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Long Lasting Insecticidal Nets (LLINs) Ownership and Use: A qualitative study to explore why people in Kuje Area Council of Federal Capital Territory of Nigeria are not sleeping under the LLINs for Malaria prevention

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Abstract

Background: Malaria is a major public health problem globally. In Nigeria, Malaria is responsible for 60% of outpatients, 30% of childhood deaths, 25% of deaths in infants under one year and 11% of maternal deaths. Its control is part of the Millennium Development Goal (MDG) 6 and despite Nigeria's efforts at promoting nets usage, the rate of sleeping under it is far below 80%, the desired practice for effectiveness of nets in malaria prevention and control. Methods: A qualitative research study was conducted. Using purposive sampling, 12 participants were selected from different groups who owned nets but were not sleeping under them. Semi-structured in-depth interviews to explore various views on barriers to their use were conducted. The data were subjected to a thematic content analysis. Results: Three themes emerged, namely availability and use of LLINs; reasons for not using LLINs and the role of the households in ensuring community use. Excessive heat in the net was perceived as a major barrier by almost all of the participants. Other reasons included the irritating effects of insecticides on the LLINs, vomiting, itching, rashes, difficulty with breathing, including feelings of being caged. Another was the cultural use of the LLINs for keeping dead bodies awaiting burial. This is the first time that this cultural behaviour is reported as a barrier to net use. Conclusion: Discomfort due to heat and irritating effects of insecticides have been identified as major barriers for nets use. Removal of chemical irritation effects and use of light materials to enable free circulation of air through the LLINs remain strongest recommendations from participants. Similar

qualitative research is recommended in other communities to further inform strategies to reduce the gap between nets ownership and use for effective malaria prevention and control.

Keywords: *malaria prevention, LLINs ownership, LLINs use, barriers, qualitative research, perception.*

1. Introduction

Malaria causes millions of deaths worldwide. It constitutes a huge epidemiological burden and a major public health problem in Africa and perpetuates in crippling the economic development in the region including Nigeria (WHO, 2003; Ojikutu, 2010).

According to the most recent data available, in Nigeria malaria is responsible for 60% of outpatient visits to health facilities, 30% of childhood deaths, 25% of deaths in infants under one year and 11% of maternal deaths (NMCP 2009).These percentages translate to large absolute numbers due to the high population of the country. The financial loss due to malaria annually is estimated to be 132 billion Naira (approximately $880 million) in the form of treatment costs, prevention efforts and loss of man-hours (ibid).This situation can be reversed using cost effective interventions based on the extensive evidence that the use of Long Lasting Insecticidal Nets (LLINs) is effective in malaria control leading to a potential reduction in all-cause childhood death by 14-33% in rural Sub-Saharan Africa (Alonso et al, 1991; D'Alessandro et al, 1995; Binka et al, 1996; Habluetzel et al, 1997). The World Health Organization (WHO) recommends the use of LLINs as an important strategy for malaria control (WHO, 1999).

The Governments of African countries including Nigeria set an ambitious target of ensuring that 60% of children under five and pregnant women were sleeping under Insecticide Treated Nets (ITNs) by the end of 2005 (WHO/RBM 2000).The Nigeria National Demographic Health Surveys NDHS (2008) however revealed less than 6% of children under-five and pregnant women were using nets regularly. In order to fast-track the scaling up of ITNs/ LLINs use in the country, in 2009 Nigeria adopted the universal coverage strategy (Kilian et al, 2010) whereby every household in the country would receive two free LLINs, resulting in the distribution of over 63 million nets between 2009 and 2010 (Brieger, 2010). This raises the question as to why there is a very wide gap between net ownership and use in the country, despite awareness creation campaigns on malaria prevention through sleeping under the LLINs. There is yet a paucity of published studies of self-reported reasons for owning an ITN/LLIN but not sleeping under it. In particular, qualitative studies to enable in-depth and robust reasons or barriers for non-use to be identified are lacking. The aim of the study was to explore perceptions of communities in Kuje Area Council of FCT, Nigeria, towards sleeping under LLINs so as to inform policy for the Nigeria National Malaria Control Programme (NMCP).

2. Methods

Study setting

The Kuje Area Council has two major development areas which are Kuje Central District and Rubochi development areas (FCT, 2011). While the population of approximately 100,000 comprises largely farmers, there are also civil servants, traders and livestock rearers. There are several ethnic groups with varying social backgrounds and cultural differences.

Study design

The adoption of ITNs by WHO as a cost effective intervention for malaria control hinges solely on the fact that sleeping under it every night prevents mosquito bites, thus interrupting transmission (Alonso et al, 1991). Since the decision to sleep under the nets is made by individuals who own an LLIN, a qualitative study approach was adopted, using semi-structured in-depth interviews in order to explore detailed opinion on reasons and barriers to its use from those who own them. Unlike a survey, the qualitative design was able to collect rich in-depth information and answered 'why' questions (Green andThorogood, 2009).

Study population and sampling

Purposive sampling approach was used to obtain the twelve study participants. This is a qualitative research approach in which particularly information-rich cases most likely to be able to provide data needed to address the research question are selected (Green andThorogood, 2009). In this case, all persons above the age of 18 years who owned a LLIN and were not sleeping under it were eligible for inclusion in the study. Since decisions are influenced by different groups within the community, participants from different groups were selected. The Kuje Area Council Health Clinic located within Chibiri community runs both antenatal care (ANC) and maternal and child health (MCH) clinics. Pregnant women and mothers of under-five children were given details of the study by the Senior Community Health Extension Worker (SCHEW). Four volunteers were recruited here. Two meetings about the study were held in Chibiri and Kiyi communities. The SCHEW who convened these meetings is well known and accepted by the community.

The final sample comprised two each from six categories of adult male (MAD), mothers of under-five year old children (Mu5), pregnant women (PIL), heads of households (HHH), adolescents (18-20 years) (ADOL) and community leaders (CL), with a composition of four females and eight males (Table A.2).

Data Collection

An interview guide was developed, with broad questions based on the research question and aim of the study. While the first questions provided information on their knowledge about malaria and its prevention, including the campaigns that delivered the free LLINs in the Kuje

Area Council, the latter ones focused on exploring reasons for their non-use by the participant as well as others in the community. Two pilot interviews with a male (head of household) and a female (mother of under-five) who met the inclusion criteria provided the opportunity to test the face validity of the interview guide (Green and Thorogood, 2009). No major changes were made to the guide except highlighting the need for clarifying some questions during the interview.

The SCHEW was recruited as an interpreter and trained on research ethical requirements. Although she only needed to interpret for two participants, she was present throughout the interviews to ensure uniform acceptance and confidence from the people as she was a female. A digital voice recorder was used to record each of the interviews, which lasted between 40 to 60 minutes. All interviews were conducted in a shade in-front of the participants' houses as was their choice.

Data Analysis

The interviews were transcribed and then analysed using Thematic Content Analysis (Green and Thorogood, 2009). The interviews were read over and over again for familiarization (Morse et al, 2002) and each interview was coded. Similar codes were grouped into categories and similar categories into themes (Graneheim and Lundman, 2004; Ziebland and McPherson, 2006). While the empirical data permitted the development of the coding scheme from the participants' responses, the research objectives and question determined some of the emerging themes (Green and Thorogood, 2009).The back and forth process finally resulted in the development of the theme codebook (Table A.1).

Ethical considerations

Ethics approval to conduct the study was obtained from both the Nigeria National Health Research Ethics Committee (NHREC) and the University of Liverpool (UoL) International Online Research Ethics Committee. Potential participants were informed verbally and in writing, translated into Hausa when necessary, that participation was voluntary and that confidentiality and anonymity would be ensured. Written consent was obtained from each participant prior to the interviews.

3. Results

The basic demographic information that was collected is shown on an individual basis in Table A. 2, with the participant codes used to identify the source of the quotes in this section. As shown in Table A1, the three themes that emerged from the interviews were availability and use of LLINs; reasons for not using an LLIN; and role of the households in ensuring community use of LLINs.

3.1 Theme one: Availability and use of LLINs

This theme provides information which forms the basis of malaria control programmes as the main purpose of the net is to prevent malaria infection by breaking the mosquito-man contact. This means that there must be an efficient system for the distribution of LLINs and clear desire to sleep under them every night.

Organized campaign for delivery of LLINs

All the 12 persons interviewed agreed that there was a campaign for the distribution of LLINs in Kuje Area Council. Although some could not remember the exact time the distribution took place, most knew correctly when the LLINs distribution campaign was carried out:

I remember correctly that two LLINs were given to each household early this year ***(participant CL-2)***

That they were given two LLINs per household represents the confirmation that every participant owned an LLIN, although there may not have been enough for every household member to sleep under. LLIN ownership was the prerequisite for enrolment in the study.

Others indicated that insecticide treated nets (ITNs) were given during antenatal clinics and immunization sessions for children at the Primary Health Care (PHC) Centre:

*My wife was given free insecticide treated mosquito nets (ITNs) when she attended antenatal clinic (ANC) some two years ago, and was told that she should be sleeping under it to prevent getting malaria while she was pregnant…****(participant MAD-1)***

Health education (including appropriate use of LLINs) was given during the distribution campaign and some participants clearly understood what the nets were for:

We were told that sleeping under the LLINs will prevent mosquitoes from biting us, and thus protecting us from the malaria fever. That the mosquito nets have been treated with chemical that will kill mosquitoes or send them away if they landed or came near these nets ***(participant MAD-1)***

Appropriate use of LLINs

The majority of the participants confirmed that adequate instructions were given to them on appropriate handling and use of the LLINs. This included the need to aerate the nets under the shade for 24 hours when first received, to remove the uncomfortable effects of the chemicals, before hanging it over their sleeping spaces and the need to lower and sleep under it every night. Although this participant did not regularly sleep under the net, there was evidence of compliance with this instruction for other members of the participants' household that did not have problems with using the LLINs.

Interviewer: Have your wife and children been sleeping under their LLINs every night?

Response: Yes. My wife is very good at ensuring that the mosquito nets are lowered over the beds during the night and folded up during the day ***(participant MAD-2)***

3.2 Theme two: Reasons for not using an LLIN

This theme is a major pivot upon which the research aim revolves. The factors that emerged from the interviews included various signs of discomfort and some other cultural factors.

Effect of chemicals

Three of the respondents elucidated that the effects of the chemical on the LLINs were a major barrier to sleeping under it. One described it as 'mosquito net entering the eyes' while two others had irritation leading to vomiting and 'throwing out' signs (vomiting), caused by the irritating odour of the chemical used on the nets. One respondent complained of his child's eye itching, using this as an example of what he had experienced that prevents him from LLIN use. They were emphatic about their complaints adding that removal of these irritating aspects of the chemicals will make LLINs more user- friendly. This view confirmed the lack of understanding of the purpose of the insecticide.

Interviewer: Is your child not sleeping under the mosquito net as well?

How will he sleep....?.because mosquito net is entering somebody's eye..see him eyenooowww..... that is why he is not sleeping under mosquito nets ***(participant, CL-1)***

This pregnant woman responded as that chemical on the LLIN being the cause of vomiting, coupled with the heat.

Interpreter: She is saying that now that she is pregnant she cannot sleep under it because of heat. Now there is heat so she cannot sleep under it because of heat and because she is pregnant ***(participant PIL-2)***

.Interpreter:… she even vomited when she slept under the net which is due to the chemical on the net. That is why she does not want to sleep under the net ***(participant PIL-2)***

Other signs of discomfort

Almost all the participants' responses to reasons for not using the LLINs were skewed towards heat and other physical discomforts. The majority complained of experiencing excessive heat while sleeping under LLINs, others complained of difficulty with breathing and some still of feeling of being caged, and choking.

… I initially tried to sleep inside but I had a feeling of being caged coupled with the heat and after attempts for several nights, I gave up trying ***(participant MAD-2)***

The reason why I do not sleep under mosquito net is because I feel hot and very uncomfortable including difficulty to breath inside the mosquito net as I told you before ***(participant Mu5-1)***

The major barriers here can be summarised as excessive heat, difficulty with breathing, and feeling of being caged under LLINs. Other perceived effects were itching and rashes on the body.

Cultural reason

Other reason included the cultural use of LLINs to keep dead bodies awaiting burial which made sleeping under LLINs frightening. The use of LLINs for preventing flies from perching on the decomposing corpse was a response from a participant that had migrated into FCT from Benue State.

I will not sleep inside any mosquito net (shaking his shoulders) ***(participant CL-2)***

Interviewer: Why?

Response: I come from Benue State. And from my community there, because it is expensive to keep dead bodies in the mortuaries, dead bodies are kept at home under mosquito nets to prevent flies from perching on the corpse which are in various stages of decomposition before burial ceremony which often takes place as from 2 weeks from time of death. This act has personally created a barrier for me to sleep under a mosquito net which is meant for dead bodies ***(participant CL-2).***

3.3 Theme three: Role of the households in ensuring community use of LLINs

This third theme encompasses ways of increasing use of LLINs within communities. The role of the household would include understanding reasons why LLINs should be used, spreading awareness of the protective nature of LLINs against malaria; and the willingness of the people themselves to be advocates within the communities.

Awareness of protective nature of LLINs and malaria risk

Knowledge about malaria and the most vulnerable groups help to prioritize interventions for risk reduction and being able to recognise simple signs of infection will help the populations to understand the problem better to address it. Although participants were non-users of LLINs, they demonstrated some knowledge and understanding.

... don't like mosquito bites. Apart from the pain and nuisance, the health workers told us that they are responsible for the malaria fever ***(participant Mu5-2)***

Of course, children are most frequently attacked by malaria fever than any other group ***(participant MAD-1)***

However some mentioned that other people attributed malaria to causes other than the bite of a mosquito, as shown by the response from participant PIL-1:

Because sometime when you are having that malaria you see some people talking as if someone is coming after them... so you will not even know that it is malaria.....until when you come to the clinic before they tell you that you have malaria then you will know this is malaria because it has ever happened to me. Some people think it is something different knowing that it just malaria…. Yeeess, and they imagine as if somebody is after them spiritually ***(participant PIL-1)***

Evidence that religious beliefs are not barriers for the use of LLINs

The majority of the participants indicated that there were no religious, cultural or traditional beliefs that debarred them from using LLINs. However, the cultural aspect of keeping dead bodies under the nets was identified.

No, there is no traditional or cultural belief associated with mosquito nets that I know. Even this practice of using mosquito nets to keep corpse in it is a recent one when they started giving free mosquito nets in our communities ***(participant CL-2)***

They saw greater advantages with using LLINs than insecticide sprays and when asked about the cost of LLINs, participants felt it was not a barrier to ownership.

Oh… yes I will be willing to buy them for my family. You cannot put life to money value so since I know that mosquito net will prevent my people from dying I will not mind the cost. ***(participant MAD-2)***

I will be willing to pay up to N2,000($12.5) ***(participant MAD-2)***

3.4 Other methods used to prevent mosquito bites/malaria

Most of the participants disliked mosquito bites mainly due to the nuisance effect. The majority of those that complained about heat as a barrier to LLINs use reported that they use insecticide sprays, burn mosquito coils to drive away mosquitoes or cover themselves:

I just use 'cover cloth' to cover myself ***(participant Mu5-1)***

In contrast to these common methods, one participant described drinking alcohol to wade away the mosquito biting nuisance, as explained below:

I buy 'fisherman's mosquito net' every night so that I do not feel the mosquito bites even if they are around and bite me

Interviewer: (This is exciting). What is fisherman's mosquito net?

Response: The locally made alcoholic drink known as "burukutu" is consumed in large quantities by the local fishermen to enable them sleep very soundly in their mosquito invested fishing huts. The deep sleep due to effect of alcohol prevents them from noticing any disturbing effects from mosquitoes. So I also take "burukutu" every evening so do not notice mosquito bites ***(participant CL-2)***

This is of great concern due to the detrimental effect of alcohol as well as people not protecting themselves from the mosquitoes and thus being a continuous source of malaria infection within the community.

Suggestions for improving LLINs

The various suggestions by the respondents for the improvement of the LLINs came with a lot of enthusiasm. These include ensuring free air circulation through the LLINs, removing chemical odours and possible use of lighter materials for the nets.

That is a very interesting question. If the manufacturers of these LLINs can kindly design the mosquito nets so that there will be free movement of air across the mosquito net to reduce the heat being experienced at the moment. Others may not have problems as I do but I am sure that it will enhance the acceptability of the LLINs. Secondly, the smell of the chemical can be reduced or even completely removed without reducing the effectiveness ***(participant MAD-1***

Willingness to advocate the use of LLINs

For net use to become part of the culture and therefore sustainable, volunteers are needed as advocates within the communities. These attributes were seen among this study group and demonstrated through their responses.

Interpreter: What he said is that he will go house to house to tell other people to use these LLINs. After all he has begun to see the benefits from the members of his own family who are using it ***(participant HHH-2)***

4. Discussion

Participants confirmed the fact that there was a mass LLINs distribution campaign within the community and households were given two LLINs each. The qualitative approach used in this study enabled the openness about net ownership but non- usage by the participants (UNICEF-ACSD/KAP,2009) resulting in the in-depth discussions observed during the interviews.

The emerging major barriers to LLIN use were discomfort from heat and the irritating effects of chemicals that have been applied on them. Pulford et al (2011) have recently compiled published data on the reported reasons for owning a net but not sleeping under it. Heat and low mosquito biting density were identified as two major reasons. In a study covering four countries including Nigeria, Baume (2006) identified heat as a major barrier to LLIN use. The response

from the pregnant participant regarding irritation by chemicals on the LLIN, coupled with heat, causing vomiting needs to be explored further. Chukwuocha et al (2010) in their study on malaria in pregnancy in Imo state of Nigeria reported various barriers to net use including perceived poor pregnancy outcomes due to the effect of the chemicals on the nets.

Using nets for other purposes than sleeping under have been reported in a number of studies. These include drying of fish in Sub District of Western Kenya, fish farming, curtains at home, ant traps in Uganda, and bridal veils in Zambia (Brieger 2010; Minakawa et al, 2008).

None of these uses was identified in the present study but the cultural use of the LLINs for protecting dead bodies from house flies while making burial arrangements was identified as constituting a barrier to its use for the first time. Difficulties with hanging the LLINs above the sleeping area was however not mentioned as a barrier in this study, which is surprising as this has been identified as an important barrier in other studies (Pulford et al, 2011).

It was encouraging to find that some participants, although themselves non-users of LLINs, were encouraging 'at risk' members of their families to sleep under LLINs. Improvement on the quality of nets will have the potential of accelerating net ownership and use within the communities. Members of communities, particularly heads of households, can be trained as advocates within the communities as demonstrated in Ethiopia (Deribew et al, 2012).

5. Limitations of the study

Although the use of an interpreter has its limitations (Green and Thorogood, 2009) as some translation could be lost and ability to follow-up with probes could have been missed, just two of the participants required interpretation. Even during those two interview sessions the researcher interacted with the interpreter throughout the interview, so it was a three way conversation.

There are 774 Local Government Councils in Nigeria and only one of them was selected and within the selected Kuje Area Council, just two districts were covered. Apart from the limitation in geographical coverage, the cultural differences in Nigeria are many as over 250 ethnic groups exist (NDHS, 2008). Findings from a qualitative research study can be transferred to other settings if the setting is described and there is clear audit trail of the research process as was the case for this study (Shenton, 2004). Although the sample size was small, the interviews were in-depth and Guest et al (2006) showed that data saturation was achieved in the first twelve interviews in their study in West Africa.

6. Conclusion

This study, using a qualitative research approach, has explored the barriers for LLINs use in Kuje Area Council. It has established excessive heat and various types of chemical irritations (vomiting, itching, rashes; feelings of being 'caged') as major barriers for non-use of LLINs. The cultural use of LLINs to protect corpse from house flies while awaiting burial also emerged as a barrier. Reduction of the chemical irritation effects and use of lighter materials to enable free circulation of air through the LLINs remain the strongest recommendations from participants.

In conclusion, this qualitative explorative research has added valuable information towards addressing the barriers for closing the gap between net ownership and use for the prevention and control of malaria which is a big public health problem in Nigeria. While this gap is of great concern to the NMCP, it has shown that there is need to tell people why they are being given LLINs with a clear understanding of its protective value against the killer disease- malaria. There is a need to involve households and heads of households in communities as advocates of LLINs use including self-monitoring and the promotion of health to rid their community of deaths due to malaria.

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Table A.1: Theme Codebook		
Codes	**Categories**	**Themes**
1.1.1. LLINs distribution in the community	1.1. Organized campaign for delivery of LLINs	Availability and use of LLINs
1.1.2. LLINs issued during ANC/Immunization		
1.1.3. Two LLINs given to each Household		
1.2.1. Aerating LLINs for 24 hours before use	1.2. Appropriate use of LLINs	
1.2.2. Hanging LLINs over sleeping place		
1.2.3. Lowering and sleeping under LLINs every		
2.1.1. Feeling of vomit due to chemical	2.1. Effects of chemicals	Reasons for not using an LLIN
2.1.2. Fumes entering eyes		
2.2.1 Not using LLINs due to Heat	2.2. Signs of discomfort	
2.2.2. Difficulty with breathing / choking		
2.2.3. Feeling of being caged		
2.3.1. Use of LLINs to preserve dead bodies	2.3. Other reasons	
2.3.2. Individual body sensitivity		
2.3.3. Causes itching and rashes on the body		
3.1.1. Associating mosquito bites with malaria	3.1. Awareness of LLINs for malaria prevention	Roles of the households in ensuring community use of LLINs
3.1.2. <5 Children and pregnant women affected		
3.1.3. Hallucinations associated with malaria		
3.2.1. No religious, cultural or traditional beliefs	3.2. Evidence for need to support of LLINs' use	
3.2.2. Cost of insecticides Vs. LLINs		
3.2.3. Cost not barrier for LLINs ownership		
3.3.1. Use of insecticide sprays	3.3. Other methods of preventing mosquito bites	
3.3.2. Drinking alcohol to avoid nuisance effect		
3.3.3. Health Education		
3.4.1. LLINs makers to ensure air circulation	3.4. Suggestions for improving LLINs	
3.4.2. Chemicals on LLINs to be odourless		
3.4.3. Use of lighter material for LLINs		

3.5.1. Peer Group advocacy	3.5. Willingness to advocate LLINs use in the community	
3.5.2. Advocate through hanging support		
3.5.3. Sharing benefits of LLINs' use with others		

Table A.2: Summary of description and coding of the Participants

Participant Code	Gender	Occupation	Description	District
PIL-1	Female	House wife	Pregnant woman aged 30 years	Kuje
PIL-2	Female	House wife	Pregnant woman(middle aged woman, 35 years)	Kuje
ADOL-1	Male	Secondary sch. leaver	Community member (young person aged 20 years)	Kuje
ADOL-2	Male	Blind Graduate	Community member (young person aged 18- 20 years)	Kuje
CL-1	Male	Farmer	Community Leader (old man, aged 68-70 years)	Rubochi
CL-2	Male	Farmer	Community Leader (old man, aged 65 years)	Kuje
HHH-1	Male	Farmer	Head of Household (aged 45-50 years)	Rubochi
HHH-2	Male	Farmer	Head of Household (aged 40-45 years)	Rubochi
MAD-1	Male	Farmer	Male Adult (middle aged man, 30-35	Kuje

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MAD-2	Male	Farmer	Male Adult (aged 40 years)	Rubochi
Mu5-1	Female	House wife	Mother of Under five (aged 20 years)	Kuje
Mu5-2	Female	House wife	Mother of Under five (aged 35 years)	Kuje