Knowledge, Attitudes and Practices in Malaria Prevention Among the Residents of the Southern Part of Benin: A Cross-Sectional Study

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Abstract

Background: Malaria is a life-threatening parasitic disease transmitted by mosquitos which remains a major public health issue in Benin, leading to high consultation and hospitalisation rates, especially among children under five and adults.

Aim: This study aims to assess the knowledge, attitudes, and practices of residents and health workers in southern Benin regarding malaria prevention and the factors influencing these aspects.

Methods: This was a cross-sectional study, conducted in Benin, in 2022. Data were collected using a *Knowledge, attitudes and practice* (KAP) questionnaire which was adapted to the needs of this study Participants included both residents and healthcare workers.

Results: A total of 529 respondents participated in the study, including 124 health workers and 405 non-health workers. Among them, 96% had heard of malaria, primarily through health facilities (53%) and schools (50%). The majority (63%) were aware of the National Malaria Control Programme, while 75% believed malaria could be prevented, and 88% reported using mosquito nets. The findings indicate a high level of knowledge about malaria, its symptoms, treatment, and prevention measures, with no statistically significant differences in overall malaria knowledge ($r=0.11$; $p<0.01$). However, participants from rural areas were more likely to rely on alternative treatments ($r=0.14$; $p<0.01$), whereas health professionals demonstrated greater knowledge of malaria and its prevention ($r=0.15$; $p<0.01$). Additionally, awareness of the National Malaria Control Programme was higher among more educated individuals ($r=-0.28$; $p<0.01$), healthcare workers ($r=0.19$; $p<0.01$), and urban residents ($r=-0.23$; $p<0.01$).

Conclusion: Malaria remains a major health challenge in Benin. Strengthening professional efforts, continuous education of health workers, and targeted public awareness about the National Malaria Control Programme are essential for effective prevention and control.

Keywords: malaria, knowledge, attitudes, practices, Benin

Introduction

Malaria is a serious disease caused by parasites of the *genus Plasmodium*, which is transmitted to humans through the bite of an Anopheles mosquito (1). There are many types of *Plasmodium*, but the disease in humans is caused by P*lasmodium falciparum* (the most frequent), P*lasmodium ovale, Plasmodium malariae, Plasmodium vivax* and *Plasmodium knowlesi*. The development of the disease in humans depends on many factors such as health status, previous illnesses and living conditions. In Benin, malaria is the leading cause of mortality among children under five and a significant contributor to morbidity in adults. It accounts for 40% of outpatient consultations and 25% of all hospital admissions (2, 3).

The most common symptoms of malaria include fever, headache and chills, vomiting, nausea and muscle aches. Diagnosis is based on clinical presentation and laboratory tests. Early initiation of treatment is crucial, with treatment plans varying depending on the type of malaria. Disease prevention remains a major public health challenge in many African countries. Malaria has also a negative impact on family budgets. It has been noted that 47% of households in low- and middle-income countries faced catastrophic health expenditures, i.e., costs exceeding 40% of family income (4). Key strategies in the fight against malaria include preventing mosquito bites and implementing preventive chemoprophylaxis programmes (5). Prevention includes vector control which has a major role and preventive measures that include the use of insecticide-impregnated mosquito nets when sleeping, the use of mosquito repellents, the use of coils and sprays, the wearing of protective clothing and the installation of mosquito nets on windows. However, the results so far are not very encouraging due to lower coverage and the emergence of vector resistance to insecticides (2).

Benin also opted for free treatment of cases of simple and severe malaria in children under five and pregnant women. Since 2003, Benin has adopted a policy of Intermittent preventive treatment (IPT) using sulfadoxine-pyrimethamine (SP) (6). All eligible pregnant women can receive two doses during antenatal consultations in the public and private sectors. Likewise, there is regular procurement and distribution of RDTs (rapid diagnostic tests) in health centres, use of RDT in public and private health institutions; establishment of a framework for public and private sector consultations for the use of RDTs. Finally, from October 2023, the WHO recommends two malaria vaccines for preventing malaria in children, administered in four doses to infants aged five months and older (4).

Malaria is a major public health concern in African countries, not only impacting health outcomes but also placing a significant financial burden on communities and healthcare systems. Regarding the treatment, it is important to note that there is a certain number of people who do not go to the hospital due to financial difficulties. Beninese households spend about a quarter of their annual income on malaria prevention and treatment (3). It is similar in Bafang and Bakassa, where the monthly amounts that respondents spend on malaria prevention and treatment represent a third of the guaranteed minimum wage (SMIG) in Cameroon. This has also been observed in several African countries and calls into question the need for governments and global organisations (WHO, UNICEF), given the low income of the population, to fully subsidize the prevention and treatment of malaria if we want to effectively control this disease (7). This decision on malaria treatment was also made in Benin in October 2011, but it includes free treatment for pregnant women. This free policy is implemented by the National Malaria Control Programme (in French *Programme National de Lutte contre le Paludisme*). However, according to surveillance data and reviews conducted by the National Malaria Control Programme, the application of this initiative varies across health centres and public hospitals (8).

While effective national programmes to combat malaria are essential, it is equally important to focus on educating residents, promoting changes in harmful

lifestyle practices, and encouraging proper preventive measures. Additionally, raising awareness about the importance of seeking timely medical care is crucial in reducing the disease's impact (9). The aim of this study was to examine the general knowledge of the population and health workers in the southern part of Benin about malaria, its treatment, prevention measures, the frequency of malaria prevention method usage, and the factors influencing these aspects.

Materials and Methods

Study design

This was a cross-sectional study.

Ethics

The study was conducted in alignment with the institutional Codes of Ethics. All methods were performed in accordance with the relevant guidelines and regulations.

Written informed consent was obtained from all study participants.

The approval of the Ethics Committee of the Catholic University of Croatia was obtained. Based on the request submitted on July 10, 2022, the committee issued a certificate on July 20, 2022. The certificate is kept under CLASS No.: 641-03/22-03/030, Reg. No.: 498-15-06-22-001.

Participants

The study included both residents of Benin and healthcare workers. The inclusion criterion was a minimum age of 18 years.

Data collection and study tools

The study was conducted in the West African country of Benin, specifically in the cities of Porto-Novo and Cotonou, during July and August 2022. Data was collected using a questionnaire-based method during community events, at local hospitals, in participants' homes, or workplaces (convenience sampling). The survey questionnaire was adapted from the study Community Knowledge, Attitudes, and Practices (KAP) on Malaria in Swaziland: A Country Earmarked for Malaria Elimination by Hlongwana et al., with the author's consent (10). Modifications were made to suit the needs of this research, including the omission of some original questions and the addition of new ones related to access to medical care in case of illness, treatment methods, and the National Malaria Control Programme in Benin. The questionnaire was translated into French, the official language, to ensure accessibility. Participation was fully anonymous, and the collected data cannot be traced back to any individual participant.

Statistical analysis

Data was processed using Microsoft Excel and IBM SPSS. A p-value of 0.05 was considered the threshold for statistical significance. The Pearson correlation test was used to examine relationships between variables, with significance levels set at either $p<0.01$ or $p<0.05$, depending on the data.

Results

A total of 529 participants were included, 124 of whom were healthcare workers. The socio-demographic characteristics of the participants are shown in Table 1.

Table 1. *Socio-demographic characteristics of the participants*

		N	%
Sex	Male	252	48
	Female	273	52
	Blank	4	0.8
Age	18-25	166	31
	26-33	156	30
	34-41	93	18
	42-49	61	12
	50-57	32	6.0
	58-65	18	3.4
	Blank	3	0.6
Living area			
	Rural residents	261	49
	City residents	266	50
	Blank	2	0.4
Healthcare workers	Rural area	68	55
	City	56	45

The results reveal a moderate positive correlation between working in healthcare and knowledge of malaria, with healthcare workers more likely to understand the concept and its consequences (r=0.15–0.21; p<0.01 – Table 2.). A significant positive association was also found between rural residence and familiarity with malaria (r=0.11; p<0.01).

Most participants (92%) seek help at health institutions, while 26% turn to pharmacies. Additionally, being a healthcare worker is positively correlated with promptness in seeking medical help (r=0.19; p<0.01), as they are more likely to act within 24 hours. In contrast, rural residency is negatively correlated with promptness (r=-0.13; p<0.01), indicating delays in seeking care among rural populations (Table 3).

The analysis revealed significant associations between place of residence and malaria prevention. Rural residents are more likely to believe malaria cannot be prevented or to be unsure, while urban residents more often use preventive measures like mosquito sprays (r=0.20; p<0.01) and window nets (r=0.10; p<0.05). The question about malaria transmission was open-ended and 468 of the participants (89%) answered that mosquito or similar variations (for example: mosquito bite, female mosquito, insect) transmit malaria. Participants were asked about the symptoms, and the following were listed: fever, vomiting, diarrhea, weakness, jaundice, anaemia, headache, body aches.

The data reveal encouraging trends, with 92% of participants stating they would seek help at a health facility. Most participants (52%) reported that they would seek help within 24 hours, while 30% would do so within three days. Among those who would not seek help, 95% did not provide a reason. However, those who did cite a lack of financial resources or the distance to the healthcare facility as the main barriers. Results show that participants from rural areas were more likely to rely on alternative treatments (r=0.14; p<0.01).

Most participants (84%) use doctor-prescribed medicines for treatment, while 30% also rely on natural remedies. Only a few participants mentioned natural treatments, including boiled papaya leaves, lemon, horseradish, wormwood, boiled lemongrass, artemisia, and other local plants. Attitudes and practices related to prevention were also examined. Of the respondents, 75% believe malaria is preventable, while 15% expressed uncertainty. When asked about how malaria can be prevented (open-ended question), 360 participants mentioned measures such as using sleeping nets, maintaining cleanliness, installing window nets, applying natural remedies, wearing long-sleeved clothing, removing stagnant water, and using mosquito-repellent coils. Participants were also asked about the preventive methods they personally use, and the results are shown in Table 4.

Table 2. *Correlation of Variables: Gender, Healthcare workers, Place of residence, Recognition of the term Malaria, Mortality from malaria, and Awareness of malaria*

	1.	2.	3.	4.	5.	6.
1. Sex	-	-0.03	0.11**	-0.03	-0.08	0.01
2. Healthcare workers		-	0.06	0.15**	0.11*	0.21**
3. Place of residence			-	0.11**	-0.16**	-0.12**
4. Recognition of the term malaria				-	0.02	0.10*
5. Mortality from malaria					-	0.24**
6. Awareness of malaria						-

*r - the correlation coefficient ; **p<0.01*

Table 3. *Correlation between variables healthcare workers, place of residence and the promptness of seeking help (p<0.01)*

	1.	2.	3.
1 Healthcare workers	-	0.06	0.19**
2 Place of residence		-	-0.13**
3 Promptness of seeking help			-

*r - the correlation coefficient; **p<0.01*

Table 4. *Malaria prevention used by participants*

Which prevention methods do you use?	N	%
Mosquito sleeping net	465	88
Regular cleaning of the house and garden	393	74
Closing windows and doors	274	52
Mosquito nets on windows	249	47
Mosquito coils	175	33
Mosquito room spray	103	20
Repellents	93	18
Burning leaves or bark of plants and fruits	84	16
I don't use anything	10	2.0
Something else	5	0.9

When asked about the causative agent of malaria, it is worrying that as many as 18% of health workers either left the question blank or provided invalid responses. However, 81% (100 participants) correctly identified *Plasmodium* as the causative agent. Regarding the biggest barriers to eradicating malaria, respondents cited the non-observance of preventive measures (18%) and poor hygiene practices, such as not maintaining clean yards and failing to remove stagnant water (14%).

Knowledge of the national malaria control plan was also assessed, with 63% of respondents reporting awareness of its existence. Awareness of the national malaria control programme is higher among individuals with higher education, those in healthcare ($r=0.19$; $p<0.01$), and urban residents ($r=-0.23$; $p<0.01$) (Table 5.).

Table 5. *Correlation Between Demographic Data and Awareness of the National Malaria Control Programme*

Awareness of the National Malaria Control Programme		
	r	p
Sex	0.01	0.83
Age	0.02	0.64
Education level	-0.28**	0.00
Religion	0.07	0.13
Healthcare workers	0.19**	0.00
Place of residence	-0.23**	0.00

*r - the correlation coefficient; **p<0.01*

When asked about the type of information they would like to receive, 37% showed interest in learning about malaria prevention, while 35% sought details on treatment. Regarding preferred sources, 72% favoured healthcare workers or institutions.

Discussion

This study highlights a high level of malaria awareness among participants, with 95% reporting prior knowledge of the disease. Additionally, three-quarters believed it could be prevented, with many using mosquito nets while sleeping. Moreover, the findings indicate that participants have a high level of knowledge about malaria, including its symptoms, treatment, and prevention measures.

Other authors got similar results. In Cameroon, 94% to 100% of respondents demonstrated knowledge of malaria (11, 12), while in Gabon (13) and Ethiopia (14), this percentage reached 100%. The research conducted in Ethiopia shows that only 75% of respondents associate malaria transmission with mosquito bites (14). In western Cameroon, 77% of respondents associate malaria transmission with *Plasmodium* (11), while Mabiala et al. (13) reported a higher percentage of 83% in Gabon. A study conducted by Seck et al. (15) in Popoguine, Senegal, showed that 82% of the respondents knew the ways of malaria transmission. The results of this study conducted in southern Benin show that 87% of participants correctly identified malaria symptoms, such as fever, headache, vomiting, and anaemia. In comparison, Djoufounnae et al. (12) in Cameroon reported that 57% of participants could identify malaria symptoms accurately. Addis et al. (14) in Ethiopia found a higher percentage, with 95% of participants recognising the correct symptoms. Similarly, Manan et al. (16) in South Africa showed that 63% of household heads could identify at least three malaria symptoms. The high level of knowledge about malaria transmission observed in some populations may be linked to education levels. Raising awareness through various channels—such as radio,

television, newspapers, school programmes, health centres, and social media—plays a critical role in increasing awareness. Other impactful methods include advertising campaigns, interpersonal discussions in hospitals, and information dissemination via posters, pictograms, or discussions with healthcare providers (12). The study conducted in Dangbo by Kiniffo et al. (9) from 2000 highlights that knowledge about malaria is influenced by factors such as age, socioeconomic status, place of residence, and mother's education levels. Importantly, the level of knowledge about malaria transmission serves as a critical indicator for designing effective strategies to combat the disease (17).

While the high knowledge rates reported across various studies represent a positive foundation for malaria control, further efforts are necessary. Governments must invest in raising awareness, as some misconceptions persist. For example, respondents in some studies still attribute malaria to causes such as cold, dirt, fruit, seasonal changes, or exposure to the sun (9, 18, 19). Addressing these misconceptions through targeted education and awareness campaigns is essential to enhancing disease prevention efforts. The most common prevention method used by people in Africa is an impregnated mosquito net. The results of this study show that 92% of participants use impregnated mosquito nets. In a study conducted in Cameroon (12) in 2022, more than 92% of the people surveyed reported using a mosquito net as a method of protection against malaria. In contrast, the research study by Mabial et al. (13) in Gabon reveals that only 59% of respondents use impregnated mosquito nets as a preventive measure. Although this usage rate is unsatisfactory, it may be attributed to mass and free distribution campaigns initiated by public authorities and their development partners, aiming to provide impregnated mosquito nets to every household. However, numerous studies have shown that this tool has a meaningful environmental impact only when it is widely adopted at the community level, making the outcome heavily dependent on the local population's practices (20, 21). Furthermore, an analysis of the responses regarding the mode of transmission of malaria revealed that not all health workers are aware that *Plasmodium* is the causative agent of malaria. These findings are concerning and highlight the urgent need to organise nationwide education programmes for health workers on malaria. Given the ongoing devastation caused by this disease in African countries, it is imperative to ensure that all health workers possess the necessary and sufficient knowledge to effectively combat and manage it.

Self-medication, visits to traditional healers and the use of local herbs, as shown by Liheluka et al.'s (18) study in Tanzania, are not effective ways to manage simple and/or complicated/severe malaria. The reason for this lies in the impossibility of such practices to eliminate parasitemia and contribute to the progression of the disease, other undesirable phenomena, consequences and the possible transmission of parasites resistant to antimalarial drugs. Furthermore, self-medication is common in Tanzanian communities due to factors such as concerns about the declining effectiveness of antimalarial drugs, poor patient-provider relationships, high treatment costs, drug shortages, long waiting times, and limited access to healthcare facilities (18). Similarly, our study shows that residents of rural areas rely on traditional methods more often than those in urban areas.

The results indicate that a majority of participants (63%) included in our study were aware of the PNLP. This suggests a relatively high level of awareness, though there remains a significant portion of the population that is uninformed, highlighting the need for further outreach and education efforts. To ensure the programme reaches all segments of the population, targeted awareness campaigns should be implemented, particularly in rural and underserved areas. Additionally, efforts must focus not only on informing the public but also on ensuring the effective implementation of the programme through improved accessibility, healthcare infrastructure, and community engagement.

Limitations and strengths of the study

The key advantage of this research is that it provides valuable insights into the situation in the southern part of Benin, covering knowledge, attitudes, and practices among both residents and health workers. The findings serve as a foundation for organising educational programmes for both the general population and healthcare workers, guiding efforts to reduce malaria-related mortality and encouraging the use of modern biomedical prevention and treatment methods.

However, this study has certain limitations. The main weakness of the study is the relatively small sample size, particularly among health workers. The sample size may affect the generalizability of the results, and the length of the questionnaire may have contributed to some questions being left unanswered by a significant number of respondents, preventing the collection of all anticipated data. Furthermore, it should include individuals under the age of 18, especially schoolchildren, given the prevalence of malaria in the area and the importance of early education on malaria prevention.

Conclusion

This study reveals that a significant proportion of participants have a high level of knowledge about malaria, including its transmission and symptoms. They demonstrate positive attitudes and effective prevention practices, such as using insecticide-treated mosquito nets (LLINs) and residual home spraying. For treatment, many seek care at health centres and rely on medications prescribed by healthcare workers.

Despite these encouraging findings, African governments, including Benin, must continue investing in awareness campaigns and improving access to malaria prevention and treatment. A portion of the population still engages in harmful practices, such as self-medication, which poses health risks and contributes to the persistence of the disease and the development of *Plasmodium* resistance to antimalarial drugs.

To achieve Benin's ambitious goal of "zero malaria" by 2030, specific measures must be implemented:

1. Raising Awareness – Educating the population, healthcare workers, traditional healers, and mobile drug vendors on malaria causes, transmission, symptoms, prevention strategies, and certified treatments.

2. Promoting Early Treatment – Encouraging people to seek medical attention within 24 hours of the first symptoms to prevent complications.

3. Inclusive Education – Organising free training sessions in local languages to ensure that illiterate residents receive essential information on malaria preven-tion, diagnosis, and treatment.

Declarations

Acknowledgements: We are grateful to all individuals who took part in this study. The study described in this manuscript is based on Marcelle Nonvignon Avocetien's Master of Nursing thesis. The thesis was written and defended in the Croatian language. The thesis is available in the online repository: https://urn.nsk.hr/urn:nbn:hr:224:255283

Authors' contributions: The authors confirm contribution to the paper as follows:

Study conception and design: MNA, OGS, MČ. Data collection: MNA, TG, OGS. Interpretation of results: MNA, MA. Draft manuscript preparation: MNA, TG, OGS, MČ. All authors critically reviewed and approved the final version of the manuscript.

Ethics considerations: The approval of the Ethics Committee of the Catholic University of Croatia was obtained. Based on the request submitted on July 10, 2022, the committee issued a certificate on July 20, 2022, confirming that this research is in accordance with the Code of Ethics of the Catholic University of Croatia and other rules and regulations for conducting research involving humans. The certificate is kept under CLASS No.: 641-03/22-03/030, Reg. No.: 498-15-06-22-001.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Competing interests: All authors declare that they have no conflicts of interest.

Data sharing statement: The data underlying this article will be shared on reasonable request to the corresponding author.

References

1. Yaya HS, Ze A. Le fardeau socio-économique du paludisme en Afrique. Canada: Presses Université Laval, 2013., pp. 15-53.
2. Akogbéto MC, Padonou GG, Gbénou D, et al. Bendiocarb, a potential alternative against pyrethroid resistant Anopheles gambiae in Benin, West Africa. *Malar J*. 2010;9:204.
3. Severe malaria observatory. Données factuelles concernant le paludisme [Internet]. Available from: https://www.severemalaria.org/fr/pays/benin
4. World Health Organisation. World malaria report 2023: Global messaging briefing kit [Internet]. 2023. Available from: https://www.paho.org/en/documents/global-messaging-briefing-kit-world-malaria-report-2023
5. Ministere de la santé. PNLP-Programme National de Lutte contre le Paludisme [Internet]. Available from: https://sante.gouv.bj/PNLP-Programme-National-de-Lutte-contre-le-Paludisme
6. Plan strategique national de lutte contre le paludisme, 2011-2015. Vers un Bénin sans Paludisme [Internet]. Available from: https://www.santetropicale.com/rapports.asp?action=lire&id=989&specialite=
7. Mutombo AM, Wakamb GA, Tshibanda KN. et al. La prise en charge à domicile du paludisme chez l'enfant de 0 à 5 ans: Un problème réel de santé publique à Lubumbashi (RD Congo). *Pan Afr Med J*. 2014;18.
8. Agency for International Développent des États-Unis. Analyse des politiques de gratuité et étude du cout de traitement du paludisme au Bénin [Internet]. 2018. Available from: https://www.hfgproject.org/analyse-des-politiques-de-gratuite-et-etude-du-cout-de-traitement-du-paludisme-au-benin/
9. Kiniffo IR, Agbo-Ola L, Issifou S, Massougbodji A. Les meres des enfants de moins de cinq ans et le paludisme dans la Vallee de Dangbo au sud-est du Benin. *Médecine d'Afrique Noire*. 2000;47(1).
10. Hlongwana KW, Mabaso ML, Kunene S. et al. Community knowledge, attitudes and practices (KAP) on malaria in Swaziland: A country earmarked for malaria elimination. *Malar J*. 2009;8,29.
11. Enama MLO, Ntonga PA, Mbida AM. et al. Le paludisme : connaissances, attitudes et pratiques des chefs de ménage de la region de l'ouestCameroun. *J Appl Biosci*. 2020;147:15117-24.
12. Djoufounna J, Bamou R, Mayi MPA. et al. Population knowledge, attitudes and practices towards malaria prevention in the locality of Makenene, Centre-Cameroon. *Malar J*. 2022;21(1):234.
13. Mabiala AN, Obame-Nkoghe J, Bisseye C. et al. Connaissances et méthodes de lutte contre le paludisme au sein des ménages de la cité minière de Moanda en zone semi-rurale au Sud-Est Gabon. *J Appl Biosci*. 2021;159:16411-9.
14. Addis D, Gebeyehu Wondmeneh T. Assessment of malaria prevention knowledge, attitude, and practice and associated factors among households living in rural malaria-endemic areas in the Afar Pastoral Region of Ethiopia. *Front Public Health*. 2023;11:1258594.
15. Seck I, Fall I, Faye O et al. Connaissances, attitudes et pratiques des femmes sur le paludisme, dans la zone rurale de Poponguine, Sénégal. *Médecine Tropicale*. 2008;68(6):629-633.
16. Manana PN, Kuonza L, Musekiwa A. et al. Knowledge, attitudes and practices on malaria transmission in Mamfene, KwaZulu-Natal Province, South Africa 2015. *BMC Public Health*. 2018;18(1):41.
17. World Health Organisation. World malaria report 2014 [Internet]. 2014. Available from: https://www.who.int/publications/i/item/9789241564830
18. Liheluka EA, Massawe IS, Chiduo MG. et al. Community knowledge, attitude, practices and beliefs associated with persistence of malaria transmission in North-western and Southern regions of Tanzania. *Malar J*. 2023;22(1):304.
19. Yaya S, Bishwajit G, Ekholuenetale M. et al. Knowledge of prevention, cause, symptom and practices of malaria among women in Burkina Faso. *PLoS One*. 2017;12(7).
20. Louis JP, Le Goff G, Trebucq A. et al. Utilisation et acceptabilité des moustiquaires imprégnées au niveau familial en milieu rural - Mbebe-Kikot - Cameroun. *Bulletin de Liaison et de Documentation – OCEAC*. 1992;101, pp. 36-39.
21. Mathenge EM, Gimnig JE, Kolczak M. et al. Effect of Permethrin-Impregnated Nets on Exiting Behavior, Blood Feeding Success, and Time of Feeding of Malaria Mosquitoes (Diptera: Culicidae) in Western Kenya. *J Med Entomol*. 2001;38(4):531-6.