ORIGINAL ARTICLE

# Impact of health education intervention on malaria prevention practices among nursing mothers in rural communities in Nigeria

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## ABSTRACT

**Introduction:** Malaria is the most prevalent parasitic endemic disease in Africa, which is preventable, treatable and curable. This study aims to assess the effect of health education intervention on the knowledge, attitude, and prevention practices amongst mothers of under-five children in a rural area of Ogun State, Nigeria. **Materials and Methods:** The study design was a quasi-experimental study carried out in Ijebu North Local Government Area of Ogun State. A multistage random sampling technique was used in choosing the required samples and a semi-structured questionnaire was used to collect relevant information. A total of 400 respondents were recruited into the study with 200 each in both the experimental and control groups and were followed up for a period of 3 months. **Results:** There was no statistically significant differences observed between the experimental and control groups. Knowledge of indoor spraying increased from 14.7% to 58.2% ($P < 0.001$) and window and door nets increased from 48.3% to 74.8% ($P < 0.001$). The proportion of those with ITN use increased from 50.8% to 87.4% ($P < 0.001$) while those with practice of maintaining clean environment also increased from 40.4% to 54.5% ($P < 0.001$). There were no significant changes in all the practice of malaria prevention methods in the control group. **Conclusion:** This suggests that malaria control can be significantly improved in rural areas, if the caregivers are adequately empowered through appropriate health education intervention though change in attitude and belief may require a longer and persistent effort.

**Key words:** Health education intervention, knowledge, malaria, nursing mothers, practice, rural Nigeria

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## INTRODUCTION

Today malaria is found throughout the tropical and sub-tropical regions of the world and causes more than 300 to 500 million acute illness and at least one million deaths annually.[1-3] Approximately, 40% of the world's population, mostly those living in the poorest countries, is at risk of malaria.[1] It affects five times as many people as Acquired Immune Deficiency Syndrome (AIDS), leprosy, measles and tuberculosis combined.[4] The malaria preventive behaviours among mothers of under-fives have been found to be generally poor across the six geo-political zones in Nigeria.[5-7] Findings from the national malaria situation survey relating to the preventive health behaviour in malaria included the fact that bed-net use among under fives was found to be generally low across the six geo-political zones as only 10% of the respondents claimed to use bed nets.[6] The survey also revealed that the preventive measures reportedly adopted included the use of the following: Window/door nets –32.6%, insecticide aerosol –33.8%, repellents –22.7% and herbs –23.0%.[7]

Malaria is the most prevalent parasitic endemic disease in Africa, which is preventable, treatable and curable,[4-5] yet it remains one of the major health problems in Nigeria.[7] The malaria situation in the country is deteriorating despite numerous interventions that have been instituted so far.[6] The obstacles to the success of these interventions are socio-cultural, economic and political in nature.[8] Malaria is currently the most important cause of death and disability in children under five in the country.[5] Modern medicine has tended to interpret health in terms of medical interventions, and to over-emphasise the importance

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of medical technology. It is important to promote the concept of health as a result of the interaction of human beings and their total environment. The ultimate aim of Behavioural Change Communication (BBC) is to ensure that individuals, families, communities and health workers are taking preventive measures to prevent disease, improve on their recognition of malaria and use of antimalarial drugs rationally.[9] Concerted efforts should be put in place to facilitate a smooth transition into the use of Arthemisin based combination theraphy (ACTs). Intensive BBC and capacity development should be directed towards consumers and all cadres of health providers through under listed means.

There are several reasons why Africa bears an overwhelming proportion of the malaria burden. Most malaria infections in Africa, South of the Sahara are caused by *Plasmodium falciparum*, the most severe and life-threatening form of the disease. This region is also home to the most efficient, and, therefore, deadly, species of the mosquitoes which transmit the disease. Moreover, many countries in Africa lacked the infrastructures and resources necessary to mount sustainable campaigns against malaria and as a result few benefitted from historical efforts to eradicate malaria.[5] The Roll Back Malaria (RBM), through its strategy, which are early detection, rapid treatment, multiple prevention, well-co-ordinated action, dynamic global movement and focussed research, have formed a RBM global partnership, which is working to reduce illness and death in young children. The increase in the prevalence of malaria is Nigeria is due to both behavioural and non-behavioural factors. The focus on community-directed interventions in the design of the project was driven by the large theoretical and empirical literature highlighting the importance of community involvement in the delivery of health services in general, and preventive health measures, in particular.[10-17] While the involvement of community workers does not necessarily mediate socioeconomic differences within communities,[18] the overall health improvements achievable through community-based interventions appear large.[11] The achievable improvements appear particularly large in cases where communities actively make program decisions,[19] and where community programme rollout is further delegated to local families and kinships.[20] The behavioural factors relate to some cultural practices, which promote mosquito breeding and mosquitoes' access to the people as well as the failure of 'at risk' population to use technologies proven to be effective for the treatment, control and prevention of malaria promptly and adequately. The non-behavioural factors include geographical or ecological peculiarities, the availability of mosquitoes and the presence of plasmodia. A thorough understanding of both behavioural and non-behavioural factors is crucial for the design of appropriate interventions for tackling malaria. This study aims to assess the effect of health education intervention on the knowledge, attitude and malaria prevention practices amongst mothers of under-five children in a rural area of Ogun State, Nigeria.

## MATERIALS AND METHODS

### The study area

The study was carried out in Ijebu North Local Government Area of Ogun State, Ijebu North Local Government is one of the 20 Local Governments in Ogun State. The experimental study was carried out in Oru, a semi-rural town in Ijebu North Local Government Area, of Ogun State, Nigeria. It is bounded in the East by Iperin, West by Awa, North by Ijebu-Igbo, and South by Ago Iwoye. Oru has a population of about 100,000 people (2006 population census). The control study was carried out in Atikori ward at Ijebu-Igbo, a semi-rural town in Ijebu North Local Government Area, of Ogun State Nigeria with a population of about 150,000 people (2006 population census).[20,21]

The two study areas are inhabited by people of mixed cultural background and languages predominantly Ijebu/Yorubas. They are also inhabited by Olabisi Onabanjo University students and workers including lecturers and other non-teaching staff. The people are mostly farmers, planting cocoa, cassava, kolanuts etc., while some are engaged in small-scale businesses. The health institutions within the Local Government consist of seven primary health care centres and a government general hospital. There are three Primary Health Care Centres (PHCs) in the Southern axis and four PHCs and a government general hospital located in the Northern axis of the Local Government. Malaria is holoendemic in this Local Government with heavy rainfalls in February-March and July-October every year.

### Study design

The study design was a quasi-experimental study to determine the effect of malaria education programme on the uptake of insecticide-treated nets (ITN) among nursing mothers in rural communities in Nigeria. Two political wards, one randomly selected from the southern axis (Ijebu-Oru) and the other one randomly selected from the northern axis (Ijebu-Igbo) formed the experimental and control groups, respectively. It was decided to choose the experimental and control groups from two different ends (North axis and South axis) of the Local Government to prevent cross interference during and after the intervention periods. The distance between the experimental and the control group is about 10 km.

The study was carried out in three phases – Pre-intervention, Intervention and Post-Intervention phases. Phase one (pre-intervention) involved cross-sectional comparative descriptive study, while phase two involved comprehensive health education intervention in the experimental group only. Phase three (post-intervention)

involved comparative study between the experimental and control group.

## Pre-intervention activities

These included the following:

1. Obtaining official permission to proceed with the project from the Local government area (LGA) authorities
2. Consent of the mothers of under-five children to fully participate at all stages of the project was obtained
3. Fifty households were selected in a nearby community (Ilaporu) for pre-testing of the questionnaire before large scale study. The questionnaires were pre-tested with the research assistants, who had debriefing on field experiences and proffered solutions to identified problems. Amendments were made, which led to re-designing aspects of the instrument that were ambiguous or lacked clarity
4. A baseline survey to determine the mother's knowledge, attitude and practice (KAP) about malaria prevention and management was conducted using the corrected questionnaires. This represented the pre-training assessment for the intervention group and the initial assessment for the control group

   A semi-structured questionnaire was used to collect data and was administered with the assistance of eight selected trained research assistants (community health extension workers). Answers to questions on socio-demographic variables, knowledge, attitudes and practice about malaria prevention and treatment were collected. An average of 20 questionnaires was administered daily for 10 days. The same was also done for the control group
5. The training curriculum and programme was based on a course content adapted from the training manual for the management of malaria in Nigeria 2005.[22]

## Intervention activities

The intervention consisted of a structured educational programme based on a course content adapted from the national malaria control programme and the information obtained from the gaps in knowledge identified from the distributed questionnaire formed the basis of the training. Training sessions were conducted during which various aspects of the management and control of malaria was taught. Multiple health channels were used. These include: A training workshop, use of education materials such as posters, story book and malaria post signs. Two malaria post signs were erected at the community health centre, which is beside the community major market. The signs post indicated graphic descriptions of the insecticide treated bed net and directions for its use. The benefits and annotations were written in Yoruba. The sign post was located at conspicuous positions around the health centre, which is not far from the major market. Colourful malaria posters indicating malaria symptoms and signs in children and annotated diagrams for prevention and treatment was pasted at different locations within the health centre.

Each batch was trained for 1 day. The training consisted of 3 modular units which are knowledge about malaria transmission, its prevention and treatment, attitude on malaria prevention strategies, practice of malaria prevention and treatment practices. Each module consisted of a lecture and an exercise. The training period lasted for 2 weeks with training taking place 5 days a week. The participating mothers/guardians were divided into 10 batches of 20.

Training was held for 5 hours a day from 10.00 am to 3.00 pm. The training method was both didactic and participatory. A model of the time-table is shown in the Table 1.

## Post-intervention

The post-intervention evaluation was carried out to determine a residual gain in malaria-related KAP 3 months after the training and initial assessment in the intervention and control groups, respectively. This represented the 3 months post-training assessment. Evaluation of the effects of training was done using standardised scores for the various variables during analysis.

## Sample size

The minimum sample size needed was obtained from the formula for comparing proportions between two groups.[23]

$$n = \left\{ \frac{Z_1 - \alpha_{/2}\sqrt{2P0(1-P0)} - Z_\beta \sqrt{P0(1-P0) + P1(1-p_1)}}{P0 - P1} \right\}^2$$

The outcome measure for computing the sample size was the proportion of households in Nigeria using mosquito nets, P1 = 12% (NDHS, 2003).

The study was hoped at improving the percentage by 15%.

P2 = Minimum proportion of mothers expected to be utilizing mosquito net after the intervention = 27%

P0 = average of P1 and P2= (12 + 27)/2 = 19.5%

$Z_{1-\alpha/2}$ = Standard normal deviate corresponding to level of significant ($\alpha$) of 5% =1.96

$Z_\beta$ = Standard normal deviate corresponding to type II

**Table 1: Training time table**

| Week | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
|---|---|---|---|---|---|
| 1 | Batch 1 Units i, ii and iii | Batch 2 Units i, ii and iii | Batch 3 Units i, ii and iii | Batch 4 Units i, ii and iii | Batch 5 Units i, ii and iii |
| 2 | Batch 6 Units i, ii and iii | Batch 7 Units i, ii and iii | Batch 8 Units i, ii and iii | Batch 9 Units i, ii and iii | Batch 10 Units i, ii and iii |

error of 10% (Power = 90%) = 1.28

D = design effect of 1.5 for the sampling design used

P1–P2 = 15%

Then

$$n = 1.5\left\{\frac{(196\sqrt{2\times0.195(1-0.195)}+1.28\sqrt{0.12\,(1-0.12)}}{\sqrt{+0.27(1-0.27)}}}{0.15}\right\}^2$$

The minimum sample size from the above formula is 182 for each group. However, 200 women per group were studied after allowing for 10% attrition rate.

## Subject selection

(i) Inclusion criteria: Only mothers or guardians who are permanent residents (resident in the area >6 months) and currently having children of <5 yrs of age living with them were included in the study

(ii) Exclusion criteria: Mothers or guardians whose <5 yrs old children were not living with them at the time of the study were not included in the study.

## Sampling technique

A multistage random sampling technique was used in choosing the required samples for this study. Ijebu North Local Government has seven political wards. Four of these wards were located in the Northern axis of the Local Government and the remaining three were in the Southern axis of the Local Government. Each of the political wards served as a cluster. The first step was to choose between the northern part and the southern part, which one became the experimental or control group, this was done by tossing a coin. From the list of political wards in each axis, a ward was selected by simple random sampling technique by casting a lot e.g., balloting using same size of papers and thoroughly mixed and then picking it at random. House enumeration was carried out by the researcher and two officials from the town-planning unit of the Local Government. A total number of 1,800 houses were counted in the experimental and control wards, respectively. A systematic random sampling technique using a sample interval of five and four in the experimental and control wards, respectively, was used to choose 200 houses each in experimental and control groups, respectively. The sample interval was obtained by dividing the total number of houses by the sample size in the experimental and control wards, respectively (1,000/200 and 800/200). The first house was determined by using the table of random number to pick a house from the house enumeration list and the one household was studied per house and this was randomly selected. In the two groups, a simple random sampling technique was carried out by ballottement to choose a mother of under five from households where there were more than one mother with under five in a house. Where there was one household in a house, the mother of under five automatically qualified to participate in the study.

## Data collection technique

A baseline survey to determine the mothers' knowledge about insecticide treated nets (ITNs) was conducted using the corrected questionnaires (Pre-training assessment). A semi- structured questionnaire was used to collect data and was administered with the assistance of eight selected trained research assistants (community health extension workers). Answers to questions on socio-demographic variables, KAP about malaria prevention and treatment were collected.

The data collectors were trained for 3 days on the study objectives, survey methods and completion of the questionnaires. The proficiency of the questionnaires and interviewers were verified through pre-testing and the deficiencies were corrected. Furthermore, field monitoring was carried out to check quality of the data being collected. The questionnaire was verbally translated into Yoruba language where applicable and back translated to English language for validity. The questionnaires were pre-tested with the research assistants, who had debriefing on field experiences and proffered solutions to identified problems. Amendments were made, which led to re-designing aspects of the instrument that were ambiguous or lacked clarity. Fifty households were selected in a nearby community (Ilaporu) for pre-testing of the questionnaire before large scale study.

A training curriculum and programme based on the health educational needs was developed and this formed the baseline data collected for the study group survey. The training was carried out in the health centre situated in Oru following the approval from the local government authority. A post-training evaluation was done after three months on the experimental group to determine the gains in ITN related KAP using the same (self administered and in some cases assisted) questionnaire, while no intervention was administered to the control group.

## Data analysis

The questionnaires were kept safe and confidential and checked for proper completion on collection from participants. The data was entered into SPSS statistical software version 12. Frequencies were generated for detection of errors (data editing). Data was summarised using means, standard deviation and proportions.

To measure the effectiveness of health education intervention, the degree of change was measured and this was subjected to the tests of significance (McNemar's Chi-square, *P* values) where appropriate. The degree of

change between two samples was calculated by finding the difference in percentage point between the proportions in the second sample with a given attribute and the proportion in the first sample with the same attribute. This was calculated in both the experimental and control groups.

For the purpose of analysis, marital status was re-categorised as currently married and not married. Not married include single, the separated and the widows. Knowledge of malaria was categorised as good and poor: "Good response" entailed the knowledge that malaria is caused by mosquito insect while other responses regarding malaria causation were categorised as "poor" level of knowledge.

### Ethical consideration

The research proposal was approved by the Olabisi Onabanjo University Teaching Hospital Ethical Committee. Informed consent was obtained from the Chairman, Ijebu North Local Government Area and the community leaders. Oral and written consent was obtained from the selected mothers and guardians before administering the questionnaires. The participants promised to fully cooperate and they were also assured of their freedom to opt out at any stage of the project. The participants/ respondents were assured of confidentiality and this assurance was indicated on the questionnaire (non inclusion of self identifying characteristics).

## RESULTS

### Socio-dermographic characteristics of respondents

Four hundred mothers/guardians of children under five years of age completed the questionnaire at the commencement of the study. These respondents were in two groups – the control and experimental (intervention) groups. The control group had two hundred respondents (50% of the total number of participants); 180 (90%) of them were available to complete the questionnaire after the 3-month intervention period. The experimental group had 200 respondents (50% of the total number of participants) of which 190 (95%) responded to the study questionnaires after the 3-month intervention period. The socio-demographic characteristics of the caregiver in both the experimental and control groups are shown in Table 2.

More than half of the respondents fell into age group 25-34 years in both the experimental (52.5%) and the control (52.5%) groups, followed by 26.0% (experimental) and 26.5% (control group) in the <25 years of age category and those above 35 years were 21.5% (experimental) and 21.0% (control group). A high percentage of the experimental group (92.0%) and control (90.0%) were married. Over 66.6% (experimental) and 74.0% (control) were Christians while the rest while Muslims [Table 2]. About 40% of the experimental group were earning above 5,000 naira compared with 33.5% of the control group. While 52.9% of the experimental group had up to secondary school education, only 55% of the control group had the same level of education, followed by primary level in 29.2% of experimental group and 25% of control while for those with no formal education, about 5% and 7% were found among the experimental and control groups respectively. There was no significant statistical differences observed between the experimental and control groups in terms of socio-demographic characteristics such as age ($P = 0.99$), marital status ($P = 0.48$), religion ($P = 0.1$), and income ($P = 0.51$)

**Table 2: Socio-demographic characteristics of the respondents**

| | Experimental group *n*=200 (%) | Control group *n*=200 (%) | Test statistic value ($\chi^2$) | *P* value |
|---|---|---|---|---|
| Age in years | | | 0.02 | 0.99 |
| <25 | 52 (26.0) | 53 (26.5) | | |
| 25–34 | 105 (52.5) | 105 (52.5) | | |
| 35+ | 43 (21.5) | 42 (21.0) | | |
| Total | 200 (100) | 200 (100) | | |
| Marital status | | | | |
| Currently married | 184 (92.0) | 180 (90.0) | 0.49 | 0.48 |
| Others | 16 (8.0) | 20 (10.0) | | |
| Total | 200 (100) | 200 (100) | | |
| Religion | | | | |
| Christianity | 133 (66.6) | 148 (74.0) | 2.68 | 0.1 |
| Islam | 67 (33.3) | 52 (26.0) | | |
| Total | 200 (100) | 200 (100) | | |
| Mother's income (Naira) | | | | |
| Less than 2,500 | 66 (33.0) | 74 (37.0) | 2.33 | 0.51 |
| 2,500-4,999 | 64 (32.0) | 59 (29.5) | | |
| 5,000-7,499 | 27 (18.5) | 19 (9.5) | | |
| 7,500+ | 43 (21.5) | 48 (24.0) | | |
| Total | 200 (100) | 200 (100) | | |
| Father's income (Naira) | | | | |
| Less than 2,500 | 11 (5.5) | 12 (6.0) | 1.13 | 0.77 |
| 2,500-4,999 | 19 (9.5) | 23 (11.5) | | |
| 5,000-7,499 | 38 (19.0) | 43 (21.5) | | |
| 7,500+ | 132 (66.0) | 122 (61.0) | | |
| Total | 200 (100) | 200 (100) | | |

### The effect of health education on knowledge and attitude towards malaria prevention

Table 3 showed that during the pre-intervention period, 69.4% of the respondents in experimental group attributed the cause of malaria to mosquito bites, while the others had incorrect responses ranging from excessive sunlight (18.5%) dirty environment (8.1%) and eating of bad food (4.0%). After the intervention, the proportion of respondents in the experimental group who had correct

knowledge of aetiology of malaria increased significantly to 100% (that is none of them had incorrect knowledge of malaria causation). Among the controls, there was no difference in the pre and post intervention proportions of the respondents' knowledge of malaria aetiology.

The proportions of the respondents with knowledge of the different malaria prevention methods were compared. The results are shown in Table 4. In the experimental group, the proportion of those using ITN increased from 60.8% to 97.4% ($P < 0.001$) while those with knowledge of maintaining clean environment also increased from 50.4% to 64.5% ($P < 0.001$). Other significant improvements were knowledge of indoor spraying which increased from 14.7% to 58.2% ($P < 0.001$), knowledge of window and door nets, which increased from 48.3% to 74.8% ($P < 0.001$). The use of drugs and traditional herbs for prophylaxis also reduced from 42.0% to 20.0% ($P < 0.001$) and 17.0% to 27.3% ($P < 0.001$), respectively. There was no significant improvements for use of mosquito coil ($P < 0.01$), while in the control group there were no significant changes in all the knowledge of malaria prevention methods pre and post intervention except with the use of indoor spraying ($P < 0.02$).

The attitude to malaria prevention pre-and post intervention of the experimental group shows that there were no improvement in the proportion of those who believe that malaria could not be prevented ($P = 0.76$). Prior to the intervention programme, 90.7% of respondents in experimental group and 88.4% in control group believed that it was possible to prevent malaria in children. These views did not change even after the intervention programme, which did not produce any statistically significant difference both in experimental and control group.

### The effect of health education on malaria prevention practices

The malaria prevention practices of the respondents utilising different malaria prevention practices were compared and the results are shown in Table 5. In the experimental group, the proportion of those with ITN use increased from 50.8% to 87.4% ($P < 0.001$) while those with practice of maintaining clean environment also increased from 40.4% to 54.5% ($P < 0.001$). Other significant improvements were practice of indoor spraying, which increased from 4.7% to 48.2% and it was a significant result ($P < 0.001$); use of window and door nets, which increased by almost two folds ($P < 0.001$) and use of drugs which changed from 32.0% to 10.0% ($P < 0.001$). The use of traditional herbs decreased from 17.3% to 7.0% ($P < 0.001$). There was no significant improvements for use of mosquito coil ($P < 0.01$) while in the control group there were no significant changes in the practice of malaria prevention methods.

## DISCUSSION

The study shows that a good percentage of respondents both in the experimental (69.4%) and control (73.3%) groups had good knowledge of the cause of malaria, which

**Table 3: Knowledge and attitude towards malaria prevention**

| | Experimental group | | | | Control group | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre-intervention *n*=200 (%) | Post-intervention *n*=190 (%) | Degree of change | *P* value | Pre-intervention *n*=200 (%) | Post-intervention *n*=180 (%) | Degree of change | *P* value |
| Knowledge of disease causation | | | | | | | | |
| Correct | 137 (68.5) | 180 (95.0) | 26.5 | <0.001 | 147 (73.5) | 130 (72.2) | −1.3 | 0.78 |
| Incorrect | 63 (31.5) | 10 (5.0) | | | 53 (26.5) | 50 (27.8) | | |
| Attitude towards malaria prevention | | | | | | | | |
| Belief | 97.5 | 100% | 2.5% | >0.0 | 97.5% | 97.7% | −0.2% | >0.0 |
| Don't belief | 2.5 | 0.0% | −2.5% | 5 | 2.5% | 2.3% | 0.2% | 5 |
| Total | 100% | 100% | | | 100% | 100% | | |

**Table 4: Knowledge of malaria prevention methods amongst the respondents**

| | Experimental group | | | | Control group | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre-intervention *n*=200 (%) | Post-intervention *n*=190 (%) | Degree of change (%) | *P* value | Pre-intervention *n*=200 (%) | Post-intervention *n*=180 (%) | Degree of change (%) | *P* value |
| ITN use | 122 (60.8) | 185 (97.4) | 36.6 | <0.001 | 95 (47.5) | 82 (45.5) | −2.0 | >0.05 |
| Indoor spraying | 29 (14.7) | 111 (58.2) | 43.5 | <0.001 | 32 (16.1) | 44 (24.5) | 8.2 | <0.02 |
| Mosquito coil | 69 (34.3) | 92 (48.3) | 13.9 | <0.01 | 71 (35.7) | 69 (37.7) | 2.0 | >0.05 |
| Drugs | 84 (42.0) | 38 (20.0) | 22.0 | <0.001 | 90 (45.2) | 88 (49.0) | 3.8 | >0.05 |
| Clean environment | 101 (50.4) | 123 (64.5) | 14.1 | <0.001 | 109 (54.4) | 94 (52.4) | 2.0 | >0.05 |
| Window and door nets | 97 (48.3) | 142 (74.8) | 26.5 | <0.001 | 69 (34.3) | 69 (38.1) | 3.8 | >0.05 |
| Use of traditional herbs | 55 (27.3) | 33 (17.0) | 10.3 | <0.001 | 38 (18.9) | 36 (20.2) | 1.3 | >0.05 |

ITN – Insecticide-treated nets; Multiple responses

**Table 5: Different methods of malaria prevention practices**

| | Experimental group | | | | Control group | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre-intervention *n*=200 (%) | Post-intervention *n*=190 (%) | Degree of change (%) | *P* value | Pre-intervention *n*=200 (%) | Post-intervention *n*=180 (%) | Degree of change (%) | *P* value |
| ITN use | 50.8 | 87.4 | 36.6 | 0.001 | 37.5 | 35.5 | −2.0 | >0.05 |
| Indoor spraying | 4.7 | 48.2 | 43.5 | 0.001 | 6.1 | 14.5 | 8.2 | < 0.02 |
| Mosquito coil | 24.3 | 38.3 | 13.9 | 0.001 | 25.7 | 27.7 | 2.0 | >0.05 |
| Drugs | 32.0 | 10.0 | 22.0 | 0.001 | 35.2 | 39.0 | 3.8 | >0.05 |
| Clean environment | 40.4 | 54.5 | 14.1 | 0.001 | 44.4 | 42.4 | 2.0 | >0.05 |
| Window and door nets | 38.3 | 64.8 | 26.5 | 0.001 | 24.3 | 28.1 | 3.8 | >0.05 |
| Use of traditional herbs | 17.3 | 7.0 | 10.3 | 0.001 | 8.9 | 10.2 | 1 | >0.05 |

ITN – Insecticide-treated nets; Multiple responses are common

was as a result of bite from infected mosquito. This result agreed with the findings of other researchers.[24-26] After the intervention programme, all the participants knew the direct cause of malaria. This showed a difference of 30.6 percentage points, which was the degree of change as a result of the intervention programme, and this relationship was found to be statistically significant. No such relationship existed in the control group that was not exposed to the training programme. There was only slight difference in the responses before and after the programme. The relatively good knowledge about the causes of malaria observed in these two groups before the intervention may be due to the fact that malaria is a common ailment among children in the population studied, which is in agreement with findings from Kenya.[27]

Unfortunately, the study shows a non significant change in attitude towards malaria prevention. About 9.3% and 11.6% in experimental and control groups, respectively, did not believe that malaria was preventable; this is lower than 77% observed in another study.[28] This difference may be due to the difference in the level of education of both study group. This conclusion has been observed by several other investigators.[29-30] However, this misconception about malaria prevention could adversely affect preventive behaviour, hence there's need for more reinforcement in health education. Malaria control can be significantly improved in rural areas if the caregivers are adequately empowered through appropriate health education intervention though change in attitude and belief may require a longer and persistent effort.

The study shows an increase in knowledge score from 2.8% (pre-intervention) to 51.6% (post-intervention) in the experimental group and this was statistically significant ($P < 0.001$). On the other hand, there was no such increase in knowledge in the pre- and post-intervention of the control group. The knowledge about ITN use, indoor spraying, mosquito coil, clean environment, window and door nets and the use of drugs for prophylaxis improved statistically in the experimental group. Such statistically significant improvement was not observed in the experimental group. This suggests that health education intervention has improved the knowledge of the mothers about various malaria prevention strategies. This result is consistent with the findings of an Ethiopian study[24,30] and Nigerian study[29] who observed similar improvement among the mothers of under five children.

The study shows that the practice about ITN use, indoor spraying, mosquito coil, clean environment, and window and door nets, is statistically significant in the experimental group. Such statistically significant improvement was not observed in the control group. This suggests that health education intervention has improved the knowledge of the mothers about the various malaria prevention methods. This result is consistent with the findings n similar studies[24,29,30] where similar improvements were observed.

Given the nature of the experimental study, interpretation of study results should be done with caution. The study might also have been faced with a lot of influence from external forces which might have introduced bias into the study. The prevention of the cross-over effect could not be totally guaranteed between the experimental and control groups during and after the intervention programme. Furthermore, the study might have been subjected to recall bias usually associated with cross sectional studies.

## CONCLUSION

The study concludes that health education intervention has improved the knowledge of the mothers about the various malaria prevention strategies among the nursing mothers with non significant change in attitude. Malaria control can be significantly improved in rural areas, if the caregivers are adequately empowered through appropriate health education intervention though change in attitude and belief may require a longer and persistent effort.

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