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Use of insecticide-treated mosquito nets in Mususa Commune in Butembo, Democratic Republic of the Congo, after the distribution campaign

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ABSTRACT

Introduction: this study aimed to determine the factors of the underutilization of the insecticide-treated mosquito nets in Mususa Commune so as to guide health authorities in planning health education.

Methods: it was about a cross-sectional study, conducted from April 2nd to May 6th, 2015 on 400 heads of households of MususaCommune.

Results: A rate of use of mosquito nets impregnated with insecticide of 62.25% was observed. The female sex (RR:0.67; 95% CI:0.53-0.85) , ITN protects against rats (RR:0.21;95%CI:0.06-0.76), use of mosquito nets impregnated with insecticide not required (RR 0.47 ; 95% CI : 0.24-0.92), water as a vehicle for malaria (RR: 0.67 ; 95% CI: 0.49-0.91), use of turns (RR:0.59; 95% CI: 0.35-0.99) are the factors associated with the underutilization of insecticide-treated mosquito nets in Mususa commune.

Conclusion: The good use of insecticide-treated mosquito nets is an effective way to reduce the incidence of malaria in Butembo.

Keywords: Use, insecticide-treated mosquito nets, MususaCommune

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INTRODUCTION

Malaria is one of the most common infectious diseases . It is a major public health problem in the world, particularly in Africa and South Asia. It is caused by a microscopic parasite transmitted by mosquito bites [1]. About 50% of the world's population lives in areas where there is a risk of getting malaria from infected mosquito bites [1]. Each year, this disease affects around 250 million people and kills one million, mostly African children under five [1]. Most deaths occur in children in Africa. In Africa, every minute a child dies from malaria although the child mortality rate has decreased by 58% compared to 2000 [2]. While standards set insecticide-treated mosquito net coverage at least 80% in malaria-endemic areas for the entire population, it is estimated that 50% of households in sub-Saharan Africa have a mosquito net [3].

A study conducted in Brazzaville in 2005 indicates that 7.7% of all household heads surveyed used insecticide-treated mosquito nets [4]. In Ivory Coast, the initial rate of children who slept under a mosquito net before the distribution of ITNs was 16.7%. It is identical to the rate for children under 5 years of age in 2006,during a multiple indicator survey, which reported a rate of 17.1% [5].

In the Democratic Republic of Congo (DRC), the Demographic and Health Survey report found a prevalence of 31% of malaria cases among children under five. Indeed, this survey found that only 19% of children under 5 years spent the last night under insecticide-treated mosquito nets (ITNs) [6]. In most rural areas of tropical Africa, the walls and roofs of each home are not joined and each sleeper is exposed to tens or even hundreds of mosquito bites each night. Even if they did not transmit any severe disease; encouraging the use of mosquito nets would remain an essential act of health education [7]. Therefore, this study will answer the question: What are the factors underlying the underutilization of ITN in Mususa Commune given high prevalence of malaria?

This study aims to determine the factors of the underutilization of Insecticide-impregnated mosquito net in Mususa Commune in order to guide health authorities in the planning of health education.

METHODS

Study design and setting: It was a cross-sectional analytical study, carried out from April 2nd to May 6th, 2015. Was included in our study any head of household belonging to our sample and having accepted to fill our questionnaire or to answer our interview. This study was carried out in Mususa commune. This is one of the four communes of the city of Butembo, located in the North-Kivu Province, in the East of the Democratic Republic of theCongo. This commune is extended on 40.3km² and its temperature varies between 17°C and 25°C. The population is homogeneous, estimated at 203 425 inhabitants in 2014. (Annual report of the Municipality of Mususa 2014). Our study population was 203,425 Inhabitants among whom 400 heads of households were surveyed. Simple one-stage random sampling was applied with no-show ballot. The stratification was done by drawing 3 papers without discount which corresponded respectively to quarters found in Mususa commune: Bwinongo with 5058 households, Katwa with 5349 households and Vungi with 4043 households. This gives a total of 14450 households. Hence the below breakdown of the number of households to survey by quarter:

Stratum1:Bwinongo:

$$\frac{5058}{14450} \times 400 = 140 \text{ Households}$$

Stratum 2:

$$\frac{5349}{14450} \times 400 = 148 \text{ Households}$$

Katwa:

Stratum 3:

$$\frac{4048}{14450} \times 400 = 112 \text{ Households}$$

Vungi:

Definition of variables: To collect the data, we have previously designed a survey questionnaire (with these variables: Age, sex, religion, profession, level of education, marital status, household size, number of children under 5, household income, awareness of INT, its importance and transmission pathways of malaria, alternative to the use of ITNs, barrier to the use of ITN) and we also interviewed heads of household who were not able to read or write, and therefore not able to fill our questionnaire.

Ethical consideration: This work does not present an ethical problem ; nevertheless, we respected the principle of anonymity and our respondents answered us voluntarily.

Data analysis: We used the Microsoft Office Excel 2007 softwareand SPSS 17.0 software so as to process and analyze the collecteddata; we also used the Epi-info software calculator. The compliance test(Pearson's Chi-square) was used to measure the strength of association between the dependent variable and the independent variables. We also used relative risk (RR) to assess the strength of association between factors and the use of ITN

RESULTS

Table I : Involvement of individual and demographic characteristics in non-use of ITN.

Variable	Modality	N	Positive	%	X^2	dOF	P	RR	Limitations
Sex	Male	307	207	67.43				1.49	1.18 to 1.89
	Female	93	42	45,16				0.67	0.53 to 0.85
	Total	400	249	62.25	15.058	1	0,000		
Age	18-25	41	19	46.34				0.72	0.52 to 1.01
	26-35	101	59	58.41				0.92	076 to 1.11
	36-45	80	56	70,00				1.16	0.98 to 1.37
	46-55	79	53	67.09				1.10	0.92 to 1.31
	56-65	62	37	59.68				0.90	0.72 to 1.16
	66-75	22	15	68.18				1.10	0.82 to 1.48
	76 and above	15	10	66.67				1.07	0.74 to 1.55
	Total	400	249	62.25	8.508	6	0.203		
Religion	Catholic	186	119	63.98				1.05	0.90 to 1.23
	Protestant	155	95	61.29				0.98	0.83 to 1.14
	Muslim	9	4	44.44				0.71	0.34 to 1.48
	Sect	9	4	44.44				0.71	0.34 to 1.48
	Other	41	27	65.85				1.06	0.84 to 1.35
	Total	400	249	62.25	2,952	4	0,566		
Profession	Farmer	139	82	58.99				0.92	0.78 to 1.09
	Teacher	28	16	57.14				0.91	0.66 to 1.27
	trader	66	39	59.09				0.94	0.76 to 1.17
	State Agent	23	9	39,13				0.61	0.37 to 1.03
	Healthpersonnel	23	12	52.17				0.83	0.56 to 1.24
	Resourceful	62	42	67.74				1.11	0.91 to 1.34
	Other	59	49	83.05				1.42	1.22 to 1.64
	Total	400	249	62.25	19.103	6	0,004		
Level of education	Schoolneverattended	64	40	62.50				1	0.82 to 1.24
	Primary	102	56	54,90				0.85	0.70 to 1.03
	Did not finish secondary	57	42	73.68				1.22	1.02 to 1.46

	Secondarystudies	92	60	65.22				1.06	0.89 to 1.26
	Bachelorstudies	85	51	60,00				0.95	0.79 to 1.16
	Total	400	249	62.25	6.044	4	0.196		
Marital status	Single	54	26	48,15				0.75	0.56 to 1.00
	Married	252	167	66.27				1.20	1.01 to 1.42
	Widower	40	23	57.50				0.92	0.69 to 1.21
	Divorced	6	1	16.67				0.26	0.04 to 1.56
	Living in common-law	48	32	66.67				1.08	0.87 to 1.34
	Total	400	249	62.25	12,390	4	0,015		
Household size	1-2	45	28	62.22				1.00	0.78 to 1.27
	3-4	82	49	59.76				0.95	0.78 to 1.16
	5-6	117	81	69.23				1.17	1.00 to 1.36
	7-8	78	44	56.41				0.89	0.72 to 1.10
	9 and over	78	47	60.26				0.96	0.79 to 1.17
	Total	400	249	62.25	3.90	4	0.419		
Childrenunder 5 years	0	180	103	57.22				0.88	0.76 to 1.03
	1-2	193	129	66.84				1.15	0.99 to 1.34
	3 and more	27	17	62.96				1.01	0,75 to 1,34
	Total	400	249	62.25	3,672	2	0,159	0.88	0.76 to 1.03

Table II : Use of Mosquito net and household monthly income

Variable	Modality	n	Positive	%	X^2	dOF	P	RR	limitations
Monthlyincome in $	30- 59.9	2	2	100.0				1.58	1.41 to 1.78
	60-99.9	8	6	75.00				1.19	0.78 to 1.81
	100- 149.9	13	7	53.85				0.84	0.50 to 1.40
	150-99.9	21	11	52.38				0.80	0.52 to 1.23
	200-399.9	27	18	66.67				1.06	0.79 to 1.42
	300-499.9	50	30	60,00				0.92	0.71 to 1.20
	500-749.9	21	15	71.43				1.14	0.85 to 1.54
	750-999.9	8	7	87.50				1.40	1.05 to 1.87
	≥1000	12	7	58.33				0.91	0.56 to 1.49
	Total	162	103	63.58	6.331	8	0 610		

Table III: Implication of socio-cultural characteristics in the non-use of ITNs.

Variable	Modality	N	Positive	%	X^2	dOF	P	RR	limitations
Havingheardabout ITN	Distribution	103	69	66.99				1.11	0.94 to 1.30
	Hospital	163	97	59.51				0.93	0.79 to 1.09
	Church	10	3	30,00				0.49	0.19 to 1.26
	Radio / TV	34	16	47.06				0.74	0.51 to 1.06
	School	46	31	67.39				0.9	0.88 to 1.36
	Street / third party	44	33	75.00				1.24	1.02 to 1.49
	Total	400	249	62.2	12.832	5	0,025		
Importance of ITNs	Dirt	1	0	0.00				-	-
	Bites	379	245	64.64				3.39	1.40 to 8.22
	Rats	15	2	13.33				0.21	0.06 to 0.76
	Aesthetic	1	1	100.00				1.61	1.49 to 1.74
	Luxury	4	1	25.00				0.40	0.07 to 2.18
	Total	400	249	62.25	20,815	4	0,000		
Transmission of Malaria	Water	53	23	43.40				0.67	0.49 to 0.91
	Region	9	6	66.67				1.07	0.67 to 1.71
	Mosquito bites	272	180	66.18				1.23	1.02 to 1.47
	Eat and drink	26	13	50,00				0.79	0.54 to 1.17
	Climate	40	27	67.50				1.09	0.87 to 1.38
	Total	400	249	62.25	12.006	4	0,017		
Alternative to ITNs	Insecticide	90	61	67.78				1.12	0.94 to 1.32
	Mosquito coil	24	9	37.50				0.59	0.35 to 0.99
	Perfume	30	15	50,00				0.79	0.55 to 1.14
	Nothing	256	164	64.06				1.09	0.92 to 1; 28
	Total	400	249	62.25	9,700	3	0,021		0.94 to 1.32
Barrier to use ITN	Heat								
		24	11	45.83				0.72	0.47 to 1.13
	Itsshape	17	8	47.06				0.75	0.45 to 1.25
	Nuisance	29	11	37.93				0.59	0.37 to 0.95
	Not required	20	6	30,00				0.47	0.24 to 0.92
	Let mosquitoespass	27	12	44.44				0.70	0.46 to 1.07
	Headache	10	6	60,00				0.96	0.58 to 1.61
	No obstacle	273	195	71.43				1.68	1.35 to 2.08
	Total	400	62.25	249	34.24	6	0,000		

DISCUSSION

Table I shows us that there is dependence between sex and the use of ITN, because theoretical Chi-square is less than calculated Chi-square. In addition, this table shows that the use of ITN is significantly related to the male sex, and that the female sex has a significant association with non-use. This result is contrary to that found in a survey done in Guinea which revealed that the male is directly and inversely associated with non-use of ITNs [8].

In addition, we also observe that the age of the head of household has a non-significant association with the use of ITN. Our study found a result opposite to the one, demonstrated in five African countries, where age has been shown to influence the use of ITN [8]. Simultaneously, by linear regression, with a difference in results, Pierre Akilimali found that the probability of using ITN decreased with age [9]. From the same table, we noticed that there is independence between religion and the use of ITN because. The same findings were noticed in a study conducted in Burkina Faso[10]. A research conducted in Niger indicated that cultural beliefs are not the true explanatory factors for non-use of ITNs [11].

From the same table, we found that there is a dependency between inhabitant profession and the use of ITN. These findings are similar to the one of a study carried out in Ethiopia where the cost-effective occupation of the household head was an important factor in the possession and use of ITN [12].

Concerning the level of education, we observe that there is independence between this factor and the use of ITN. This result is different from what Pierre Akilimali found. In fact, this author found that the level of education influences the use of the impregnated mosquito net (9). The same deference was noticed in Burkina Faso, where the level of schooling influenced the use of ITN [10]. The reason for divergence between our results and those of these authors would be related to other factors such as the accessibility of different levels of education to health education or the intervention of cultural factors. But also, we found that those who had not finished high school were significantly 1.22 times more likely to use ITN than household heads from other education levels.

As far as the marital status is concerned, there is a dependency between the latter and the use of the ITN. This is also the result that a post-distribution survey study found in Burkina Faso: the marital status of the head of household is a factor influencing the use of ITNs [10]. Indeed, we have noticed that marriage has a significant association with the use of ITN. On the other hand, divorce is a determining factor in a non-significant association with the non-use of ITN.

From the same table, it appears that the fact that a household which has one to two people does not influence the use of ITN nor does it induce non-use. On the other hand, when the household has a size of 5 to 6 people, the non-significant association with the use of ITN is observed. In contrast, by logistic regression, P. Akilimali found that the probability of using ITN decreased with household size [9].

At last, from the table I, we observe that the use of ITN by household heads was 1.15 times higher in households with one to two children under five years of age. This result is similar to the one reported in a Gambia study: the use of ITN is significantly associated with the number of children under five in the household, as well as when there are children aged five to 10 years [13]. The study conducted in Equatorial Guinea adds that this presence must be less numerous [8]. , it is similar to our study which brings out the similar findings.

From Table II, we note that there is an independency between the level of household monthly income and the use of ITN in Mususa commune. This result different from the findings of a South China survey where there was a significant relationship between the monthly income of the household head and the use of ITN [14].This difference is explained by the fact that our study was carried out after a free mosquito nets distribution campaign.

From Table III, we note that there is a dependency between having heard about the ITN and its use. This result is similar with Akilimali's findings. In fact, Akilimali found a relationship between household exposure to the awareness message and the use of ITN [9]. However, we found that the use of ITN was significantly 1.24 times higher for household heads who had never been sensitized to the use of ITN but having heard about the ITN than heads of household who had already heard about it (this is negligence). But also, we notice that those who heard about ITN during the distribution campaign have used it 1.11 times. This last result goes in the way of the observation in Burkina Faso which stipulates that the use of the ITN was also associated with the number of information, education and communication sessions on the subject [10].

From the same table, it appears that there is a dependency between the importance of ITN and its use. This finding is similar with that of another study in Burkina Faso that found that inhabitants

who thought ITN protected against mosquito bites significantly used ITN [12]. Thus, we observed that among those who knew the importance of ITN as protection against mosquito bites, the use was significantly 3.39 times higher for these heads of households than for others (who knew otherwise). But, the fact of thinking that ITN protects against rats and cockroacheswas significantly associated to the non-use of ITN.

We found that there is a dependency between knowledge of the malaria transmission pathway and the use of ITN. Our study is in agreement with the one carried out in Niger, which has shown that negligence, which refers to a poor knowledge of the disease and its etiology, and to a singular perception of the usefulness of this technical tool lead significantly to the non-use of ITN, and a perfect knowledge of the mode of transmission of malaria significantly lead to the use of ITN [11]. Thus, we realized that knowledge of malaria transmission pathway determined a significant association with the use of ITN. On the other hand, when household heads thought that water was the vehicle of malaria, this determined a significant association between this knowledge and the non-use of ITN.

In addition, there is also a dependency between the use of alternatives to ITN and its use. Results found in the region of South of China explained that the burning of the smoke turns and the use of the insecticides intra-domiciliary induced in the non use of the ITN [14]. These observations support this last finding in our study, for when using electronic mosquito swatter, we observed a significant association between this factor and the non-use of ITN.

Through the same table, we note that there is a dependency between identifying an obstacle to the use of ITN and its non-use. In the same way, a study conducted in Niger in 2012 found that the non-use of the ITN was justified by the feeling of suffocation and the disruption of sleep by this protective tool [11].We also identified the same factor, but the most incriminated in our study was the belief that ITN was not required in the community. We also observed that failure to identify an impediment to the use of ITN resulted in a significant association between this factor and the use of ITN.

CONCLUSION

The non-use of ITN was significantly associated with certain factors related to the head of household : the female gender, the fact that the use of ITN is used to protect against rats and cockroaches, the fact that the use of ITN is not required in her environment, the knowledge of wherein water is the carrier of malaria and the use of electronic strike-mosquito (electronic mosquito swatter). By acting on these factors, especially during the health education, the health expert will easily contribute to the decrease of cases of malaria in the society.

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