Journal of Mosquito Research, 2013, Vol.3, No.6, 45−53
ISSN 1927-646X
http://jmr.sophiapublisher.com

Research Report **Open Access**

Malaria and the Use of the Insecticide-Treated Net (ITN) among Under-Five Children in Kuje Area Council of the Federal Capital Teritory Abuja, Nigeria

Ashikeni M.A. [1], Envuladu E.A. [2], Zoakah A.I. [2]

1. Department of Disease Control, FCT Primary Health Care Board, Abuja, Nigeria
2. Department of Community Medicine, Faculty of Medical Sciences, University of Jos, Nigeria

Corresponding author email: mashikeni@yahoo.com; Authors

Journal of Mosquito Research, 2013, Vol.3, No.6 doi: 10.5376/jmr.2013.03.0006
Received: 15 Feb., 2013
Accepted: 04 Mar., 2013
Published: 22 Apr., 2013

Preferred citation for this article:
Ashikeni et al., 2013, Malaria and the Use of the Insecticide-Treated Net (ITN) among Under-Five Children in Kuje Area Council of the Federal Capital Teritory Abuja, Nigeria, Journal of Mosquito Research, Vol.3, No.6 45-53 (doi: 10.5376/jmr.2013.03.0006)

Abstract **Background**: About 29.8 million children under five are at risk of malaria in Nigeria and in most cases the incidence of acute illness is difficult to measure because of the imprecision in clinical diagnosis and lack of microscopic confirmation. The study assessed the effectiveness of the insecticide-treated nets (ITN) in reducing the prevalence of malaria among children under the age of five following free distribution of the ITNs and an intensive health education to the mothers and care givers on the prevention of malaria.

Methodology: It was a community based comparative interventional study that was carried out in Kuje and Rubochi communities of the Federal Capital Territory, Abuja among 232 children under-five years who were selected through a two staged sampling technique. A semi structured interviewer administered questionnaire was used to obtain information from the caregivers and the mothers of the children while blood samples were collected from the children for microscopic examination of thin blood films for malaria parasites after obtaining consent from the mothers and caregivers.

Children with malaria were treated at baseline in both the intervention and the control groups and health education was given to the mothers/caregivers after which free ITNs were distributed to the intervention group only. At post intervention, the same health education and free ITN were also given to the caregivers/mothers of the under-five children in the control group after a post intervention assessment was carried out in both groups using the same instruments that were used at pre-intervention.

Data collected were collated and analyzed using SPSS version 16 statistical software and results presented using tables with significance of association tested with the Chi square test. The level of significance was set at 95% ($p \leq 0.05$) for all statistical analysis.

Result: The mean age of the under five children was 18.4±12 months and 26.7±15 months in intervention and the control groups respectively. Ownership of ITNs increased from 58% to 100% in the study group and from 52.5% to 69.9% in the control group.

ITN usage rose from 57% to 83% after the study (p=0.0000) in the intervention group. In the control, the proportion of under five children sleeping under an ITN also rose from 45.8% to 58.3% but this was not statistically significant (p=0.08943).

A 93% reduction in prevalence of malaria (P= 00000) using a thin blood film was recorded in the intervention group.

Conclusion: This study showed a prevalence of malaria in under- five children of 39.3% in the study group (Kuje) and 22.0% in the control group (Rubochi). Proper use of ITNs was associated with a 93% decline in the prevalence of malaria in the intervention group from 39.3% to 2.7%.

Keywords Malaria; Insecticide-treated net (ITN); Mosquito, Nigeria

Introduction

Malaria is a life-threatening parasitic disease caused by a unicellular protozoan in the class sporozoa, order haemosporidium and genus plasmodium (Gupta

Mahajan, 2003; Obionu, 2007). It is a major impediment to health in Sub Saharan Africa as it remains the single biggest cause of death among young children in Africa (http://whqlibdoc.who.int/hq/2003/WHO_CDS_MAL_2003.1093.pdf:17-27). In highly endemic areas, children and pregnant women are most vulnerable to attack, as other adults acquire a degree of immunity through continued exposure (Obionu, 2007; http://www.who.int/tdr/publications/tdr-research-publications/social-aspects-malaria-control/pdf/seb_malaria.pdf).

In Nigeria, Plasmodium falciparum is the most predominant malaria parasite and accounts for about 98% of cases, while P. malariae usually occurs as a mixed infection with P. falciparum. The main vector in Nigeria is Anopheles gambiae, which is of all malaria vectors, the most effective, most widespread and most difficult to control. Anopheles funestus and Anopheles arabiensis are also commonly encountered while Anopheles melas is found in coastal areas (Federal Ministry of Health, 2005a; Anumudu et al., 2004). Malaria is stable and endemic in most of Nigeria except in some highland areas of the Mambilla Plateau and Obudu (Federal Ministry of Health, 2005b). Among young children fever is the most common symptom of malaria (http://www.rollbackmalaria.org).

About 60% of the cases of malaria worldwide occur in Sub Saharan Africa and over 80%~90% of malaria deaths occur in this same region. The situation is so serious here that every 30 seconds a child under five dies from malaria and many children who survive an episode of severe malaria suffer permanently from learning impairments or brain damage (http://www.who.int/tdr/publications/tdr-research-publications/social-aspects-malaria-control/pdf/seb_malaria.pdf; Global Health, 2009; Erhart and D'Alessandro, 2002).

Most children experience their first malaria infections during the first year or two of life, when they have not yet acquired clinical immunity – which makes these early years particularly dangerous (http://whqlibdoc.who.int/hq/2003/WHO_CDS_MAL_2003.1093.pdf:17-27; http://www.who.int/tdr/publications/tdr-research-publications/social-aspects-malaria-control/pdf/seb_malaria.pdf; Adetokunbo and Gilles, 2003). It is estimated that African children have between 1.6 and 5.4 episodes of malaria each year, a figure that varies according to geographical and epidemiological circumstances, with severe infections killing within hours (http://www.rbm.who.int/docs/rps_publications/unicef_malaria_en.pdf). Children are vulnerable to malaria from about 4 months of age when maternal antibodies have waned off. About 29.8 million children under five are at risk of malaria in Nigeria (http://www.who/mediacentre/factsheets) and in most cases the incidence of acute illness is difficult to measure because of the imprecision in clinical diagnosis and lack of microscopic confirmation (Munthali, 2005; Lesi et al., 2004). Indeed, malaria is one of the leading killers of children under five years, accounting for almost one death in ten worldwide and nearly one death in five in Sub-Saharan Africa (http://www.who.int/tdr/publications/tdr-research-publications/social-aspects-malaria-control/pdf/seb_malaria.pdf; http://www.rollback-malaria.org).

Malaria remains a huge public health problem in Sub-Saharan African countries and accounts for 10% of its disease burden even though it is both preventable and curable (http://www.who.int/tdr/publications/tdr-research-publications/social-aspects-malaria-control/pdf/seb_malaria.pdf; Federal Ministry of Health, 2005a; Adetokunbo and Gilles, 2003).

The Nigerian Government and development partners are scaling up prevention interventions to reduce the malaria burden and to achieve the Abuja targets (Federal Ministry of Health, 2005a; 2005b; 2005c). One strategy is to distribute Long Lasting Insecticidal Nets (LLINs), free to persons at risk especially children under five years and pregnant women.

The study was aimed at determining the prevalence of malaria among under five children in Kuje using both laboratory evidence of parasitaemia and the history of fever and assessing the effect of ITNs in reducing the prevalence of malaria among these children.

Journal of Mosquito Research, 2013, Vol.3, No.6, 45−53
ISSN 1927-646X
http://jmr.sophiapublisher.com

1 Methodology

1.1 Study design

The study was a Community based comparative Interventional study.

1.2 Study population

Children aged less than five years in two wards in Kuje Area Council namely Kuje central and Rubochi were recruited into the study, as intervention (experimental or study) and control groups respectively. Kuje central is the headquarters of the Area Council while Rubochi is over two hours drive away from Kuje.

1.3 Inclusion/Exclusion criteria

All children less than five years were eligible for the study. Those recruited were followed up for five months.

1.4 Sample size determination

The minimum sample size was determined using the formula for comparative designs below (Kirkwood and Sterne, 2003).

$$N = \frac{(Z\alpha + Z\beta)^2\, 2p(1-p)}{d^2}$$

Where N= minimum sample size for each group

Zα=percentage point of normal distribution corresponding to the (two sided) significance level. In this case significance level is 5%, so Zα=1.96

Zβ = power of the test, which is conventionally 80%; Zβ = 0.84

p= mean proportion of under- fives with malaria in the control group (55%) (Nsimba et al., 2002; Arnaud et al., 2005) and intervention group (28%) (From previous studies, use of ITN's will reduce the incidence of malaria by an average of 50%) (Federal Ministry of Health, 2005a; http://www.rollback-malaria.org)

p =55 + 28 /2 = 42 or 0.42

1-p= the variance of the proportions = 1 - 0.42 = 0.58

d= the minimum difference to be detected by the study (20%) = 0.2

Substituting in the formula therefore:

$$N = \frac{(1.96 + 0.84)^2 \times 2 \times 0.42 \times 0.58}{0.2^2} = \frac{3.819648}{0.04} = 96$$

20% was added to take care of Attrition = 96+20=116

Sample size = Experimental group (116) + Control group (116) = 232.

1.5 Sampling technique

A two staged sampling technique was used.

1.5.1 First stage

From the ten political wards in Kuje Area Council, Kuje central was randomly selected as the intervention group by balloting. A second ward, Rubochi with similar socio demographic characteristics but not too close to Kuje ward was selected to serve as control.

1.5.2 Second stage

Houses with children less than five years of age from each of the two selected wards were enumerated. A total of 285 houses were enumerated in Kuje central and these formed the sampling frame from which a sample of 130 households was randomly selected using computer generated random numbers.

In Rubochi ward, 245 houses were enumerated. These formed the sampling frame from which 118 houses were selected using computer generated random numbers. Mothers of selected children were then invited to the nearby Primary health care center and semi structured questionnaires were administered to them by a team of trained assistants. Where there was more than one eligible child in a household, one was selected randomly by balloting. If the child's mother was not available, the visit was repeated. If a participant did not consent, was not available after three visits, or withdrew from the study she/he was replaced by another eligible child selected by simple random technique using the computer generated random numbers.

1.6 Data collection technique

Data was collected at pre-intervention and at post intervention using the same instruments.

Data was collected using both the semi structured interviewer administered questionnaire and the laboratory investigation results sheet.

1.6.1 Pre-intervention data collection

The questionnaire was used to collect data on the

socio-demographic characteristics of the under-five children, the ownership and utilization of the ITNs in both the intervention and the control communities at base line.

Four research assistants were recruited and trained for one day on how to enumerate the houses and also to later administer the questionnaires. The primary health care numbers were a guide but since some new houses were not previously numbered, we had to allocate new numbers to all the houses. The research assistants were taught to identify all houses in the selected wards with children aged less than five years and number them serially with chalk or marker pen and keep a record of the number and head of the household with them.

Two experienced Medical Laboratory scientists were also recruited to carry out investigations on all the participants using thin blood films stained with Giemsa for malaria parasites to determine the laboratory evidence of malaria, using sterile equipment to obtain a drop of blood. Slides were prepared in the field and labeled but stained and examined later in the laboratory at Asokoro District Hospital. They were to study and report on each slide and wherever they do not agree on the findings; a third experienced laboratory scientist will be invited to study and report on the slide. The microscopes were serviced and reagents were certified by the laboratory scientist at Asokoro District Hospital before the study began.

1.6.2 Intervention

The National Malaria control programme in collaboration with the Public health department of the Federal Capital Territory Administration (Roll Back Malaria Unit) provided all the Insecticide Treated Nets for this study. The Giemsa stain, glass slides, sterile needles, cotton wool and other materials needed for this study were provided by the researcher.

Only the mothers in the intervention group (Kuje) received basic health information on malaria and its prevention at this initial time. Using the local languages of Gbagyi and Hausa as well as English, health education messages were given along with a drama presentation depicting the dangers of malaria in children and a demonstration of how to mount the ITNs at the selected nearby Primary Health Center.

This was followed by a question and answer session where any doubts were clarified. Health education was given by the researchers with the assistance of trained health workers who work in the communities being studied and understand the local languages.

All children who presented with a history of fever or temperature of or greater than 37.5℃ were treated free with ACTs in both the intervention and control group.

After the baseline data collection, free Long Lasting Insecticidal Nets (LLIN) were distributed to all mothers of under five children in the intervention group. The importance of always using the Insecticide Treated Nets was subsequently reinforced any time mothers visited the clinic by the health workers and the researcher.

1.6.3 Post intervention

After twenty weeks, data was again collected from both the intervention and the control group using the same instruments with blood specimens taken for MP using the same procedure and examined by the same laboratory scientists for comparison. After collecting the post intervention data, the control group received health education with a drama presentation depicting the dangers of malaria in children and the importance of the ITN in protecting them against malaria, just like in the intervention group. The control group were then provided with Long Lasting Insecticidal Nets and shown how to mount them. The use of the nets was thereafter reinforced by the health workers whenever the mothers visited the PHCs.

1.7 Data analysis

Data collected were collated and analyzed using SPSS version 16 statistical software and results presented tables with significance of association tested with the Chi square test. The level of significance was set at 95% ($p \leq 0.05$) for all statistical analysis.

1.8 Ethical consideration

Ethical Clearance was obtained from the Ethical

Committees of the Jos University Teaching Hospital (JUTH) and the Federal Capital Territory Administration before going to the Local Government Area. Written permission was also obtained from the Chairman of the Local Government Area and the leaders of selected communities.

Informed written consent was obtained from all the mothers before enrollment into the study. The aim of the study was explained to all the participants who were assured of confidentiality of any information provided. Their full cooperation was solicited and they were told they could withdraw at any point of the study without suffering any penalties or being denied any benefits.

2 Results

The age distribution of children under five years in Kuje is shown as table 1.

Table 1 Age distribution of children under five years in Kuje

Age (months)	Intervention		Control	
	Freq	%	Freq	%
<6	2	1.5	4	3.4
6-11	52	40	22	18.6
12-17	21	16.2	11	9.3
18-23	9	6.9	11	9.3
24-29	20	15.4	16	13.6
30-35	2	1.5	11	9.3
36-41	16	12.3	17	14.4
≥42	8	6.2	26	22
Total	130	100.0	118	100.0

The mean age of the under five children in the intervention group was 18.4±12 months and 26.7±15 months in the control group.

2.1 Utilization of insecticide treated nets by under five children at Kuje

Fifty eight percent of Households in the study group had at least one insecticide treated mosquito net at baseline. This however increased significantly to 100% after distribution of nets during the study. In the control group, 52.5% of households had at least one insecticide treated net at baseline. After five months 69.9% of households in the control group had at least one insecticide treated net (Table 2).

In the study group 57% of mothers with ITN admitted that the child slept under the net the night before the intervention. This rose to 83% after the intervention (X^2 = 19.18, df=1, p=0.0000 statistically significant). In the control, the proportion of under five children sleeping under an ITN also rose from 45.8% to 58.3% but this was not statistically significant (p=0.08943) (Table 3).

2.2 Prevalence of malaria in under five children at Kuje

The history of fever in the last one month was assumed to be indicative of malaria. The prevalence was 7% in the study group. After intervention, it reduced to 1.1% (not statistically significant, p=0.06486). In the control group, the prevalence rose from 6% to 17.5% (statistically significant, p=0.0098) (Table 4).

The results of the thin blood film showed a prevalence of 39.2% at baseline reducing to 2.7% in the intervention group after 5 months, a 93% reduction in prevalence of malaria (statistically significant P= 00000). In the control, the prevalence of malaria increased from 22.0% at baseline to 32.0% after five months (not statistically significant, P = 0.1112) (Table 5).

3 Discussion

The thin blood film showed a baseline prevalence of 39.2% in the intervention group and 22% in the control group. This prevalence reduced in the intervention group to 2.7% after using ITN for five months but was observed to increase in the control group to 32%. A study in Tanzania by Nsimba and colleagues in 2002 found a prevalence of malaria of 55% in children under five years (Nsimba et al., 2002) and another study in Gabon in 2005 found a prevalence of 47.5% in children between 6 months and five years of age (Arnaud et al., 2005). Adah and

Journal of Mosquito Research, 2013, Vol.3, No.6, 45−53
ISSN 1927-646X
http://jmr.sophiapublisher.com

Table 2 Household possession of at least one insecticide treated net at Kuje

HH ITN Possession/ ownership	Interv				Control			
	Pre interv		Post interv		Pre interv		Post interv	
	Freq	%	freq	%	freq	%	Freq	%
Possess	75	58.0	112	100	62	52.5	72	69.9
Do not possess	55	42.0	0	0.0	56	47.5	31	30.1
Total	130	100.0	112	100.0	118	100.0	103	100.0

Mantel Haenszel =52.90, df=1, p=0.0000; X^2=6.10, df= 1, p=0.01350

Table 3 Children Under five who slept under an ITN the previous night at Kuje

HH ITN Possession/ ownership	Interv				Control			
	Pre interv		Post interv		Pre interv		Post interv	
	Freq	%	Freq	%	Freq	%	Freq	%
Yes	74	57.0	93	83.0	54	45.8	60	58.3
No	56	43.0	19	17.0	64	54.2	43	41.7
Total	130	100.0	112	100.0	118	100.0	103	100.0

X^2 = 19.18, df=1, p=0.0000; X^2 =2.88, df=1, p=0.08943

Table 4 Prevalence of malaria in Under five children in Kuje using history of fever

History of fever	Interv				Control			
	Pre interv		Post interv		Pre interv		Post interv	
	Freq	%	freq	%	Freq	%	Freq	%
Had fever	9	7.0	1	1.1	7	6.0	18	17.5
Had no fever	121	93.0	94	98.9	111	94.0	85	82.5
Total	130	100.0	95	100.0	118	100.0	103	100.0

Yates corrected X^2= 3.26, df= 1, p=0.06486; X^2=6.68, df=1, p=0.0098

Table 5 Prevalence of malaria in Under five children in Kuje using thin blood film before and after the intervention

Presence of MP	Interv				Control			
	Pre interv		Post interv		Pre interv		Post interv	
	Freq	%	Freq	%	Freq	%	Freq	%
Yes	51	39.2	3	2.7	26	22.0	33	32.0
No	79	60.8	109	97.3	92	78.0	70	68.0
Total	130	100.0	112	100.0	118	100.0	103	100.0

Yates corrected X^2 =36.92, df =1, p=0.0000; X^2 = 2.54, df=1, p=0.1112

colleagues found a prevalence of 57.3% among under five children attending PHCs in Jos North LGA (Adah et al., 2009). Other studies have found haematological parasitaemia of up to 70% in children less than one year especially in the peak of the transmission season in highly endemic areas (http://www.rollbackmalaria.org). The increase in prevalence in the control group in this study is likely to be due to the seasonal increase with the rainy season in June when the post intervention phase of

this study was carried out. The baseline studies were conducted in January in both the study and control groups.

3.1 ITN ownership, utilization and effects on malaria

In the intervention group, net ownership as determined by the possession of at least one ITN in a household was found to be 58%. Most respondents got their nets from health facilities during the immunization campaigns of the Federal Government. However, adequate utilization of the ITN by the child sleeping under the net every night showed a different picture. The mother's account that the child slept under the ITN last night was recorded and showed that only 57% of those who owned nets utilized them adequately. After the intervention, net ownership increased to 100% while adequate usage increased to 83%. With such high ITN utilization rate, it is not surprising that the prevalence of malaria in this group dropped to 2.7%, a reduction in prevalence of malaria by 93%. Some studies have shown that the incidence of Falciparum malaria fell by 50% with about 100% ownership and 50 -75% under five children sleeping under the ITN (http://malaria.who.int/wmr2008/ malaria2008.pdf. Some countries in Africa such as Eritrea (63% utilization) and Malawi (36% utilization) have been able to significantly improve the utilization of ITNs on a national scale between 2002-2004 (http://whqlibdoc.who.int/hq/2003/WHO_CDS_MAL_ 2003.1093.pdf:17-27; http://www.rollbackmalaria.org). In Senegal, net ownership increased from 11% in 2000 to 41% in 2004. In the Gambia, 77% of under five children slept under the ITN following the efforts of a National Impregnated Bed Net Programme. Nigeria, Ghana and Togo are boosting net distribution through the ITN Massive Promotion and Awareness Campaign (IMPAC) as well as EPI plus. Nets are distributed free to under five children alongside measles and polio vaccination (Oresanya et al., 2008; http://rbm.who.int/wmr2005/). Many mothers in the survey attested to having received nets from such immunization campaigns as evidenced by net ownership of up to 50% in both the intervention and control populations . The Nigerian Malaria Control Programme also uses health facilities for routine distribution (http://www.rollbackmalaria.org). Net ownership is different from net utilization. Most mothers were not putting their under five children to sleep under the nets all the time. For the child to benefit fully from the effects of the net, it should be used all the time (http://malaria.who.int/wmr2008/ malaria2008.pdf; Baume and Marin, 2008).

The proportion of children less than five years sleeping under an ITN has been rising in a few countries. In Zambia, it rose from 1% in 1999/2000 to 23% in 2005/2006. In neighbouring Ghana, it rose from 4% in 2002/2004 to 22% in 2005/2006 (http://www.un.org/millenniungoals/pdf/mdg2007.pdf). Noor and others reported in 2009 that ITN ownership was Less than 40% in Nigeria and other African countries and ITN use by children less than five years was 3.3% (Noor et al., 2009).

The appropriate use of ITN may be affected by educational level as was found in this study. A statistically significant association was found between increasing levels of education and adequate utilization of the ITN ($p=0.034$). Oresanya et al also found a significant association between educational level and use of ITN (Oresanya et al., 2008). The same authors also report association with the season, color of nets, child's age, size of household. ITN use was higher in the rainy season compared to the hot and dry season (Taylor et al., 2008; Widmar et al., 2009). In this study, most of the respondents owned white nets (78%) but a good proportion preferred blue (32%). If the mothers do not like the colour of the nets they may not use them. Many respondents who were not using the ITN said this was because it was causing a lot of heat and discomfort. Some of the participants advised that more nets be made available to all mothers and children while others wished the sizes will be bigger so they could be used with family sized beds and life span of the long lasting nets should be more than four years. Lengeler reported that ITNs could reduce the incidence of uncomplicated malaria by 50% compared to non-users (Oresanya et al., 2008). This study shows even higher reduction in the cases of malaria. Malaria prevalence in this study was reduced by 93% in the study group where the utilization of ITN was as high as 83% following intervention.

4 Conclusion

This study showed a prevalence of malaria in under five children of 39.3% in the study group (Kuje) and 22.0% in the control group (Rubochi). Proper use of ITNs was associated with a 93% decline in the prevalence of malaria in the study group from 39.3% to 2.7%. In contrast, in the control group the prevalence rose from 22.0% to 32.0%.

ITN ownership was found to increase from 58.0% at baseline to 100.0% in five months of the intervention while adequate utilization demonstrated by the under five children sleeping under the ITN every night rose from 57.0% to 83.0% after intervention and resulted in a 93.0% reduction in the prevalence of malaria in children under five years.

References

Adah O.S., Ngo-Ndomb T., Envuladu E.A., Audu S., Banwat M.E., Yusuff O.T., and Zoakah A.I., 2009, Home treatment of malaria amongst under fives presenting with fever in PHC facilities in Jos north LGA of Plateau State. Niger. J. Med., 18(1): 88-93
PMid:19485157

Adetokunbo O.L., and Gilles H.M., 2003, Malaria, Short Textbook of Public Health Medicine for the Tropics, 4th edition, Malta. Bookpower, pp.199-209, 233

Anumudu C.I., Okafor C.M.F., Ngwumohaike V., Afolabi K.A., Nwuba R.I., and Nwagwu M., 2004, Clinical manifestations and immune response to merozoite surface proteins 1(MSP1) in severe paediatric malaria in Adeoye State maternity hospital, Ibadan, Afr. J. Med. med Sci., 33(1): 57-63
PMid:15490796

Arnaud D., Nze Obiang P.C., Tchoua R., Planche T., Mboza B., and Mbounja M., 2005, Severe falciparum malaria in Gabonese children: Clinical and laboratory features, Malaria J., 4: 1
http://dx.doi.org/10.1186/1475-2875-4-1
PMid:15638948 PMCid:546207

Baume C.A., and Marin C., 2008, Gains in awareness and use of insecticide nets in Nigeria, Senegal, Uganda and Zambia, Malar J., 7: 153
http://dx.doi.org/10.1186/1475-2875-7-153
PMid:18687145 PMCid:2527013

Erhart A., and D'Alessandro U., 2002, Malaria vaccines: a brief overview, Postgraduate Doctor-Africa, 24(4): 66-69

Federal Ministry of Health, 2005a, National malaria policy on insecticide treated mosquito nets in Nigeria, Online, Available at http://nmcpnigeria.org/f/itn/Policy%20for% 20 ITNs%20in%20Nigeria%20(Revised,%20June%20'05).pdf

Federal Ministry of Health, 2005b, A road map for malaria control in Nigeria, National Malaria Control Programme Strategic Plan 2006-2010, Online, Available at http://nmcpnigeria.org/f/Nigerian%20NMCP%20%20200 6%20-%202010%20Strategic%20Plan%202-3-06.pdf

Federal Ministry of Health, 2005c, National malaria control programme, Case Management and Drug Policy (Online), Available at http://nmcpnigeria.org/?p=case%20management

Global Health, 2009, Weekly Tuberculosis and Malaria Report About Global Fund to fight AIDS, Tuberculosis and Malaria, (Online), Available at http://www.global-healthreporting.org

Gupta M.C, Mahajan B.K., 2003, Malaria, Textbook of Preventive and Social Medicine, 3rd edition, India, Jaypee Brothers, pp.260-273
http://dx.doi.org/10.5005/jp/books/10951_18
http://dx.doi.org/10.5005/jp/books/10951 PMid:12675699

Kirkwood B.R., and Sterne J.A.C., 2003, Calculation of required sample size, Essential Medical statistics, 2nd edition, Oxford, Blackwell, pp.422-428

Lesi F.E.A., Ben-Edet A.E., Mafe A., and Grange A.O., 2004, Accuracy of clinical diagnosis of malaria in children under five in Lagos, Nigeria Quarterly Journal of Hospital Medicine.14(1): 100-102

Munthali A.C., 2005, Managing malaria in under-five children in a rural malawian

Noor A.M., Mutheu J.J., Tatem A.J., Hay S.I., and Snow R.W., Insecticide treated net coverage in Africa: mapping progress in 2000-07, Lancet., 2009, 373(9657): 58-67 http://dx.doi.org/10.1016/S0140-6736(08)61596-2

Nsimba S.E.D., Massele A.Y., Eriksen J., Gustafsson L.L., Tomson G., and Warsame M., 2002, Case management of malaria in under-fives at primary health care facilities in a Tanzanian district, Tropical Medicine and International Health. 7(3): 201–209

http://dx.doi.org/10.1046/j.1365-3156.2002.00847.x
PMid:11903982

Obionu C., 2007, Primary Health Care for Developing countries, 2nd edition, Enugu, Ezu books Ltd., pp.79-94

Oresanya O.B., Hoshen M., and Sofola O., 2008, Utilization of insecticide-treated nets by under-five children in Nigeria: Assessing progress towards the Abuja targets, Malaria Journal, 7: 145
http://dx.doi.org/10.1186/1475-2875-7-145
PMid:18667077 PMCid:2543041

Taylor E., Nku D., Duvell S., Tabala M., Meshnick S., and Behets F., 2008, Bed net Ownership, use and Perceptions among women seeking antenatal care in Kinshasa, Democratic Republic of Congo (DRC), Opportunities for improved maternal and child health, BMC Public Health, 8: 331
http://dx.doi.org/10.1186/1471-2458-8-331
PMid:18816373 PMCid:2571099

Widmar M., Nagel C.T., Ho Y.D., Benziger P.W., and Hening N., 2009, Determining and addressing obstacles to the effective use of long lasting insecticide impregnated nets in rural Tanzania, Malar. J., 8: 315 village, Nordic Journal of African Studies, 14(2): 127-146