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Preventive Measures Against The Vectors Of Malaria In Akanda, Southwest Gabon: Knowledge, Attitudes, Practices, And Beliefs

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Abstract

Background: Reliable data on the Knowledge, Attitudes, Beliefs, and Practices (KABP) of the indigenes of Akanda and its environs on the different approaches to fight against vectors of malaria is lacking. Objective: To evaluate the KABP of the indigenes of Akanda and its environs on the different techniques used to fight against vectors of malaria. Materials and Methods: A cross sectional survey using semi-structured questionnaires was conducted on heads of randomly selected households at Akanda from April to June 2019. Results: We interviewed 369 heads of households and the population had a high literacy rate. It was noticed that 94% of respondents knew that mosquitoes could transmit malaria. More than 80% believed that Insecticide-Treated bed Nets (ITNs) could protect them from malaria infection. There was no preference in ITNs usage with age cohorts and seasons of the year. The ITNs owned by respondents were mostly purchased from shops. Respondents underlined that their reluctance to sleep under ITNs was because of their inability to breath under such conditions. Also, apart from the use of ITNs for malaria control, Indoor Residual Spraying (IRS) using insecticides (mostly Rambo®) purchased from shops and cleaning around house surroundings were practiced by >50% of respondents. Conclusion: Despite respondent's awareness of mosquitoes as vectors of malaria as well as the use of ITNs, IRS, and cleaning of home surroundings to reduce malaria vectors burden, the ITNs coverage rate is very weak and more sensitization is also required at Akanda in Gabon.

Keywords: Malaria, vectors, KABP, control, Akanda, Gabon

Introduction

Malaria remains an important parasitic disease of man despite tremendous efforts over the years to bring the infection rates to bay (Badger-Emeka, 2020). Africa remains the most affected continent with 93% (213 millions) of global malaria burden and 94% deaths (WHO, 2018). Besides malaria, arboviral infections such as dengue, chikungunya, yellow fever and Zika fever, threaten 831 millions people worldwide, including 70% of the African population (Zahouli *et al.*, 2017).

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In Gabon, arthropod-borne diseases are a threat to its public health (Paupy *et al.*, 2012; Minsanté-SNIS, 2018a; Minsanté-SNIS, 2018b). According to the National Health Information System (NHIS) of Gabon, malaria was the cause of 153 666 cases of consultations and 160 deaths recorded in health care facilities in 2016 (Minsanté-SNIS, 2016). According to Leroy *et al.* (2009), the 2007 Chikungunya epidemic affected nearly 20,000 individuals in the country. Malaria in particular is the main scourge to economic development (due to its high mortality and morbidity rates) as well as school and professional absenteeism in Gabon (Minsanté-SNIS, 2016).

The fight against these vector-borne diseases relies on the control of vector populations (Diakarida *et al.,* 2019 ; Beugre *et al.,* 2020 ; Zagui *et al.*, 2020). The major component of vector control is through the use of insecticides that are applied via different modes (Sevidzem *et al.,* 2019). In the case of mosquitoes, The different modes of insecticide application include insecticide-treated bed nets (ITNs or LLINs), and Indoor Residual Spraying (IRS) (Nd'ri *et al.,* 2020).

The malaria control program of the Ministry of health in Gabon is the only public organ responsible for the fight against malaria and its vectors and has been involved in mass control programs such as distribution of insecticide bed nets and sensitizations. At the community level, indoor residual spraying is common and most of these insecticides are purchased from local vendors (Nd'ri *et al.,* 2020). In 2018, Koumba *et al.* (2018) established the occurrence of resistant alleles (kdr-w and kdr-e) in a rural community of Gabon and attributed this to insecticide resistance selection pressure caused by the repeated usage of some non-standard insecticides. Because the community of Akanda was reported to have high malaria vector abundance and malaria prevalence (Pamba *et al.*, 2020a; Pamba *et al*., 2020b), it was deemed necessary to conduct a survey to evaluate the knowledge, attitudes, practices, and beliefs of the population of Akanda on the fight against the vectors of malaria in order to provide reliable data required by malaria control program of Gabon.

Materials and Methods

Study area

This study was conducted in the city of Akanda (0°30'00" North; 09°30'00" East) (Figure 1), a suburban area located in the northern periphery of the city of Libreville, the capital of Gabon. Akanda covers 45 482 hectares of land and is part of the departement du Komo-Mondah in the province de l'Estuaire.

There are several socio-economic activities including trading, sports, health, education, and tourism in this locality. Entomologically, the study of Pamba *et al.* (2020a) identified several breeding sites as well as adults of the

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vectors of malaria and arboviruses in Akanda. A hospital-based survey indicated that Akanda is a malaria endemic zone (Pamba *et al.*, 2020b).

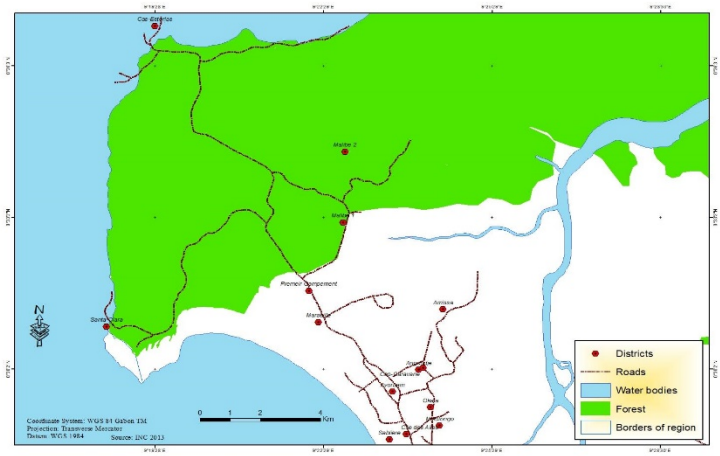

Figure 1. Map showing the study area (Akanda) and its districts

Ethics

Oral consent was received from the target population before commencing the study.

Cross-sectional survey

Three hundred and sixty nine (369) heads of households residing in Akanda and its environs were randomly selected and included in the study.

Data analysis

Data analysis was conducted using Sphinx Plus^2 version 5.0. Descriptive statistics (frequencies and percentages) were calculated.

Results

Description of respondents

A total of 369 heads of households were interviewed and consisted of 187 males and 182 females. The age cohort that was most highly represented was from 20-29 years old. Concerning the level of education, most of the respondents had completed secondary school. Based on the housing type, most of the buildings of respondents were constructed with cement blocks (Table 1).

Table 1. Socio-demographic information of the study population

Parameters	Category	Number	Proportion (%)
Sex	Male	187	50.68
	Female	182	49.32
Age	15-19	27	7.32

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	20-29	119	32.25
	30-39	92	24.93
	40-49	85	23.04
	>50	46	12.47
Level of education	No response	1	0.27
	Never been to school	34	9.21
	Primary	37	10.03
	Secondary	144	39.02
	Professional school	61	16.53
	University	92	24.93
Housing type	Cement blocks	249	67.48
	Wood	90	24.39
	Soil bricks	30	6.78

Respondents knowledge on malaria

A majority (94%) of the respondents attributed malaria to bites from infected mosquitoes. Only 6% had erroneous knowledge on the cause of malaria (Figure 2).

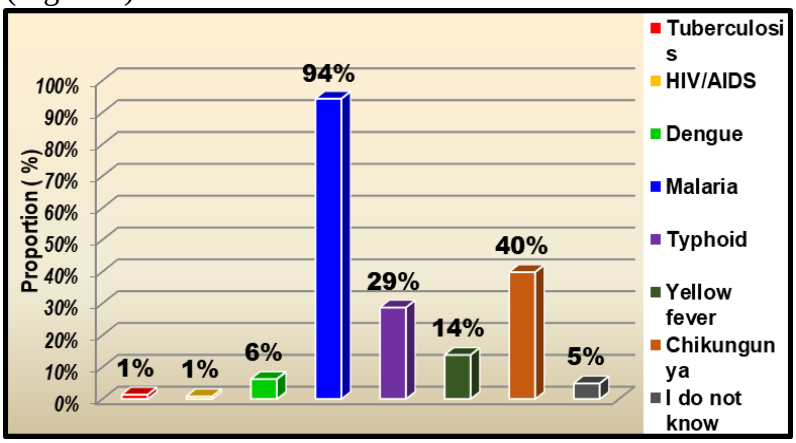

Figure 2. Knowledge of respondents on mosquito as vector of malaria

Respondents knowledge on the different mosquito control approaches

More than eighty percent (80 %) of respondents were aware of the use of insecticide-treated bed nets (ITNs/LLINS) to control malaria. More than 60% of the respondents cleaned around their households to kill mosquitoes (Table 2). The most frequently used insecticide for Indoor Residual Spraying (IRS) to kill mosquitoes was Rambo® (62.06%) and Raid® was rarely used (Table 2).

Table 2. Knowledge of respondents on the fight against malaria vectors

Parameter	Category	Number	Proportion (%)

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Which method(s) you know is used to fight against mosquitoes	No response	1	0.27
	Fan	112	30.35
	Vaccination	48	13.01
	Mosquito	186	50.41
	Mosquito nets	301	81.57
	Insecticide	193	52.30
	Air conditioner	19	5.15
	Cleaning around homestead	243	65.85
	Others	16	4.34
Types of insecticide brands used to kill mosquitoes	No response	2	0.54
	None	89	24.12
	Rambo®	229	62.06
	ORO®	26	7.05
	Killit®	30	8.13
	Killtox®	4	1.08
	Raid®	1	0.27
	Others	64	17.34

Respondents knowledge, attitudes, Practices, and Beliefs on insecticide-treated bed nets

A high proportion of the respondents used insecticide-treated bed nets to prevent the bites of mosquitoes. Most respondents (82.66%) stated that children as well as adults slept under ITNs. A high number of respondents stated that they used ITNs was all year round. We noted that some respondents did not choose to sleep under ITNs because of the difficulty breathing under such conditions (Table 3).

Table 3. Respondents knowledge, attitudes, practices, and beliefs on the use of insecticide-treated bed nets

Parameters	Category	Number	Proportion (%)
Do you use mosquito nets?	No response	227	61.52
	Yes	105	28.46
	No	37	10.03
Reasons why you do not use mosquito bed nets	No response	328	88.89
	Negligence	11	2.98
	Difficult to use	3	0.81
	I feel heat when sleeping under mosquito bed net	9	2.44

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	Difficulty breathing when sleeping under mosquito bed net	16	4.34
	It disturbs me from sleeping	4	1.08
	Others	5	1.36
Persons sleeping under mosquito bed nets	No response	227	61.52
	No body sleeps under mosquito bed nets	21	5.69
	Children between 0 to 5 years old	30	8.13
	Children and adults	99	26.83
	Pregnant women	3	0.81
Which period of the year do you use mosquito bed nets?	No response	1	0.27
	Dry season	8	2.17
	Rainy season	41	11.11
	Throughout the year	305	82.66
	I do not know	14	3.79

It was observed that most of the respondents purchased their ITNs from shops (Table 4). Some that received free ITNs said it was from family members, friends, etc. In Gabon, the price of a mosquito net ranges from 3500 to 8000 FCFA.

Table 4. Source of acquisition of mosquito bed nets

Parameter	Category	Number	Proportion (%)
Mode of aquisition of mosquito nets	No response	228	61.79
	Purchase	106	28.73
	Free	40	10.84

Discussion

Results from surveys on knowledge, attitudes, beliefs and practices are applicable to design or improve malaria control programs, and to identify indicators for a program's effectiveness (Mazigo *et al.*, 2010). The result of our study can be incorporated into the decision-making processes, the design of sustainable interventions with active community participation, and the implementation of sensitization schemes in Gabon. The study population consisted of literate adults who were able to understand our research questions.

About 94% of the respondents were aware that mosquito bites could lead to the transmission of malaria. This observation has also been made in Nigerian communities by Enato *et al.* (2007) and those in Côte d'Ivoire by N'di *et al.* (2020). We noted that in addition to the usage of ITNs, respondents (60%) also cleaned around their buildings to destroy the breeding sites of mosquitoes. This practice of respondents fits perfectly with scientific findings

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of Pamba *et al.* (2020a) who reported that abandoned containers as well as natural substrates constituted mosquito breeding sites in Akanda.
Indoor Residual Spraying (IRS) was equally practiced by more than 50% of the respondents. However, the insecticide that was mostly used for the IRS was Rambo® and this could be explained by the fact that it is cheap and available in shops (Mbouloungou *et al.,* 2020). We found that more than 80% of the respondents were aware that the use of ITNs could prevent malaria. This observation has been made by N'dri *et al.* (2020) and Jumbam *et al.* (2020). However, only The respondents reluctance to sleep under ITNs was because it impaired breathing and generated heat. This observation has been made in a similar survey in Angola by Foumane *et al.* (2015) and in Ghana by Owusu *et al.* (2018).

Also, most respondents allowed children and adults to sleep under ITNs and this practice has been observed elsewhere by different authors (Owusu *et al.,* 2018 ; Jumbam *et al.,* 2020).

Most respondents used ITNs throughout the year and this could be due to the annual aggressivity pattern of mosquitoes that makes them use this approach all the time. This observation corroborated the finding of Maghendji-Nzondo *et al.* (2016) and Mbouloungou *et al.* (2019) that malaria cases occurred throughout the year with peak in the short rainy season. We found that most respondents purchased ITNs themselves and only few individuals were provided to them free. Because most individuals prefer to use ITNs donated for free than to purchase, this could explain the low percentage of those who use ITNs to fight malaria in Akanda and its environs.

Conclusion

We noticed that 94% of the respondents were aware of the fact that malaria is transmitted by mosquitoes. More than 80% of them believed that ITNs could prevent malaria infection. However, only 28.5% of respondents reported using ITNs. The use of Indoor Residual Spray (IRS) and cleaning around houses was also practiced. There was no preference in ITNs usage by age cohort or season of the year. The ITNs used by most respondents were purchased. This preliminary finding on the KABP of the indigenes of Akanda and its environs on the use of malaria preventive measures will instruct the malaria control program of Gabon to prepare and execute effective control approaches for this part of the country.

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