Original Article

Predictors of Indoor Insecticides spray utilization in the Prevention of Malaria related mosquito bites in Ogun State, Nigeria: A Community based study

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ABSTRACT

BACKGROUND: Modern medicine tends to interpret health in terms of medical interventions and to overemphasize the importance of medical technology. It is important to promote the concept of health as the result of the interaction of human beings and their total environment.

METHODS: This was a descriptive cross-sectional study. A cluster sampling technique was used to select the participants into the study. The study was carried out between January 2012 and February 2012. One participant per household was selected into the study. A semi- structured questionnaire was used to collect relevant information which was collated and analyzed using SPSS 15 statistical software.

RESULTS: A total of 400 households were recruited into the study. The prevalence of insecticide spray utilization in the last 6months was 18.5%. Source of information on the use of insecticides included the radio/TV 174 (43.5%), Relatives 78 (19.5%), Health workers 54 (13.5%), friends 68 (17.0%) and others 26 (6.5%). Reasons for not using insecticides included being expensive (cost) 94 (23.5%), fear of side effect 16 (4.0%), Inconvenience 38 (9.5%) and un-availability 74 (18.5%). Predictors of utilization of insecticide spray were young age (<30 yrs) of heads of household (O.R= 5.10, C.I=1.06-21.7), tertiary education (OR= 9.14 C.I=1.13-53.08), Nuclear family structure (OR=2.45 C.I=1.13-3.74) and availability of insecticide spray (OR=2.21 C.I=1.24-4.05).

CONCLUSION: The study shows that households with heads that are young and educated are more likely to use insecticide spray. The study indicates that programs that will be geared towards increasing the knowledge and awareness of indoor insecticide spray in the prevention of Malaria should be introduced at the community level.

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INTRODUCTION

Modern medicine tends to interpret health in terms of medical interventions and to overemphasize the importance of medical technology. It is important to promote the concept of health as the result of the interaction of human beings and their total environment. Malaria has significant measurable direct and indirect costs, and has recently been shown to be a major constraint to economic development[1-4]. One of the major aims of the Roll Back Malaria initiatives is to ensure that individuals, families, communities and health workers are taking preventive measures against malaria[5-6]. Few successes recorded in Malaria control may not result solely from the control strategies, but are also the result of a combination of factors that include changes in the environmental and epidemiological conditions determining the transmission of malaria.

Statistics from the World Health Organization (WHO) Malaria Report 2011 shows that 106 countries in the world are at risk of transmission of malaria infection [7]. A total of 216 million estimated malaria cases occurred worldwide in 2010, 81% of which were reported in the African Region, followed by South East Asia (13%) and Eastern Mediterranean Region (5%). The total number of malaria deaths was estimated to be 655,000 in 2010; 91% of whom occurred in the African Region, 6% in South-East Asia and 3% in the Eastern Mediterranean Region[7].Although the proportion of people exposed to malaria parasites has decreased during the last century, the absolute number of people at risk for malaria infection increased from 0.8 billion in 1900 to 3.3 billion in 2010, as a consequence of the absolute increase of the population living in malaria-endemic regions[7-8].

Malaria constitutes a major economic burden in sub-Sahara countries including Nigeria[9-10]. In some countries with a heavy malaria burden, the disease may account for as much as 40% of public health expenditure, 30-50% of inpatient admissions, and up to 50% of outpatient visits[11-12]. A control strategy comprising of proper application of existing means is advocated. This includes Early Diagnosis and Treatment (EDT) of symptomatic malaria to prevent progression to severe and potentially fatal stages, preventive measures including use of insecticide treated nets (ITNs) and selective residual spraying and prediction, containment and if possible, prevention of epidemics and strengthening of local capacities [9].

WHO advocates the combined approach of insecticide nets or spray and EDT in its Roll Back Malaria initiative [9]. Indoor insecticide spray utilization is generally poor in Nigeria among all categories of people [2-3,9]. Logical framework has been proposed to evaluate the performance and impact of public health interventions.

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This framework has been used in various international studies [13-17]. Evaluating the impact of the different control strategies on the reduction of malaria is an important task; however, it is an extremely complex task with high costs. Some studies have shown that the prevalence of malaria is increasing despite numerous interventions that have been instituted so far. The obstacles to the success of these interventions are socio-cultural, economic, and political in nature [11]. This study was therefore designed to assess the determinants of indoor insecticides spray in the prevention of malaria in Ogun state, Nigeria.

MATERIALS AND METHODS

Background of the study area

The study was conducted in Sagamu local government area (SLGA) Ogun state, which is located in the South Western part of Nigeria. Sagamu local government area is one of the 20 local government area in Ogun state. It was carved out of the former Ijebu Remo local government in 1991 and has a total land area of 68.03km2. It is bounded on the west by the Obafemi Owode local government area, on the east by both Ikenne and Odogbolu local government area and also shares a boundary with Ikorodu local government area of Lagos state in the south.

According to the 2006 census, the area has a population of 253,412 inhabitants which consists of mainly "Remo"-speaking people of Ogun state. Other ethnic groups like the Hausas, Igbos and the Benue people are well represented. Most of the towns are either semi-urban or rural. Other major towns in the local government besides Sagamu include Ogijo, Sotubo, Ode-lemo, Emuren and Simawa. The local government has 15 political wards, 12 of which fall within the Sagamu metropolis. This area is a major transit region between the southwest, southeast and the northern part of Nigeria.

Ilaye community is one of the 20 communities in Sagamu local government areas. There are more than 5,000 inhabitants which consists of mainly "Remo"-speaking people. The head of the community is the Onilaaye. The major occupations of the inhabitants are farming, trading and artisans. Ilaye community is located in the North-eastern part of Sagamu. It is a semi-urban community bounded in the north by Sagamu-Benin expressway, south by Isale-oko community, in the East by Ikenne Rubber Plantation and in the West by Majopa river, Soyindo and Epe communities. The vegetation is the typical rain forest type and seasons alternating between harmattan and rainy seasons.

Study Population

(i) **Inclusion Criteria:** Heads of the household or any member of the household aged 18 years and above available at the time of visit who has resided in the area for at least 6months in each household were included in the study.

(ii) **Exclusion Criteria: Households less than 6 months in the area and a**dults who were not living with them at the time of the study were not included in the study.

Study design

This was an descriptive cross-sectional study that quantitatively explored the determinants of indoor insecticides spray in the prevention of malaria in Ogun state, Nigeria. A cluster sampling technique was used to select the participants into the study. One participant per each household was selected into the study. A semi-structured questionnaire was used to collect relevant information.

Sampling size

The minimum sample size required for the study was estimated to be 216 using the formula

$$\frac{n=z^2pq}{D^2}$$

where n is the sample size,
Zá is the standard normal deviate, set at 1.96 (for 95% confidence interval)
D is the desired degree of accuracy (taken as 0.050 and
P is the estimate of our target population involved in environmental sanitation = 10% [11].

Sampling procedure

Cluster sampling technique was used to obtain a representative sample of the communities in Ogun State. Using a sampling frame of all the local government in Ogun State, Sagamu local government area was selected by simple random sampling by balloting or using a table of random numbers. Sampling frame of all the 20 communities in Sagamu local government areas was drawn. The community where the study was carried out was selected by simple random sampling by balloting). The community selected was Ilaye community.

Using the major tarred road called Lawson road, the community was divided into 4 clusters and two clusters were selected among the 4 clusters identified using simple random sampling (SRS) by balloting. All 134 houses in the clusters selected were visited. Heads of the household or his representative (any member of the household aged 18 years and above available at the time of visit who has resided in the area for at least 6 months) in each household was interviewed in the houses selected.

Study Instrument

The instrument used was a structured questionnaire consisting of 2 parts, namely sociodemographic section (Section A), and utilization of indoor insecticides spray

(Section B). Section A includes information on socio-demographic data such as age, marital status, religion, employment status, ethnic group and educational status. Section B included information on factors associated with use of indoor insecticides spray. Regular use of the insecticide spray was defined as household use of spray for at least 3 times a week.

The questionnaire was pretested among 20 individuals in Ikenne local government, a nearby local government to the study area. Appropriate adjustments were then made to the questionnaire to improve its internal validity.

Data collection

Head of household or his representative (One participant per household who consented to take part in the study) were interviewed using a structured questionnaire, which was administered by a trained interviewer. The study was carried out between January 2012 and february 2012. The interviewers were all medical students rotating through the Community Medicine and primary health care department of the Olabisi Onabanjo University Teaching Hospital during the period of the study and one resident doctor. All participants were interviewed individually over a 10 to 15minute period in a language they can understand. Completed questionnaires were scrutinized on the spot and at the end of the daily field sessions for immediate correction of erroneous entry.

Ethical consideration

Ethical clearance was obtained from the Olabisi Onabanjo Teaching Hospital Ethics Board. Confidentiality on respondents' information was maintained. The purpose, general content and nature of the study were explained to each respondent to obtain verbal and written consent before inclusion into the study.

Data analysis

The data were coded and entered into a computer database using SPSS 15 statistical software. Percentages or means and standard deviation were computed for baseline characteristics of respondents interviewed. The data analysis focused on univariate frequency table and bivariate cross tabulations that identify important relationships between variables. Respondents were categorized into low and high socioeconomic status using location of resident as cut off.

The relationships between variables were examined through bivariate analysis, by computing odds ratio at 95% confidence level and chi squared where appropriate. Predictor variables were restricted to outcome measures that were statistically significant. A p-value = 0.05 or confidence limits which did not embrace unity (1) was considered as statistical significance.

RESULTS

Socio-demographic characteristics of respondents

A total of 400 households were studied. The age of the head of households ranged from 18 to 70 years, (mean 37.24 ± 6.69 years). One- third 266 (66.5%) of the respondents were Christians and 118 (29.5%) Muslims. Majority 362 (90.5%) were of the Yoruba tribe, 6 (1.5%) were Hausas and 32 [8.0%] were Igbos. About half 216 (54.0%) of the respondents have completed a secondary education,74 (18.5%) had a primary education and 32 (8.0%) had no education.

Table 1: Socio-dermographic Characteristics of head of households and Insecticides spray utilization

	Total No [%]	Utilize Insecticides spray No[%]	Do not Utilize Insecticides spray No[%]	p-value
Age of head of household				
<30 yrs	108 [27.0]	28 [37.8]	80 [24.5]	
30-45 yrs	178 [44.5]	32 [43.2]	146 [44.8]	0.044
46-59 yrs	80 [20.0]	12 [16.2]	68 [20.8]	
>60 yrs	34 [8.5]	2 [2.7]	32 [9.8]	
Total	400[100.0]	74 [18▪5]	326 [81▪5]	
Level of Education of head of household				
Nil formal education	32 [8 3]	1 [0 3]	31 [9▪5]	
Primary	74 [18▪5]	10 [13▪5]	64 [19▪6]	
Secondary	216 [54·0]	43 [59▪5]	174 [53▪4]	0·009
Tertiary	78 [19.5]	20 [27.0]	58 [17.8]	
Occupation of head of household				
Unskilled	186 [46·5]	26 [35·1]	160 [49.1]	
Semi- skilled	98 [24·5]	24 [32·4]	74 [22·7]	0·001
Skilled	76 [19·0]	14 [18·9]	62 [19·0]	
Professional	40 [10·0]	10 [13.5]	30 [9·2]	
Type of family				
Nuclear	324 [81·0]	66 [89·2]	258 [19·8]	0·029
Extended	76 [19·0]	8 [10·8]	68 [89·2]	
Structure of family				
Monogamous	240 [60·0]	40 [54·1]	200 [45·9]	0·157
Polygamous	160 [40· 0]	34 [45·9]	126 [54·1]	
Income of head of household				
<N10 000 00	258 [64·6]	42 [56·8]	216 [66·3]	0·08
N10 000-20 000	90 [22·4]	14 [18·9]	76 [23·3]	
>N20,000	52 [13.0]	18 [24·3]	34 [10.4]	

Utilization of Insecticide spray

Source of information on the use of insecticides included the radio/TV 174 (43.5%), Relatives 78 (19.5%), Health workers 54 (13.5%), friends 68z(17.0%) and others 26 (6.5%). Reported methods of home management of malaria infection were self medication 124 (31.0%), use of local herbs 190 (47.5%), prayer 38 (9.5%). Antimalaria drug frequently used as first line drugs are arthemisin combination 78

(19.5%)Chloroqine 36 (9.0%) Sulphamidine derivatives 110 (27.5%). Other preventive methods employed in the prevention of malaria in the household studied were use of coils/paper 172 (43.0%) Repellant creams 56 (14.0%), Insecticide treated nets (ITN) 92 (23.0%), Screening nets 192 (48.0), Otapiapia 86 (21.5%).

The prevalence of indoor insecticide spray utilization in the last 6 months was 18.5%. Reasons for not using indoor insecticides spray include cost 94 (23.5%), side effect 16 (4.0%), Inconvenience 38 (9.5%) and unavailability 74 (18.5%). Habits employed during the spraying of insecticides included the protection of food items 194 (48.5), hand washing 184([46.0%), cleaning exposed surfaces after use 86 (21.5%), dusting bed sheets 80 (20.0%). Side effects reported for regular use included headache 54 (13.5%), Nausea 40 (10.0%), Sneezing 102 [25.5%], Teary eyes 74 (18.5%) and cattarh 64 (16.0%)

Table 2: Other factors influencing the utilization of Insecticide spray in the households

	Total No (%)	Utilize Insecticides spray No[%]	Do not Utilize Insecticides spray No[%]	P Value
Frequency of Malaria infection in the household				
Once in 6 months	262 [65·5]	52 [70·2]	210 [29·8]	0·317
More than Once in 6 months	138 [34·5]	22 [19·8]	116 [80·2]	
Convenience of use				
Convenient	254 [63.7]	52 [70·3]	202 [29·7]	0·119
Not Convenient	145 [36·3]	22 [29·7]	123 [70·3]	
Availability				
Available	254 [63.7]	58 [78.4]	196 [21.6]	0.002
Not Available	146 [36·5]	16 [21.6]	130 [78.4]	
Cost				
Expensive	226 [56·5]	46 [62·2]	180 [37·8]	0·169
Not expensive	174 [43.5]	28 [37.8]	146 [62.2]	

Factors influencing the use of indoor insecticide spray

There was a statistically significant difference in the utilization of insecticide spray among households with high income (X^2=10.25, p=0.027), Nuclear family background (X^2=3.96, p=0.029) and those who believe that the insecticide spray were available (X^2=8.67, p=0.002). The higher the level of education and occupation of the household heads, the more the proportion that utilizes the insecticide spray (X^2=11.62, p=0.009 & X^2=20.52, p=0.0001). Frequency of malaria attack (X^2=3.53, p=0.32), convenience of use of insecticide spray (X^2=1.72, p=0.12) and cost (X^2= 1.18, p=0.27) were not statistically significantly associated with the utilization of spray.

In the multiple logistic regression models, four variables were found to be independently associated factors for utilization of insecticide spray. Predictors of utilization of insecticide spray were young age (<30 yrs) of heads of household (O.R= 5.10, C.I=1.06-21.7), tertiary education (OR= 9.14 C.I=1.13-53.08), Nuclear family structure (OR=2.45 C.I=1.13-3.74) and availability of insecticide spray (OR=2.21 C.I=1.24-4.05).

Table 3: Determinants of utilization of indoor insecticide spray using Multivariate logistic Regression

	Odds Ratio [C.I]
Age of head of household	
<30 yrs	5.10 [1.06-21.7]
31-45 yrs	2·89 [0·60-17·27]
46-59 yrs	1·91 [0·78 11·45]
>=60 yrs	1.00
Level of Education of head of household	
Nil formal education	1.00
Primary	5·18 [0·61-40·79]
Secondary	7.89 [1.12-54.3]
Tertiary	9.14 [1.13-53.08]
Occupation of head of household	
Unskilled	1.00
Semi- skilled	1.23 [0.65-2.11]
Skilled	0.87 [0.43-1.72]
Professional	1.25 [0.35-2.42]
Type of family	
Nuclear	2.45 [1.13-3.74]
Extended	1.00
Income of head of household	
<N10,000.00	1.00
N10,000-20,000	0.97 [0.32-1.75]
>N20,000	2.32 [1.53-5.00]
Availability of insecticides	
Yes	2.21 [1.24-4.05]
No	1.00

DISCUSSION

The study showed that only 18.5% of the households in the population studied regularly used indoor insecticide spray in the last 6 months. This shows that majority of this Nigerian Population are not using indoor insecticide spray. The results of this study are comparable to several surveys in Africa, where insecticide use through ITN varies from 5% to 70% depending on the population studied. Its use is usually high among households with children and pregnant women[18-22].

The most important method of malaria prevention among this Nigerian community was screening of doors and windows with nets followed by insecticide sprays and environmental engineering. The youths were knowledgeable about the mode of transmission of malaria and the benefits of using malaria preventive methods such as nets and insecticides. This is similar to several other studies among the general population where the commonest mode of malaria prevention was

screening nets followed by insecticides sprays and mosquito coils [22-25]. This may probably be because of the convenience involved in the use of screening nets and the fact that it is fixed permanently and does not need a regular maintainance.

The study shows that the major reasons for not using indoor insecticides spray are its un-availability and its high cost. This is similar to findings in several studies which have suggested that the widespread adoption of insecticide spray will therefore probably require a subsidy[25,26]. Vector control is not systematic in any country in Africa and it is carried out with very little evidence. The remote population lives with diagnostic and treatment problems and in houses that do not satisfy the conditions for spraying. Spraying continues to be out of reach for the population that needs it most.

The most effective source of information among the households studied was the mass media; the need to educate individuals about malaria and to implement fumigation and spraying services is indicated in this study. This could be done using mass media. Well constructed information on malaria could easily be disseminated to a large number of people in a short time. Health education on mass media should include control of major endemic diseases such as malaria. This will go a long way in the control of these diseases at the community level in developing countries [27-28].

The study shows that households with heads that are young, educated and with high income are more likely to use insecticide spray. This may be because the use of insecticide spray is being viewed as a risky behavior among the low socio-economic class. This indicates that programs that will be geared towards increasing the knowledge and awareness of indoor insecticide spray in the prevention of Malaria should be introduced at the community level. Health education should be targeted at the less educated and less privileged part of the population in the use of insecticide spray. Emphasis should be placed on the role of environmental control and the use of ITN rather than insecticide spray in the control of Malaria in Africa.

The results of this study should be interpreted cautiously. The study was limited in that it relied on self-report, and is therefore subject to reporting bias. The effect of social desirability bias and telescoping bias may be other potential limitations in this study. Furthermore, the limitations of a cross-sectional study to explore risk and protective factors are important limitations of this study. Despite these limitations, we believe that our data provide useful information for the assessment of the prevalence of indoor insecticide spray use in Nigeria and other low income countries. Our findings have implications for interventions in the control of Malaria in a typical African population.

CONCLUSION

The study shows that households exhibit habits to prevent the occurrence of side effect due to indoor insecticide spray. In many African countries, there is a dirth of environmental health officers and entomologists especially in the rural areas. The government has to ensure adequate environmental control and strengthen the entomology in order to prevent the occurrence of side effect due to indoor spraying. Emphasis should be placed on the role of environmental control in the use of insecticide spray because of the green house phenomenon and recent climatic change in global climate. This can be done through political decisions that take into consideration the technical criteria of the programme.

The study implies that households with heads that are young, educated with high income are more likely to use insecticide spray. This may be because the use of insecticide spray is being viewed as a risky behavior among the low socio economic class in Africa. Therefore, the findings of this study are relevant when one considers that to have lasting control of malaria, the combined impact of the different strategies and of the adequate implementation of each one is necessary. In addition, the current landscape of regions with high and low transmission, which the countries display, requires all the tools and technologies available, as well as adjustment of the strategies and activities to this epidemiological context. The importance of an adequate implementation of the control strategies to maintain the current achievements cannot be exaggerated.

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