INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print); 2222-5234 (Online)
Website: https://www.innspub.net
Email contact: info@innspub.net
Vol. 28, Issue: 1, p. 28-34, 2026

RESEARCH PAPER OPEN ACCESS

Knowledge, attitudes, and practices regarding malaria prevention and the use of long lasting insecticidal nets after mass distribution campaigns in northern Côte d'Ivoire

Donatié Serge Touré[1], Konan Fabrice Assouho[*2], Konan Rodolphe Mardoché Azongnibo[3], Ibrahim Kounady Ouattara[1], Foungoye Allassane Ouattara[4], Mamadou Doumbia[4]

[1]*Animal Biology Department, Peleforo Gon Coulibaly University, Korhogo, Côte d'Ivoire*
[2]*Animal and Fisheries Resources Department, University of San Pedro, Côte d'Ivoire*
[3]*Tropical Geography Institute, Félix Houphouët-Boigny University, Côte d'Ivoire*
[4]*Animal Production Department, Nangui Abrogoua University, Côte d'Ivoire*

Key words: Knowledge, Attitudes, Practices, Côte d'Ivoire

Received Date: December 20, 2025 **Published Date:** January 04, 2026

DOI: https://dx.doi.org/10.12692/ijb/28.1.28-34

ABSTRACT

In many countries of Africa including Côte d'Ivoire, the malaria remains a serious health challenge. To prevent the transmission of this disease, long-lasting insecticide-treated mosquito nets (LLINs) have been periodically distributed in Côte d'Ivoire. The present study aimed to evaluate knowledge of malaria, attitudes toward malaria, and adoption of control and prevention practices in some communities across the Northern region of Côte d'Ivoire. A cross-sectional based study was carried out in two neighbourhoods of Korhogo in January, 2025 from 107 randomly selected household respondents by a structured pre-tested questionnaire. All respondents had good knowledge score about malaria. The use of LLIN was reported as the most common means of controlling and preventing malaria. On prevention from getting malaria, it should be noted that in Natio Kobadara, a LLIN usage rate of approximately 87% was achieved. In comparison, the Soba site performs better, with a LLIN usage rate of approximately 95%. In Natio Kobadara, 81% of respondents knew the date of the last MIILDA distribution, while in Soba, 74% of respondents knew the date of the last MIILDA distribution. Respondents from both sampled neighbourhoods have a good understanding of malaria, including its transmission, its symptoms and its control or prevention.

***Corresponding author:** Konan Fabrice Assouho ✉ assokofabrice@gmail.com
https://orcid.org/0000-0002-7090-3032

INTRODUCTION

Malaria is a vector-borne disease caused by the *Plasmodium* parasite, transmitted to humans through the bite of infected female *Anopheles* mosquitoes. In Côte d'Ivoire, the burden of malaria is a significant public health issue and remains a major cause of mortality, particularly among children under 5 and pregnant women (WHO, 2024). In the country, *Plasmodium falciparum* is responsible for most cases of malaria, and the main vectors are *Anopheles gambiae* S.S., *Anopheles coluzzii* and *Anopheles funestus* S.L (Adja *et al.*, 2022). Another vector, *An. nili s.l.* has also been found to play a key role in local transmission (Assouho *et al.*, 2020).

Significant progress has been made in Côte d'Ivoire. The number of deaths from malaria fell from 3,222 in 2017 to 1,316 in 2020, representing a decline in mortality of approximately 50%, and the national incidence of malaria among children under five fell by 26.1% (WHO, 2022). However, malaria remains the leading cause of morbidity in the country. To reduce the burden of this disease, the Ministry of Health, Public Hygiene and Universal Health Coverage of Côte d'Ivoire recommends the use of artemisinin-based combination therapies (ACTs) in the treatment of uncomplicated malaria and the use of long-lasting insecticide-treated mosquito nets (LLINs) to protect populations against this disease. This latter strategy acts as a barrier to prevent contact between the host and the vector in order to prevent mosquito bites (WHO, 2015). Since the WHO recommended this strategy, it has been considered an essential component of the overall malaria control plan in most national programmes south of the Sahara (WHO, 2019). The effectiveness of this strategy has been reported not only on the *Anopheles* population, but also on malaria indicators in the human population (Karch *et al.*, 1993). For this purpose, several campaigns to distribute milda have been organised in the country where the most recent date is 2024. During mass distribution campaigns, each household received one LLIN for two people.

However, little information exists regarding the use of these LLIN. In fact particulary, to our knowledge, there is a scarcity of data on malaria KAP in the northern region of Côte d'Ivoire. While it has been proven that a better understanding of the clinical signs of a disease, how it is transmitted, how it can be prevented and treated is the key to the success of a control programme (Etang *et al.*, 2016), hence the importance of this work, which aims to evaluate knowledge of malaria, attitudes toward the disease, adoption of control and prevention practices after the 2024 mass distribution campaign in two neighbourhoods across the northern region of Côte d'Ivoire. The study also investigated variables linked to KAP regarding malaria.

MATERIALS AND METHODS

Study setting

This study was carried in Korhogo, located in the savannah zone in the north of the country. This city has a Sudanese climate with two distinct seasons: one rainy season and one dry season. Annual rainfall ranges from 1,100 to 1,600 mm (Boko-Koiadia *et al.*, 2016). Average temperatures range between 24° and 33°C. The vegetation in Korhogo, like that of the entire region, consists of wooded savannah. Two neighbourhoods were selected for this study: Soba and Natio Kobadara (Fig. 1). These are the neighbourhoods with the highest number of malaria cases per year. Both neighbourhoods are large in size and have a high population density. The first site is the central neighbourhood of Soba (9° 27' 69" North, 5° 36′ 31″ west). This neighbourhood, one of the city's oldest, is characterised by a high level of urbanisation with medium and low-end housing (Kassi, 2023). The second study site is the Natio Kobadara neighbourhood (9° 28′ 50″ north, 5° 36′ 19″ west). It is an old village that has been swallowed up by the city's growing urbanisation. It is located in the north-east of the city and combines urban and rural characteristics. This neighbourhood has a west-east orientation and is crossed by an intermittent watercourse on which a dam has been built, thus promoting market gardening and rice field irrigation.

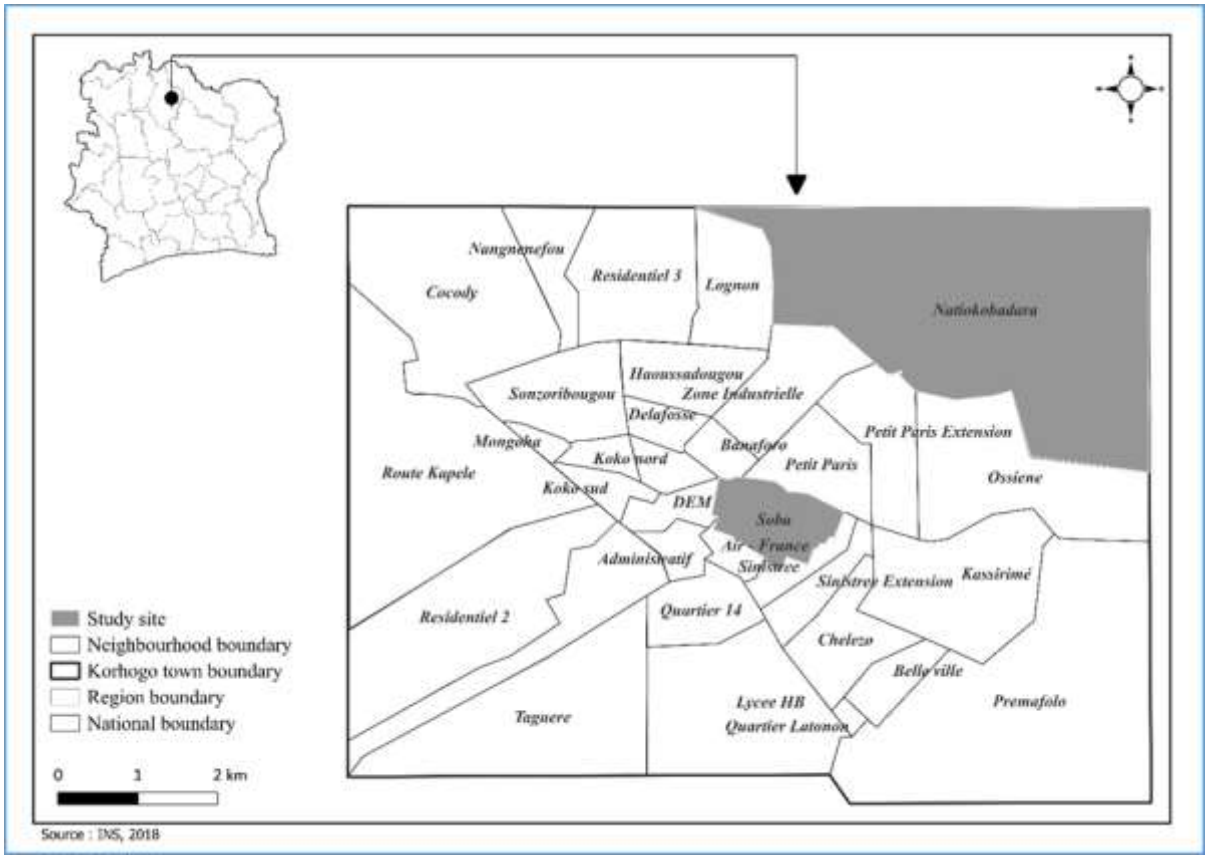

Fig. 1. Town of Korhogo showing the sampled neighbourhoods

Study design and data collection procedure

The data were collected in January 2025, five months after the mass distribution campaign, through a qualitative and quantitative survey based on questionnaires sent to heads of households or their representatives aged 18 or over. After obtaining the necessary institutional authorisations, a sample of households was randomly selected in the two selected neighbourhoods. Data collection was carried out by a team of two people, using questionnaires prepared in french and translated into the local language where necessary. The households to be interviewed were selected using spatial sampling with QGIS software (version 3.34). Using satellite imagery (Google Satellite), the buildings were digitised and exported as shapefiles for transfer to QGIS. The QGIS tool was used to generate random points corresponding to the sample size, with each point representing a household to be surveyed. The geographical coordinates were saved in GPX format and transferred to the OsmAnd application, which is compatible with smartphones. The informed consent of the participants was obtained, ensuring the confidentiality of the information collected. The questionnaires were used to collect information on socio-demographic characteristics, as well as knowledge of malaria and the use of LLIN. The number of households selected was determined using the SCHWARTZ formula. In Korhogo we are thirty-two neighbourhood. For Schwartz formula, we need to survey 385 households in these thirty-two neighbourhoods. The results give us 13 households per neighbourhood. Given that we are working on two sites, we decided to interview at least 50 households per site. As a result, 57 households were sampled in Natio Kobadara and 50 households in Soba.

Data analysis

The informations collected were recorded in an Excel database. Descriptive analyses were performed to measure the various sociodemographic indicators related to LLIN ownership and use. The LLIN coverage rate was estimated as the number of households owning at least one mosquito net out of

the total number of households surveyed per study site. The usage rate corresponded to the number of households that reported sleeping under a LLIN on the night before the survey out of the total number of households surveyed per study site. The Chi-square test was used to compare these rates between the different sites using R 4.1.2 software with a 95% confidence interval.

RESULTS

Socio-demographic and work-related data

Table 1 presents socio-demographic and work-related data of 107 participants involved in the study, comprising 57 heads of households in Natio Kobadara and 50 in Soba. The sample consisted of predominantly female participants, comprising 78% of the total, with males representing 22.0%.

Table 1. Socio-demographics and work-related data (n= 107)

Category	Characteristic	Natio Kobadara	Soba
Households surveyed	Respondents	57	50
Gender	Female	44 (77.20%)	39 (78.00%)
	Male	13 (22.80)	11 (22.00%)
Knowledge of malaria	Yes	57 (100.00%)	49 (98.00%)
	No	00 (00.00%)	01 (02.00%)
Sources of information about malaria	Hospital	43 (75.40%)	50 (100.00%)
	Family	10 (17.54%)	00 (00.00%)
	Others	03 (5.25%)	00 (00.00%)
Malaria vectors	Mosquito bite	57 (100.00%)	50 (100.00%)
	Dirty environment	41 (71.93%)	46 (92.00%)
	Food	19 (33.33%)	14 (28.00%)
	Sun	06 (10.53%)	06 (12.00%)
	Rain	06 (10.53%)	15 (03.00%)
	Others	01 (01.75%)	01 (02.00%)
Signs and symptoms of malaria infection	Headaches	48 (84.20%)	47 (94.00%)
	Fever	55 (96.50%)	47 (94.00%)
	Thrill	12 (21.05%)	22 (44.00%)
	Vomiting	23 (40.35%)	18 (36.00%)
	Appetite loss	19 (33.33%)	08 (16.00%)
	Vertigo	05 (08.77%)	13 (26.00%)
	Others	02 (03.51%)	00 (00.00%)
Ways to prevent and control malaria	LLIN	55 (96.50%)	48 (96.00)
	Sanitation	11 (19.30%)	00 (00.00%)
	Grilles for doors and windows	04 (07.02%)	08 (16.00%)
	Others	03 (05.26%)	00 (00.00%)
Usage of LLIN	Yes	50 (87.72)	47 (94.00%)
	No	07 (12.28%)	02 (04.00%)

Knowledge of malaria and its symptoms about malaria among household heads surveyed

Basic knowledge about malaria can be found under Table 1. All the respondents had heard about malaria. The source of knowledge about malaria was analysed. It reveals that in both neighbourhoods, hospitals are the main source of information about malaria. In Natio Kobadara, approximately 75% of households report having been informed by these hospitals, while in Soba, this rate is even higher, reaching approximately 94%. The family represents a source of information for 20% of households in both Natio Kobadara and Soba. The category 'Other' (school, media, etc.) appears only in Natio Kobadara, concerning approximately 6% of households. This comparison reveals significant disparities in information channels between the two neighbourhoods. All the respondents knew that mosquito bites can transmit malaria. However, other routes of disease transmission chosen included dirty environment, food, sun, rain. Headaches, fever, thrill and vomiting were the most common signs and symptoms indicated for malaria infection. The least signs and symptoms indicated for malaria infection were Appetite loss and vertigo. The use of LLIN was reported as the most common means of controlling

and preventing malaria. Nevertheless, sanitation and grilles for doors and windows were cited as a measure to control and prevent malaria.

Attitudes and practices of heads of households toward malaria prevention

On prevention from getting malaria, it should be noted that in Natio Kobadara, a LLIN usage rate of approximately 87% was achieved (Table 1). Although encouraging, this rate suggests that approximately one-eighth of the target population is not using LLIN correctly despite its distribution. In comparison, the Soba site performs better, with a LLIN usage rate of approximately 95% with no significant difference from Natio Kobadara (Khi^2= 2.70; p= 0.54). Furthermore, for prevention of mosquito bites, other preventive measures are used such as sanitation and grilles for doors and windows.

Information about the last LLIN distribution campaigns

In Natio Kobadara, 81% of respondents said they knew the date of the last LLIN distribution, while 14% did not know the date and 5% were unsure. In Soba, 74% of respondents knew the date of the last LLIN distribution, 16% do not know it, and 10% are unsure. In fact, in Natio Kobadara, the hospital is the main source of information, with 30%, closely followed by television at 29%. The chiefdom also plays a significant role, reaching 26%, while radio has little influence, with only 5%. Approximately 10% of respondents mentioned other sources of information. In contrast, in the Soba neighbourhood, television dominates, accounting for 40%, closely followed by the chiefdom at 36%. The hospital also plays an important role with 18%, while radio remains marginal at 16%.

DISCUSSION

The current study therefore aimed to evaluate knowledge of malaria, attitudes toward the disease, adoption of control and prevention practices in two neighbourhoods of Korhogo across the northern region of Côte d'Ivoire by a cross-sectional based study was carried out in january 2025. Its reveals a predominance of women in both neighbourhoods, which is probably due to the times at which the surveys were conducted (8 am to 12 pm). These times coincide with the absence of men, often due to their professional activities. This corroborates the observations of Kouadio *et al.* (2019), who note a similar overrepresentation of women in household surveys in urban areas of Côte d'Ivoire.

The results of the knowledge assessment showed that the respondents had good knowledge about malaria. In fact, there was a high level of community awareness of malaria transmission, signs and symptoms. This observation is comparable with the other studies in Ghana (Lopez and Brown, 2023), Cameroon (Talipouo, 2019), Northwest Ethiopia (Alelign, 2018), North-western Tanzania (Kinung'hi *et al.*, 2016) and Swaziland (Hlonguana *et al.*, 2009). Indeed, knowledge of malaria is generally satisfactory, with distinct sources of information: Soba favours healthcare facilities, while Natio Kobadara emphasises the increased role of the family and diverse sources. This diversity of information, as shown by Adjah and Panayiotou (Adjah and Panayiotou, 2021), indicates that it is important to use different methods of communication. However, the findings of this study are higher than the ones reported in Southern Ethiopia (Fugo *et al.*, 2015) and Nigeria (Singh *et al.*, 2014). The high level of knowledge may in part be due to health education campaigns (Assan *et al.*, 2017). A few respondents in this study, however, had knowledge gaps and included drinking contaminated water, and eating contaminated food as ways that malaria is spread.

The Soba neighbourhood has a higher use of LLINs than Natio Kobadara neighbourhood, due to its central location, while Natio Kobadara, which is more remote and industrialised, has a varied distribution of LLINs. This indicates that individual and socio-economic factors have a greater influence on ownership than geographical factors. This intra-neighbourhood heterogeneity is also documented by Mogeni *et al.* (2021), who emphasise the importance of micro-targeted approaches in urban interventions.

Furthermore, some survey participants feel uncomfortable sleeping under MILDAs and prefer to use insecticides. Their low use in the field reveals space constraints and a lack of knowledge about the effectiveness of MILDAs in preventing malaria, hence the importance of improving education and raising awareness among the population.

Regarding information on the latest campaigns to distribute LLINs, Sources vary considerably between neighbourhoods: Soba favours traditional chieftainship and television, while Natio Kobadara relies mainly on the hospital. Television is the dominant medium in both areas, with a slightly higher daily viewing frequency in Soba. These observations are consistent with the studies by Amodu *et al.*, (2020) on the influence of the media on health behaviours in West Africa. In addition, the Natio Kobadara Hospital, located in the heart of the neighbourhood, facilitates access to information for the population. However, precise knowledge of MIILDA distribution methods remains limited in both neighbourhoods, with insufficient memorisation of exact dates, restricting membership. This shortcoming has also been identified by Mensah *et al.*, (2022) as a factor limiting the effectiveness of mass campaigns.

CONCLUSION

Overall score for respondents' knowledge of malaria was good. LLIN is the most widely used prevention tool among the population, in combination with other prevention measures such as environmental sanitation and the use of window screens and curtains. LLIN usage rates (87% in Natio Kobadara and 98% in Soba), appear to be relatively in line with NMCP expectations.

Finally, communication about distribution relies mainly on television and local authorities, but precise knowledge of distribution dates remains low, thus limiting adherence. It also seems important to be able to conduct such surveys in other neighbourhoods of the city as well as in other localities.

ACKNOWLEDGEMENTS

We would like to thank the administrative and traditional authorities, as well as the people interviewed in Soba and Natio Kobadara, who gave up their time to participate in the survey. Furthermore, the researchers are highly appreciated for their involvement in the manuscript writing, editing, approval, or decision to publish.

REFERENCES

Adja AM, **Assouho KF**, **Assi S-B**, **Guindo-Coulibaly N**, **Tia E**, **Sagna AB**. 2022. High vectorial transmission of malaria in urban and rural settings in the northern, western and eastern regions of Côte d'Ivoire. Journal of Vector Borne Diseases **59**, 275–284.

Adjah ESO, **Panayiotou AG**. 2021. Impact of malaria-related messages on insecticide-treated net use for malaria prevention in Ghana. Malaria Journal **20**(1), 1–12.

Alelign A, **Petros B**. 2018. Knowledge, attitudes and practices of malaria transmission and preventive measures in Woreta town, Northwest Ethiopia. BMC Research Notes **11**(1), 491.

Amodu OK, **Adeyemo AA**, **Olumese PE**. 2020. Media influence on health-seeking behavior and malaria prevention practices in sub-Saharan African communities. Journal of Health Communication **25**(1), 39–47.

Assan A, **Takian A**, **Hanafi-Bojd AA**, **Rahimiforoushani A**, **Nematolahi S**. 2017. Knowledge, attitude and practice about malaria: socio-demographic implications for malaria control in rural Ghana. Journal of Public Health Policy **38**(4), 445–463.

Assouho KF, **Adja AM**, **Guindo-Coulibaly N**, **Tia E**, **Kouadio AMN**, **Zoh DD**. 2020. Vectorial transmission of malaria in major districts of Côte d'Ivoire. Journal of Medical Entomology **57**, 908–914.

Boko-Koiadia AN, **Cissé G**, **Koné B**, **Séri D**. 2016. Climate variability and change in the environment at Korhogo in Côte d'Ivoire: myth or reality. European Scientific Journal **12**(5), 158–176.

Etang J, **Mbida Mbida A**, **Ntonga Akono P**, **Binyang J**, **Eboumbou Moukoko CE**, **Lehman LG**. 2016. *Anopheles coluzzii* larval habitat and insecticide resistance in the island area of Manoka, Cameroon. BMC Infectious Diseases **16**(1), 217.

Fuge TG, **Ayanto SY**, **Gurmamo FL**. 2015. Assessment of knowledge, attitude and practice about malaria and ITN utilization among pregnant women in Shashogo District, Southern Ethiopia. Malaria Journal **14**, 235.

Hlongwana KW, **Mabaso ML**, **Kunene S**, **Govender D**, **Maharaj R**. 2009. Community knowledge, attitudes and practices on malaria in Swaziland: a country earmarked for malaria elimination. Malaria Journal **8**, 29.

Karch S, **Garin B**, **Asidi N**, **Manzambi Z**, **Salaun JJ**, **Mouchet J**. 1993. Moustiquaires imprégnées contre le paludisme au Zaïre. Annales de la Société Belge de Médecine Tropicale **73**, 37–53.

Kassi K. 2023. Production et accès à l'eau potable dans la ville de Korhogo. Revue Internationale du Chercheur **4**(4), 1016–1041.

Kinung'hi SM, **Mashauri F**, **Mwanga JR**, **Nnko SE**, **Kaatano GM**, **Malima R**. 2010. Knowledge, attitudes and practices about malaria among communities: comparing epidemic and non-epidemic prone communities of Muleba district, north-western Tanzania. BMC Public Health **10**(1), 395.

Kouadio AM, **Adoubryn KD**, **Ouhon J**. 2019. Socio-demographic characteristics and malaria prevention practices in urban Côte d'Ivoire. Médecine Tropicale et Santé Internationale **29**(3), 301–308.

Lopez AR, **Brown CA**. 2023. Knowledge, attitudes and practices regarding malaria prevention and control in communities in the Eastern Region, Ghana. PLoS One **18**(8), e0290822.
DOI: 10.1371/journal.pone.0290822

Mensah EA, **Anto F**, **Aikins MK**. 2022. Knowledge and retention of information after household LLIN distribution campaign in Ghana. Malaria Journal **21**(1), 1–10.

Mogeni P, **Williams TN**, **Bejon P**. 2021. Heterogeneity of malaria transmission in sub-Saharan urban settings. Malaria Journal **20**(1), 1–15.

Singh R, **Musa J**, **Singh S**, **Ebere UV**. 2014. Knowledge, attitude and practices on malaria among the rural communities in Aliero, northern Nigeria. Journal of Family Medicine and Primary Care **3**(1), 39–44.
DOI: 10.4103/2249-4863.130271

Talipouo A, **Ngadjeu CS**, **Doumbe-Belisse P**, **Djamouko-Djonkam L**, **Sonhafouo-Chiana N**, **Kopya**. 2019. Malaria prevention in the city of Yaoundé: knowledge and practices of urban dwellers. Malaria Journal **18**(1), 167.
DOI: 10.1186/s12936-019-2799-6

WHO. 2015. World malaria report 2015: stratégie technique mondiale de lutte contre le paludisme 2016–2030. World Health Organization.

WHO. 2019. World malaria report: addressing inequity in the global malaria response. World Health Organization, Geneva.

WHO. 2022. World malaria report 2022. World Health Organization, Geneva.

WHO. 2024. World malaria report: Addressing inequity in the global malaria response. World Health Organization, Geneva.