

Assessing the Effectiveness and Acceptability of Indoor Residual Spraying (IRS) on Malaria Morbidity in Selected Communities in Bori, Rivers State, Nigeria

R.B. Bob-Manuel

Department of Biology, Faculty of Natural and Applied Sciences, Ignatius Ajuru University of Education, Rumuolumeni, P.M.B. 5047, Port Harcourt, Rivers State, Nigeria

Abstract: - This research was aimed at assessing the effectiveness and acceptability of Indoor Residual Spraying (IRS) in selected communities in Bori, Rivers State. IRS is the process of spraying the inside of dwellings (walls and ceilings) with an insecticide to kill or repel mosquitoes that spread malaria. A structured questionnaire was administered to 500 households and all were retrieved. The result showed a coverage of 59.2%. The population was male dominated (62%) within a vibrant age group of 21 – 40 years (65.8%), comprising business owners (32%), farmers (22%), civil servants (27%) and students (18%). 69.4% of them were permanent residents of over 20 years. Mosquito bites were experienced mainly at night (41%) during the wet season (83%). After five months of the IRS intervention, there was mosquito vector population reduction, 358 (71.6%) but fairly high prevalence of malaria disease (63%). Overall effectiveness of the intervention was 62.2% with 68.2% wholeheartedly accepting the programme. As recommended by the World Health Organization (WHO) and adopted by the National Malaria Control Programme (NMCP), IRS still represents one of the main tools in the basic strategy applied to achieve decreases in malaria cases in Africa, Nigeria and Bori inclusive.

I. INTRODUCTION

Mosquitoes constitute one of the largest dipteran families and are of major significance both as vectors of diseases and as biting pests. Malaria is a life threatening disease caused by parasites that are transmitted to people through the bites of infected *Anopheles* mosquitoes. Malaria has caused much suffering and premature deaths in poorer regions of the tropics. It is endemic in rural and urban communities (Greenwood *et al.*, 2008). According to the World Health Organization (WHO), in 2012 there was an estimated 207 million cases of malaria and 627,000 malaria deaths worldwide (WHO, 2013). The majority of the estimated cases (80%) and deaths (90%) occur in the sub-Saharan Africa. Furthermore, most (77%) of the deaths occur in children under 5 years of age. Still in the World Health Organization report in 2014, there was 198 million cases of malaria worldwide in 2013, with an estimated deaths of 580,000 (WHO, 2014). At the beginning of 2016, malaria was considered to be endemic in 91 countries and territories. The

burden of the disease heaviest in Africa, where 82% and 90% of global cases and deaths, respectively, occurred (Nzena *et al.*, 2018). In 2017, an estimated 219 million malaria cases which caused 435,000 global deaths were reported by WHO (2018). The largest burden of malaria morbidity is in Africa, with 200 million cases (92%) and deaths (93%) (WHO, 2018; Gebrehiwot *et al.*, 2019; Muleye *et al.*, 2019). In 2018, there were an estimated 228 million cases of malaria worldwide. The estimated number of malaria deaths stood at 405,000 (WHO, 2018). More than the world population live in areas where these mosquito species are present. The objectives of malaria vector control are to protect people against infective malaria mosquito by reducing vector longevity, vector density and human-vector contact and to reduce the intensity of local malaria transmission at community level and thus the incidence and prevalence of infection and disease. The most powerful and applied interventions are Long Lasting Insecticide Treated Net (LLITN) and Indoor Residual Spraying (IRS). IRS being one of the methods prescribed by WHO has been used in Rivers State, Bori Communities in particular and awareness has been carried out in the Local Government Area. It is worthy of note that the use of LLITN and IRS in particular are only effective when high coverage are achieved and sustained. This research wishes to establish the effectiveness and sustenance of IRS in Bori and other communities in the Local Government Area.

II. METHODOLOGY

Study Area

The population of the study was in five communities viz: Major, Dorgbam, Nwiikabaari, Nortem and Yoo-yoo. These communities were considered because they are more populated and seem to be more developed, more broad-minded in embracing government interventions particularly the IRS programme, but still have more cases of malaria outbreaks and infections. Pre-survey visits were made to identify the communities, houses and to obtain their consents to participate in the study. Return visit to the consenting communities marked the commencement of the research. Questionnaires were administered to individuals particularly

to the head of households to obtain information on gender, age, number in each house, permanent/temporary residents, spray regime, effectiveness/ineffectiveness of spray, brands of insecticide used etc.

Data Analysis

A total of 500 questionnaires were administered and all were recovered and used for analysis. Simple percentages and frequencies were determined.

III. RESULTS

Indoor Residual Spraying (IRS) intervention took place in the communities. The coverage was fair (Table 1), 296 (59.2%) of houses were sprayed. 130(26%) were not available during the exercise and 14.8% refused to participate. Table 2 summarized the demographic information. The population was male dominated (62%) within a vibrant age bracket of 21- 40 years, 329(65%), who were mainly civil servants (27%), business owners (32%), farmers (22%), and students (18%). A great number had lived in the community for more than 20 years, 347 (69.4%). Mosquito bites were experienced mainly at night (41%), during the wet season (83%). After five months of the IRS intervention, prevalence of malaria was fairly high (63%) in the communities(Table 3). There was however, reduction of mosquito bites after the intervention, 358(71.6%) Some side effects were experienced as indicated in Table 4. Despite the malaria prevalence after the intervention, 62.2% attested the effectiveness of the intervention while 68.2% accepted the programme (Table 5).

Table 1 Coverage of Indoor Residual Spraying (IRS) Intervention in Selected Communities in Bori

S/N	Statement	Respondents	Percentage (%)
1.	Houses/Rooms Spraying	296	59.2
2.	Not available during the exercise	130	26.0
3.	Refusals:		
	• Fear of side effects of chemical	20	4.0
	• Dislike chemicals	36	7.2
	• No reason	18	3.6

Table 2 General demographic information of respondents in selected communities in Bori

S/N	Statement	Frequency	Percentage (%)
1.	Gender:		
	• Male	310	62.0
	• Female	190	38.0
2.	Age Range:		
	• 15 – 20	99	19.8
	• 21 – 40	329	65.8
	• 41 and above	72	14.4

3.	Occupation:		
	• Farming	111	22.2
	• Trading/Business	160	32.0
	• Civil Servants	135	27.0
	• Student	92	18.4
4.	Residency:		
	• 20 years and above	347	69.4
	• Less than 20 years	153	30.6

Table 3 Times and seasons of mosquito bites and malaria reports after Indoor Residual Spraying (IRS) Intervention in Bori

S/N	Statement	Frequency	Percentage (%)
1.	Mosquito bites during the day:		
	• Early morning	152	31.6
	• Afternoon	40	8.0
	• Evening	97	19.4
	• Night	205	41.0
2.	Season bites:		
	• Wet season	415	83.0
	• Dry season	85	17.0
3.	Malaria reports:		
	• Yes	410	82.0
	• No	90	18.0

Table 4 Comments of respondents on Indoor Residual Spraying(IRS) about five months after Intervention in Bori

S/N	Statement	Frequency	Percentage (%)
1.	Reduction of Indoor biting mosquitoes	358	71.6
2.	Experienced and disliked smell of chemical	61	12.2
3.	Experienced increased heat/temperature	48	9.6
4.	Experienced skin irritation	33	6.6

Table 5 Effectiveness and Acceptability of Indoor Residual Spraying (IRS) Intervention after five months in Bori

S/N	Statement	Frequency	Percentage (%)
1.	Malaria Prevalence:		
	• Yes	317	63.4
	• No	183	36.6
2.	Effectiveness:		
	• Yes	311	62.2
	• No	189	37.8
3.	Acceptability:		
	• Highly accepted	341	68.2
	• Partially accepted	119	23.8
	• Not accepted	40	8.0

IV. DISCUSSION

Malaria vector control strategies are to protect people against malaria mosquito bites by reducing vector longevity, vector density and human-vector contact and to reduce the intensity of local malaria transmission at community level and thus the incidence and prevalence of infection and disease. Despite the wide number of promising control tools against mosquitoes, current strategies for malaria vector control used in most African countries including Nigeria are not sufficient to achieve successful malaria control. The majority of National Malaria Control Programmes in Africa still rely on Indoor Residual Spraying (IRS) and Long-Lasting Insecticidal Bed Nets (LLINs). These methods reduce malaria incidence but generally have little impact on malaria prevalence (Benelli and Beer, 2017). These statements are in line with the reports of this work. There was significant reduction of indoor biting mosquitoes by 71% but the prevalence of malaria disease was fairly high (63%). Gari and Lindtjom (2018) commented that the core vector control measures, LLINs and IRS reduce the risk of malaria infection by targeting indoor biting mosquitoes. These two interventions however, are found to be effective in malaria vector control, but not sufficient to eliminate malaria. IRS is suitable for malaria transmission particularly in high endemic areas. It has been implemented since 2006 (Tukei *et al.*, 2017). WHO (2006) stated that for IRS to be effective, 80% of homes and barns in an area must be sprayed; and if enough residents refuse spraying, the effectiveness of the whole programme can be jeopardized. Although the coverage of the programme in this findings was fair compared to the WHO recommendation, there was no total refusal of spraying. Reduction of mosquito bites by 71.6% and overall effectiveness of 62.2% are encouraging. The shortfall could be due to the fact that about 26% of the residents were not available during the exercise for the fact that majority of the target population were vibrant youths who were engaged in businesses, farming, civil servants, students, etc. Also, Teguine *et al.*, (2019) estimated high coverage in IRS (89.3%) but commented that households of respondents who were formally employed or owned any form of business were more likely to be unsprayed. This was perhaps the likely situation in this study. IRS is important in the control of the mosquito vector of malaria, which often rest on walls before and after feeding, unlike the *Culex* and *Aedes* mosquitoes that most often tend to rest indoors on objects that cannot be sprayed like curtains, clothes, furniture and the like. Dwellings in the communities in focus had suitable walls for the exercise.

V. CONCLUSION

The coverage of IRS intervention in Bori was fair and it was associated with significant reduction of vector activity which however, was not sustained in eliminating the prevalence of malaria disease. The programme was effective and wholeheartedly accepted. However, future IRS interventions should be extended to other communities in the State taking all necessary steps to ensure more effective implementation,

including selecting appropriate and authorized insecticide that would be void of unacceptable side effects. Spraying where and when should be well considered to sustain high level of coverage.

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