

KNOWLEDGE, ATTITUDES, AND PRACTICES REGARDING MALARIA PREVENTION IN THE MBANDAKA HEALTH ZONE: A CASE STUDY OF THE BAKENGELEKE NEIGHBORHOOD, 2023-2024

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ABSTRACT

Background: Malaria remains a major public health challenge in the Democratic Republic of Congo, particularly in the Mbandaka Health Zone. Understanding population-level knowledge, attitudes, and practices (KAP) is essential for designing effective prevention interventions.

Objective: This study aimed to assess the knowledge, attitudes, and practices regarding malaria prevention among residents of the Bakengeleke neighborhood in the Mbandaka Health Zone.

Methods: A descriptive cross-sectional study was conducted from June to September 2024. A sample of 150 individuals aged 15 years and older, residing in the neighborhood for at least six months, was surveyed using a structured questionnaire. Data were analyzed using SPSS software, with descriptive statistics and chi-square tests.

Results: The mean age of respondents was 34.5 years; the majority were female (56.7%) and had secondary education (54.7%). Knowledge about malaria transmission (84.7% identified mosquito bites) and symptoms (80% cited fever) was satisfactory. However, only 73.3% reported using insecticide-treated nets (ITNs), with only 46.7% using them every night. Stagnant water treatment was performed regularly by only 34.7% of respondents, and 22.7% practiced self-medication for fever. Environmental unsanitary conditions (40%) and lack of ITNs (33.3%) were the main perceived barriers. Education level was significantly associated with regular ITN use ($p=0.02$) and healthcare-seeking behavior ($p=0.01$).

Conclusion: Despite relatively good knowledge and favorable attitudes, preventive practices remain insufficient. The gap between knowledge and practices is explained by material barriers, discomfort, and financial constraints. Strengthening targeted awareness campaigns, improving ITN availability and comfort, and promoting environmental sanitation are urgently needed.

Keywords: Malaria, Knowledge, Attitudes, Practices, Mbandaka, Prevention, KAP.

1. INTRODUCTION

1.1 Background

Malaria remains a leading cause of morbidity and mortality in the Democratic Republic of Congo (DRC), accounting for nearly 50% of all consultations and hospitalizations (National Malaria Control Program [PNLP], 2022). According to the World Health Organization (WHO, 2023), the African region bears 94% of global malaria cases and 95% of malaria deaths, with the DRC ranking second only to Nigeria in disease burden.

The city of Mbandaka, capital of Équateur Province, is located in the heart of the Congolese central basin. Its equatorial climate—characterized by high temperatures (average 26°C), high humidity (80-85%), and abundant rainfall (1800-2000 mm annually)—creates optimal conditions for the proliferation of *Anopheles* mosquitoes, the vectors of *Plasmodium* parasites. Malaria transmission is perennial, with peaks during the rainy seasons (April-May and July-August).

1.2 Problem Statement

The Bakengeleke neighborhood, located in the Bolenge Health Zone (Wangata Commune), exemplifies the challenges faced by peri-urban areas in Mbandaka. Despite government efforts—including free distribution of insecticide-treated nets (ITNs), indoor residual spraying, awareness campaigns, and free diagnostic testing and treatment—malaria remains highly prevalent. This persistence raises questions about the effectiveness of community-level responses.

The Knowledge, Attitudes, and Practices (KAP) model posits that good knowledge leads to favorable attitudes, which in turn influence preventive practices. However, studies in sub-Saharan Africa and the DRC have shown that knowledge does not always translate into practice. Socioeconomic factors (poverty, education level), cultural factors (traditional beliefs, recourse to traditional healers), and structural factors (geographic and financial access to care, ITN availability) may constitute major barriers.

1.3 Study Objectives

General objective: To assess the knowledge, attitudes, and practices regarding malaria prevention among residents of the Bakengeleke neighborhood in the Mbandaka Health Zone.

Specific objectives:

1. Determine the level of knowledge about malaria causes, symptoms, transmission modes, and prevention methods
2. Analyze attitudes toward malaria and preventive measures
3. Describe current preventive practices (ITN use, environmental sanitation, healthcare-seeking behavior)
4. Identify sociodemographic and behavioral factors associated with KAP
5. Formulate operational recommendations to strengthen community-based malaria control interventions

1.4 Research Hypotheses

H1: The majority of the population knows the transmission modes and main symptoms of malaria but does not systematically adopt recommended preventive behaviors.

H2: There is a positive and significant association between education level and the adoption of effective malaria prevention measures.

H3: Attitudes that trivialize malaria (minimizing its severity) reduce adherence to prevention campaigns and preventive behaviors.

2. METHODS

2.1 Study Design

This was a descriptive cross-sectional study with analytical aims, using a quantitative approach.

2.2 Study Setting

The study was conducted in the Bakengeleke neighborhood, Bolenge Health Zone, Wangata Commune, Mbandaka City, Équateur Province, Democratic Republic of Congo. The neighborhood has an estimated population of 12,000 inhabitants distributed across 15 avenues and approximately 2,500 households. The main economic activities are small-scale trade, fishing, urban agriculture, and informal labor.

2.3 Study Population and Sampling

Target population: All residents of the Bakengeleke neighborhood aged 15 years and older who had resided in the neighborhood for at least six months.

Sample size: Calculated using Schwartz's formula: $n = Z^2 \times p \times (1-p) / d^2$, with $Z=1.96$ (95% confidence interval), $p=0.5$ (estimated prevalence), and $d=0.05$ (margin of error). The calculation yielded 384 participants, adjusted to 150 participants due to time and resource constraints.

Sampling method: Simple random sampling. Fifteen avenues were identified, and 10 households were randomly selected per avenue. Within each household, one participant was selected using the Kish method.

2.4 Data Collection Instrument

A structured questionnaire with closed and semi-open questions was developed based on WHO/PNLP KAP questionnaires and the scientific literature. The questionnaire covered five sections: (A) sociodemographic characteristics, (B) knowledge, (C) attitudes, (D) practices, and (E) information sources and campaign satisfaction.

Validity: The questionnaire was reviewed by an expert committee (three public health researchers, two health agents) and pre-tested on 20 individuals in a neighboring neighborhood.

Reliability: Internal consistency was assessed using Cronbach's alpha ($\alpha=0.78$ for knowledge, $\alpha=0.72$ for attitudes, $\alpha=0.75$ for practices), indicating acceptable reliability.

2.5 Data Collection

Data were collected from June to September 2024 by five trained interviewers (three master's students, two health agents). Each interview lasted 20-30 minutes. Questionnaires were completed by interviewers in the presence of participants.

2.6 Ethical Considerations

The study complied with the Declaration of Helsinki and national ethics guidelines. Informed consent (verbal or written) was obtained from all participants. Anonymity and confidentiality were guaranteed through numerical coding. Administrative authorizations were obtained from ISTM Mbandaka, the Mbandaka Health Zone, and the Bakengeleke neighborhood chief.

2.7 Data Analysis

Data were entered into Excel and analyzed using SPSS version 25. Descriptive statistics (frequencies, percentages, means) were calculated. Chi-square tests were used to explore associations between variables, with statistical significance set at $p < 0.05$.

3. RESULTS

3.1 Sociodemographic Characteristics

Table 1. Sociodemographic Characteristics of Respondents (N=150)

Characteristic	n	%
Sex		
Male	65	43.3
Female	85	56.7
Age		
15-24 years	35	23.3
25-34 years	48	32.0
35-44 years	40	26.7
45-54 years	18	12.0
55+ years	9	6.0
Education level		
None	15	10.0
Primary	38	25.3
Secondary	82	54.7
Higher/University	15	10.0

The mean age was 34.5 years. The sample was predominantly female (56.7%) with secondary education (54.7%).

3.2 Knowledge About Malaria

Table 2. Knowledge About Malaria Causes, Symptoms, Transmission, and Prevention (N=150)

Variable	n	%
Cause of malaria		
Mosquito bites	127	84.7
Dirty water/garbage	15	10.0
Fatigue/cold	5	3.3
Does not know	3	2.0
Symptoms (multiple responses)		
Fever	120	80.0
Headache	52	34.7
Chills	45	30.0
Vomiting	38	25.3
Muscle aches	30	20.0
Does not know	8	5.3
Transmission modes (multiple responses)		
Mosquito bites	127	84.7
Blood transfusion	35	23.3
Mother-to-child (pregnancy)	28	18.7
Contact with infected person	20	13.3
Does not know	5	3.3
Prevention methods (multiple responses)		
Insecticide-treated net	135	90.0
Rapid consultation for fever	110	73.3
Sanitation/stagnant water elimination	98	65.3

Variable	n	%
Insecticide spraying	45	30.0
Anti-malarial vaccine	25	16.7

The majority (84.7%) correctly identified mosquito bites as the cause of malaria, and fever (80.0%) as the main symptom. ITNs were the best-known prevention method (90.0%).

3.3 Preventive Practices

Table 3. Preventive Practices Among Respondents (N=150)

Practice	n	%
ITN use		
Yes	110	73.3
No	40	26.7
Frequency of ITN use		
Every night	70	46.7
Sometimes (not every night)	40	26.7
Rarely	10	6.7
Never	30	20.0
Stagnant water treatment		
Regularly	52	34.7
Sometimes	46	30.7
Never	52	34.7
Healthcare-seeking behavior for fever		
Health center/hospital	101	67.3

Practice	n	%
Self-medication (pharmacy)	34	22.7
Traditional healer	10	6.7
Nothing/rest at home	5	3.3

While 73.3% reported using ITNs, only 46.7% used them every night. Regular stagnant water treatment was performed by only 34.7% of respondents, and 22.7% practiced self-medication for fever.

3.4 Attitudes and Perceived Barriers

Table 4. Attitudes and Perceived Barriers (N=150)

Variable	n	%
Perception of malaria severity		
Very serious	95	63.3
Fairly serious	40	26.7
Not very serious	10	6.7
Not serious at all	5	3.3
Perceived difficulties (multiple responses)		
Environmental unsanitary conditions	60	40.0
Lack of ITNs	50	33.3
ITN discomfort (heat)	35	23.3
Cost of care	25	16.7
Lack of suspension for ITN	20	13.3
Lack of information	15	10.0

The majority (90.0%) perceived malaria as a serious disease. Environmental unsanitary conditions (40.0%) and lack of ITNs (33.3%) were the main perceived barriers.

3.5 Hypothesis Testing

Table 5. Association Between Education Level and Preventive Practices

Variable	Secondary+ (%)	Primary/None (%)	p-value
Regular ITN use (every night)	54.2	36.8	0.02*
Healthcare-seeking at health center	75.0	55.3	0.01*

*Statistically significant at $p < 0.05$

H1 (knowledge-practice gap): Verified. Although 84.7% knew the cause of malaria, only 46.7% used ITNs every night, and 34.7% never treated stagnant water.

H2 (education-practice association): Verified. Education level was significantly associated with regular ITN use ($p=0.02$) and healthcare-seeking behavior ($p=0.01$).

H3 (trivialization-adherence association): Partially verified. Respondents who perceived malaria as not serious (10% of the sample) had poorer practices, but this group was minority.

4. DISCUSSION

4.1 Knowledge

The level of knowledge about malaria transmission (84.7%) is comparable to other urban studies in the DRC (Kayembe, 2020: 85%; Mwamba & Ilunga, 2021: 82%). This reflects the effectiveness of awareness campaigns by the PNLP and partners.

However, misconceptions persist: 10% attributed malaria to dirty water or garbage, and 3.3% to fatigue or cold. Similar rates have been reported in Côte d'Ivoire (Koffi et al., 2018). These

misconceptions, although minority, can lead to inappropriate behaviors (e.g., resting instead of consulting).

Fever was well identified (80%), but other symptoms (chills, muscle aches) were less known—a trend also observed in Senegal (Diop et al., 2019). Poor recognition of non-fever symptoms may delay healthcare-seeking.

Knowledge of non-vector transmission modes (blood transfusion: 23.3%; mother-to-child: 18.7%) was low, similar to findings in Cameroon (Nguemain et al., 2021). Pregnant women need specific education about vertical transmission and intermittent preventive treatment (IPTp).

Knowledge of the anti-malarial vaccine was very low (16.7%), an expected finding given that RTS,S is not yet widely deployed in the DRC.

4.2 Attitudes

Perception of malaria severity was good (90.0% considered it serious), which should motivate preventive behaviors. However, according to the Health Belief Model, perceived severity alone is insufficient; perceived susceptibility and perceived benefits are also needed. Our data (not shown) indicated that 40% of respondents did not perceive themselves as personally susceptible ("it mainly happens to children").

This low perceived susceptibility is a classic prevention challenge: people tend to underestimate their personal risk, especially for common diseases they have experienced without serious consequences.

4.3 Practices

ITN use (73.3%) exceeded the national average (PNLP, 2022: 65%), but regular use (every night) was much lower (46.7%). This discrepancy between possession/occasional use and regular use is well documented. Reasons cited (heat discomfort, lack of suspension) are consistent with the literature (Tshimanga, 2018; Kayembe, 2020).

Environmental sanitation (stagnant water treatment) was very inadequate (only 34.7% performed it regularly). This is concerning because sanitation is a collective preventive measure that complements individual ITN protection. Poor sanitation increases vector density, raising transmission pressure.

Healthcare-seeking for fever (67.3%) was acceptable, but self-medication (22.7%) remained high, though lower than rates reported in Senegal (Diop et al., 2019: 40%). Self-medication is often driven by the desire for speed and avoidance of consultation costs. It is dangerous because it can mask symptoms, delay appropriate treatment, and promote resistance.

4.4 Study Limitations

Several limitations should be acknowledged: (1) modest sample size (n=150) limiting generalizability; (2) self-report bias (social desirability); (3) cross-sectional design precluding causal inference; (4) potential seasonal variation in practices; and (5) single-neighborhood focus limiting generalizability to other areas.

5. CONCLUSION

This study assessed knowledge, attitudes, and practices regarding malaria prevention among residents of the Bakengeleke neighborhood in the Mbandaka Health Zone. Key findings include:

1. **Knowledge:** Generally satisfactory (84.7% identified mosquito bites as the cause; 80% cited fever as a symptom; 90% knew ITNs as a prevention method). However, gaps remain regarding other symptoms, non-vector transmission, and the anti-malarial vaccine.
2. **Attitudes:** Mostly favorable (90% perceived malaria as serious). However, perceived personal susceptibility was low, and ITN discomfort was a significant barrier.
3. **Practices:** Insufficient and irregular. Only 46.7% used ITNs every night; 34.7% never treated stagnant water; 22.7% practiced self-medication. Environmental unsanitary conditions and lack of ITNs were the main perceived difficulties.

4. **Hypotheses:** The knowledge-practice gap was verified; the association between education level and practices was verified; the impact of trivialization was partially verified.

5.1 Recommendations

For health authorities (Mbandaka Health Zone, PNLP, Provincial Health Division):

- Strengthen interactive, participatory awareness campaigns using simple visual aids
- Focus on larval source management through community-based sanitation campaigns
- Improve ITN availability and accessibility through more frequent free distributions
- Address ITN discomfort by promoting more breathable models and providing hanging materials
- Combat self-medication through health worker training and public awareness
- Improve financial accessibility of care by ensuring effective free TDR/ACT

For community leaders (neighborhood chiefs, religious leaders, community health workers):

- Actively engage in awareness campaigns and sanitation operations
- Serve as role models by consistently using ITNs and maintaining clean environments
- Systematically refer febrile individuals to health centers for TDR testing

For the population:

- Use ITNs every night, year-round; hang them properly; maintain them with cold water
- Sanitize the environment: eliminate stagnant water, dispose of empty containers, cut grass
- In case of fever, consult a health center for free TDR testing; complete the full ACT treatment
- Particularly protect children under five and pregnant women

For researchers:

- Expand this study to other neighborhoods and health zones
- Conduct qualitative studies to explore reasons for irregular ITN use and self-medication
- Evaluate the impact of proposed interventions (e.g., ITN suspension distribution, sanitation campaigns)
- Document perception and acceptability of the future anti-malarial vaccine

Malaria control is a collective responsibility. By uniting efforts, we can reduce the preventable and curable burden of this disease.

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