Assessment of the Effectiveness of Malaria Control Measures in Communities in Abia State, Nigeria

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Abstract:
Introduction: All efforts to eradicate malaria in the developing world including Nigeria have failed leaving the only option to control measures. The control measures for consideration are therapeutic, health education including environmental control, long lasting insecticide treated bed nets and bed nets with covering of the doors, windows and vents in the houses. The study is to assess the effectiveness of various malaria control measures in preventing malaria.
Materials and method: The study used all the 120 households who attended the regular health education programme for free distribution of insecticide treated bed nets in the government health centre in the study area. The households were made up of three groups of 40 households each, comprising a control and two intervention groups. A month interval was given to the respondents to familiarize themselves with the correct use of the treated bed nets and application of health education programmes that they were provided with. Data were analyzed using frequency tables.
Results: Out of the 40 households with 240 inhabitants in the control group, 24(10%) of them were infected with malaria. The results in the intervention groups show that the first intervention group, with 235 inhabitants, only 6(2.6%) were infected with malaria while in the second intervention group, with 218 inhabitants, none was treated for malaria. It is worthy to note that malaria cases were treated throughout the 12 months' period of the study.
Conclusion: The fact that the second intervention group who used health education, treated bed net in addition to netting their doors, windows and vents had no reported case of malaria shows that this package is the best option for malaria control measures. Therefore, use of treated bed nets, netting doors, windows, and vents as well as adhering to health education malaria control practices are the most effective malaria control packages. It is therefore recommended that for successful malaria control measure, the package of health education, use of treated bed net, netting of doors windows and vents should be strictly adopted.

Keywords: Assessment, malaria, health education, mosquito netting, vents

1. Introduction

Malaria has had devastating effects on the health of the individuals in developing countries including Nigeria. The concern of the people had made nations to initiate control measures to eradicate malaria. For instance, studies by Dutt et al (2010), Brown (1986) showed that in Syrilanka, the eradication programme acclaimed the applause of international world because it achieved the desired goal, though the goal was momentary because it played down on the epidemiology of malaria with regards to mosquito vector activities. The success achieved by the programme was short-lived and there was resurgence of malaria in the island of Syrilanka. The failure of malaria eradication programme, the resurgence of malaria and the epidemic of malaria in Syrilanka dashed the hope of the developing countries in supporting malaria control instead of eradication programmes as a visible option (Dutt et al 2010, Bassat 2011 Birx, and Nkenagasong 2009).

According to English et al (2009), Chanda et al (2011) and WHO (2013), malaria is not easy to diagnose or to treat because of features like fever, headache, myalgia with or without vomiting, abdominal ache, vomiting and dizziness. These features and types of malaria like choleric, algid, neurological black water malaria can also be confused with other diseases (Kyabayinze et al 2012 and WHO 2013). Malaria is of concern to the world body because of its severe socio-economic health effects seen more among pregnant women and children under the age of five. For instance, in 2012, 207 million cases of malaria occurred globally with over 700 thousand deaths most of which were seen in children under the age of five (WHO 2013).

Also in 2013, WHO (2013) identified 104 countries endemic of malaria infection. Efforts of the world body to control an endemic disease like malaria led to the adoption of alma-ata declaration in 1978 and some years later, that of roll-back malaria programme. As a result, spirited efforts were made by community health workers in Nigeria to control malaria by treating the masses in rural health institutions (Obionu 2010 and Marycilian et al 2011). The therapeutic control of malaria was generally ineffective both in rural and urban areas. According to Eke (1979), there was noticeable drug resistance from quinine to chloroquine to sulphur combination drugs. In support of Eke's findings, WHO (2010) recommended Artesunate combined therapy (ACT) as drug of choice for effective treatment for malaria. In the same vein, Eke et al (2006), McGready, Wongsaen and Chu (2014), noticed high rate of asymptomatic plasmodium infection in endemic areas studied, and recommended the need to adopt preventive measures that include stopping bite of mosquitoes.

Further, Eke (1979) recommended the use of multiple malaria control measures like therapeutic, health education, environmental control including mosquito insecticide treated bed nets, bed nets and covering of all possible openings – doors, vents and windows. However, he argued that therapeutic control per say is not a good option for control measures because of individuals with as symptomatic infection. Therapeutic control needs to be renewed from time to time because of resistance of malaria parasite to drugs. Also health education will need compliance to various control measures. This compliance is also difficult to accomplish (Petti et al 2006, Birx et al 2009, and Uchechukwu and Ikechukwu 2011)

In the same vein, environmental control is not easy to achieve because of the numerous control measures to be observed including avoiding stagnant water in various containers like potholes, cans, discarded tyres, and others, besides, mosquitoes fly from and around the premises (Eke 1979, Price, Douglas and Anstey 2009 and Naing et al 2014)

The insecticide bed nets per say has its own problem. It may let in mosquitoes that could bite the owners of the house long before lowering the mosquito nets. There is need for constant and careful control to ensure that the nets are not torn as to let in mosquitoes before sleeping in the net (Okwa et al 2009, Uchechukwu et al 2011, and Poespoprodjo, Fobia and Kenangalem 2014)

From the review, it was noted that each control measure has its own limitation, showing that no single control measure can satisfactorily control malaria infection. It is therefore, necessary to use multiple methods for malaria control to achieve the desired goals. The aim of this study is therefore to assess the effectiveness of each of the combined measures in preventing malaria in urban areas.

2. Materials and Methods

The study which lasted for 12 months, used all the 120 households who attended the regular health education programme for free distribution of insecticide treated bed nets in the government health centre in the study area. The households were made up of three groups of 40 households each, comprising a control and two intervention groups. For the control group, there were 240 individuals, for first intervention group the population was 235, while for the second intervention group, the population was 218. The control group did not use the treated bed net, but had only health education as provided by the health centre staff and the researchers. For the two intervention groups, the first group in addition to health education, had and used insecticide treated bed net, while the second group in addition to health education and insecticide treated bed net, had nets on their doors, windows and vents. All the treated bed nets were distributed free of charge by the health centre. However, the costs for netting of the windows, doors and vents with the treated nets were willingly borne by the respondents in the second intervention group. It is worthy to note that in the process of providing malaria control measures to the study group, the researchers considered the socio-economic, profitability and practicability of the measures to the respondents.

During the study, the researchers used one month to carryout home visits to assist and emphasize to the population their expected roles and responsibilities regarding malaria control. In addition, the researchers stressed the need to ensure that the children's beds in the intervention group were adequately netted. Thereafter, on monthly basis, for the 12 months' period the study lasted, the researchers embarked on follow-up visits to each of the households. The follow-up visits were meant to ascertain the extent to which the respondents adhered correctly to the preventive methods provided to them. Also during the follow-up visits, the respondents were counseled to encourage any member of their households with signs and symptoms of malaria to visit the health centre for clinical evaluation, laboratory confirmation and treatment. Those who were clinically diagnosed with malaria were sent to the medical laboratory technician for laboratory confirmation. The laboratory technician collected from finger-prick the blood of those who were confirmed with malaria for thick blood film analysis. The blood was stained with 5% Giemsa for 30 minutes. The thick film was examined using the microscope at 100 high powers (100x objectives). Each film was graded as positive (asexual malaria parasites seen) or negative (no malaria parasite seen) based on inspection of at least 200 fields of thick smear. Those confirmed with malaria infection were treated free of charge. All cases treated were recorded on monthly basis. The monthly follow-up visits which were interactive in nature were carried out once in a month. This means that the researchers made 12 visits during the study period. Data were analyzed using frequency tables.

2.1. Ethical Consideration
The University ethical committee approved the project before it was undertaken. The consent of the participants was sought after briefing them on the objectives of the study. Those who consented were used for the study.
  ➢ Conflict of interest: There is no conflict of interest. The researchers bore all the expenses during the research.

3. Results
The results of this study will be presented in three parts, the control group, and the first and second intervention groups. The effectiveness of the malaria control methods studied was measured by the malaria incidence rate noted in each group.

3.1. The Control Group
The effectiveness of the malaria control measures provided to these respondents was examined. For the 240 individuals in the control group, 24 of them representing 10% of the population were diagnosed and treated for malaria. See table 1

Months	Number Diagnosed and Treated	Percentage
1st month	3	1.25
2nd	2	.83
3rd	2	.83
4th	2	.83
5th	2	.83
6th	3	1.25
7th	3	1.25
8th	1	.42
9th	2	.83
10th	1	.42
11th	1	.42
12th	1	.42
Total	24	10

Table 1: Respondents and number Diagnosed and Treated for malaria monthly

3.2. Findings for First Intervention Group
Out of the 235 individuals in the first intervention group, 6 of them representing 2.6% were diagnosed and treated for malaria in the first 4 months of the study only. See table 2. In the words of 8 respondents "we feel very hot and uncomfortable sleeping inside the bed net without fan. Most of the time we stay outside especially during the moonlight"

Months	Number Diagnosed and Treated	Percentage
1st	2	.85
2nd	2	.85
3rd	1	.43
4th	1	.43
Total	6	2.6

Table 2

3.3. Second Intervention Group
For the second intervention group, it is worthy to note that of all the 218 individuals studied, none was neither diagnosed nor treated for malaria.
The results obtained from the three groups studied showed that the control group had 24(10%) incidence of malaria, intervention group one had 6(2.6%) while intervention group two had no recorded malaria incidence within the period of study.

4. Discussion
This study examined the most effective method of preventing malaria in the community using quasi experimental method. In the process the study used three groups, two for intervention and one for control. The effectiveness of the control measures was measured by the group with least incidence of malaria. Also in providing malaria control measures to the study group, the researchers considered the socio-economic, profitability and practicability of the measures to the respondents. As a result, the individuals in the second intervention group who appeared economically buoyant willingly opted to finance the extra coverings of doors, windows and vents for added protection. The fact that individuals in this group recorded zero malaria infection showed that using health education, treated bed nets in addition to netting of doors, windows and vents is the most effective method of controlling malaria. Also the fact this group had zero infection showed that they adhere strictly to the health education instructions of lowering and tucking in properly the

bed nets as well as ensuring that no mosquitoes entered the rooms or the bed nets before sleeping. If these malaria control measures are strictly followed, malaria disease will be a thing of the past for individuals in the communities (Wongsrichanalai et al 2007)

The fact that the control group were diagnosed and treated for malaria throughout the 12 months of study showed that using health education alone for malaria control is not effective. Similar to malaria eradication programme in Syrilanka Island in the 1960's where spirited efforts were made to achieve the initial success to eradicate malaria without all the control measures in place, there was huge resurgence of malaria as articulated by W.H.O. (2009). The significant enticement for those in the control group was the free consultation, free blood test and free treatment offered to them throughout the period of study.

The finding in the first intervention group where some individuals in the group were diagnosed and treated for malaria in the first four months of the study, thereafter, there was zero malaria incidence for the last eight months of the study shows that in the first four months, the respondents were not consistent sleeping in the mosquito bed nets. This was shown by the respondents' report that they felt hot and uncomfortable sleeping inside the bed net without fan and preferred to sleep or stay outside during moonlight without appropriate preventive measures against mosquito bites. Also the respondents may not have been careful in ensuring that no mosquitoes were trapped in the bed nets or inside the room before sleeping. The study group recording zero malaria incidence for the last 8 months showed that the respondents must have taken all the necessary precautionary measures against mosquitoes bites unlike what they did in the first four months.

5. Conclusion
Since the second intervention group who used health education which included environmental mosquito control measures, insecticide treated bed net, in addition to netting of doors, windows and vents recorded zero malaria incidence, shows that is the most effective method of malaria control measures in malaria endemic areas. It is recommended that for effective malaria control, all malaria control measures should be used at the same time.

6. Recommendation
Based on the findings in the study, the followings are recommended:
  i. Since the long lasting bed nets have life span of four years, it is recommended that users of these bed nets should be encouraged to replace theirs every four years
  ii. Even if the bed nets have not lasted up to the four years' period, bed nets that are torn should be either repaired or replaced.
  iii. Regular seminars and workshops should be conducted to highlight the benefits of sustained use of malaria control measures
  iv. The appropriate government authorities should ensure that regular and compulsory environmental clean-up exercises are carried out to reduce mosquito breeding and malaria parasite transmission.
  v. Experienced community health workers should carryout regular clinical diagnosis for malaria to reduce failure of the rate of detection of malaria cases
  vi. Health care authorities in health centres should provide reliable diagnostic facilities and treatment to reduce the practice of patients scouting for diagnosis and treatment elsewhere.

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