The Effect of Mass Media Campaign on the Use of Insecticide-Treated Bed Nets among Pregnant Women in Nigeria

A. Ankomah, S. B. Adebayo, E. D. Arogundade, J. Anyanti, E. Nwokolo, U. Inyang, Oladipupo B. Ipadeola, and M. Meremiku

1 Department of Population, Family and Reproductive Health, School of Public Health, University of Ghana, P.O. Box LG 25, Legon, Accra, Ghana
2 Planning, Research and Statistics Directorate, National Agency for Food and Drug Administration and Control, PMB 5023, Wuse, Abuja, Nigeria
3 PLAN-Health Project, Management Sciences for Health, PMB 240, Kubwa, Abuja, Nigeria
4 Technical Services Directorate, Society for Family Health, PMB 5116, Wuse, Abuja, Nigeria
5 Society for Family Health, PMB 5116, Wuse, Abuja, Nigeria
6 Malaria Action Program for States, PMB 44, Abuja, Nigeria
7 University of Calabar, PMB 1115, Calabar, Nigeria

Correspondence should be addressed to A. Ankomah; aankomah@ug.edu.gh

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Background. Malaria during pregnancy is a major public health problem in Nigeria especially in malaria-endemic areas. It increases the risk of low birth weight and child/maternal morbidity/mortality. This paper addresses the impact of radio campaigns on the use of insecticide-treated bed nets among pregnant women in Nigeria.

Methods. A total of 2,348 pregnant women were interviewed during the survey across 21 of Nigeria’s 36 states. Respondents were selected through a multistage sampling technique. Analysis was based on multivariate logistic regression.

Results. Respondents who knew that sleeping under ITN prevents malaria were 3.2 times more likely to sleep under net (OR: 3.15; 95% CI: 2.28 to 4.33; \( P < 0.0001 \)). Those who listened to radio were also about 1.6 times more likely to use ITN (OR: 1.56; 95% CI: 1.07 to 2.28; \( P = 0.020 \)), while respondents who had heard of a specific sponsored radio campaign on ITN are 1.53 times more likely to use a bed net (\( P = 0.019 \)).

Conclusion. Pregnant women who listened to mass media campaigns were more likely to adopt strategies to protect themselves from malaria. Therefore, behavior change communication messages that are aimed at promoting net use and antenatal attendance are necessary in combating malaria.

1. Background

Malaria during pregnancy is a major public health problem; it increases the risk of low birth weight (LBW) (<2500 g) and child morbidity and mortality during the first year of life by inducing intrauterine growth retardation, prematurity, infant anaemia, and maternal anaemia [1–3]. It is estimated that over 30 million women living in malaria-endemic parts of Africa become pregnant every year [4]. Malaria in pregnancy is responsible for 11% of maternal deaths in Nigeria [5]. In areas where malaria is endemic, 20–40% of all babies born may have low birth weight [6]. Malaria in pregnancy is a priority area in the Global Roll Back Malaria (RBM) strategy. In 2000, the World Health Organization recommended a package of interventions to prevent malaria during pregnancy. This package includes the promotion of insecticide-treated bed nets (ITNs), intermittent preventive treatment in pregnancy (IPT), and effective case management of malarial illness [7]. The strategy also promotes the integration of malaria prevention into the safe motherhood package. Therefore, one of the strategies of the Nigerian National Strategic Plan for Malaria Control is to create awareness on prevention of malaria in pregnancy through the use of ITNs, among others.

There has been a massive effort to ensure availability of ITNs in every household in Nigeria as part of the scaling up for impact (SUFI) which endeavours to ensure universal...
access to long lasting insecticide-treated nets (LLINs). During distribution campaigns, LLINs are provided free to household members such that every household has at least two nets. In addition, nets are provided at highly subsidized rates through social marketing in health facilities and drug stores for ease of access to pregnant women and women with children less than five years. The cost-effectiveness of ITNs relative to other forms of malaria prevention and treatment also makes it a better option for malaria prevention especially among residents of rural communities, people with poor access to health facilities, and people with low socioeconomic status [8–10]. The risk of malaria in pregnancy has been reported in several countries in sub-Saharan Africa including Uganda [11], Malawi [12], Tanzania [13], and Ethiopia [14].

In a study among pregnant women in Lagos state, only 11.2% and 37.5% actually used ITNs in two study hospitals [15]. In some parts of Nigeria, use of bed nets among pregnant women is still low. In a study in northern Nigeria, 73% of respondents have never used ITN before because of lack of awareness [16]. In another study in Ibadan, southwest Nigeria, only 20.9% of pregnant women use ITNs [17].

To promote use and uptake of these malaria prevention strategies, mass media campaigns have been initiated to sensitise the general public, particularly pregnant women, on the effectiveness and long term benefits of correct and consistent use of the ITNs during pregnancy. The mass media campaign messages were aired on national radio and television stations in English, Pidgin English, and the three main local languages in Nigeria. Also billboards with clear messages about the link between mosquitoes and malaria prevention were placed at strategic locations in major cities in Nigeria to further improve access to correct information. The messages on the billboards were reproduced into posters and handbills that were widely distributed across the country. This evaluation is focused only on the mass media campaigns via the radio. Very few nationwide health interventions are evaluated. The aim of this paper is to assess the impact of exposure to these campaigns on uptake of the malaria prevention strategies in pregnancy.

2. Data and Methods

2.1. Study Area and Population. Twenty-one out of the 36 states in Nigeria including the Federal Capital Territory were visited for this study. All the states were implementing programmes that draw from the National Strategic Plan for Malaria Control which is based on the principles of Global Malaria Control strategy and Roll Back Malaria initiatives. This study was a cross-sectional and population-based survey. A systematic multistage sampling technique was used to select pregnant women resident in the eighteen Global Fund states and three other adjoining states. The first stage was the selection of localities/sites to form 20 clusters. All the localities in a state were arranged in their geographic order with their sizes attached. The projected population of the localities was considered as the measure of size. A cumulative measure of size was obtained and using a systematic sampling procedure, 20 clusters were allocated to the localities. Pregnant women within the selected households were identified and screened for eligibility. Data were collected by trained interviewers using validated questionnaires to obtain information on maternal and child health with focus on malaria control. Data from a total of 2,348 pregnant women who were interviewed were collated and analysed.

The dependent variable is based on the responses from respondents to the question on whether the respondent slept under an ITN the night prior to the study. All analyses were performed using SPSS 18.0 and conclusions are based on the 0.05 level of significance.

Structured questionnaires based on thematic areas were administered by trained interviewers. The questionnaire was validated and pilot tested before use. Interviewers were trained with a specific focus on all aspects of the interview process and questionnaires. The questionnaires were pretested to check for comprehensibility of questions as well as procedures for conducting interviews. The study questionnaires elicited information on key programme indicators and the various issues related to knowledge, behaviour, and practices related to prevention and treatment of malaria. The questionnaire also elicited information to determine if respondents listened regularly to the radio and if they listened to specific messages presented in radio broadcasts that focused on prevention of malaria. Approval was also received from the State Ministries of Health and leaders of each of the communities selected for the survey. Informed verbal consent was obtained from the heads of households and the respondents; those who declined consent were not interviewed. All selected caregivers and pregnant women were interviewed in their homes and confidentiality was assured. During data collection, quality control processes were implemented by supervisors to identify and correct problems while in the field.

Data were entered using the Census and Survey Processing System (CSPro) and were exported to, managed, and analysed using Statistical Package for the Social Sciences (SPSS 18.0). Frequency tables and cross tabulations were used to generate data tables and figures to present results in keeping with survey objectives and analysis plan. We employed a logistic regression technique [18–20] to explore influence of factors such as knowledge about ITN, causes of malaria, and correct ways of preventing malaria on the use of bed nets.

Specifically, we explored exposure to mass media campaigns in Nigeria under the auspices of the National Malaria Control Programme with emphasis on messages promoting the use of ITNs. We aimed to determine whether the use of ITNs could be attributed to exposure to this mass media campaign. All categorical variables were dummy-coded. We explored the influence of these determinants on the use of ITNs and later explored the influence of exposure to mass media on the use ITNs. A binary dependent variable was created for use or nonuse of ITNs and determinants, as well as exposure to media. Statistical significance was based on a P value of 0.05. At an exploratory data analysis stage, several models were explored. Test of goodness-of-fit was based on Hosmer and Lemeshow test [21], with models with $P > 0.05$.
Table 1: Percentage distribution of the demographic characteristics of the respondents included in the survey.

| Characteristics          | Urban (n = 1064) | Rural (n = 1284) | Total (n = 2348) |
|--------------------------|-----------------|-----------------|-----------------|
|                         | n               | %               | n               | %               | n               | %               |
| Age of respondent        |                 |                 |                 |                 |                 |                 |
| Below 26 years           | 331             | 31.1            | 505             | 39.3            | 836             | 35.6            |
| 26 years and above       | 733             | 68.9            | 779             | 60.7            | 1512            | 64.4            |
| Education                |                 |                 |                 |                 |                 |                 |
| None                     | 137             | 12.9            | 316             | 24.6            | 453             | 19.3            |
| Qur’anic only            | 114             | 12.3            | 208             | 16.5            | 322             | 13.7            |
| Primary                  | 210             | 22.7            | 326             | 33.7            | 536             | 22.8            |
| Secondary                | 466             | 50.3            | 369             | 31.8            | 835             | 35.6            |
| Higher                   | 137             | 14.8            | 65              | 6.7             | 202             | 8.6             |
| Geopolitical zones       |                 |                 |                 |                 |                 |                 |
| Northwest                | 197             | 18.5            | 260             | 20.2            | 457             | 19.4            |
| Northeast                | 184             | 17.3            | 268             | 20.9            | 452             | 19.3            |
| North-central            | 189             | 17.8            | 263             | 20.5            | 452             | 19.3            |
| Southwest                | 247             | 23.1            | 101             | 7.9             | 348             | 14.8            |
| Southeast                | 110             | 10.3            | 188             | 14.6            | 298             | 12.7            |
| South-south              | 137             | 12.9            | 204             | 15.9            | 341             | 14.5            |
| Occupation               |                 |                 |                 |                 |                 |                 |
| Formal job               | 87              | 8.2             | 51              | 3.9             | 138             | 5.9             |
| Self-employed            | 366             | 34.4            | 387             | 30.2            | 753             | 32.0            |
| Housewives               | 397             | 37.3            | 481             | 37.5            | 878             | 37.4            |
| Others                   | 248             | 22.3            | 331             | 29.3            | 579             | 24.7            |
| ANC attendance           |                 |                 |                 |                 |                 |                 |
| Registered               | 618             | 58.1            | 630             | 49.1            | 1248            | 53.2            |
| Did not register         | 446             | 41.9            | 654             | 50.9            | 1100            | 46.8            |
| Ownership of nets        |                 |                 |                 |                 |                 |                 |
| Yes                      | 296             | 34.8            | 381             | 35.6            | 677             | 35.3            |
| No                       | 557             | 65.3            | 1114            | 64.3            | 1671            | 64.7            |
| Received IPT             |                 |                 |                 |                 |                 |                 |
| Yes                      | 247             | 23.2            | 282             | 22              | 529             | 22.5            |
| No                       | 817             | 76.8            | 1002            | 78              | 1819            | 77.5            |

assumed to be good and to fit well to the data. In this study, exposure was measured as having listened to radio and having heard of the special media campaigns on the use of ITNs. We proposed the null hypothesis that there will be no relationship between personal media exposure and use of ITNs.

3. Variables

Table 1 presents the general characteristics of the pregnant women involved in the survey. The dependent and independent variables are described in the next section.

3.1. Dependent Variable. The dependent variable is the use or nonuse of ITN the night immediately preceding the survey.

3.2. Independent. The key independent variables in this paper are geopolitical zones, residence, age, education, educational attainment, gestational stage of registration for antenatal care, knowledge about use of ITN, listenership to radio, exposure to campaigns on ITN, locality of residence (rural or urban), knowledge about modes of prevention of malaria, age of the respondents, and knowledge that mosquito bites are the main cause of malaria. All the independent variables were dummy-coded. For instance, five dummy variables were created for Nigeria’s six geopolitical zones (northeast, northwest, southeast, southwest, and south-south) with north-central being the reference category. For locality of residence, rural area was considered as reference category, and respondents below age of 20 were considered as reference category for respondents’ age. Education was an ordinal variable, with five
possible responses regarding the highest level of education attained: no formal education, Qur’anic, primary, secondary, and postsecondary education.

4. Results

A total of 2,348 pregnant women were interviewed during the survey across the 21 states. Table 1 presents findings of the descriptive summary and sociodemographic characteristics of respondents. Overall, about a fifth of the respondents had never attended school. There is a substantial geographic variation with northeast having the highest proportion of respondents with no formal education. Respondents in age group 26 years and above constituted the largest proportion. About 37 percent of the respondents interviewed were housewives, 32 percent were self-employed, and only about 6 percent have a formal job (blue collar job). Unlike in the other geopolitical zones, a substantially larger proportion of the respondents were in urban areas than in rural areas.

Table 2 presents findings of the bivariate analyses of use of ITNs by selected characteristics. Knowledge of modes of preventing malaria, ownership of bed nets, knowledge that using an ITN prevents malaria, knowledge of dangers of malaria in pregnancy, and ANC attendance were all significantly associated with ITN use.

Table 3 presents findings from logistic regression model for use of ITNs. At an exploratory data analysis stage, several models were explored. However, we present the results for the model with best fit. Test of goodness-of-fit was based on Hosmer and Lemeshow test (HL). The test showed that the model presented here fits well to the data ($P = 0.944$). Exposure to mass media was observed to be positively associated with sleeping under ITN as those who listened to radio (OR = 1.56; 95% confidence interval 1.07 to 2.28; $P = 0.02$) and had heard of the mass media campaign (OR = 1.53; 95% confidence interval 1.07 to 2.17; $P = 0.02$) were about two times more likely to sleep under a bed net the night preceding the survey compared with their counterparts who did not. The knowledge that sleeping under ITN prevents malaria was significantly associated with sleeping under a bed net. Respondents with correct knowledge on use of ITNs were approximately three times more likely to sleep under ITNs compared with their counterparts who did not know that ITNs protect against malaria (OR = 3.15; $P < 0.0001$). Findings from this model also revealed a positive association between receiving IPT and use of ITN with those who received IPT about one and a half times more likely to sleep under ITNs compared with their counterparts who did not know that ITNs protect against malaria (OR = 1.48; $P = 0.02$). However, the significant effect of registering for ANC which was evident in the bivariate model disappeared after adjusting for other covariates. This implies that the net effect of ITN use by registration for ANC cancelled out after adjusting for other covariates.

5. Discussion

The role of mass media cannot be overemphasised in addressing reproductive health issues particularly in view of its potential for wide audience reach and cost-effectiveness in reaching large audiences. The use of ITNs during pregnancy has been shown in a systematic review to have a beneficial impact on pregnancy outcome in malaria-endemic Africa [22]. Although bed nets are available at most health facilities, some pregnant women still encounter difficulties accessing the nets [16].

Thus the promotion of net use is critical in the quest for the eradication of malaria in Africa. Combining the use of bed nets and IPT is perhaps the surest way of preventing malaria in pregnant mothers and this will in turn promote the health of mothers and their babies. Promoting use of ITNs, through mass media, has proved to be effective and has improved ITN use among pregnant women in Nigeria. ITNs when used by a large number of the target population within a community are effective not only in preventing malaria but also in generating a residual effect by significantly reducing vector populations thereby reducing rate of transmission [23], though this is presently still being discussed in the literature [24]. In addition the production of education and communication materials on malaria in pregnancy to be expanded and distributed nationally to all antenatal clinics in both private and government facilities, particularly in rural areas.

Although there have been increased efforts on the distribution of ITNs and education on their use in Nigeria, ITN ownership is still low as at the time of this survey. Reasons for poor use include misconceptions about ITNs and poor knowledge about the efficacy of ITNs in preventing malaria. There are still several misconceptions about malaria that negatively affects the number of pregnant women who use bed nets [25]. Efforts should be directed at uptake of antenatal services as soon as a woman confirms her pregnancy status. This will avail her opportunity of receiving ITNs (which are often distributed at no cost in most antenatal facilities) for the benefit of both mother and child. The low level of utilisation of ITNs has led to the call to expand the involvement of mass media [26] and the results of our study provide some evidence to support this call. This paper will guide policy makers and stakeholders in the planning and implementation of intervention in maternal and child health to adopt the mass media and an effective approach to reaching target groups and the general population.

6. Conclusion

The use of mass media in promoting the use of bed nets is effective. Respondents who knew that sleeping under ITN prevents malaria were 3.2 times more likely to sleep under net (OR: 3.15; 95% CI: 2.28 to 4.33; $P < 0.0001$). Those who listened to radio are about 1.6 times more likely to use ITN (OR:1.56; 95% CI: 1.07 to 2.28; $P = 0.020$), while respondents who had heard of a specific (monitored) sponsored radio campaign on ITN are 1.53 times more likely to use a bed net ($P = 0.019$). As much as one would have expected the respondents who have attained secondary education or higher to use net, findings showed a reverse relationship, although this was not statistically significant. The level of utilization
Table 2: Bivariate analysis showing percentage distribution of use of ITN according to selected sociodemographic characteristics.

| Characteristics                              | Use of ITN |
|----------------------------------------------|------------|
|                                              | Yes (n = 259) | No (n = 2089) | P value |
|                                              | Value   | %     | Value   | %     |          |
| **Locality**                                 |          |       |          |       |          |
| Rural                                        | 126     | 11.8  | 938     | 88.2  | 0.141    |
| Urban                                        | 133     | 10.4  | 1151    | 89.6  |          |
| **Age of caregivers**                        |          |       |          |       |          |
| Below 26 years                               | 91      | 10.9  | 745     | 89.1  | 0.463    |
| 26 years and above                          | 168     | 11.1  | 1344    | 88.9  |          |
| **Education**                                |          |       |          |       |          |
| None                                         | 46      | 10.2  | 407     | 89.8  | 0.268    |
| Qur’anic only                                | 37      | 11.5  | 285     | 88.5  |          |
| Primary                                     | 69      | 12.9  | 467     | 87.1  |          |
| Secondary                                   | 80      | 9.6   | 755     | 90.4  |          |
| Higher                                      | 27      | 13.4  | 175     | 86.6  |          |
| **Geopolitical zones**                       |          |       |          |       |          |
| Northwest                                   | 71      | 15.5  | 366     | 84.5  | 0.016    |
| Northeast                                   | 47      | 10.4  | 405     | 89.6  |          |
| North-central                               | 49      | 10.8  | 403     | 89.2  |          |
| Southwest                                   | 27      | 7.8   | 321     | 92.2  |          |
| Southeast                                   | 31      | 10.4  | 267     | 89.6  |          |
| South-south                                 | 34      | 10.0  | 307     | 90.0  |          |
| **Registered for ANC**                      |          |       |          |       |          |
| No                                          | 98      | 8.9   | 1002    | 91.1  | 0.001    |
| Yes                                         | 161     | 12.9  | 1087    | 87.1  |          |
| **Knowledge of dangers of malaria in pregnancy** |          |       |          |       |          |
| No                                          | 208     | 11.3  | 1638    | 88.7  | 0.269    |
| Yes                                         | 51      | 10.2  | 451     | 89.8  |          |
| **Knowledge that ITN prevents malaria**      |          |       |          |       |          |
| No                                          | 134     | 7.6   | 1619    | 92.4  | <0.001   |
| Yes                                         | 125     | 21.2  | 464     | 78.8  |          |
| **Ownership of a bed net**                  |          |       |          |       |          |
| No                                          | 5       | 0.3   | 1666    | 99.7  | <0.001   |
| Yes                                         | 254     | 37.5  | 423     | 62.5  |          |
| **Knowledge of causes of malaria**           |          |       |          |       |          |
| No                                          | 134     | 9.9   | 1220    | 90.1  | 0.024    |
| Yes                                         | 125     | 12.6  | 869     | 87.4  |          |
| **Risk of malaria in pregnancy**            |          |       |          |       |          |
| Perceived it as not harmful                  | 16      | 6.5   | 229     | 93.5  | 0.017    |
| Perceived it as harmful                      | 242     | 11.6  | 1847    | 88.4  |          |
| **Misconception about causes of malaria**   |          |       |          |       |          |
| No misconception                            | 139     | 12.0  | 1017    | 88.0  | 0.074    |
| Had misconception                           | 120     | 10.1  | 1072    | 89.9  |          |
| **Misconception about prevention of malaria** |          |       |          |       |          |
| No misconception                            | 124     | 10.2  | 1093    | 89.8  | 0.100    |
| Had misconception                           | 135     | 11.9  | 996     | 88.1  |          |
| **Knowledge of modes of prevention of malaria** |          |       |          |       |          |
| Not correct knowledge                       | 147     | 8.5   | 1576    | 91.5  | <0.001   |
| Correct knowledge                           | 112     | 17.9  | 513     | 82.1  |          |
| **Total**                                   | 259     |       | 2089    |       |          |
Table 3: Results from logistic regression model 1 with respondents who slept under bednet as outcome variable.

| Variable                           | Odds ratio | P value | Confidence level Lower | Confidence level Upper |
|------------------------------------|------------|---------|------------------------|------------------------|
| Northwest                          | 1.53       | 0.07    | 0.96                   | 2.45                   |
| Northeast                          | 0.87       | 0.60    | 0.51                   | 1.49                   |
| Southwest                          | 0.98       | 0.95    | 0.57                   | 1.69                   |
| Southeast                          | 1.19       | 0.51    | 0.71                   | 2.01                   |
| South-south                        | 1.41       | 0.19    | 0.85                   | 2.33                   |
| Secondary and higher education     | 0.74       | 0.06    | 0.53                   | 1.02                   |
| Registered for ANC                 | 1.19       | 0.31    | 0.85                   | 1.65                   |
| Knew that using ITN prevents malaria | 3.15     | 0.00    | 2.28                   | 4.33                   |
| Listened to radio                  | 1.56       | 0.02    | 1.07                   | 2.28                   |
| Heard of campaign on ITN           | 1.53       | 0.02    | 1.07                   | 2.17                   |
| Received IPT                       | 1.48       | 0.02    | 1.06                   | 2.08                   |

of ITNs in Nigeria is still low. We advocate for expanded involvement of the mass media in community enlightenment programmes. Furthermore, efforts at the distribution of ITNs in all antenatal clinic outlets should be intensified.

7. Limitation of Study

In spite of the findings from this study, it is worth noting that a similar challenge of inability to establish causal relationship as in any cross-sectional study was encountered in this study. Further, the survey did not include questions to measure socioeconomic status of the respondents which are possible confounders to subject of interest. Therefore, we recommend that results be interpreted with an element of caution.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Authors’ Contribution

A. Ankomah, S. B. Adebayo, and J. Anyanti conceptualized the study and designed and wrote the study protocol and with M. Meremiku analyzed the data and wrote the initial draft. E. D. Aroagundade, E. Nwokolo, U. Inyang, and Oladipupo B. Ipadeola managed the data collection from the various sites and wrote the literature review. All authors read and approved the final paper.

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