

Assessment of People's Knowledge, Attitude and Practice on Malaria in Northern Liberia

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Abstract:

Context: Malaria remains a significant public health challenge in Northern Liberia, characterized by high infection rates and considerable morbidity. Despite ongoing efforts to combat the disease, public health knowledge and education gaps persist, contributing to inadequate malaria prevention and control practices. This region faces unique challenges, including limited healthcare services, insufficient malaria transmission and prevention awareness, and ineffective educational programs. Northern Liberia's diverse socio-economic landscape further complicates the situation. Many communities have limited access to reliable health information and resources, exacerbating the spread of malaria. Misconceptions and misinformation about malaria and its prevention methods are prevalent, which hinders the effectiveness of existing interventions and contributes to higher rates of transmission and adverse health outcomes. **Settings and Design:** The study was conducted in Lofa County, Northern Liberia, a region characterized by a high malaria prevalence and a diverse population comprising urban and rural communities. A cross-sectional survey was conducted using a structured questionnaire to collect quantitative data from residents of Lofa County. This design was chosen because it allows for assessing the prevalence of various factors related to malaria awareness and control at a single point, providing a snapshot of the current situation (Levin, 2006). **Results:** The results showed that 97.2% of respondents had contracted malaria, with 66% having received formal education on malaria prevention. However, 34% had not received any education. Local clinics primarily sought medical assistance (53.8%), significantly relying on home remedies (43%). Notably, only 24.5% of respondents had adequate access to anti-malarial medication. Additionally, there were considerable gaps in knowledge, with only 46.2% aware of different malaria parasites and 53% unaware of the long-term consequences of untreated malaria. **Conclusions:** The study highlights a pressing need for improved public health education and better access to malaria prevention and treatment resources in Northern Liberia. Community-based interventions, including targeted educational campaigns and more vital collaboration between government and non-governmental organizations, are essential to address these knowledge gaps and reduce malaria prevalence. Enhanced public health efforts are essential to mitigate the impact of malaria and improve health outcomes in this region.

Keywords: Malaria, Public Health, Awareness, Education, Northern Liberia, Lofa County.

Introduction

Malaria poses a significant threat to public health, particularly in sub-Saharan Africa. According to the World Health Organization (WHO), malaria is an acute febrile illness caused by Plasmodium parasites transmitted to humans by female Anopheles mosquitoes (World Health Organization, 2021.). The disease disproportionately affects regions like sub-Saharan Africa, with children under five and pregnant women being the most vulnerable groups (UNICEF, 2021.).

In Liberia, malaria remains a leading cause of morbidity and mortality despite ongoing efforts to combat the disease (Ministry of Health and Social Welfare, Republic of Liberia, 2019).

Globally, an estimated 249 million malaria cases occurred in 2022, leading to 608,000 malaria deaths in a single year - most were young children in sub-Saharan Africa. (Centers for Disease Control and Prevention.).

Factors contributing to the high prevalence of malaria in this region include climatic conditions favourable for mosquito breeding, limited access to healthcare, and widespread poverty, which hinders the implementation of effective control measures (Centers for Disease Control and Prevention, 2019.).

Efforts to combat malaria have been multifaceted, involving the distribution of insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), and the introduction of artemisinin-based combination therapies (ACTs). However, challenges such as insecticide resistance, the emergence of drug-resistant malaria strains, and gaps in healthcare infrastructure continue to impede progress (Global Health Sciences, 2021.; World Health Organization, 2021.).

In Liberia, the situation is particularly dire. The 2019 Liberia Malaria Indicator Survey revealed that 36% of children under five had tested positive for malaria, underscoring the endemic nature of the disease in the country (Ministry of Health and Social Welfare, Republic of Liberia, 2019).

Lofa County, located in Northern Liberia, is one of the regions most affected by malaria. The county's rugged terrain and remote communities pose additional challenges to the delivery of healthcare services and the implementation of malaria control interventions (Liberia Institute of Statistics and Geo-Information Services, 2019).

The expansion of interventions and development of new malaria prevention technologies have saved millions of lives globally and cut malaria mortality by 36% from 2010 to 2020.

This study aims to investigate the current public health awareness and education related to malaria in Northern Liberia, focusing on Lofa County. By examining the local population's knowledge, attitudes, and practices, this research seeks to identify barriers to effective malaria prevention and treatment and propose strategies to enhance public health interventions. Understanding the community's perceptions and behaviors regarding malaria is crucial for developing targeted and sustainable

interventions that can reduce the disease burden and improve health outcomes in this vulnerable region.

Methodology

Study Design: This cross-sectional study examined the public health knowledge gap related to malaria awareness and education in Northern Liberia. It aimed to identify the levels of knowledge, attitudes, and practices (KAP) concerning malaria prevention and treatment among the local population.

Study Area: The research was conducted in Northern Liberia, focusing on several regional communities. This area was selected due to its high malaria prevalence and reported inadequacies in public health education.

Study Population: The study population included residents of Northern Liberia, with a focus on both urban and rural communities. Participants were selected using a stratified random sampling method to ensure a representative sample across different demographics, including age, gender, educational background, and socioeconomic status.

Inclusion Criteria: Residents of Northern Liberia aged 18 and above who have lived in the area for at least one year.

Exclusion Criteria: Individuals who are not permanent residents, those under 18, and those unable or unwilling to provide informed consent.

Sample Size: The sample size was determined using standard statistical methods for cross-sectional studies, aiming for a confidence level of 95% and a margin of error of 5%. Based on the estimated population of Northern Liberia, a sample size of 400 participants was deemed adequate.

Data Collection Methods: Data were collected through structured interviews and questionnaires administered by trained field workers. The questionnaire was designed to assess:

Knowledge: Awareness of malaria transmission, symptoms, prevention methods, and treatment options.

Attitudes: Perceptions and beliefs about malaria and its impact on health.

Practices: Actual behaviours related to malaria prevention and treatment, such as using insecticide-treated nets (ITNs) and seeking medical care.

Data Analysis: The collected data were entered into a database and analysed using statistical software (e.g., SPSS). Descriptive statistics were used to summarize the KAP levels, while inferential statistics (e.g., chi-square tests and logistic regression) were employed to identify factors associated with inadequate malaria awareness and education.

Results

Table 1: Demographic and Knowledge Characteristics of Respondents

Demographic and Knowledge Characteristics	Frequency (N=400)	Percent %
Age Level		
Between 18 – 25	116	29.0
Between 25 – 35	142	35.5
Between 35 – 45	105	26.2
Above 45	37	9.2
Gender Level		
Male	195	48.8
Female	205	51.2
Education Level		
No formal education	85	21.2
Primary education	48	12.0
Secondary education	153	38.2
Higher education	105	26.2
Other	9	2.2
Knowledge of Malaria Causes		
Mosquito bites	256	64.0
Contaminated water	9	2.2
Improper use of mosquito nets	12	3.0
Poor Sanitation and waste management	123	30.8

Source: Field data, 2024

Demographic Characteristics: The respondents' ages ranged from 18 to over 45, with the majority (64.5%) being between 18 and 35. The gender distribution was relatively balanced, with 48.8% males and 51.2% females. Educational attainment varied, with 21.2% having no formal education, 12.0% with primary education, 38.2% with secondary education, and 26.2% with higher education.

Table 1 comprehensively summarizes respondents' demographic characteristics and knowledge of malaria causes.

Age Level:

- The largest age group is between 25 and 35 years (35.5%), followed by the 18-25 age group (29%), indicating a predominantly young adult population.
- Participants aged 35-45 comprise 26.2%, and those above 45 make up 9.2%, showing a gradual decrease in older age groups.

Gender Level:

- The gender distribution is relatively balanced, with females slightly outnumbering males (51.2% vs. 48.8%).

Education Level:

- Most respondents have secondary education (38.2%) and higher education (26.2%).
- Notably, 21.2% have no formal education, and a smaller fraction have primary education (12%) or fall into the "Other" category (2.2%).

Knowledge of Malaria Causes:

- The majority of respondents correctly identify mosquito bites as the primary cause of malaria (64%).
- Other causes, such as contaminated water (2.2%), improper use of mosquito nets (3%), and poor sanitation and waste management (30.8%), show varying levels of awareness.

Significance and Importance:

- **Demographic Insights:** Understanding the age, gender, and education level of respondents is crucial for tailoring public health interventions. The predominance of young adults suggests that targeting health education and prevention programs to this demographic can be highly effective.
- **Educational Background:** The significant number of secondary and higher education respondents indicates a relatively educated population that can be engaged through informational campaigns and training.
- **Knowledge of Malaria Causes:** The high awareness of mosquito bites as a primary cause is encouraging, but the misconceptions about other causes indicate a need for more comprehensive education campaigns to address these gaps.

Table 2: Responses on Malaria Prevention and Treatment

Prevention and Treatment Factors	Frequency (N=400)	Percent %
Have contracted malaria		
Yes	389	97.2
No	11	2.8
Received education/training		
Yes	264	66.0
No	136	34.0
Seek medical assistance		
Hospital	13	3.2
Local clinic	215	53.8
Home remedies	172	43.0
Confident in identifying symptoms		
Very confident	223	55.8
Somewhat confident	144	36.0
Not confident at all	33	8.2
Perception of government efforts		
Excellent	55	13.8
Good	159	39.8
Fair	115	28.8
Poor	71	17.8
Access to anti-malarial medication		
Yes	98	24.5
No	302	75.5

Source: Field data, 2024

Table 2 Knowledge of Malaria: Most respondents (64.0%) correctly identified mosquito bites as the primary cause of malaria. However, misconceptions were also present, with 30.8% attributing malaria to poor sanitation and waste management. Only 46.2% were aware of the different malaria parasites, and 53.0% were unfamiliar with the long-term consequences of untreated malaria.

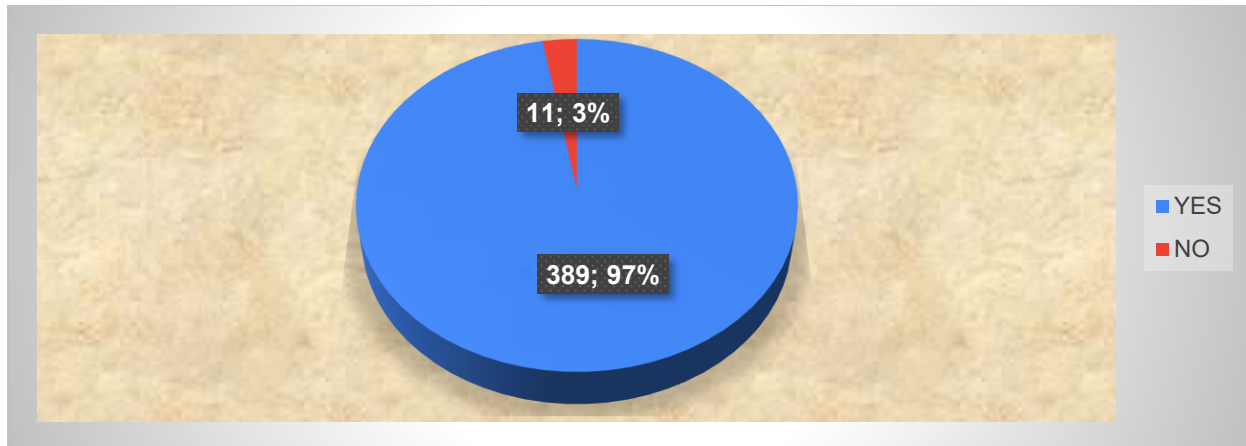
details respondents' experiences and attitudes towards malaria prevention and treatment.

- **Have contracted malaria:**
 - A striking 97.2% of respondents or their family members have experienced malaria, highlighting the high prevalence of the disease.

- **Received education/training:**
 - 66% have received formal education or training on malaria prevention and treatment, while 34% have not, indicating a gap in educational outreach.
- **Seek medical assistance:**
 - When suspecting malaria, most respondents prefer local clinics (53.8%), followed by home remedies (43%), with only 3.2% going to hospitals.
- **Confident in identifying symptoms:**
 - A majority feel very confident (55.8%) or somewhat confident (36%) in identifying malaria symptoms, but 8.2% are not confident.

- **Perception of government efforts:**
 - Perceptions are mixed: 13.8% rate efforts as excellent, 39.8% as good, 28.8% as fair, and 17.8% as poor.
- **Access to anti-malarial medication:**
 - A majority (75.5%) believe they do not have adequate access to anti-malarial medication, with only 24.5% stating they have enough access.
- **Significance and Importance:**
 - **High Malaria Prevalence:** The near-universal experience with malaria underscores the urgent need for effective prevention and treatment programs.
 - **Education and Training Gaps:** The 34% who lack education or training on malaria prevention represent a critical target for future public health initiatives.
 - **Healthcare Access:** The reliance on local clinics and home remedies suggests a need for better healthcare infrastructure and increased accessibility to hospitals and formal medical care.
 - **Symptom Identification Confidence:** The high confidence levels in symptom identification are positive but must be universal.
 - **Perception of Government Efforts:** Mixed perceptions highlight areas where governmental efforts can be improved and better communicated.
 - **Medication Access:** The significant gap in access to anti-malarial medication points to a crucial area for policy and logistical improvements.

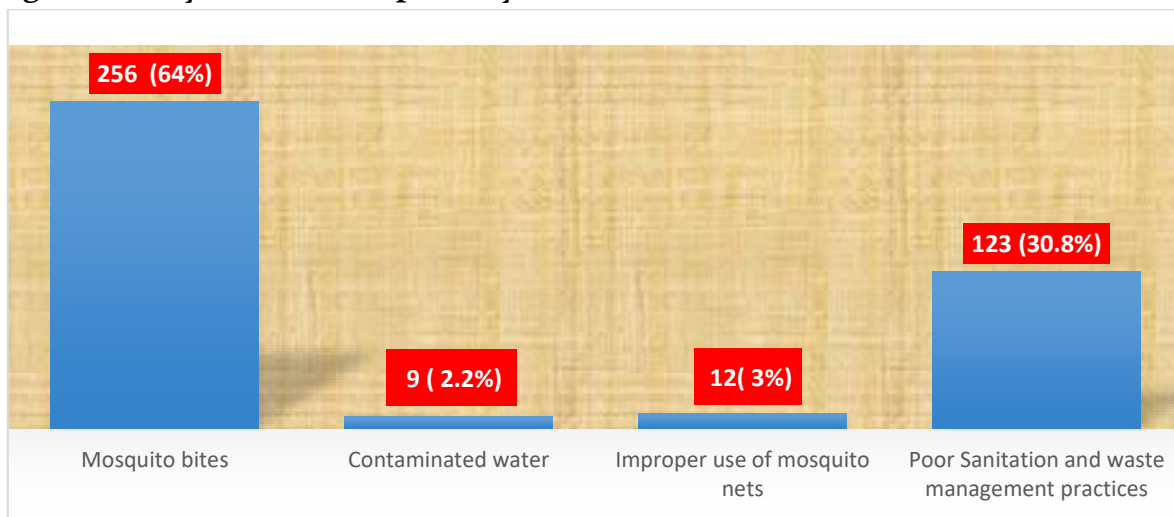
Figure 1 Have you or anyone in your family ever contracted malaria?



Source: (Field data, 2024)

Figure 1 shows that Out of a total of 400 respondents, 11 individuals, constituting 3% of the total, answered "NO," " indicating that neither they nor anyone in their family has had malaria. This data suggests that malaria incidence within the surveyed population or their families is relatively high, with a large percentage reporting a history of the disease. At the same time, 389 individuals, comprising 97% of the total, answered "YES indicating that they or someone in their family has contracted malaria at some point. It could be used to inform public health interventions, targeting resources in areas or populations with higher malaria prevalence.

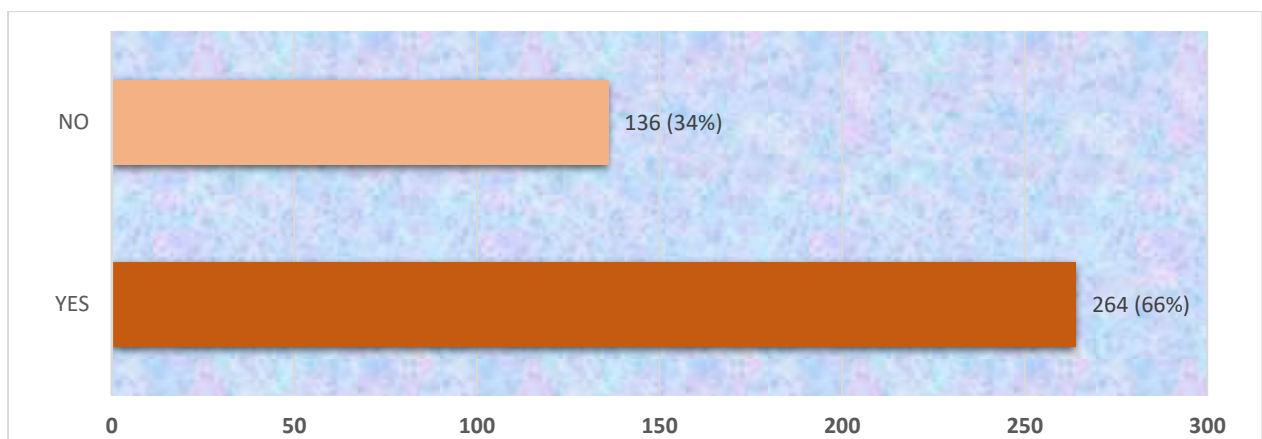
Figure 2: Do you know the primary cause of malaria?



Source: (Field data, 2024)

Figure 2 shows , The statement “Mosquito bites” This is identified as the primary cause by 64% of the respondents, indicating that the majority attribute malaria transmission to mosquito bites, while the statement “Contaminated water” Only 2.2% of respondents believe contaminated water is the primary cause of malaria, Improper use of mosquito nets shows Approximately 3% of respondents consider improper use of mosquito nets as the primary cause, and the statement “Poor Sanitation and waste management” practices: A significant portion, 30.8%, of respondents believe that poor sanitation and waste management practices are the main contributors to malaria transmission. These percentages give insight into the perceptions within the surveyed population regarding the primary causes of malaria. It's clear that the majority attribute it to mosquito bites, followed by poor sanitation and waste management practices.

Figure 3: Have you received formal education or training on malaria prevention and treatment?

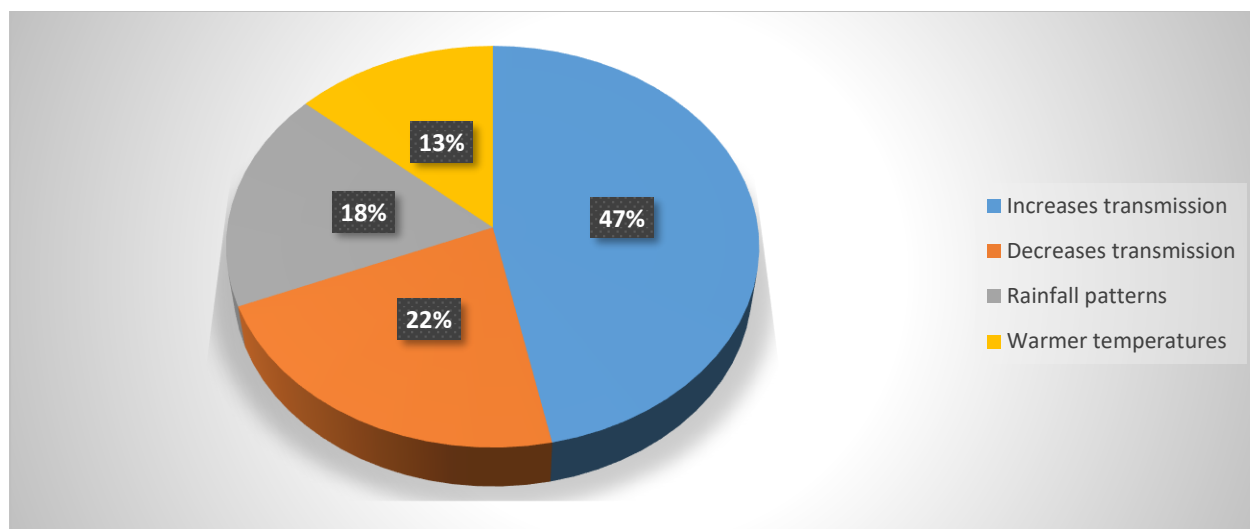


Source: (Field data, 2024)

Figure 3 shows that, out of the 400 respondents, 264 individuals, as YES, which is 66% of the total, have received formal education or training on malaria prevention and treatment and

The remaining 136 respondents say NO, constituting 34% of the total, have yet to receive formal education or training on malaria prevention and treatment. This data suggests that a significant portion of the respondents have received formal education or training on malaria prevention and treatment, but a notable proportion still need to. This could indicate potential gaps in education or access to training programs regarding malaria prevention and treatment.

Figure 4: How do you think climate change affects the spread of malaria in Northern Liberia?

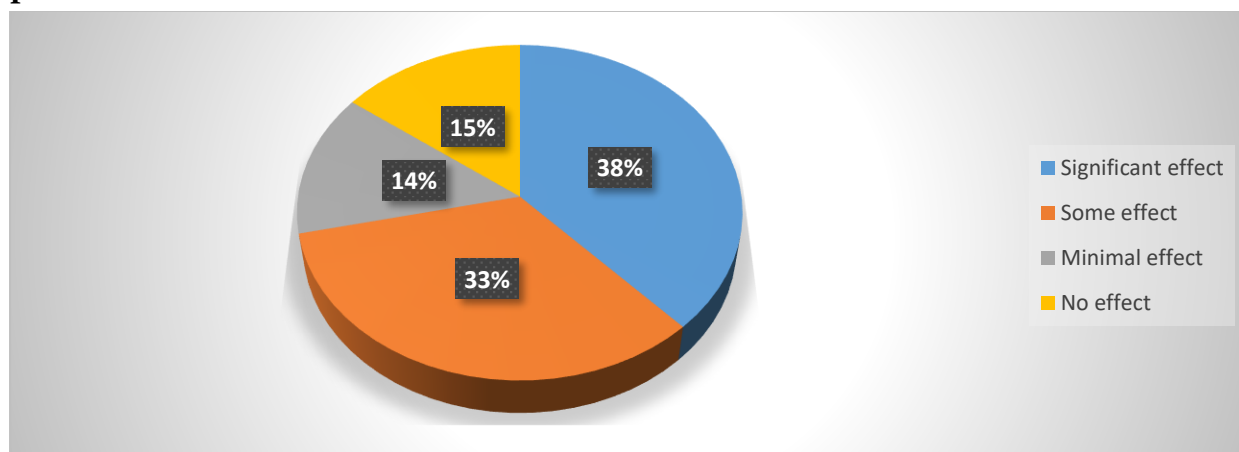


Source: (Field data, 2024)

Figure 4, reveals that 46.8% of respondents believe climate change increases malaria transmission, suggesting significant awareness of how warmer temperatures and altered rainfall patterns can create favorable conditions for mosquito breeding and disease spread. Conversely, 22.0% think climate change decreases transmission, possibly due to perceptions of drying breeding sites or altered mosquito behavior reducing malaria prevalence.

Additionally, 17.8% of respondents link climate change to changes in rainfall patterns, recognizing the impact of environmental factors on mosquito breeding habitats and malaria dynamics. Meanwhile, 13.5% attribute climate change to warmer temperatures, acknowledging how accelerated mosquito life cycles can increase breeding rates and malaria transmission. These findings show a significant awareness of the complex relationship between climate change and malaria, highlighting the need to integrate adaptation strategies into malaria control efforts in Northern Liberia to mitigate potential impacts.

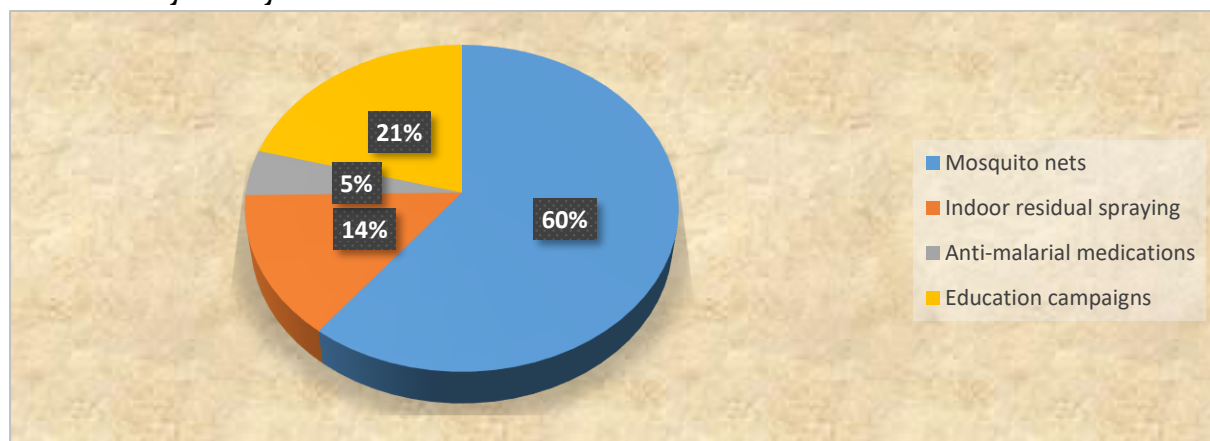
Figure 5: How does socioeconomic status influence access to malaria prevention and treatment?



Source: (Field data, 2024)

Figure 5 shows that 38.0% of respondents believe socioeconomic status significantly affects access to malaria prevention and treatment. This suggests they perceive substantial barriers for lower socioeconomic groups in obtaining essential resources and services. Meanwhile, 33.5% acknowledge some effect of socioeconomic status, recognizing it as an obstacle but not as critically as the first group. In comparison, 13.8% think it has minimal impact, viewing other factors as more significant in determining access. Additionally, 14.8% believe socioeconomic status has no effect, suggesting they see access to malaria prevention and treatment as equitable across different socioeconomic groups. Overall, the findings indicate that most respondents recognize the role of socioeconomic status in access to malaria-related services, with a significant portion viewing it as a major factor. This highlights the need to address socioeconomic disparities to ensure equitable access to malaria prevention and treatment for all individuals, and further analysis could identify specific barriers faced by different groups to inform targeted interventions for vulnerable populations.

Figure 6: What are the most effective methods for malaria prevention in your community that you know of?



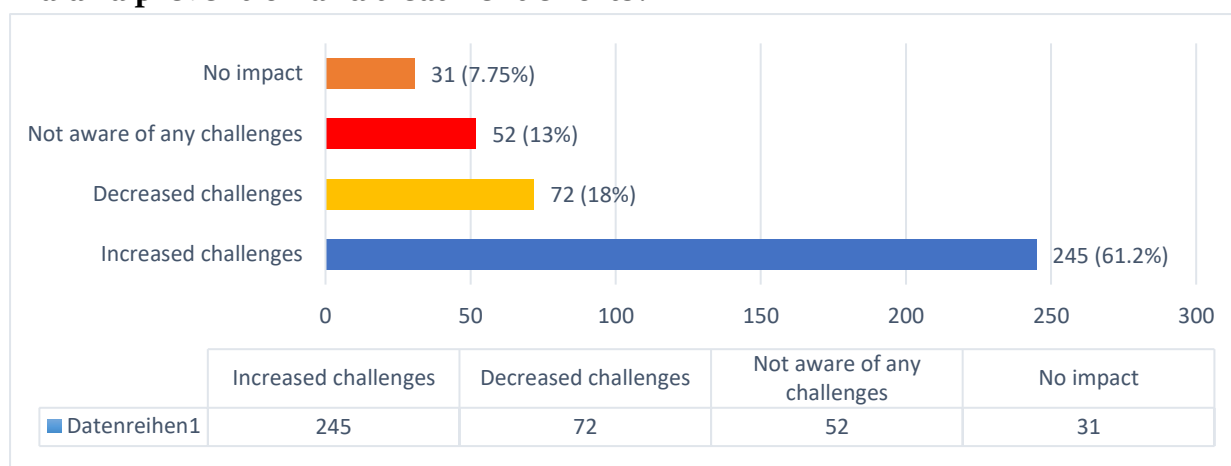
Source: (Field data, 2024)

Figure 6, show that 60.5% of the respondents use mosquito net to prevent mosquito bite, education campaigns are recognized by 20.8% of respondents as effective. Education plays a crucial role in raising awareness about malaria prevention methods, symptoms, and treatment-seeking behavior, which can empower communities to take proactive measures against the disease.

Smaller percentages of respondents also acknowledge indoor residual spraying and anti-malarial medications as effective methods for malaria prevention. Indoor residual spraying targets mosquitoes that transmit malaria by spraying insecticides on the indoor walls of houses, reducing the mosquito population. When used appropriately, anti-malarial medications can treat and prevent malaria infection, especially in high-risk areas.

Combining these methods, along with strong community engagement and collaboration between various stakeholders, can contribute to effective malaria prevention in your community.

Figure 7: How do you think the COVID-19 pandemic has impacted your area's malaria prevention and treatment efforts?



Source: (Field data, 2024)

According to **Figure 7**, most respondents (61.2%) believe that the COVID-19 pandemic has made preventing and treating malaria in their area more challenging. This indicates that the pandemic may have impacted public health priorities, resource allocation, and healthcare services in a significant way, making it more challenging to combat malaria. On the other hand, according to 18% of respondents, the COVID-19 pandemic has made efforts to prevent and treat malaria easier. It is possible that during the pandemic, changes in healthcare priorities or resources unintentionally resulted in better malaria prevention strategies. A smaller percentage of respondents (13%) either do not know about any difficulties or think the pandemic has not affected efforts to prevent and treat malaria (7.75%). The results show that different people have different opinions about how the COVID-19 pandemic has affected efforts to control malaria. This underscores the difficulty of handling public health issues

in a worldwide health emergency.

		Age Level	Gender Level	Education Level
Age Level	Pearson Correlation	1	.774**	.903**
	Sig. (2-tailed)		.000	.000
	N	400	400	400
Gender Level	Pearson Correlation	.774**	1	.763**
	Sig. (2-tailed)	.000		.000
	N	400	400	400
Education Level	Pearson Correlation	.903**	.763**	1
	Sig. (2-tailed)	.000	.000	
	N	400	400	400
Correlation is significant at the 0.01 level (2-tailed).				

Table 3 shows the correlations among Age Level, Gender Level, and Education Level are robust and statistically significant. Age level has the strongest correlation with education level (0.903), indicating that education level tends to increase substantially as people age. Gender Level also strongly correlates with age (0.774) and Education (0.763), suggesting notable linear relationships among these variables. The statistical significance at the 0.01 level for all correlations confirms that these relationships are improbable due to chance, providing strong evidence of genuine associations in the data.

Table 4: Correlations of Age level, Gender, Education, Knowledge, Attitude and Perception on Public Health Knowledge

		Age level	Gender Level	Education Level	Knowledge	Attitude	Perception
Age level	Pearson Correlation	1	.774**	.903**	.551**	.600**	.859**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	400	400	400	400	400	400
Gender Level	Pearson Correlation	.774**	1	.763**	.565**	.638**	.736**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	400	400	400	400	400	400
Education Level	Pearson Correlation	.903**	.763**	1	.594**	.639**	.780**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	400	400	400	400	400	400
Knowledge	Pearson Correlation	.551**	.565**	.594**	1	.768**	.279**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	400	400	400	400	400	400
Attitude	Pearson Correlation	.600**	.638**	.639**	.768**	1	.278**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	400	400	400	400	400	400
Perception	Pearson Correlation	.859**	.736**	.780**	.279**	.278**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	400	400	400	400	400	400
**. Correlation is significant at the 0.01 level (2-tailed).							

Table 4 shows the table shows the complex interplay between demographic factors (age, gender, education) and public health-related variables (perception, knowledge, and attitude). Age and education influence public health perceptions and knowledge, while attitudes are more directly linked to knowledge levels. These insights can inform

public health strategies, such as targeted educational campaigns for different age groups, and underscore the need to consider demographic contexts when designing public health interventions. Education and Age (0.903, $p < 0.01$): A robust positive correlation suggests that older individuals tend to have higher education levels. Perception and Age (0.859, $p < 0.01$): A strong positive correlation indicates that older individuals have stronger perceptions related to public health knowledge. Knowledge and Age (0.551, $p < 0.01$): A moderate positive correlation shows that age is moderately associated with increased public health knowledge. The correlation between Attitude and Perception related to public health knowledge is weak but positive, with a Pearson correlation coefficient of $r = 0.278$ and a significance level of $p < 0.01$.

Age, Gender, and Education are strongly interrelated and significantly impact Perception, with all correlations significant at the $p < 0.01$ level. Knowledge and Attitude: These variables are closely linked, with more knowledgeable individuals having more positive attitudes towards public health, supported by significant p-values. Perception: This variable is strongly influenced by Age, Gender, and Education but shows weaker correlations with Knowledge and Attitude, indicating that other factors may play a significant role in shaping perceptions of public health knowledge. Overall, the considerable p-values reinforce the robustness and validity of these correlations, highlighting the essential relationships among Age, Gender, Education, Knowledge, Attitude, and Perception in the context of public health knowledge.

Discussion

The findings from this study are consistent with previous research indicating high malaria prevalence in sub-Saharan Africa, particularly in regions like Northern Liberia. The 97.2% incidence rate among respondents aligns with data from other studies highlighting the endemic nature of malaria in similar areas (World Health Organization, 2021). This high incidence is not surprising given the favorable climatic conditions for mosquito breeding, such as high temperatures and rainfall, which are prevalent in this region (Centers for Disease Control and Prevention, 2021.).

However, the 34% of respondents who have not received formal malaria prevention education indicates a gap that warrants attention. Compared to studies in other African countries, this lack of education is a significant barrier to effective malaria control and prevention efforts. For instance, a study in Nigeria revealed that education on malaria prevention significantly reduces the incidence of the disease by promoting the use of insecticide-treated nets and encouraging prompt treatment-seeking behavior (Adeneye et al., 2013). Similarly, research in Uganda found that community health education interventions significantly improved knowledge and practices related to malaria prevention and treatment (Nanyonjo et al., 2014).

The gap in malaria education observed in this study suggests that similar interventions are needed in Northern Liberia. Effective malaria control requires the distribution of preventive tools like ITNs and antimalarial drugs and comprehensive public health

education to ensure proper use (WHO, 2021). For instance, the World Health Organization emphasizes the importance of educating communities about the correct use of ITNs, recognizing the symptoms of malaria, and seeking timely medical treatment (World Health Organization, 2021).

Moreover, the study's findings highlight the need for targeted public health campaigns addressing the specific malaria prevention barriers in Northern Liberia. These barriers may include misconceptions about malaria transmission and prevention, cultural beliefs, and the accessibility of healthcare services (Mboera et al., 2013). Addressing these barriers through culturally appropriate health education programs could significantly improve malaria prevention efforts and reduce the disease burden in this region (Mboera et al., 2013).

In addition to educational interventions, the study underscores the importance of strengthening the healthcare infrastructure in Northern Liberia. Access to healthcare services is crucial for effective malaria control. However, many remote communities in Lofa County face significant challenges in accessing these services (Liberia Institute of Statistics and Geo-Information Services, 2019.). Improving healthcare infrastructure, such as increasing the availability of health facilities and trained healthcare providers, is essential for effective malaria diagnosis, treatment, and prevention (World Health Organization, 2021).

Overall, the study indicates that while significant efforts are underway to combat malaria in Northern Liberia, more comprehensive and targeted interventions are needed. These should include educational initiatives and improvements in healthcare infrastructure to reduce malaria and improve regional health outcomes effectively.

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