is also similar to findings of Pettifor (2008) in Kinshasha, Democratic Republic of Congo, where women with secondary or higher education were 2.8 times more likely to use an ITN compared to women with less education. However, it is contrary to findings by Natalie et al. (2006) in Ghana where greater knowledge of malaria was not associated with improved ITN use. The possible explanation for this difference in findings is the different geographic and epidemiologic settings of our study areas.

Non attendance of antenatal clinic was another factor associated with non utilization of freely acquired ITNs by pregnant housewives. This finding is similar to that of Chukwuocha (2010) in Imo River Basin, Nigeria, where pregnant women that do not attend antenatal clinics were unlikely to use available ITN. One possible explanation for this is that health education on malaria and the importance of using ITNs are delivered at the antenatal clinics during health talk sessions. Women who do not attend antenatal clinics will therefore lack the awareness and motivation to use an ITNs. Moreover, ITNs are distributed freely at antenatal clinics to encourage use.

Lack of formal education was associated with non utilization of freely acquired ITN. One possible explanation for this finding is that formal education enables individuals to better understand a disease, its dangers, susceptibility to it and to take necessary preventive action against the disease. However, on a contrary note, the findings of Pettifor (2008) in Democratic Republic of Congo revealed that education was not associated with ITN use.

Owning only one ITN was associated with non utilization by households. This finding is similar to that of Tchinda (2012) in Cameroun where lower household number of ITN was associated with non-utilization. One possible explanation for this is that the issuance of only one ITN to a large family(coupled with the absence of a sensitization campaign) may likely underplay the important role of the ITN in the minds of the recipients, thereby resulting in non utilization.

One limitation of the study is that it assessed non utilization of ITN for a limited short period of time: night before the survey. By so doing, it excludes regular non – users of ITN who only happen to use it the night before the survey. This might affect the statistical significance of findings.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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REFERENCES

Adonga, P.B., Kirkwood, B., Kendall, C. 2005. How local community knowledge about malaria affects insecticide-treated net use in northern Ghana. *Tropical Medicine & International Health* 10(4): 366-78.

Akunyili, D. 2007. *Otapiapia not registered with NAFDAC*. Available at www.triumphnewspapers.com. Accessed on 12 August 2012.

Alaii, J.A., Hawley, W.A., Kolczak, M.S., ter Kuile, F.O., Gimnig, J.E., Vulule, J.M., Odhacha, A., Oloo, A.J., Nahlen, B.L. & Phillips-Howard, P.A. 2003. Factors affecting use of permethrin-treated bed nets during a randomized controlled trial in western Kenya. *American Journal of Tropical Medicine & Hygiene* 68 (4 Suppl): 137-41.

Baume, C.A. & Marin, M.C. 2007. Intra-household mosquito net use in Ethiopia, Ghana, Mali, Nigeria, Senegal and Zambia: are nets being used? Who in the household uses them? *American Journal of Tropical Medicine & Hygiene* 77: 963-971.

Baume, C.A., Reithinger, R. & Woldehanna, S. 2009. Factors associated with use and non-use of mosquito nets owned in Oromia and Amhara regional states, Ethiopia. *Malaria Journal*. 8: 264.

Chukwuocha, U.M., Dozie, I.N., Onwuliri, C.O., Ukaga, C.N., Nwoke, B.E., Nwankwo, B.E., Nwoke, E.A., Nwaokoro, J.C., Nwoga, K.S., Udujih, O.G., Iwuala, C.C., Ohaji, E.T., Morakinyo, O.M. & Adindu, B.C. 2010. Perceptions on the use of insecticide treated nets in parts of the Imo River Basin, Nigeria: implications for preventing malaria in pregnancy. *African Journal of Reproductive Health* 14(1): 117-28.

Department of Community Medicine, Ahmadu Bello University, Zaria, Nigeria. 2012. Year 2012 Community Diagnosis Conduct Census for Gimba Village, Soba Local Government Area, Kaduna State, Nigeria.

Federal Ministry of Health and National Malaria Control Programme, Abuja, Nigeria. 2009. *Strategic Plan 2009-2013 "A Road Map for Malaria Control in Nigeria"*. Abridged Version, Yaliam Press Limited. Abuja, Nigeria.

Githinji, S., Herbst, S., Kistemann, T. & Noor, A.M. 2010. Mosquito nets in a rural area of Western Kenya: ownership, use and quality. *Malaria Journal* 9: 250.

Grabowsky, M. 2008. The billion-dollar malaria moment. *Nature*. 451(7182): 1051-2. .

Jombo, G.T.A., Mbaawuaga, E.M., Anongu, S.T., Egah, D.Z., Enenebeaku, M.N.O., Peters, E.J., Utsalo, S.J., Okwori, E.E. & Odey, F. 2010. The burden of malaria among under five children: Finding from Makurdi city, north central Nigeria. *Reviews in Infection* 1(3): 140-144.

Klein, R.E., Weller, S.C., Zeissig, R., Richards, F.O. & Ruebush, T.K. 1995. Knowledge, beliefs, and practices in relation to malaria transmission and vector control in Guatemala. *American Journal of Tropical Medicine & Hygiene* 52: 383-388.

Lengeler, C. 2004. Insecticide-treated bed nets and curtains for preventing malaria. *Cochrane Database Systematic Review* 2: CD000363-pmid: 15106149.

Musa, U., Hati, S.S., Mustapha, A. & Magaji, G. 2010. Dichlorvos concentrations in locally formulated pesticide (Ota-piapia) utilized in northeastern Nigeria. *Scientific Research and Essay* 5(1): 049-054.

Natalie, D.L.C., Crookston, B., Dearden, K., Gray, B. & Ivins, N, et al. 2006. Who sleeps under bednets in Ghana? A doer/non-doer analysis of malaria prevention behaviours. *Malaria Journal* 5: 61.

Ndjinga, J.K. & Minakawa, N. 2010. The importance of education to increase the use of bed nets in villages outside of Kinshasa, Democratic Republic of the Congo. *Malaria Journal* 9: 279.

Njoroge, F.K., Kimani, V.N., Ongore, D. & Akwale, W.S. 2009. Use of insecticide treated bed nets among pregnant women in Kilifi District, Kenya. *East African Medical Journal* 86: 314-322.

NPC and ORC Macro. 2009. *Nigeria Demographic and Health Survey, 2008*. Calverton, Maryland: National population commission and ORC Macro.

PAN: Pesticides Action Network Nigeria. 2007. *Strategic Assessment of the Status of POPs Pesticides Trading in South Western Nigeria*. Nigerian Environmental Study Team (NEST).

Pettifor, A., Taylor, E., Nku, D., Duvall, S., Tabala, M., Meshnick, S. & Behet, F. 2008. Bednet ownership , use and perceptions among women seeking antenatal care in Kinshasha, Democratic Republic of Congo (DRC): Opportunities for improved maternal and child health. *BMC Public Health* 8: 331.

Pulford, J., Hetzel, M.W., Bryant, M., Siba, P.M. & Mueller, I. 2011. Reported reasons for not using a mosqueto net when one is available: a review of published literature. *Malaria Journal* 10: 83.

Roll Back Malaria Partnership. 2005. *Global Strategic Plan: Roll Back Malaria 2005-2015*. Geneva.

Tchinda, V.H. et al. 2012. Factors associated to bed net use in Cameroon: a retrospective study in Mfou health district in the centre region. *Pan African Medical Journal* 12: 112.

The US President's Malaria Initiative. 2006. *The Lancet*. 368 (9529): 1.

Thwing, J., Hochberg, N., Vanden Eng, J., Issifi, S., Eliades, M.J., Minkoulou, E., Wolkon, A., Gado, H., Ibrahim, O., Newman, R.D. & Lama, M. 2008. Insecticide-treated net ownership and usage in Niger after a nationwide integrated campaign. *Tropical Medicine & International Health* 13: 827-834.

Toe, L.P., Skovmand, O., Dabire, K.R., Diabate, A., Diallo, Y., Guigumde, T.R., Doannio, J.M.C., Akogbeto, M., Baldet, T. & Gruenais, M. 2009. Decreased motivation in the use of insecticide-treated nets in a malaria endemic area in Burkina Faso. *Malaria Journal* 29(8): 175.

World Health Organization. 2002. Roll Back Malaria Fact Sheet. Geneva.

World Health Organization. 2008. World Malaria Report.
World Health Organization. 2010. *World Malaria Report.* Geneva.

Yakubu, A.M. 1996. *Western Education in the Northern Nigeria: Challenges and Strategies.* First Edition. National Gamji Memorial Club.

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