Predictors of insecticidal net use among internally displaced persons aged 6-59 months in Abuja, Nigeria

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Key words: Internally displaced persons, long-lasting insecticidal nets, Child, Nigeria

Received: 11/07/2017 - Accepted: 09/02/2018 - Published: 27/02/2018

Abstract

Introduction: Malaria is the commonest cause of morbidity and mortality among displaced populations especially children in endemic countries. Nigeria, an endemic country, has had increase in internally displaced persons (IDP) due to insurgency. utilization of long-lasting insecticidal nets (LLIN) is a key strategy employed to achieve global targets of malaria elimination and its effectiveness is determined by utilization, coverage and maintenance. We determined the coverage and utilization of LLIN among children aged 6-59 months at IDP camps and its predictors. Methods: A cross-sectional study was conducted among children aged 6-59 months at the three IDP camps in Abuja. We collected data on socio-demographic characteristics, LLIN ownership and utilization using computer-aided interview, complemented by direct observation of nets. We defined universal LLIN coverage as the proportion of households with one LLIN to two persons and utilization as an eligible child sleeping under the LLIN the night preceding the survey. Bivariate analysis was done at p < 0.25 and logistic regression at 5% level of significance. Results: Overall, 393 children were enrolled with mean age of 33.3 ± 17.4 months, 51.6% were female. Household LLIN ownership was 76.7.5%, universal coverage 11.2% and utilization 89.7%. Independent predictors of LLIN utilization were LLIN hung at sleeping area (adjusted OR: 99.9, CI: 22.7 – 438.8) and type of camp site (adjusted OR: 8.2, CI: 2.5 – 27.4). Conclusion: LLIN utilization was high in these IDP camps despite low coverage. LLIN distribution and hanging campaigns are recommended to reduce malaria transmission in the IDP camps.
Introduction

Globally, in 2015, Malaria accounted for an estimated 214 million cases and 438 thousand deaths [1]. Nigeria and the Democratic Republic of Congo (DRC) accounted for more than one third of the malaria attributable deaths globally [1,2]. Both countries are not only endemic for malaria, but also suffer from conflict and violence resulting in displacement of thousands of people [3,4]. It has been shown that malaria strikes during conflict and disaster in malaria endemic countries [2,3,5]. This is partly due to the breakdown of health services and interruption of control programs. In addition, people displaced from regions of lower to higher endemicity are prone to more severe disease while those displaced from regions of higher endemicity can enhance disease transmission [2,3]. Internally displaced persons are a disadvantaged population, prone to challenges such as insecurity, limited access to health care, infectious and epidemic prone diseases. Since 2000, there has been an upsurge of internally displaced persons (IDPs) in Nigeria due to insurgency in the North East, communal clashes in the North Central and South West and attacks from Fulani herdsmen [4] and this contribute to the high number of IDPs in Nigeria. Furthermore, Nigeria has been categorised among countries which may suffer from protracted conflict and strife [3].

Malaria has been identified as a common cause of morbidity and mortality among displaced populations especially women and children [6,7]. This may worsen the already poor under-five indices which was reported as 128 deaths per 1000 live births in 2015, one of the worst in the world [8]. Malaria is a major contributor to under-five morbidity and mortality in un-displaced and even more so in displaced populations [2,9]. However, most IDP camp evaluations focus on shelter, "Water, Sanitation , Hygiene" (WASH) and malnutrition [5,10,11]. Only few countries include IDPs in their national malaria control programme plan, even in malaria endemic countries [10,12]. The Global Technical Strategy aims to eliminate malaria from at least 35 countries in which it was transmitted in 2015 [13]. Four main preventive strategies have been instituted for its control amongst which the use of long-lasting insecticidal nets (LLIN) is considered the corner stone with a preventive effect comparable to vaccination [2,14–16]. Effectiveness of LLIN depends on the coverage, utilization, maintenance and timely replacement of nets among other factors [2,13]. Preventive measures utilised among IDPs and refugees include LLIN, insecticide treated tarpaulins, mosquito proofing of night shelters and insecticide treated net wall hangings [17,18]. Of these, LLINs are available in the country and distribution campaigns in the general populace has been done since 2010. This study was conducted to determine the coverage of LLIN and predictors of LLIN utilization among internally displaced children aged 6-59 months living at IDP camps in Abuja, Nigeria.

Methods

Study area and design

The study was conducted in Abuja, the nation’s capital. It has an altitude of 477mm, average temperature and rainfall of 25.7°C and 1389mm respectively. The climate is tropical with two main seasons. The rainy season from May to October and dry season from November - February, Malaria transmission occurs all year round with the peak transmission from July - September. The camps at New Kuchingoro and Durumi Area One are camp - like sites in open air settlements with tents made of tarpaulin in fields and farm lands in rural areas, lacking basic amenities while the Wassa camp is a settlement site where the displaced persons are housed in abandoned buildings. No health facility is available at any of the camps, though the camps at Wassa and Durumi Area one have a dispensary. The only services provided are consultation for common ailments and drug dispensing. Displaced persons mostly access health care from facilities outside the camp. Drugs at the dispensary are usually donated by non-governmental organisations (NGOs) and philanthropists however the supply is irregular. A cross-sectional study was conducted among children aged 6-59 months at the three IDP camps in Abuja from July – October 2016.

Study population

All children aged 6-59 months living within Abuja IDP camps excluding those unavailable at the time of survey.

Data collection

Two structured interviewer-administered questionnaires (household and child) adapted from the 2015 Nigeria Malaria Indicator Survey were used to collect data on both the household and child [19]. Data were collected using Open Data Kit (ODK) on android-based phones. Trained interviewers administered the questionnaires to collect information on the socio-demographic characteristics of the caregivers, number of household members, state of residence before displacement, reason for displacement, duration of stay in camp, LLIN ownership and type of housing or shelter structure. Also data on demographic characteristics, and utilization of LLIN was collected with the child questionnaire and direct observation of nets to determine if LLIN was hung over sleeping areas.

Data analysis

Data analysis was done using Epi Info version 7.1.2.6. A child was considered to have utilised LLIN if he slept under an LLIN the night preceding the survey. Person-net ratio was computed by dividing the number of persons per household by the number of LLIN owned while the coverage was determined by the proportion of households with the ideal ratio of two persons to one LLIN (>0 - ≤2). Descriptive statistics was computed using frequencies, proportions and means. Bivariate analysis was done using odds ratios and 95% confidence interval was used to test for associations between utilization of LLIN and the factors. To identify the predictors of LLIN utilization, logistic regression analysis was conducted using factors with statistically significant associations at p < 0.25. For the logistic regression, significance level was set at p < 0.05.

Ethical consideration

Prior to the commencement of the study, ethical approval was obtained from the Federal Capital Territory Health Research Ethics Committee Abuja (reference code: FHREC 2016/01/10 /22-02-16). Before inclusion in the study, informed consent was obtained from care givers of eligible children, and they were assured of confidentiality. They were also informed that non-participation in the study would not affect their stay or welfare within the camp in any way. To further ensure confidentiality, personal identifiers were removed from all data sets and access was password restricted.

Results

A total of 393 children from 242 households were studied. Their mean age was 33.3 ± 17.4 months. About half of the participants were female 203 (51.6%) with the highest number of respondents from the Wassa IDP camp 233 (59.3%). The mothers were mainly in the 20-24 year age group 74 (32.5%), most had no formal
Table 1

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underneath an already hung net than having to put up the net
during the time of the survey. The odds of using LLIN was higher
among children in households where nets were observed hung in the
home over sleeping area (odds ratio (OR) : 55.9, 95% confidence interval (CI) : 18.1-172.1), respondents that lived near
bush and farmland (OR: 2.9, 95% CI: 1.33-6.59), had owned the
LLIN for 6 months or less, (OR: 2.6, 95% CI: 1.2-5.6 ), were
christians (OR:2.4, 95% CI: 1.1 -5.6) were also more likely to use
LLINs. Additionally, respondents were more likely to use nets with
holes (OR: 2.2, 95% CI:1.01-4.90), Other factors for net use which
were not found to be statistically significant were child's age and
sex, mothers age and educational status and if nets were free or
purchased. The independent predictors of LLIN utilization after
controlling for other factors were LLIN observed hung over sleeping
place (adjusted (aOR): 99.9, 95% CI: 22.7 - 438.7) and type of
camp site (aOR: 8.2, 95% CI: 2.5-27.4) (Table 3).

Discussion

This study investigated the coverage and utilization of LLIN among
IDPs aged 6-59 months at IDP camps in Abuja, Nigeria. Overall, the
study found high LLIN ownership in the households and utilization
among children aged 6-59 months while the coverage was low. The
independent predictors of utilization were LLIN observed hung over
sleeping places and the type of camp site. This study showed high
ownership of LLIN (76.7%) in households of IDPs aged 6-59
months. Even though the proportion is lower than that
recommended by the WHO [2], it is higher than the LLIN ownership
nationally and in the Federal Capital Territory Abuja 69% and 42%
among children less than 59 months of age respectively [19]. The
high ownership of LLIN at the IDP camps may be attributed to the
fact that lots of the LLINs at the camp were donated through NGOs,
national malaria elimination programme, religious organisations and
were not purchased. Though ownership does not equate utilization
[6], it is still an encouraging pointer towards achieving global
targets in malaria elimination. The high ownership found in this
study was similar to the finding among IDPs in Uganda where
ownership was 75.6% [20]. This was also found after LLIN
distribution campaign was done at the camps, so similar to our
study, the LLIN were freely obtained. However, in the Democratic
Republic of Congo, only 34% of households in the IDP camp had
LLIN [6]. This may be attributed to the fact that unlike the finding of
free LLIN distribution at the camps in the Abuja and Ugandan
study, a low wealth quintile was established in the Democratic
Republic of Congo camps. Thus, access to bed nets, if not freely
distributed was limited as most households could not afford to
purchase LLIN [6].

This study also found a low coverage rate of LLIN in the
households. Coverage of LLIN is an important determinant of the
effectiveness of this key strategy. This implies despite high
ownership of LLIN, Children living in the IDP camps still fall short of
accessing the protection afforded by LLIN. This low coverage found
in our study may be a reflection of the low coverage rate found in
the country in un-displaced populations as the NMIS found a
coverage of 22.9% in Abuja [19]. Even though low, the rate is still
twice the rate in IDPs aged 6-59 months of age. In a study among
IDPs in Uganda, the coverage was appreciably higher than that
found in our study( 56.9%) [20]. Though the coverage was
assessed after mass distribution campaigns at the camp, there was
no information as to whether distribution was done based on
household size which could have accounted for the much higher
coverage rate.

The strongest predictor of LLIN utilization in this study was net
observed hanging at sleeping areas during the survey. The odds of
using an LLIN was 100 times more among those who had their net
hanging. This is understandable as it is more convenient to sleep
underneath an already hung net than having to put up the net
before sleeping. This corroborates findings in other studies [20,21].
Type of Camp site was another independent predictor of LLIN
utilization determined in our study. Those IDPs aged 6-59 months
living at camp like sites which consisted of tents made of tarpaulins
in open fields, were eight times more likely to use LLIN than those
living at abandoned housing shelters in settlement sites. It can be
inferred that the houses though in state of disrepair offer better
protection and housing than the tents which may influence the
utilization of LLIN in both types of camps. With those exposed to
poorer housing structures, more likely to utilise LLIN. Other
variables not statistically significantly associated were age and
educational status of the mothers, although IDPs aged 6-59 months
whose mothers were 36 years of age and older were twice more
likely to utilise LLIN than those with younger aged mothers. Our
findings are subject to some limitations. utilization of LLIN,
determined by history of LLIN use the previous night was not
independently verified. Despite this, the study provides relevant
information on the current situation of LLIN coverage and utilization
in malaria prevention among displaced persons aged 6-59 months
at IDP camps in Abuja, Nigeria. A special population in which there
is dearth of information especially on malaria prevention. Another
strength of this study is the sighting and observance of nets
utilization determined in our stu-

Conclusion

Ownership and utilization of LLIN within the IDP camps in Abuja
were high, emphasis should be on improving the low coverage rate
which may affect effectiveness of LLIN in malaria prevention. Efforts
to increase utilization of LLIN among the children should focus on
improving household LLIN coverage rate by promoting further LLIN
distribution and hanging campaigns.

What is known about this topic

- Utilization of LLIN is protective against malaria;
- Utilization of LLIN is determined by its ownership and
universal coverage;
- Utilization is low among vulnerable populations such as
displaced persons.
What this study adds

- Ownership and utilization of LLIN is high among IDPs in Abuja;
- Ownership of LLIN per household could be high while universal coverage remains low;
- Type of camp site is also an independent predictor of LLIN utilization.

Competing interests

The authors declare no competing interests.

Authors’ contributions

Joan Ejembi conceptualised the research and took part in planning, monitoring data collection process, analysing the data, writing the results and the manuscript. Adebola Olayinka and Olufemi Ajumobi participated in planning the research, result interpretation, writing and reviewing the manuscript. Muhammed Ibrahim participated in data analysis, result interpretation, writing and reviewing the manuscript. Saad Ahmed participated in result interpretation, writing and reviewing the manuscript. All the authors read and approved the final manuscript.

Acknowledgments

This study was supported by Cooperative Agreement Number (GH15-1619) U2GGH001876, funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services. We also acknowledge Mr Nnamdi Usifo who developed the ODK questionnaire, Dr Abayomi Olorukoba who assisted with the data analysis, the IDP camp administrators, study participants and all those who have contributed to this study.

Tables and figure

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Table 2: LLIN coverage and utilization among children aged 6-59 months at IDP camps in Abuja

Table 3: Factors associated with LLIN use among children aged 6-59 months at IDP camps Abuja

Figure 1: Reasons proffered for non-utilization of LLIN among children aged 6-59 months at IDP camps Abuja

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| Table 1: Demographic characteristics of children aged 6-59 months and their mothers at internally displaced persons camps Abuja |
|---------------------------------------------------------------|
| Characteristics                                      | Frequency (N = 242) | Percentage (%) |
| Age of children (months) (n = 393)               |                  |                |
| 6-11                                            | 49               | 12.5           |
| 12-23                                           | 72               | 18.3           |
| 24-35                                           | 68               | 17.3           |
| 36-47                                           | 80               | 20.4           |
| 48-59                                           | 124              | 31.5           |
| Sex                                             |                  |                |
| Female                                          | 203              | 51.6           |
| Male                                            | 190              | 48.4           |
| Camp site                                       |                  |                |
| New Kuchingoro                                  | 50               | 12.7           |
| Durumi Area One                                 | 110              | 28.0           |
| Wassa                                           | 233              | 59.3           |
| Age of Mother (years) (n=242)                   |                  |                |
| 15-19                                           | 5                | 2.2            |
| 20-24                                           | 74               | 32.5           |
| 25-29                                           | 73               | 32.0           |
| 30-34                                           | 39               | 17.1           |
| 35-39                                           | 24               | 10.5           |
| >39                                            | 13               | 5.7            |
| Educational status of mother                    |                  |                |
| No formal                                       | 104              | 45.6           |
| Primary                                         | 40               | 17.5           |
| Secondary                                       | 83               | 36.4           |
| Tertiary                                        | 1                | 0.5            |
| Religion                                        |                  |                |
| Christianity                                    | 100              | 42.5           |
| Islam                                           | 135              | 57.5           |
| Duration of stay in camp (months)               |                  |                |
| < 6                                             | 15               | 7.0            |
| 6-11                                            | 13               | 6.1            |
| 12-17                                           | 34               | 15.8           |
| 18-23                                           | 18               | 8.4            |
| 24-29                                           | 116              | 54.0           |
| > 29                                            | 19               | 8.8            |
### Table 2: Long-lasting insecticidal net ownership, coverage of households and utilization among children aged 6-59 months at internally displaced persons camps in Abuja

| Variables                                      | Frequency | Percentage(%) |
|------------------------------------------------|-----------|---------------|
| **Households with LLIN *(Ownership) [N =232]* |           |               |
| Yes                                           | 178       | 76.7          |
| No                                            | 54        | 23.3          |
| **HH members to LLIN ratio+ (Coverage) [N =232]** |           |               |
| > 0 - ≤ 2                                     | 26        | 11.2          |
| > 2                                           | 152       | 65.5          |
| 0                                             | 54        | 23.3          |
| **Children 6-59 months who slept under LLIN night prior to survey - (Utilisation) [N =290]** |           |               |
| Yes                                           | 260       | 89.7          |
| No                                            | 30        | 10.3          |

*Ownership: Availability of at least one LLIN in a household*

+Coverage: Proportion of HH that have at least one LLIN to 2 persons per HH

-Utilisation: Child aged 6-59 months slept under an LLIN the night before the survey
Table 3: Factors associated with utilization of long-lasting insecticidal nets among children aged 6-59 months at internally displaced persons camps in Abuja

| Characteristics                        | Used LLIN | Did not use LLIN | OR   | 95% CI     | p-value | AOR  | 95% CI     | p-value |
|----------------------------------------|-----------|------------------|------|------------|---------|------|------------|---------|
| Sex                                    |           |                  |      |            |         |      |            |         |
| Female                                 | 139 (90.3)| 15 (9.7)         | 1.1  | 0.54-2.45  | 0.78    |      |            |         |
| Male                                   | 121 (89.0)| 15 (11.0)        |      |            |         |      |            |         |
| Age group (months)                     |           |                  |      |            |         |      |            |         |
| <36                                    | 127 (90.7)| 13 (9.3)         | 1.2  | 0.58-2.68  | 0.57    |      |            |         |
| 36-59                                  | 133 (88.7)| 17 (11.3)        |      |            |         |      |            |         |
| Religion                               |           |                  |      |            |         |      |            |         |
| Christianity                          | 134 (93.7)| 9 (6.29)         | 2.4  | 1.10-5.62  | 0.03    | 2.5  | 0.66-9.12  | 0.18    |
| Islam                                  | 126 (85.7)| 21 (14.3)        |      |            |         |      |            |         |
| Mothers age (years)                    |           |                  |      |            |         |      |            |         |
| ≥36                                    | 132 (88.9)| 4 (11.1)         | 1.7  | 0.60-5.26  | 0.21    | 2.6  | 0.51-13.52 | 0.25    |
| ≤35                                    | 216 (81.8)| 48 (18.2)        |      |            | 1       |      |            |         |
| Mothers educational status             |           |                  |      |            |         |      |            |         |
| Formal                                 | 119 (79.3)| 31 (20.7)        | 0.6  | 0.36-1.20  | 0.09    | 0.6  | 0.13-1.70  | 0.31    |
| No formal                              | 128 (85.3)| 22 (14.7)        |      |            | 1       |      |            |         |
| Net seen hanging                       |           |                  |      |            |         |      |            |         |
| Yes                                    | 232 (98.3)| 4 (1.69)         | 55.9 | 18.12-172.14| < 0.001 | 99.9 | 22.7-438.8 | <0.0001 |
| No                                     | 27 (50.9) | 26 (49.1)        |      |            | 1       |      |            |         |
| Net purchased                          |           |                  |      |            |         |      |            |         |
| Yes                                    | 77 (87.5) | 11 (12.5)        | 0.7  | 0.33-1.60  | 0.43    |      |            |         |
| No                                     | 183 (90.5)| 19 (9.41)        |      |            |         |      |            |         |
| Duration of net ownership (months)     |           |                  |      |            |         |      |            |         |
| 0-6                                    | 86 (83.5) | 17 (16.5)        | 2.6  | 1.20-5.57  | 0.01    | 0.4  | 0.08-2.24  | 0.32    |
| >6                                     | 170 (92.9)| 13 (7.1)         |      |            |         |      |            |         |
| Holes in LLIN                          |           |                  |      |            |         |      |            |         |
| Yes                                    | 147 (93.0)| 11 (7.0)         | 2.2  | 1.01-4.90  | 0.04    | 0.8  | 0.19-3.26  | 0.70    |
| No                                     | 108 (85.7)| 18 (14.3)        |      |            |         |      |            |         |
| Breeding site type                     |           |                  |      |            |         |      |            |         |
| Farmland/bush                          | 205 (91.9)| 18 (8.1)         | 2.9  | 1.33-6.59  | 0.005   | 2.6  | 0.69-10.15 | 0.16    |
| Stagnant water                         | 46 (79.3) | 12 (20.7)        |      |            | 1       |      |            |         |
| Type of camp site                      |           |                  |      |            |         |      |            |         |
| Camp-like site                         | 103 (77.4)| 30 (25.6)        | 0.6  | 0.37-1.16  | 0.08    | 8.2  | 2.5-27.4   | 0.0006  |
| Settlement site                        | 157 (83.9)| 30 (16.1)        |      |            | 1       |      |            |         |
Figure 1: Reasons proffered for non-utilization of LLIN among children aged 6-59 months at IDP camps Abuja