



Factors Favouring the Resurgence of Cases of Malaria in The Populations of The Provinces of Maniema and Kwango in The Democratic Republic of Congo

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ABSTRACT

Malaria remains one of the most widespread and deadly parasitic diseases in the world and is a real public health problem. The aim of this study was to analyse the factors favouring the resurgence of malaria cases in the provinces of Maniema and Kwango. It was a case-control study based on a retrospective survey of people of both sexes hospitalised (or on sick call) for severe malaria, with data collection covering a 12-month period from 2021-2022. Factors favouring the resurgence of

malaria cases were determined by multivariate analysis using logistic regression. The present study showed that actions taken to reduce malaria in the community (OR: 0.313; p=0.000), participation in a sanitation activity (OR: 0.687; p=0.041) and socio-economic level (OR: 0.629; p=0.000) were factors favouring the resurgence of malaria cases.

Keyword: Factors, Favouring, Malaria resurgence.

INTRODUCTION

Malaria is one of the most widespread parasitic diseases in the world. It is caused by plasmodium parasites transmitted to humans by the bites of infected female anopheles' mosquitoes [1]. It remains one of the most widespread and deadly parasitic diseases in the world and is a real public health problem. Of the five species, Plasmodium falciparum is the most widespread and the most dreaded, since it is responsible for the potentially fatal pernicious attack and can present in two forms: the simple form and the severe form [2-3]. The disease is manifested by fever, headaches and vomiting, which appear ten to fifteen days after the mosquito bite. If left untreated, malaria can lead to complications such as anaemia, abortion, low birth weight and death [3-4].

According to the World Health Organisation (WHO) report on malaria worldwide, there will be an estimated 247 million cases of malaria and 619,000 deaths by 2021, mainly among children under 5 [5]. In Africa, malaria accounts for 10% of the continent's total burden of disease [6]. Malaria is endemic in intertropical Africa, particularly in sub-Saharan Africa where 90% of cases and deaths are concentrated. According to the WHO, around 95% of the estimated 228 million cases were detected in the African region, resulting in 602,000 deaths. According to the WHO, the six countries hardest hit by malaria in the region account for almost 55% of the morbidity and 50% of the mortality attributable to this disease worldwide [7], and children under the age of 5 account for around 80% of malaria deaths in the region. The Democratic Republic of Congo (DRC) is currently the second most affected country by malaria in Africa. This is due to a number of problems with care at all levels, ignorance of prevention methods on the part of the population, and an unhealthy environment characterised by poor urbanisation and poor drainage of waste water and rainwater, all of which create breeding grounds for mosquitoes, in this case the malaria vectors Anopheles. To remedy this situation, the NMCP has initiated the following actions to combat malaria: the acceptance, use and effectiveness of insecticide-impregnated mosquito nets by the population, raising awareness about the fight against malaria, the availability of new antimalarial treatments in health facilities and even in households, the appropriation of Intermittent Preventive Treatment (IPT) by pregnant women, pre-school consultations (CPS) for children under 5 years of age and surveillance in all its forms in the different provinces in order to reduce malaria-related morbidity and mortality in the DRC [8-13].

However, despite these measures, malaria is still a public health problem and remains the main cause of morbidity and mortality. To achieve this, it would seem necessary to act on other factors that contribute to the disease, in particular the environment, behaviour and socio-economic status of the population. The aim of this study is to analyse the factors favouring the resurgence of cases of malaria in the populations of the provinces of Maniema and Kwango.

METHODOLOGY

This was a case-control study based on a retrospective survey of people of both sexes hospitalised (or on-call) for severemalaria. Data collection covered a 12-month period from 2021 to 2022.

Study Population

The study took place in households in selected health areas in the provinces of Maniema and Kwango.

Maniema is located in the centre-east of the Democratic Republic of Congo. It lies between 0 (Equator) and 5 degrees South latitude and between 24°30' and 28°50' East longitude. This area stretches between the Lomami River in the west and the start of the mountain ranges in the east of the DRC; the eastern boundary is also marked by a series of rivers, including, from north to south: Mesa, Oso, Lowa, Biasi, Oku, Lukolia, Lugulu, Elila, Kama, Luama and Mudjale at the foot of the Tembo mountains. In the west, the border also follows a series of rivers, including the Lomami between parallels 5°00' and 2°20' south, the Kasuku between 1°20' and 1°50' south, the Lualaba and the Lowa. The surface area of Maniema is estimated at around 132,250 km². Maniema comprises 7 territories, from north to south: Lubutu, Punia, Kailo (where Kindu, the provincial capital, is located), Pangi, Kibombo, Kasongo and Kabambare.

The province of Kwango has been detached from the former province of Bandundu since July 2015 in application of the decentralisation introduced by the Constitution of 18 February 2006. It covers an area of 89,974 km² and has an estimated population of 1,994,036, with a density of 22 inhabitants/km². Its capital is Kenge. The province divides the Kwango district into two distinct entities: Kwango, with Kenge as its capital, and 5 territories (Kenge, Feshi, Kahemba, Kasongo-Lunda and Popokabaka).

It is bounded: to the North by the South of Kwilu Province; to the East by the West of Kasai Province and the Republic of Angola; to the South by the Republic of Angola; to the West by the Republic of Angola, the East of Kongo Central Province and the City Province of Kinshasa. The Kwango district lies between longitudes East 16° 5' 17" (the most westerly point) and 19° 58' 15" (the most easterly point) and between latitudes South 4° 21' 10" (the most northerly point) and 8° 5' 17" (the most southerly point).

These two provinces were chosen not only for reasons of accessibility, but also because of the resurgence of malaria in the population. Given that most of the population live in urban-rural areas, we opted for the 3rd degree, which enabled us to balance the sampling between the areas of 2 provinces. All respondents who took part in the study gave their free and informed consent. Figures 1 and 2 show the location of the two provinces and their health zones.

Data Collection and Analysis

Two main techniques were used to collect the data: interviewing and observation Interviewing was carried out by the interviewer and was the most commonly used technique, while observation was based on registers and other reporting documents. Overall, the sample used in this study was 800 subjects, including 400 cases and 400 controls (**table 1**).

Table 1: Breakdown of case and control households by health area, health zone and province

Province	Health zone	Health area	Households surveyed		Total	
			Case	Controls		
			Staff	Staff	Staff	
Maniema	Kindu	Three Z	31	30	61	
		Lumbulumbu	24	26	50	
		Basoko	25	24	49	
	Lubutu	Umbundje	14	14	28	
		Ndeka	12	14	26	
		Mungele	11	13	24	
		Nyakisende	14	14	28	
		Osoo	14	14	28	
		Sanzasili	13	13	26	
		Kasongo	Muviringo	13	13	26
			Kauta	13	13	26
	Kankumba		12	12	24	
	Mufala		14	14	28	
	Wazura		14	14	28	
	Maringa		14	14	28	
Kwango	Kenge	Holy spirit	29	25	54	
		Barrier	56	0	56	
		Wamba	50	0	50	
	Boko	Lonzo	45	35	80	
		bridge Kwango	40	40	80	
Total			458	342	800	

After checking and coding the forms, the data were processed statistically using Epi Data 3.1 and SPSS for Windows version 26.0. All analyses were carried out with a significance level of 5%. The information was summarised using the statistical methods indicated: frequency, measures of central tendency and dispersion (mean, standard deviation).

RESULTS

A total of 800 respondents were included in the study. Women predominated (32.6% of cases and 22.4% of controls), with a sex ratio of 0.75 (cases) and 0.91 (controls) respectively. Overall, the mean age of those surveyed was approximately 34.69 years. $\pm 11,9$ years, ranging from 16 to 75 years. As for other socio-demographic aspects, the results of this study showed that the majority of participants were married, i.e., 40.4% (cases) and 28.9% (controls). In terms of level of education, 35.4% (cases) and 27.8% (controls) had secondary education. In terms of occupation, 15.1% (cases) and 11.4% (controls) were farmers, with a low socio-economic level of 73.6% (40.0% for cases and 33.6% for controls).

Ninety-five point four (95.4%) of the respondents had a good knowledge of malaria (Figure 3) and its signs, citing fever first (89.5% overall, cases and controls). Similarly, 94.1% (53.8% of cases and 40.4% of controls) knew the causal agent of malaria (Figure 4).

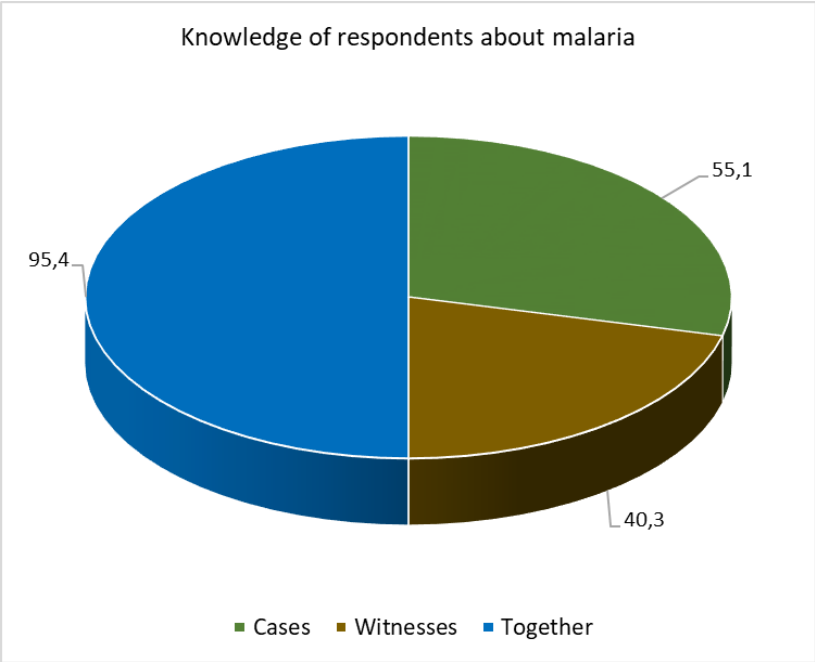


Figure 3: Respondents' knowledge of malaria.

citing mosquitoes as the causal agent (54.1% of cases and 40.0% of controls) (Figure 5). In terms of behaviour, overall, 82.8% slept under a mosquito net, 5.0% slept outside the rooms and 95.0% slept in the bedroom. In terms of where they lived, 34.8% (cases) and 26.8% (controls) lived in areas where it was dry. With regard to sleeping quarters, 53.9% of participants (cases) and 41.1% of witnesses were accustomed to sleeping in bedrooms. Of the 800 households surveyed, 754 were infected with malaria, representing a prevalence rate of 94.3%. Of these, 44.2% (26.7% of cases and 17.5% of controls) of households took the patient to the centre and/or hospital for treatment and 19.6% of households (11.8% of cases and 7.8% of controls) gave the patient malaria medication at home. In bivariate analysis, the factors favouring the resurgence of malaria cases were the population's awareness of the behaviour to adopt when faced with a patient with a fever, the population's awareness of malaria prevention measures, participation in a community anti-malaria sanitation activity, actions taken to reduce malaria in the community and socio-economic level (table 2). In multivariate analysis, actions taken to reduce malaria in the community (OR: 0.313; p=0.000), participation in a sanitation activity (OR: 0.687; p=0.041), and socioeconomic level (OR: 0.629; p=0.000) were factors favouring the resurgence of malaria cases (table 3).

Table2: Factors favouring the resurgence of malaria cases in the provinces of Maniema and Kwango (bivariate analysis).

Variables	Cases of malaria n=458	Controls n=342	OR	IC à 95%	p
Raising public awareness of what to do when faced with a patient suffering from fever					
Yes	371	243	1,737	[1,249 – 2,417]	0,001*
No	(46,4%) 87 (10,9%)	(30,4%) 9 (12,4%)			

Raising public awareness of preventive measures against malaria					
Yes	359	236	1,629	[1,183 – 2,242]	0,002*
No	(44,9%) 99 (12,4%)	(29,5%) 106 (13,3%)			
Participation in a community sanitation activity to combat malaria					
Yes	344	205	2,017	[1,490 – 2,730]	0,000*
No	(43,0%) 114 (14,2%)	(25,6%) 137 (17,1%)			
Measures taken to reduce malaria in the community (n=800)					
Cleaning up the environment/Distribution of mosquito nets and sleeping under mosquito nets	133 (16,6%)	37 (4,6%)	3,373	[2,269 – 5,014]	0,000*
No action/Nothing	325 (40,6%)	305 (38,1%)			
Encouraging pregnant women to attend a pre-natal consultation					
Yes	360	236	1,912	[1,354 – 2,700]	0,000*
No	(47,1%) 75 (9,8%)	(30,8%) 94 (12,3%)			
Socioeconomic level					
High	138 (17,3%)	73 (9,1%)	1,589	[1,146- 2,203]	0,003*
Low	320 (40,0%)	269 (33,6%)			

Table 3: Factors favouring the resurgence of malaria cases in the provinces of Maniema and Kwango (multivariate analysis).

Factors		resurgence of malaria					
		Bi-varied analysis			Logistic regression		
		OR crude	IC to 95%	p	OR adjusted	IC to 95%	p
Participation in a community sanitation activity	No	2,017	[1,490- 2,730]	0,000*	0,687	[0,480- 0,984]	0,041
	Yes						
Measures taken to reduce malaria in the community	Cleaning up the environment and sleeping under mosquito nets	3,373	[2,269- 5,014]	0,000*	0,313	[0,205- 0,479]	0,000*
	No action/Nothing						
Socioeconomic level	High	1,589	[1,146- 2,203]	0,003*	0,629	[0,454- 0,872]	0,005*
	Low						

(*) Statically significant value (p<0,05)

DISCUSSION

This study reported a malaria prevalence of 94.3%. Ramdzan et al [14] in Indonesia and Meresa et al [15] in Ethiopia reported lower population prevalences of 33.6% and 45.3% respectively.

Similarly, a study carried out in Burkina Faso in 2017 by Tusting [16] reported a prevalence of 70.6%. In terms of knowledge of malaria, this study showed that 95.4% knew about malaria and the causal agent, the mosquito (94.1%). In the Knowledge, attitudes and practices study carried out in 2011 in Abidjan by Diaby et al [17] on knowledge of the causal agent of malaria, the mosquito, the proportion was much lower than ours, at 53.4%.

With regard to mosquito nets ownership, the results of this study show that 94.8% of the majority of the population in the 2 provinces surveyed owned a mosquito net received during mass distribution (64.0%). Overall, 82.8% of this population had slept on mosquito nets in the 48 hours preceding the survey. The MICS-Malaria 2018 report states that 67.6% of households own a mosquito net (impregnated or not), 11.6% of households received them during the distribution campaign and 52.0% of households slept under mosquito net during the survey [18].

The population of these 2 provinces is accustomed to sleeping on mosquito net (82.8%). The results of a study conducted by Drabo K.M. [19] in Burkina Faso in 2014 showed that only 50% reported having slept under a mosquito net the night before the survey.

Among the behavioural factors, awareness of the population on how to behave when faced with a patient with a fever, awareness of the population on malaria prevention measures, participation in a community malaria sanitation activity, actions taken to reduce malaria in the community and the socio-economic level were the factors favouring the resurgence of malaria cases in this study. A study conducted in South Africa in 2018 by Abiodun et al [20] shows that the occurrence of malaria depends on the vegetation index. The more weeds are present, the more frequent malaria is. This implies the need to maintain a healthy environment by avoiding stagnant water and clearing weeds from concessions. Spraying stagnant water or weeds with insecticides can also be a means of prevention.

References

1. WHO, Global report on surveillance, monitoring and evaluation of malaria control programmes, 2020.
2. Mint Lekweiry K, Ould Ahmedou Salem MS, Basco L, Briolant S, Hafid JE, Ould Mohamed Salem Boukhary A. Malaria in Mauritania: retrospective and prospective overview. *Malar J*. 2015; 14:100.
3. Bourrée P, Bisaro F, Couzigou C, parasitic diseases and pregnancy, Elsevier BV. 2008, issue 402 :63.70
4. Anstey NM, Russell B, Yeo TW, Price RN. The pathophysiology of vivax malaria. *Trends Parasitol*, 2009 ; 25 : 220-227.
5. WHO, World Malaria Report, 2021.
6. Mvumbi Makaba Dieudonné, Place de la biologie moléculaire dans l'épidémiologie, le diagnostic et l'évaluation de la chimiorésistance du paludisme en République Démocratique du Congo, Thesis, Univesité de Kinshasa, 2017.
7. Relief Web-OCHA, Malaria Day: African countries make significant progress despite Covid-19 (WHO), April 2022.
8. PNLP, Plan stratégique National de Lutte contre le paludisme, 2020-2023 en RD Congo, 2020.

9. Abdillahi, A; Kinde-Gazard,D; Massougboji, A; Nahum, A; Ogouyemi-Hounto, A. Prise en charge au Bénin : Evaluation des pratiques professionnelles suite à l'introduction des dérivés d'artémisinine, *Med Trop.*, 2009; 69:561-564.
10. Losimba Joris, Jacque Emina, Josué Begu Mbolipay, Johanna Karamere, Olivier Kakesa, Ismael Nana, Micheal Humes and Yazoume Ye, Report on the evaluation of the impact of malaria control interventions on all-cause mortality in children under five in the Democratic Republic of Congo from 2005 to 2015, March 2018.
11. UNICEF, Malaria still deadly in DR Congo, Awareness Day for journalists of the Child Friendly Network, April 2016.
13. WHO, Guidelines for the treatment of malaria, 2015
14. Guillaume Béraud, Patrice Bourrée AF. Malaria: symptoms, transmission, treatments, vaccine [Internet]. 2020 [cited 2021 Jun 18]. Available from: <https://Health.women'sjournal.fr/disease-sheets/2526228-malaria-definition-countries-at-risk-symptoms-causes-treatment-vaccine-why/4>. Ramdhan AR, Ismail A, Mohd Zanib ZS. 2020. Prevalence of malaria and its risk factors in Sabah, Malaysia. *International Journal of Infectious Diseases*, 91: 68-72. DOI: <https://doi.org/10.1016/j.ijid.2019.11.026>
15. Meresa S, Megbaru A, Kiros T, Tadesse D, Bayissa S, Bugssa G. 2018. The Prevalence of Malaria in Tselemti Wereda, North Ethiopia: A Retrospective Study. *Ethiop. J. Health Sci.*, 28(5): 539-546. DOI: <http://dx.doi.org/10.4314/ejhs.v28i5.4>
16. Tusting LS, Bottomley C, Gibson H, Kleinschmidt I, Tatem AJ, Lindsay SW, Gething PW. 2017. Housing Improvements and Malaria Risk in Sub-Saharan Africa: A Multi-Country Analysis of Survey Data. *PLoS Med.*, 14(2): e1002234. DOI: <https://doi.org/10.1371/journal.pmed.1002234>
17. Diaby B, Kroa E, Niare A, Coulibaly D, Traore Y, Giani S, *et al.* Knowledge, attitudes and practices of traditional health practitioners in the city of Abidjan on malaria. *Mali Med.* 2011;26(3):8–12.
18. Doannio J., Konan YL., Amalaman K. et Attiah J. (2004). Knowledge, attitudes and practices of populations with regard to mosquitoes in an urban and peri-urban area of the Ivory Coast. *Bull Soc Pathol Exot*, 97, 4, 295-301
19. DRABO K.-M., SAWADOGO A., LAOKRI Samia, *et al.*, (2014). Malaria prevention practices in the peri-urban areas of two health districts in Burkina Faso.
20. Abiodun G, Adebisi B, Abiodun R, Oladimeji O, Oladimeji K, Adeola A, Makinde OS, Okosun KO, Djidjou-Demasse R, Semegni YJ, Njabo KY, Witbooi PJ, Aceves A. 2020. Investigating the Resurgence of Malaria Prevalence in South Africa Between 2015 and 2018: A Scoping Review. *The Open Public Health Journal*, 13 : 119-125. <https://doi.org/10.2196/2020.13.119>