ABSTRACT

BACKGROUND: As Malaria continues to take a heavy toll on the life and economy of Nigerians, The National Malaria Elimination Programme uses behaviour change communication (BCC) to promote the use of Long-Lasting Insecticide-treated Nets (LLIN) and Artemisinin-based Combination Therapy (ACT) to combat malaria. This study examined the impact of BCC on the use of LLIN and ACT in Southeast Nigeria.

METHODS: A structured questionnaire was used to gather data from 480 respondents in urban and rural communities across five states. Analysis of data was done using percentages, chi-square and logistic regression.

RESULTS: Findings showed weak effect of BCC on LLIN and ACT use despite achieving high (93.75%) exposure. Only 45.1% and 45.7% of the respondents used LLIN and ACT respectively. Urban residents were found to sleep under LLINs and use ACTs more than rural dwellers. Regression results showed that newspapers (OR=1.341) and the Internet (OR=3.216) increased the odds of LLIN use in the rural areas and magazines (OR=1.837) in the urban areas. Television (OR=2.375; P=0.002) and the Internet (OR=6.063; P=0.001) increased the odds of ACT use in the urban areas. Education was found to be a positive predictor of LLIN use in the rural (OR=4.645; P=0.011) and urban areas (OR=6.102) as well as ACT use in the rural (OR=7.268; P=0.002) and urban areas (OR=6.145; P=0.009).

CONCLUSION: Access to behaviour change communication though very high has not achieved the desired behaviour change. The National Malaria Elimination Programme should produce appropriate messages to address barriers to LLIN and ACT use.

Keywords: Behaviour Change Communication; Malaria; Rural-urban differentials; Long Lasting Insecticide-Treated Nets; Artemisinin-Based Combination Therapy; Southeast Nigeria
INTRODUCTION

Nigeria is the most malaria endemic country in the world, accounting for 27% and 24% of global malaria morbidity and mortality respectively (1). In addition, malaria costs Nigeria ₦132 Billion in annual economic loss (2). The National Malaria Elimination Programme (NMEP) employs behaviour change communication extensively to persuade Nigerians to sleep under Long Lasting Insecticide-treated Nets (LLINs) and treat malaria with Artemisinin-based Combination Therapy (ACTs) as LLINs and ACTs have been proven efficacious in malaria control.

Studies have shown that exposure to behaviour change communication (BCC) is a positive predictor of LLIN use (3,4,5), and effective in raising public awareness and knowledge of malaria (6,7,8,9,10). This is important because misconceptions about the cause of malaria often result in rejection of promoted malaria control measures (9,11,12). However, there are other variables such as place of residence that affect use of nets. For instance, some studies (13,14,15) found higher ownership of ITNs in rural areas than urban areas. This might be as a result of the fact many nations direct a lot of attention to rural areas in free ITN distribution campaigns. Rural areas suffer from infrastructural deficit, particularly in developing countries (16). However, other studies indicate higher ownership and use of ITNs in urban areas (17, 18).

Moreover, higher education has been found to be a predictor of LLIN use (19,15, 20). One explanation for the readiness of educated people to use LLINs may be that they are less likely to have misconceptions about malaria. Such misconceptions include beliefs that the chemicals in the LLINs would kill unborn children, cause chronic diseases and even sterility (21-23). Complaints of discomfort are in the form of excessive heat and feelings of suffocation associated with net use (24-26). Furthermore, socioeconomic status can also affect adoption of LLIN. Those in the upper socioeconomic quintiles have been reported to be more likely to sleep under nets (27-30).

Whenever malaria prevention fails, attention turns to treatment. Both the World Health Organisation (WHO) and NMEP favour Artemisinin-based combination therapy for malaria treatment (31,32). However, studies have indicated low utilization of ACTs in many places (33-36). The poor utilization of ACT may be traced to competing treatment regimens employed by people. For instance, some studies (37,38, 33) have found high reliance on herbs for malaria treatment among their study populations. Even where people use drugs, the tendency in many places has been to “mix drugs” (39,38) which is the act of combining doses of different drugs for malaria treatment, a practice that is discouraged in the malaria control media campaigns.

Many studies have focused on the impact of BCC on the use of insecticide-treated nets, but there is a dearth in studies that examine both the use of nets and ACTs (32). This study seeks to fill the gap by examining the extent to which Southeast Nigeria residents were exposed to behaviour change communication on malaria and how it has influenced use of LLINs and ACTs for malaria control.

METHODS

The study was a survey of 15 rural and urban communities across the five states that make up the Southeast geo-political region of Nigeria which include Abia, Anambra, Ebonyi, Enugu and Imo states. The study made use of 480 respondents. The sample size was derived from the population of the five states using the Wimmer and Dominick Online sample size calculator.

Data were collected by means of a structured questionnaire containing both open-ended and closed-ended questions. Two dependent/outcome variables were used in the study. These were the use of long-lasting insecticide-treated nets (LLINs) and Artemisinin Combination Therapy (ACT). The respondents were asked if they slept under LLINs the night preceding the survey, and if they used ACT for malaria treatment. For each of the outcome variables, their responses were categorized into 1=yes if they use any of LLIN or ACT and 0= no if they did not use any of LLIN or ACT.
The major independent variable used in the study was exposure to mass media messages on malaria through media channels such as television, radio, magazines, newspapers, the internet and billboards. Respondents who were exposed to each channel were coded 1 (yes) while respondents not exposed to any particular media channel were coded 0 (no). Furthermore, the study made use of individual-level explanatory variables such as gender (male/female), age (less than 30, 30-49, 50+ years), education (none/primary, secondary, tertiary), marital status (never married, married, widowed/divorced), employment status (unemployed/student, farmer/businessman, civil servant), income level (up to N20,000, N21,000-N50,000, more than N50,000).

The data were analyzed by means of the Statistical Package for the Social Sciences (SPSS). Percentages were used to describe the study population and exposure to malaria messages by respondents. Percentages were also used to describe the use of insecticide-treated nets and ACT. The results of these descriptive analyses were presented in tables. Finally, logistic regression was used to estimate the factors that predict use of insecticide-treated nets and Artemisinin combination therapy among the study population. The regression coefficients of the independent variables are expressed as Odds Ratio (OR). With respect to the coefficients, a variable with Odds Ratio greater than 1.00 indicated that the variable increases the likelihood of ITN/ACT use while a decreased likelihood of ITN/ACT use is implied where the Odds Ratio is less than 1.00. Four regression models were generated for the study. Model 1 shows the use of ITNs in rural areas while Model 2 shows the use of ITNs in urban areas. Model 3 and Model 4 show the use of ACT in rural and urban areas respectively.

RESULTS

A total of 450 (93.75%) of the respondents reported having been exposed to mass media messages on malaria. Specifically, 93.18% and 94.88% of urban and rural respondents respectively reported being exposed to the media messages. Radio and television were the dominant sources of information on malaria with 79.2% of the respondents reporting having been exposed to the messages via radio and 51.9% through television. Out of the 450 (93.75%) respondents exposed to media messages, 402 (89.3%) reported owning at least one LLIN. However, 203 (45.1%) reported sleeping under LLINs the night preceding the survey. This comprised 46.74% of urban and 38.03% rural respondents. Furthermore, 206 (45.7%) respondents reported using ACTs for malaria treatment. This comprised 51.91% and 32.56% of urban and rural respondents respectively. Many respondents reported treating malaria with herbal medicine, non-ACT drugs and mixed drugs.
Table 1: Bivariate/Chi-square analyses of access to malaria information and use of insecticide-treated nets and Artemisinin combination therapy.

| Spatio-demographic characteristics | Mass Media | ITN | ACT |
|-----------------------------------|------------|-----|-----|
|                                   | yes | %  | sig. | yes | %  | sig. | yes | %  | sig. |
| Gender                            |     |    |      |     |    |      |     |    |      |
| Male                              | 246 | 96.09 | 0.035 | 105 | 42.00 | 0.701 | 111 | 43.70 | 0.809 |
| Female                            | 204 | 91.48 |         | 98  | 43.75 |         | 95  | 42.60 |         |
| Age Group                         |     |    |      |     |    |      |     |    |      |
| Less than 29 years                | 113 | 91.87 | 0.507 | 52  | 43.70 | 0.317 | 68  | 55.74 | 0.000 |
| 0-49 years                        | 191 | 95.02 |         | 92  | 46.00 |         | 94  | 47.24 |         |
| 50 years+                         | 146 | 94.19 |         | 59  | 38.06 |         | 44  | 28.21 |         |
| Marital Status                    |     |    |      |     |    |      |     |    |      |
| Never Married                     | 100 | 90.91 | 0.033 | 46  | 43.40 | 0.987 | 59  | 53.64 | 0.000 |
| Divorced                          | 304 | 95.90 |         | 134 | 42.54 |         | 137 | 43.49 |         |
| Married                           | 46  | 88.24 |         | 22  | 43.14 |         | 10  | 20.00 |         |
| Education                         |     |    |      |     |    |      |     |    |      |
| Primary                           | 83  | 90.22 | 0.224 | 23  | 25.00 | 0.000 | 9   | 9.89  | 0.000 |
| Secondary                         | 127 | 94.07 |         | 50  | 37.59 |         | 52  | 38.24 |         |
| Tertiary                          | 240 | 95.24 |         | 130 | 52.21 |         | 145 | 58.00 |         |
| Employment                        |     |    |      |     |    |      |     |    |      |
| Unemployed/student                | 130 | 94.20 | 0.352 | 57  | 41.61 | 0.000 | 62  | 44.60 | 0.000 |
| Farmer/businessman                | 162 | 92.05 |         | 60  | 34.88 |         | 57  | 32.39 |         |
| Civil Servant                     | 158 | 9.95  |         | 86  | 52.12 |         | 87  | 53.70 |         |
| Income                            |     |    |      |     |    |      |     |    |      |
| Up to 20,000                      | 140 | 90.91 | 0.131 | 64  | 41.83 | 0.817 | 67  | 43.79 | 0.000 |
| 21,000-50,000                     | 177 | 94.15 |         | 79  | 42.47 |         | 63  | 33.69 |         |
| 51,000+                           | 119 | 96.75 |         | 55  | 45.45 |         | 73  | 59.35 |         |
| States                            |     |    |      |     |    |      |     |    |      |
| Enugu                             | 105 | 92.11 | 0.430 | 28  | 24.56 | 0.000 | 31  | 26.96 | 0.000 |
| Anambra                           | 101 | 91.82 |         | 61  | 56.48 |         | 64  | 58.72 |         |
| Imo                               | 76  | 93.83 |         | 26  | 32.50 |         | 31  | 39.24 |         |
| Ebonyi                            | 76  | 97.44 |         | 64  | 82.05 |         | 39  | 50.00 |         |
| Imo                               | 92  | 95.83 |         | 24  | 25.53 |         | 41  | 42.71 |         |
| Place of Residence                |     |    |      |     |    |      |     |    |      |
| Urban                             | 246 | 93.18 | 0.437 | 122 | 46.74 | 0.056 | 136 | 51.91 | 0.000 |
| Rural                             | 204 | 94.88 |         | 81  | 38.03 |         | 70  | 32.56 |         |

Bivariate/chi-square analyses in Table 1 reveal variations in the impact of demographic variables on access to mass media messages and use of LLINs and ACT for malaria control. Apart from gender (p=0.035) and marital status (p=0.033), the other variables did not differ significantly in their impact on access to media. Similarly, there was no significant difference in the impact of demographic variables on LLIN use except education (p=0.000), employment (P=0.000) and states of residence (P=0.000). It was observed for instance that the use of LLIN increased with rise in educational status. With respect to the use of ACT, there was statistically significant difference in the impact of the variables on ACT use with the exception of gender.

Regression analyses were further used to underscore the magnitude of the impact of mass media messages and the demographic variables on the use of LLINs and ACTs.
Table 2: Regression results of mass media predictors of LLIN and ACT use.

| Variable      | Model 1(LLIN) Rural | Model 2(LLIN) Urban | Model 3(ACT) Rural | Model 4(ACT) Urban |
|---------------|---------------------|---------------------|--------------------|-------------------|
| Radio         |                     |                     |                    |                   |
| No (RC)       | 1.000               | 1.000               | 1.000              | 1.000             |
| Yes           | 0.643               | 0.866               | 1.579              | 0.930             |
| Television    |                     |                     |                    |                   |
| No (RC)       | 1.000               | 1.000               | 1.000              | 1.000             |
| Yes           | 0.511*              | 0.746               | 2.735**            | 1.133             |
| Newspapers   |                     |                     |                    |                   |
| No(RC)        | 1.000               | 1.000               | 1.000              | 1.000             |
| Yes           | 1.341               | 0.877               | 0.455              | 0.696             |
| Magazines     |                     |                     |                    |                   |
| No(RC)        | 1.000               | 1.000               | 1.000              | 1.000             |
| Yes           | 1.186               | 1.837               | 0.100              | 0.989             |
| Billboards    |                     |                     |                    |                   |
| No(RC)        | 1.000               | 1.000               | 1.000              | 1.000             |
| Yes           | 0.791               | 0.712               | 1.105              | 2.113*            |
| Internet      |                     |                     |                    |                   |
| No(RC)        | 1.000               | 1.000               | 1.000              | 1.000             |
| Yes           | 3.216*              | 0.973               | 6.063**            | 1.122             |

*p<0.05; **p<0.001; ***p<0.000

Table 3: Regression results of socio-economic predictors of LLIN and ACT use.

| Variables         | Model 1(LLIN) Rural | Model 2(LLIN) Urban | Model 3(ACT) Rural | Model 4(ACT) Urban |
|-------------------|---------------------|---------------------|--------------------|-------------------|
| Gender            |                     |                     |                    |                   |
| Male (RC)         | 1.000               | 1.000               | 1.000              | 1.000             |
| Female            | 1.545               | 0.764               | 0.794              | 0.891             |
| Age               |                     |                     |                    |                   |
| Less than 29 yrs (RC) | 1.000            | 1.000               | 1.000              | 1.000             |
| 30-49 years       | 0.435               | 0.996               | 0.633              | 0.425             |
| 50+ years         | 0.894               | 1.128               | 0.498              | 0.395             |
| Marital status    |                     |                     |                    |                   |
| Never married(RC) | 1.000               | 1.000               | 1.000              | 1.000             |
| Married           | 0.677               | 1.71                | 0.705              | 1.729             |
| Divorced/widowed  | 0.497               | 2.446               | 0.129              | 2.782             |
| Education         |                     |                     |                    |                   |
| Illiterate/primary (RC) | 1.000         | 1.000               | 1.000              | 1.000             |
| Secondary         | 1.646               | 2.631               | 2.951              | 3.129             |
| Tertiary          | 4.645*              | 6.102*              | 7.268**            | 6.145**           |
| Employment status |                     |                     |                    |                   |
| Unemployed/student(RC) | 1.000            | 1.000               | 1.000              | 1.000             |
| Farmer/businessman | 3.023               | 1.112               | 0.919              | 1.422             |
| Civil servant     | 2.430               | 1.474               | 0.905              | 1.314             |
| Income            |                     |                     |                    |                   |
| Up to ₦20,0009(RC)| 1.000               | 1.000               | 1.000              | 1.000             |
| 21-50,000         | 0.895               | 0.637               | 0.622              | 0.571             |
| 51,000+           | 1.691               | 0.548               | 3.675*             | 1.074             |
| States            |                     |                     |                    |                   |
| Enugu(RC)         | 1.000               | 1.000               | 1.000              | 1.000             |
| Anambra           | 8.425**             | 1.951               | 4.761*             | 1.663             |
| Imo               | 10.684**            | 0.492               | 4.250*             | 0.412             |
| Ebonyi            | 12.678***           | 5.689**             | 5.511*             | 1.327             |
| Abia              | 1.655               | 0.690               | 4.075*             | 0.596             |

*p<0.05; **p<0.001; ***p<0.000
Table 3 shows regression results of socioeconomic predictors of net and ACT use in the rural and urban areas. Data in model 1 indicate that marital status, education, higher socioeconomic status, being civil servants and farmers increased the odds of net use in the rural areas. For instance, Females were found to be 1.5 times (OR=1.545) likely to sleep under the net relative to males. Those with tertiary education (OR=4.645; P=0.011); and residents of Anambra (OR=8.425; P=0.001); Imo (OR=10.684; P=0.001) and Ebonyi (OR=12.678; P=0.000) were significantly likely to sleep under nets. In the urban areas (model 2), the divorced/widowed, the educated, civil servants and residents of Anambra and Ebonyi states had increased odds of sleeping under nets.

Model 3 shows that secondary education (OR=2.951) and tertiary education (OR=7.268; P=0.002) increased the likelihood of ACT use in the rural areas. In addition, data show that rural residents of Anambra, Imo, Ebonyi and Abia states were significantly likely to use ACT relative to residents of Enugu. Among urban dwellers, model 4 indicates that those with tertiary education (OR=6.145; P=0.009) had significantly increased odds of using ACT for malaria treatment. In addition, divorced/widowed people, farmers/businessmen, civil servants and those with higher income were associated with increased odds of ACT use in the urban areas.

Table 4 shows the regression results of the combined effects of mass media and socioeconomic variables on net and ACT use. Data in model 1 show that while television significantly decreased the odds of net use among rural dwellers, newspapers, magazines and the internet increased the odds. In addition, tertiary education (OR=5.005; P=0.018); higher income, being farmers/businessmen positively predicted use of nets in the rural areas. In the urban areas, model 2 shows that all mass media negatively predicted net use except the magazine and internet. The married, divorced/widowed and tertiary education (OR=7.574; P=0.009) were correlated with increased odds of net use among urban dwellers. Model 3 in Table 4 further shows the combined effects of mass media and socioeconomic characteristics on ACT use in the rural areas. As can be observed, access to radio (OR=2.078) increased by 2.07 times the odds of using ACT in the rural areas compared to television (OR=2.375); and the Internet (OR=3.505). Tertiary education (OR=6.921; p<0.006), being residents of Anambra state (OR=5.979; p<0.012); Imo state (OR=8.577; p<0.007), Ebonyi state (5.334; p<0.019) and Abia state (3.446; p<0.019) all significantly predicted increased likelihood of ACT use for malaria treatment in the rural areas. In the urban areas, as shown in model 2 only access to billboard messages (2.888; p<0.011) and tertiary education increased the odds of ACT use.
Table 4: Regression results of combined mass media and socioeconomic predictors of LLIN and ACT use.

| Variables          | Model 1(LLIN) Rural | Model 2 (LLIN) Urban | Model 3 (ACT) Rural | Model 4(ACT) Urban |
|--------------------|---------------------|----------------------|---------------------|--------------------|
| Mass media         |                     |                      |                     |                    |
| Radio: No (RC)     | 1.000               | 1.000                | 1.000               | 1.000              |
| Yes                | 0.615               | 0.506                | 2.078               | 1.011              |
| Television: No (RC)| 1.000               | 1.000                | 1.000               | 1.000              |
| Yes                | 0.153**             | 0.615                | 2.375               | 0.857              |
| Newspapers: No (RC)| 1.000               | 1.000                | 1.000               | 1.000              |
| Yes                | 1.809               | 0.754                | 0.287               | 0.448              |
| Magazines: No (RC) | 1.000               | 1.000                | 1.000               | 1.000              |
| Yes                | 1.385               | 1.685                | 0.087               | 1.011              |
| Billboards: No (RC)| 1.000               | 1.000                | 1.000               | 1.000              |
| Yes                | 0.719               | 0.844                | 0.685               | 2.888*             |
| Internet: No(RC)   | 1.000               | 1.000                | 1.000               | 1.000              |
| Yes                | 3.355               | 1.079                | 3.505               | 1.095              |
| Gender:            |                     |                      |                     |                    |
| Male (RC)          | 1.000               | 1.000                | 1.000               | 1.000              |
| Female             | 1.713               | 0.708                | 0.802               | 0.920              |
| Age                |                     |                      |                     |                    |
| Less than 29 years (RC)| 1.000           | 1.000                | 1.000               | 1.000              |
| 30-49 years        | 0.291               | 0.946                | 0.865               | 0.380*             |
| 50 years +         | 0.473               | 1.276                | 0.726               | 0.322*             |
| Marital status     |                     |                      |                     |                    |
| Never Married (RC) | 1.000               | 1.000                | 1.000               | 1.000              |
| Married            | 0.938               | 2.183                | 0.554               | 1.869              |
| Divorced/Widowed   | 0.656               | 2.934                | 0.129               | 3.160              |
| Education          |                     |                      |                     |                    |
| Primary Education(RC)| 1.000           | 1.000                | 1.000               | 1.000              |
| Secondary Education| 1.359               | 2.973                | 3.226               | 3.523              |
| Tertiary Education | 5.005*              | 7.574**              | 6.921**             | 7.099**            |
| Employment status  |                     |                      |                     |                    |
| Unemployed/student(RC)| 1.000           | 1.000                | 1.000               | 1.000              |
| Farmer/businessman | 3.684*              | 1.088                | 0.785               | 1.574              |
| Civil Servant      | 2.415               | 1.385                | 1.015               | 1.412              |
| Income level       |                     |                      |                     |                    |
| Up to 20,000(RC)   | 1.000               | 1.000                | 1.000               | 1.000              |
| 21,000-50,000      | 1.352               | 0.652                | 0.555               | 0.528              |
| 51,000 +           | 4.550               | 0.619                | 2.795               | 0.946              |
| States             |                     |                      |                     |                    |
| Enugu (RC)         | 1.000               | 1.000                | 1.000               | 1.000              |
| Anambra            | 13.717**            | 1.643                | 5.979*              | 1.800              |
| Imo                | 13.730**            | 0.438                | 8.577**             | 0.412              |
| Ebonyi             | 18.659***           | 6.559**              | 5.344*              | 1.871              |
| Abia               | 2.480               | 0.601                | 3.446*              | 0.728              |

*p<0.05; **p<0.001; ***p<0.000

DISCUSSION

There was high exposure to behaviour change communication on malaria prevention in Southeast Nigeria with 93.75% of the respondents having been exposed to the messages. This agrees with other studies that reported high exposure to malaria messages
The most important media were radio and television. The importance of radio and television in malaria campaigns has been well reported (18,5). More urban dwellers (n=246) were exposed to the messages than rural dwellers (n=204).

Despite high exposure to BCC the use of nets and ACT was low in both urban and rural areas. Only 46.7% of urban and 38.03% of rural dwellers slept under LLINs the night before the survey. This low utilization of LLINs has been reported in other studies (13, 14). Similarly, 32.5% of rural dwellers reported treating malaria with ACTs relative to 51.9% in the urban areas. Other studies have found higher use of ACTs in the urban areas. Despite this, the figure is low in view of the 100% compliance with ACT use being promoted by the NMEP.

The low utilization of LLINs and ACT indicates weak effect of mass media messages. This differs from a study in Myanmar (40). The low utilization of LLINs and ACTs despite high exposure to BCC indicates that health communication alone is not enough to get people to use ACTs and nets. Health communication will not compensate for lack of funds to purchase ACTs and LLINs. The Government can help by subsidizing the cost of ACTs and LLINs to make them affordable to the masses. In addition, health communicators should produce health messages in vernacular and complement mass media messages with interpersonal communication by Community Health Workers.

REFERENCES

1. Obinna C. Malaria: Why Nigeria is far from winning despite global progress. Vanguard [Internet]. 2019 Apr [cited 2020 Mar 25]; Available from www.vanguardngr.com/2019/04/malaria-why-nigeria-is-far-from-winning-despite-global-progress/

2. Michael GC, Aliyu I, Idris U, Ibrahim H, Olalere OS, Grema, BA, et al. Investigation of malaria by microscopy among febrile outpatient of a semirural Nigerian medical centre: What happened to malaria control programs? The Nig J Gen Pract. 2019;17(1): 23-30.

3. Apo SB, Kwankye SO, Badasu DM. Exposure to malaria prevention messages and insecticide-treated bed net usage among children under five years in Ghana. Eur Sci J. 2015;11(18): 290 – 305.

4. Bowen HL. Impact of a mass media campaign on bed net use in Cameroon. Malar J. [Internet] 2013; 12: 36.

5. Adjah ESO, Panayiotou AG. Impact of Malaria related messages on insecticide-treated net use for malaria prevention in Ghana. Malar J. 2014; 13:123.

6. Okpoko CC, Aniwada EC. Issues in malaria communication in Enugu, Southeast Nigeria. Mediterr J Soc Sci. 2017;8(1): 285 – 92.

7. Kilian A, Lawford H, Uuju CN, Abeku TA, Novokolo E, Okoh F et al. The impact of behavior change communication on the use of insecticide treated nets: a secondary analysis of ten post-campaign surveys from Nigeria. Malar J. 2016;19;15:422 Doi:10.1186/512936-016-1463.

8. Amusan VO, Umar YA, Vantsawa PA. Knowledge, attitudes and practices on malaria prevention and control among private security guards within Kaduna Metropolis, Kaduna State, Nigeria. Sci J Pub Health. 2017 May;5(3): 240 – 5.

9. Kimbi HK, Nokes SB, Ndumukong-Nyanga JL, Sumbele UN, Atashili J, Atanga MSB. Knowledge and perceptions towards malaria prevention among vulnerable groups in the Buea health district, Cameroon. BMC Public Health. 2014 Aug;27; 14: 883. Doi; 10.1186/1471-2458-14-883

10. Edson F, Kayombo EJ. Knowledge on malaria transmission and its prevention among school children in Kyela District, South Western Tanzania. Tanzan Health Res Bull. 2007 Sep; 9(3):207 – 10.

11. Nyirongo TS. Communication interventions and their role in malaria prevention and
prevalence: a case study of Kaole. [Dissertation]. Lusaka: University of Zambia; 2013. Available from https://www.Dspace.unza.zm:8080/xmlui/bitstream/handle/123456789/Nyirongo.pdf

12. Asante KP, Abokyi I, Zandoh C, Owusu R, Suleman A, Amenga, et al. Community perceptions of malaria and malaria treatment behaviour in a rural district of Ghana: Implications for Artemisinin combination therapy. BMC Public Health. 2010 July 12; 10:409. Doi: 10.1186/1471-2458-10-409.

13. Birhanu Z, Abebe L, Sadhakar M, Dissaanyake G, Yihdego Y, Alemayehu G et al. Access to and use gaps of insecticide-treated nets among communities in Jimma Zone, Southwestern Ethiopia: baseline results. BMC Public Health. 2015 Dec 29; 15: 1304. Doi: 10.1186/s12889-015-2677-2.

14. Aung T, Wei C, McFarlan W, Aung YK, Khin HS. Ownership and use of insecticide-treated nets among people living in malaria endemic areas of eastern Myanmar. PLoS ONE. 2016 Sep 12; 11(9): e0162292. Doi: 10.1371/journal.pone.0162292.

15. Astatkie A, Feleke A. Utilization of insecticide-treated nets in Arbaminch town and the malarious villages of Arbaminch Zuria District, Southern Ethiopia. Ethiop. J. Health Dev. 2009; 23(3): 206 – 15.

16. Strasser R. Rural Health around the world: Challenges and solutions. Family Practice. 2003; 20(4): 457-46.

17. Inungu JN, Ankiba N, Minelli M, Numford V, Bolekala D, Raji D. Use of insecticide-treated mosquito net among pregnant women and guardians of children under five in the Democratic Republic of the Congo. Malaria Res Treatment. 2017; 6: 1 – 3. Doi: 10.1156/2017/5923696

18. Belay M, Deressa W. Use of insecticide-treated nets by pregnant women and associated factors in a predominantly rural population in northern Ethiopia. Trop Med Int Health. 2008; 13(10): 1303 – 13.

19. Seyoum D, Speybroeck N, Duchateau L, Brandt P, Rosas-Aguirre A. Long lasting insecticide net ownership, access and use in Southwest Ethiopia: A community-based cross-sectional study. Int J Environ Res Public Health. 2017; 14: 1312. Doi: 10.3390/ijerph14111312.

20. Arogundade ED, Adebayo SB, Anyati J, Nwokolo E, Ladipo O, Ankomah A et al. Relationship between caregivers’ misconception and non-use of ITNs by under-five Nigeria children. Malar J [Internet]. 2011; 10: 170.

21. Nnko SE, Whyte SR, Geissler WP. Aaganard-Hansen J. Skepticism towards insecticide treated mosquito nets for malaria control in rural community in north-western Tanzania. Tanzan J Health Res. 2012; 14(2), 1 – 11.

22. Taramwa IM, Ashaba S, Adrama HO, Ayebazibire C, Omoding D, Hilliard R. Knowledge, attitude and behavior towards the use of insecticide treated mosquito nets among pregnant women and children in rural southwestern Uganda. BMC Public Health. 2017; 17: 794. Doi: 10.1186/s12889-017-4824-4. PMID: 29017472. PMCID: PMC5634848.

23. Ugwu EO, Ezechukwu PC, Obi SN, Ugwu AO, Okeke TC. Utilization of insecticide treated nets among pregnant women in Enugu, South Eastern Nigeria. Niger J Clin Pract. 2013; 16(3): 292 – 6.

24. Jombo GTA, Mbaawuaga EM, Gyuse AN, Enenebeaku MNO, Okwori EE, Peters EJ et al. Socio-cultural factors influencing treated bed net utilization in a malaria endemic city in North-Central Nigeria. Asian Pac J Trop Med. 2010; 3(5): 402 – 6.

25. Manu G, Boamah-Kaali EB, Febir LG, Ayipah E, Owusu-Agyei S, Asante, K. P. Low utilization of insecticide-treated bed net among pregnant women in the middle belt of Ghana. Malaria Res Treatment. 2017; 2017: 1-7. Doi:10.1155/2017/48/210

26. Ezeama M, Ezeama F, Akor, QG. Factors militating against the use of insecticide treated nets among pregnant women in Nigeria. Int J Res Med Health Sci. 2014; 4(9): 8 – 14.

27. Esse C, Utzinger J, Tschannem AB, Raso G, Pfeiffer C, Granado S et al. Social and cultural aspects of malaria and its control in...
central Coted’ Ivoire. Malar J. 2008; 7: 224. Doi: 10.1186/1475-2875-7-224
28. Moon TD, Hayes CB, Blevins M, Lopez ML, Green AF, Gonzalez-Calvo L et al. Factors associated with the use of mosquito bed nets: results from two cross-sectional household surveys in Zambezia province, Mozambique. Malar J. 2016; 15: 196. Doi: 10.1186/s12936-016-1250-5.
29. Onwujekwe O, Hanson K, Fox-Rushby J. Inequalities in purchase of mosquito nets and willingness to pay for insecticide-treated nets in Nigeria: challenges for malaria control interventions. Malar J. 2014; 3:6 doi.10.1186/1475-2875-3-6
30. Anyaehie USB, Nwagha UI, Aniebue PN, Nwagha TU. The effect of free distribution of insecticide-treated nets on asymptomatic plasmodium parasitemia in pregnant and nursing mothers in a rural Nigerian community. J Clin Pract Nig. 2011; 14(1): 19-22.
31. World Health Organisation. WHO briefing on malaria treatment guidelines and artemisinin monotherapies. [Internet] 2006. [cited 2018 Nov 25]; Available from www.who.int/malaria/publications/atoz/meeting-briefing17April.pdf
32. Akoria OA, Arhuidese IJ. Progress toward elimination of malaria in Nigeria: Update of Artemisinin-based combination therapy for the treatment of malaria in households in Benin City. Ann Afr Med. 2014; 13(3): 104-13.
33. Mazigo HD, Obasy E, Mauka W, Manyiri P, Zinga M, Eliningaya KJ et al. Knowledge, attitudes and practices about malaria and its control in rural northwest Tanzania. Malaria Res Treatment. 2010; 2010: 1- 9. Doi: 10.406/2010/794261
34. Sayang C, Gausseres M, Vernazza-Lient N, Malvy D, Bley D, Millet P. Treatment of malaria from monotherapy to artemisinin-based combination therapy by health professionals in urban health facilities in Yaounde, central province, Cameroon. Malar J. 2009; 8:176. Doi: 10.1186/1475-2875-8-176.
35. Romay-Barja M, Ncogo P, Nseng G, Santana-Morales MA, Berzosa P, Herrador Z et al. The use and preference of artemether as a first-choice treatment for malaria: result from a cross-sectional survey in the Bata district, Equatorial Guinea. Malar J. 2018;17(1): 107 Doi: 10.1186/s12936-018-2254-0.
36. Romay-Barja M, Jarmri I, Ncogo P, Nseng G, Sagrado MJ, Santana-Morales MA et al. Rural-Urban differences in household treatment-seeking behavior for suspected malaria in children at Bata district, Equatorial Guinea. PLoS ONE. 2015; 10(9): e0138518. Doi: 10.1371/journal.pone.0138518
37. Ekwunife OI, Ukwe CV, Awanye AM. Knowledge and treatment seeking pattern of malaria infection in Abakaliki, Ebonyi State. Res J Pharm Biol Chem Sci. 2010; 1(2): 317 – 23.
38. Onyeneho N. Sleeping under insecticide-treated nets to prevent malaria in Nigeria. What do we know? J. Health Popul Nutr. 2013; 31(2): 243 – 251.
39. Anyanwu PE, Fulton J, Evans E, Paget T. Exploring the role of socioeconomic factors in the development and spread of anti-malaria drug resistance: A qualitative study. Malar J. 2017; 16: 203. Doi: 1186/s12936-017-1849-1.
40. Aung PL, Pumapibool T, Soe TN, Burgess J, Menezes LT, Kyaw MP et al. Health education through mass media announcements by loudspeakers about malaria care: Prevention and practice among people living in a malaria endemic area of northern Myanmar. Malar J. 2019; 18: 362. doi: 10.1186/s12936-019-2985-6.