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POPULATION ESTIMATION AND EVALUATION OF CAUSES OF MALARIA TRANSMISSION AMONG NOMADS IN TARABA STATE, NIGERIA

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ABSTRACT
The spread of malaria and associated factors among the nomadic people in Taraba State, Nigeria, are investigated in this baseline study. Nomadic groups confront major health issues, especially with regard to malaria, because of their mobility, restricted access to healthcare, and distinct socioeconomic circumstances. The study included a mixed-methods approach to evaluate the prevalence of malaria, related risk factors, and healthcare-seeking behavior. These methods included focus groups, key informant interviews, and household surveys. The results show that high malaria prevalence, particularly during the rainy season was driven by environmental and behavioral factors, poor health-seeking behaviors due to distance, financial barriers, and cultural perceptions. Low utilization of preventive measures like Treated Mosquito nets, cleaning of surrounding, poor/lack of functional health facilities are the most contributed factors to the prevalence of Malaria transmission among nomadic population in Taraba state. Other environmental influences include seasonal movement patterns and closeness to water bodies, which enhance mosquito exposure, and socioeconomic restraints, such as cultural norms and financial hurdles that restrict access to treatment. The report emphasizes the critical need for focused interventions, such as community-based malaria surveillance, mobile health services, culturally appropriate health education, and easier access to insecticide-treated nets. In order to lower the prevalence of malaria and enhance general health outcomes in Taraba State, it is essential to improve healthcare delivery for these susceptible groups.

Keywords: Malaria transmission, nomads, health service, logistic regression

INTRODUCTION
About 27% of the world's malaria cases and 32% of malaria-related deaths in sub-Saharan Africa are caused by malaria, making it a serious public health concern in Nigeria (World Health Organization [WHO], 2022). Malaria continues to exist despite national and international efforts to prevent it through vector control methods, case management, and health education, especially among vulnerable and hard-to-reach groups (National Malaria Elimination Programme [NMEP], 2021). The nomadic population in Taraba State, Nigeria, is one such high-risk group. Their susceptibility to malaria transmission is increased by their ongoing travel, socioeconomic difficulties, and limited access to medical care.

Mostly pastoralists, nomadic groups move periodically in pursuit of water and grazing pasture. They frequently travel to areas where malaria is endemic, which increases their risk of mosquito bites and restricts their access to preventive treatments such indoor residual spraying (IRS) and insecticide-treated nets (ITNs) (Ochogu *et al*., 2020). According to studies, nomadic people frequently rely on traditional medicine and self-medication, which might postpone proper treatment, and lack awareness and knowledge of malaria prevention strategies (Adebayo & Oladimeji, 2019). The high prevalence of malaria in these populations is mostly caused by environmental factors such living close to water sources, having subpar housing, and not using health facilities (Akinyele *et al*., 2021).

Furthermore, Humans contract malaria from the bites of female Anopheles mosquitoes carrying the parasite, which is spread by aquatic habitat-breeding mosquitoes (Akpodiete *et al.*, 2019;Talapko, 2019). Malaria is a highly contagious disease. 619, 000 people died from malaria in 2021, with an estimated 247 million cases worldwide, according to the World Health Organization (WHO, 2022). The report revealed that 95% of malaria cases and 96% of malaria deaths worldwide occur in the African Region, which carries a disproportionately large amount of the virus. Roughly eighty percent of malaria deaths in the Region were in children under five (WHO, 2022). Risk factors including age (children under 5), gender (Nyasa, 2021; Tetteh *et al.*, 2023), children's nutritional status (Folarin *et al.*, 2021), socioeconomic issues like poverty (Shayo *et al.*, 2021), and a lack of awareness and knowledge about malaria prevention and control (Tarekegn *et al.*, 2021) are among the well-researched risk factors for malaria infection. The risk of contracting malaria is increased by exposure to mosquito breeding areas (Ahmed *et al.*, 2021; Mkali *et al.*, 2021; Woday *et al.*, 2019). However, the risk is decreased by using preventive interventions like a fresh.

Individuals or groups who are forcibly evicted from their settlement and who lack access to suitable housing or land alternative, as well as pastoralists who have abandoned their customary Nomadic area due to the loss of their cattle, their inability to access markets, grazing areas, or water supplies. The regions between the Saharan and Sahelian zones are home to most nomads. Over the past few decades, there have been significant changes in the economy, politics, and climate that have caused pastoral movement to extend towards the Sudanian areas (Sani, 2022) Nigeria's nomads travel through a number of malaria transmission zones and occasionally cross international borders in quest of pasture and water for their herds (Sani, 2022). Plasmodium species from foreign nations are present in these communities as asymptomatic carriers of malaria parasites. The lifestyle of nomadic communities in Nigeria puts them at higher risk of malaria. Due to their high level of mobility, they are frequently left out of disease control initiatives, making it more difficult for them to receive treatment and preventive measures. Effective malaria control strategies consider community perceptions of the cause and preventive measures, care-seeking behavior patterns, and local mechanisms of transmission. Malaria is endemic and contributes significantly to morbidity and mortality Nomads. This study aimed to close the knowledge gap regarding nomadic communities' attitudes of malaria and their awareness of malaria management interventions, as there is currently little information available on these.

Over 35 million Fulani nomads are thought to be dispersed over West and Central African nations (Mission Africa, 2016). A substantial fraction of West Africa's nomadic Fulani people reside in Nigeria. An estimated 15.3 million Fulani pastoralists live in Nigeria, and a significant number of them are nomads (Ducrotoy *et al.*, 2017; Encyclopaedia Britannica, 2022). The population of Momads is exposed to different levels of risk of malaria due to the epidemiology of the disease's spread. In the riverine regions of the nation, malaria is endemic, although in the other regions, transmission is minimal. Different population groups are threatened differently by this: (i) in endemic areas, children under five are most at risk, as are pregnant women, internally displaced people (IDPs), and mobile populations, particularly those from areas of unstable transmission; and (ii) in low-transmission areas, all groups are vulnerable due to low or no immunity, which increases susceptibility to malaria outbreaks.

Focus must be placed on the population most at risk of malaria and least served by basic health care in order to successfully reduce the disease burden among the country's nomads. Assessing the prevalence of malaria, related risk factors, and healthcare service requirements among Taraba State's nomadic population is the goal of this baseline study. The project aims to offer evidence-based suggestions for enhancing malaria control methods and determine the associated factors for this underserved population by analyzing the sociocultural, environmental, and economic aspects impacting malaria transmission. The results of this study were crucial for healthcare professionals and public health policymakers in creating focused interventions that tackle the particular difficulties faced by nomadic populations, helping to eradicate malaria in Nigeria.

MATERIALS AND METHODS

Study area

This study was carried out in Taraba state, North eastern region of Nigeria. The former Gongola state was divided into Taraba and Adamawa states on August 27, 1991, by General Ibrahim Babangida's administration. Taraba state is located in the northeastern region of the nation and covers 54,473 square kilometers. Taraba state shares borders with the states of the Republic of Cameroon and the Plateau to the west, Adamawa state and the state of Adamawa to the east, and Gombe state to the north. The state's northern region is grassland, and it is mostly located in a tropical region. At 1,800 meters (6000 feet) above sea level, the Mambilla plateau has year-round warm weather. The principal rivers, the Benue, Donga, Taraba, and Ibi, originate in the Cameroon mountains and flow nearly the whole length of the state in both directions before joining the River Niger. All year long, members of communities reside along the banks of the Rivers Taraba, Donga, Ibi, and Benue fish. In different regions of the state, there are other jobs related to pottery, fabric weaving, dyeing, mat-making, carving, needlework, and blacksmithing. Taraba state has a wealth of opportunities for the growth of tourism and natural resources, including the recent discovery of massive amounts of uranium there. Taraba state is affluent and home to numerous ethnic groups, including the Fulanis, Mumuyes, Mambilla, Jibawa, Wurkuns, Jenjo, Kuteb, Icheng, Tiv, and Ndoro, to name a few. Taraba state is referred to as "Nature's gift to the nation." Taraba State has diverse geography, including forests, grasslands, and rivers, which can influence malaria transmission. Given its significant nomadic population, factors such as mobility, limited healthcare access, and environmental exposure likely play key roles in malaria prevalence.

The climate of Taraba state is marked by an annual average temperature of 33°C but high level of cold in January and an increased rainfall in August. The percentage of rainfall in Taraba state is 40.35% with 54.98% relative humidity. The state is usually very warm in March with 40.44°C, and an average wind of 8.84 km/h.. Many homes and commercial buildings in Taraba State are affected by flooding, including those in the suburbs (Mkom, 2023). According to DHIS2 Taraba State has 1395 hospitals and health care centers out of which 1151 (83%) are functional, 1006 (72%) are public, 145 (10%) are private

Figure 1: Map of Nigeria showing Taraba state

Study design

A cross-sectional design was used on 100,000 study participants who visited some randomly chosen health centers in 2024. All outpatients who were suspected of having malaria, among nomads in Taraba state, were recorded. A standardized questionnaire was used to gather sociodemographic data. This is a randomized cross-sectional survey conducted at a hospital and place of Nomads. Every nomad patient who visited the medical facilities was asked to complete a pre-tested, structured questionnaire as part of the quantitative data collection process. To gather information on the participants – such as their age, sex, occupation, education, use of mosquito nets, and whether or not there was a stream or river within a mile of their home – a face-to-face interview was held. Their medical records provided more information, including their blood type and hemoglobin genotype. Trained field research assistants with post-secondary education credentials and degree-holding were used as the enumerators and field supervisors respectively. The questionnaire was pretested before the final version were distributed and administered by the enumerators.

Questionnaire structure

The questionnaire was divided into four thematic sections. The first section covered socio-demographic information such as gender, age, knowledge about malaria/symptom, environmental/surrounding status, use of preventive measure etc and the relationship between the respondent and the head of the household. The second section covered information on how the community or individuals were exposed to mosquito bites as a result of late-night activities, homestead locations in relation to animal shelters and mosquito breeding sites, trips made outside his village in the previous six months, and instances of malaria in the previous six months. In order to minimize on-recall bias, a brief 6-month period was selected, taking into account the preceding malaria transmission season. The final section of the questionnaire concentrated on the study area's health delivery services and malaria preventive strategies. The final section covered general remarks regarding the type of eaves, vegetation cover surrounding the homesteads, and the structure and use of each farmhouse throughout the interview.

Pre-test

Pretesting of the questionnaires were done two weeks before the actual data collection operation in the community of Nomads with comparable environmental and sociodemographic patterns of Taraba state, in order to guarantee accuracy and high-quality data. A pretest survey with 50 questionnaires were conducted with a random sample of participants. After the pretest survey, the questionnaire were updated to include more important items that had been left out and to improve clarity based on the replies received. The final questionnaire modified certain vague questions from the original one. In addition to ensuring that all interviewers understood the same questions, the pretest activity served to standardize the interviewers' interviewing techniques.

Study population

The baseline survey covers the following LGA, health facility and community levels in Taraba state. The current population of Taraba state is over 3,609,800 according to 2023 population projection. Taraba state has a population density of roughly Projection 58,795 km² Surface 61.40/km² Population Density. The nomadic population in Taraba State, Nigeria is significant, with several ethnic groups practicing pastoralism. Overall, the nomadic population in Taraba State is estimated to be around 1 million to 1.5 million people, which is approximately 25-40% of the state's total population. (Source: International Organization for Migration, 2018). The study included all probable individuals Nomads with fever symptoms who reside in a community of Taraba for a minimum of six months

Sampling methodology and selection

Several essential elements were the baseline survey:

a. Qualitative interviews at the LGA, health facility, and community levels.
b. Health facility assessment in a sample of health facilities including data extraction.
c. Interviews with Nomads upon their departure who have gotten malaria treatment

The assessment also consists of several key components:

i. Routine sources such as secondary data available in the SHMIS/DHIS2,
ii. Non-routine sources such as the SDHS/SMIS.
iii. Desk review, which primarily focused on documents available at the state, region, and district levels and other assessments conducted in the past five years

Techniques and procedures for sampling

A cluster sampling process was employed to choose participants. Within a cluster, participants were chosen with the expectation that they are nomads who have resided for at least six months in a cluster. All, suspected instances that exhibit fever in a chosen sample was investigated. The illnesses were categorized based on age and sex, and a random sample method

was applied to choose every participant from the selected clusters of the Nomads

Rather than sampling the individual elements to be studied, a technique known as clustered sampling involves dividing the population into subgroups, or clusters, and then sampling the subgroups. When there are obvious "natural" groupings in a population, cluster sampling is employed. Using this method, a sample of the groups is chosen from the entire population, which is then divided up into subgroups (clusters):

a. We calculated the sample size based on the desired level of precision and confidence to be 100,000 nomads from all the communities considered (Ibi, Kum, Ussa, Yorro, Ardo-Kola, Kumi, Donga and Bali,).
b. We determined the number of interviews per cluster (it is suggested to conduct 10 interviews in each cluster).
c. We divided the sample size by the number of interviews in each cluster. This gave us 10,000 clusters.
d. We prepared a list of all existing units with their estimated populations.
e. We calculated the sampling interval by dividing the total population of the entire program area by the total number of clusters required.
f. We chose a random number. This number was used to identify the starting point on the list to begin selecting clusters. The random number was less than or equal to the sampling interval.
g. We looked at the column where you have listed the cumulative population of each community and determine which community contains (that is, the cumulative population equals or exceeds) the random number.
h. To identify the second community where a cluster is located, we added the sampling interval to the random number selected in step f. The community whose cumulative population equals or exceeds that number is the location of cluster 2.
i. To identify the remaining clusters, add the sampling interval to the number that identified the location of the previous cluster. Example: - Sample size: 100,000 - Number of clusters. If you plan a sample size of 100, 000 and doing 10 interviews in each cluster, we have 10,000 clusters in the survey.

Sample Size Determination.

A single population formula was used to calculate the sample size. 50% prevalence was used since there were no particular reports from the research field (health center). To ensure that when calculating sample size, 1.96 at 95% was the value of Z was used. CI and an error margin of 5%. Consequently, the ultimate sample size was added to the 10% non-response, bringing the total to 422. The minimum sample size was calculated using the Swinscow Formula (Swinscow *et al*., 2002).

$$n = \frac{z^2 p(1-p)}{d^2}$$

Where n is minimum sample size for the study;

Z is confidence level, P is prevalence from a similar study;

d is level of precision (d = 0.05, Z = 1.96, P = 0.5)

$n = \frac{1.96^2 0.5(1-0.5)}{0.05^2} = 485$ Participants required

A sample of 500 x 2,000 = 100,0000 individuals, comprising both genders and all age groups, who provided their consents and, in the case of children, assent, was taken. Participants who were not considered for this study were those who did not provide their consent or assent, not residents of the communities, and those that had taken malaria medications two weeks or beyond, before to the survey.

Data collection

Trained health professionals were used to collect data using a semi-structured questionnaire to gather socio-demographic information and other related risk factors. To determine who is symptomatic and who is not, clinical manifestations such as body temperature were analyzed. Before doing mRDT, this examination was performed following the selection of individuals from families. In order to assist in administering the surveys and providing interpretation or translation of its items to participants who might find them difficult to grasp or who might not speak English, trained research assistants were also be hired. SPSS version 20 software were used for data entry and analysis.

Logistic regression model equation

$$log\left(\frac{\text{P(Malaria Positive)}}{1-\text{P(Malaria Positive)}}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

Where,

P(Malaria Positive) = Probability of testing positive for malaria

X_1= Distance to Health Facility

X_2= Use of Mosquito Nets

X_3= Good Knowledge of Symptoms

X_4= Malaria Knowledge Level

X_5= Proximity to Water Bodies

β_0= Intercept

$\beta_1, \beta_2,...,\beta_6$ = Coefficients of predictors

ϵ = Error term

RESULTS AND DISCUSSION

The baseline survey included a total of 100,000 nomadic individuals, with 61% being male and 39% female. The majority of the participants belonged to the Fulani ethnic group, with an average household size of 15. The age distribution showed that 15.7% were children under 18 years old, 9.9% were aged 18-29 years, and 33.6% were aged above 50 years. The details of the demographic distributions are shown in Table 1.

Table 1: Demographic characteristics and malaria infection status of participants

Variable	Number of Perticipants	Percentage	P-value
Sex			
Male	61,050	61.05	0.023
Female	38,950	38.95	
Age Group (years)			
Less than 18	15,670	15.67	0.006
18 – 29	9,890	9.89	
30 – 39	12,905	12.91	
40 – 49	27,897	27.90	
50 and above	33,638	33.64	
Malaria Infection Status			
Not infected	38,070	38.07	0.014
Low Infected parasite	34,921	34.92	
Highly Infected	27,009	27.01	
Health Care Access			
Very accessible	1,987	1.99	0.000
Somewhat accessible	34,458	34.46	
Not accessible	63,555	63.55	
Preventive Measures			
Insecticide-treated bed nets	2,567	2.58	0.051
Mosquito treated	27,489	27.49	
Cleaning of the surrounding	24,897	24.89	
No Measure	45050	45.05	
Symptom reported			
Hot body	15,671	15.67	0.324
Body pain	3,541	35.41	
Headache	13,672	13.67	
Feeling cold	13,876	13.88	
Vomiting	11,705	11.71	
Loss of appetite	5,898	5.90	
Bitter mouth	2,054	2.05	
Others	37,427	37.43	

Table 1 shows the demographic characteristics and malaria status of the participants. One hundred thousand participants comprising of 61,050 males and 38,950 females took part in the study. The participants belong to five major age groups of nomadic Fulani frequently camping around the study area 33.64 of the participants who are elders of above 50 years old has the highest category while the those between ages 18-29 years are the lowest with percentage of 9.89%. Malaria parasite count on thick blood smears from the participants showed that 38% of the participants were not infected while the remaining 62% were infected with varying densities of malaria parasite. Estimation of levels of parasite showed that 34.9% of participants were of low infected category, while around 27% were highly infected. About 63.5% has no access to health care facilities with 34.5 somewhat accessible. Most Nomads do not take preventive measures for malaria infection which account to 45% and very few number of the participant has a mosquito treated nets. Mostly the symptom of malaria recorded from the Nomad participants are hot body, body pain, head ache cold and vomiting which account to 15.67, 35.41, 13.67, 13.88 and 11.71%, respectively

Malaria prevalence and transmission factors

The prevalence of malaria among the nomadic population was found to be around 62%, based on RDT (Rapid Diagnostic Test) and the survey examination. Seasonal variations significantly affected malaria incidence, with higher transmission rates recorded during the rainy season (67% prevalence) compared to the dry season 33% prevalence. The presence of breeding sites near settlements, such as stagnant water bodies and poorly drained grazing areas, contributed to the high transmission rates with percentage distribution of 23% from stagnant water, 12% from temporary pool, 15% from ponds created, 27% from drained grazing area, 5% from river bank and 18% from dirty environment. Usage of insecticide-treated nets (ITNs) was reported at 3%, while 45% of respondents did not use any form of vector control measures. Knowledge about malaria prevention was low, with 35% of respondents incorrectly associating malaria with exposure to cold weather rather than mosquito bites with response of only 15%. The details of the responses are presented in percentages in Figures 1-5

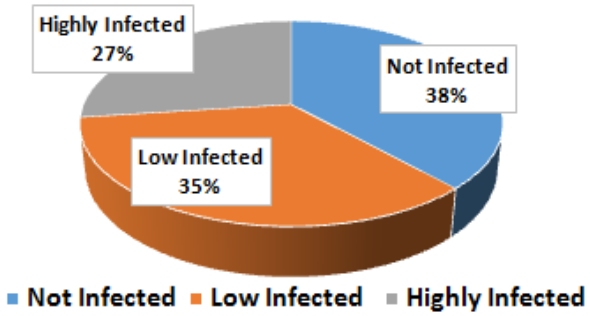

Figure 2: The prevalence of malaria among the nomadic population

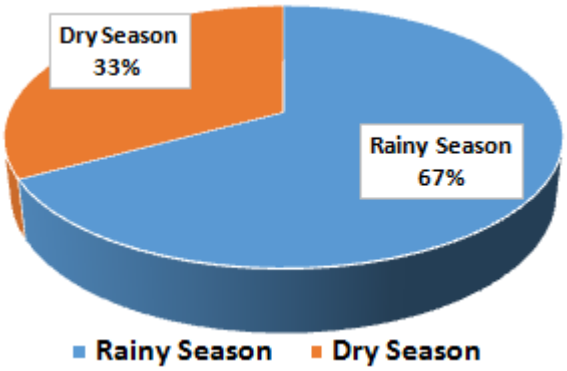

Figure 3: Prevalence of malaria according to seasonal variations

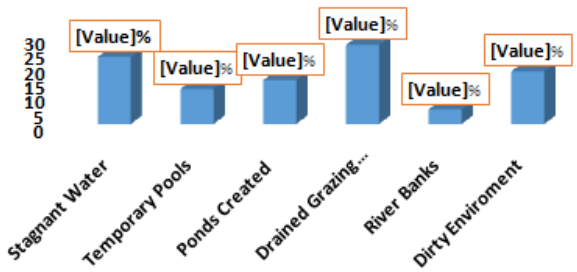

Figure 4: The presence of breeding sites near settlements

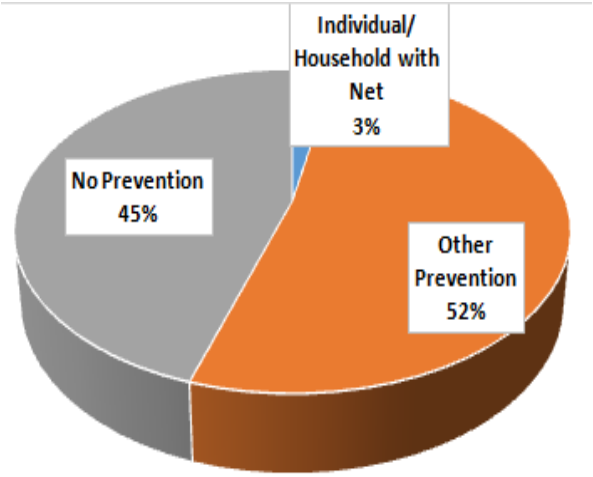

Figure 5: Usage of insecticide-treated nets (ITNs)

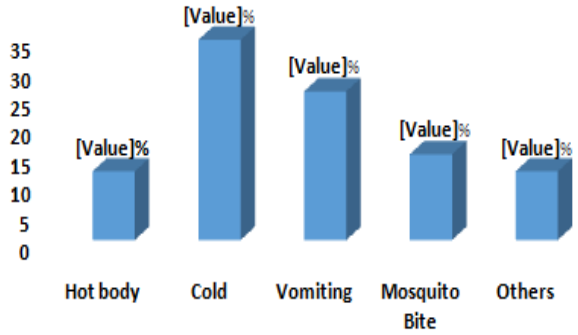

Figure 6: Knowledge about malaria transmission

Malaria burden, mortality and mobidity

The purpose of this section is to provide trends of analysis for malaria mortality, reporting rate and timeliness, clients attendance, persons tested by RDT/microscopy, persons tested positive by RDT/microscopy and ANC uptake.

Table 2: Malaria burden in Taraba state

Parameter	2020	2021	2022	2023	2024
Malaria Tested	400910	452927	619526	773926	959133
Malaria Confirmed Cases	297792	340742	480895	595179	715478
TPR%	77.00	77.00	79.00	78.00	76.00
API per 1000 Pop.	88.2	97.6	133.4	166.0	197.2

Table 3: Trends in malaria mortality and mobidity

Period	Deaths < 5	Deaths < 5 Malaria - U5	Proportion of < 5 deaths caused by malaria
2020	251	109	43%
2021	200	117	59%
2022	226	125	55%
2023	133	77	58%
2024	254	97	38%

Table 4: Malaria burden in Taraba state

TPR	2020	2021	2022	2023	2024
Ibi	90%	89%	94%	81%	85%
Takum	73%	90%	97%	91%	80%
Ussa	93%	73%	87%	87%	79%
Yorro	92%	89%	83%	79%	71%
Ardo-Kola	79%	86%	84%	81%	78%
Kurmi	80%	84%	81%	74%	78%
Donga	73%	78%	82%	79%	79%
Bali	74%	80%	82%	81%	73%
Gashaka	70%	80%	78%	76%	79%
Jalingo	88%	74%	75%	69%	73%
Karim-Lamido	73%	71%	66%	78%	83%
Sardauna	72%	72%	70%	79%	71%
Zing	73%	76%	73%	70%	70%
Lau	73%	69%	63%	72%	75%
Gassol	58%	59%	93%	75%	67%
Wukari	70%	65%	64%	72%	71%

Figure 7 illustrates the trend of malaria burden. In 2020, 88.2% of individuals were tested for malaria using RDT or microscopy, with 77% confirmed cases. The testing rate increased to 97.6% in 2021, while confirmed cases remained at 77%. In 2022, the test rate rose to 133.4%, with malaria cases at 79%. In 2023, testing reached 166%, with 78% confirmed cases, and in 2024, the test rate peaked at 197.2%, while malaria cases stood at 76%.

Figure 8 illustrates the trend of malaria mortality. In 2020, malaria-related deaths accounted for 43%. The highest proportion was recorded in 2021 at 59%, followed by 2023 with 58%. In 2022, the third-highest mortality rate was observed at 55%, while 2024 reported the lowest at 38%.

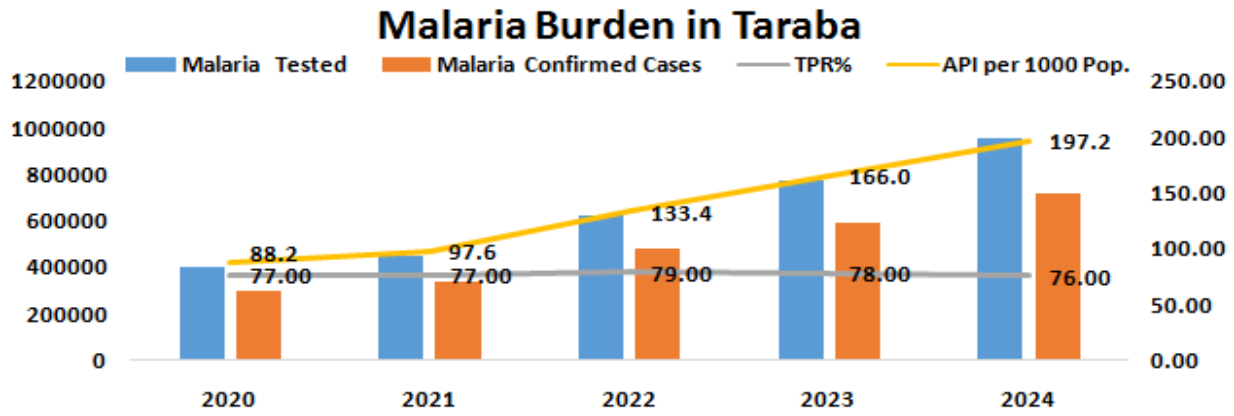

Figure 7: Plot of Table 2

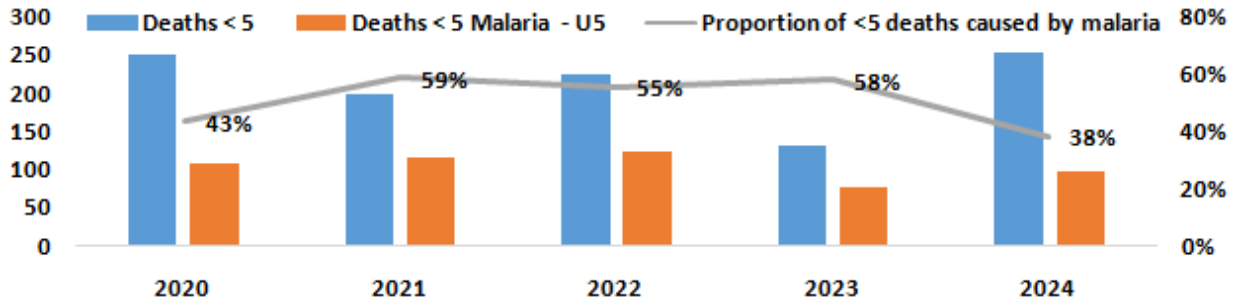

Figure 8: Plot of Table 3

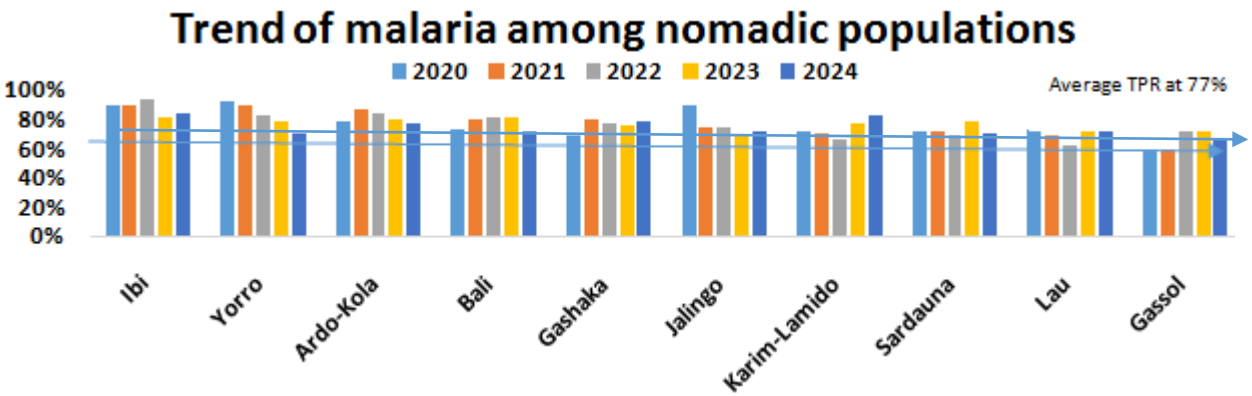

Figure 9a: Plot of Table 4

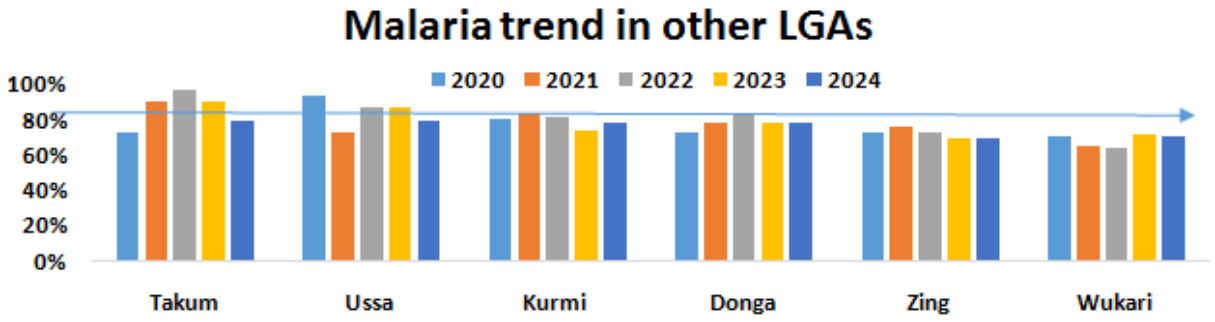

Figure 9b: Plot of Table 4

Figure 9a illustrates the trend of malaria burden. Among the 10 LGAs predominantly occupied by nomads, 5 (50%) exceeded the 5-year average TPR of 77%. The remaining 5 (50%) fell below this average, with Gashaka and Jalingo each at 76%, Karim-Lamido at 74%, and both Lau and Gassol at 70%. Figure 9b illustrates the trend of malaria burden. Among the six other LGAs, three (50%) recorded a TPR below the 5-year average of 77%. These include Sardauna at 73%, Zing at 72%, and Wukari at 68%.

Logistic regression on Factor responsible for Prevalence of Malaria among Nomads

To conduct a logistic regression analysis on factors responsible for the prevalence of malaria among nomads, we used malaria status (positive/negative) as the dependent variable and assess various independent variables that influence malaria prevalence.

i. Dependent Variable (Outcome): Malaria Status (1 = Positive, 0 = Negative)

ii. Independent Variables (Predictors):
Distance to Health Facility (1 = >10km, 0 = ≤10km)
Use of Mosquito Nets (1 = No, 0 = Yes)
Good Knowledge of Symptoms (1 = Yes, 0 = No)
Malaria Knowledge Level (1 = Low, 0 = High)
Proximity to Water Bodies (1 = Near, 0 = Far)

Data were converted to categorical variables into binary (0/1) format for logistic regression analysis and missing data were checked and handle appropriately. Table 5 shows the model parameters, standard error, z-value, p-value and Odd ratio to determine the level of significance of each factor. The p-value with more than one asterisk is highly significant at both 5 and 1% level of significance while those with one asterisk are relatively low significant at only 5% level. The contribution of each factor to the prevalence is explained under the Table 5.

Table 5: Model parameters estimates for the malaria prevalence among Nomads

Coefficients	Estimate	Std. Error	z value	P-value	Odd Ratio	Remarks
(Intercept)	-0.1588	0.22712	-2.6266	0.010547 *	0.55684	Contributed
Health Care Access	0.06455	0.21454	4.1763	0.000901 ***	0.59235	Highly Contributed
Preventive Measures	0.28788	0.20196	3.9792	0.009218 **	0.62786	Highly Contributed
Symptom reported	0.5112	0.18938	3.7821	0.000849 ***	0.66337	Highly Contributed
Knowledge about Malaria	0.73453	0.17679	2.585	0.013567 *	0.4328	Contributed
Environmental Condition	0.95786	0.16421	3.3879	0.0010547 **	0.69888	Highly Contributed

- **Health Care Access:** The risk of a health access contributed to malaria prevalence among Nomadic population in Taraba state is 59.2% less than lack of adequate health access.
- **Preventive Measures:** The risk of household who do not use the mosquito nets or other prevention is 62.8% compare with those that use the treated mosquito nets
- **Symptom reported:** The risk of Symptom reported for the malaria transmission is 66.3%
- **Knowledge about Malaria:** The risk of lack of Knowledge about Malaria is 43.3% more than the well informed individuals
- **Environmental Condition:** The risk of lack of Environmental Condition like proximity to water bodies is 69.9% more than the clean environments.

CONCLUSION

The assessment was conducted in from February, 2025. The following results were obtained from the survey conducted. Based on the comprehensive review of existing literature conducted and data sources to identify risk factors associated with malaria transmission in Taraba State of Nigeria .It was observed that Nomads in Taraba state have high burden of malaria between 2020 and 2024 as an estimated over 65,000 cases from malaria have been reported. Some of the factors associated with malaria transmission in Taraba state include. Health Care Access, Nature of preventive Measures, symptom reported, level of knowledge about malaria transmission and nature of environment/ surrounding with 59.2, 62.8, 66.3, 43.3 and 69.9% contribution to the risk of the prevalence of malaria among nomadic populations

Furthermore, High malaria prevalence, particularly during the rainy season, driven by environmental and behavioral factors, poor health-seeking behaviors due to distance, financial barriers, and cultural perceptions. Low utilization of preventive measures like Treated Mosquito nets, cleaning of surrounding, poor/ lack of functional health facilities are the most contributed factors to the prevalence of Malaria transmission among nomadic population in Taraba state. Finally, Malaria remains a significant public health concern among the nomadic population in Taraba State due to environmental, socio-economic, and healthcare access challenges. Targeted interventions such as mobile clinics, health worker training, and increased health education can significantly reduce malaria burden in this population.

Recommendations

The following recommendations were made from the research findings:

i. Establish mobile clinics to provide malaria diagnosis and treatment and bring healthcare services closer to nomadic communities.

ii. Train community health workers from within the nomadic population to serve as liaisons between formal healthcare providers and the community.
iii. Implement subsidized healthcare services to reduce cost barriers.
iv. Develop culturally sensitive health education programs to encourage formal healthcare utilization.
v. Distribution of insecticide-treated nets (ITNs) and access to preventive medication.
vi. Integration of malaria services with routine maternal and child health programs.
vii. Policy Interventions: Government support for mobile health units targeting nomadic groups.

REFERENCES

Adebayo, O. and Oladimeji, O. (2019). Healthcare access and malaria prevention among nomadic populations in Nigeria: Challenges and strategies. *Journal of Public Health and Epidemiology*, 11(3), 45-53. https://doi.org/xxxxxxx

Ahmed, A., Mulatu, K. and Elfu, B. (2021). Prevalence of malaria and associated factors among under five children in Sherkole refugee camp, Benishangul-Gumuz region, Ethiopia. A cross sectional study. *PLoS ONE* 16, e0246895.

Akinyele, R. T., Bello, I. S. and Yusuf, A. M. (2021). Environmental determinants of malaria transmission in mobile populations: A study of nomads in Northern Nigeria. *Malaria Journal*, 20(1), 112. https://doi.org/xxxxxxx

Akpodiete, N. O., Diabate, A. and Tripet, F. (2019). Effect of water source and feed regime on development and phenotypic quality in Anopheles gambiae (s.l.): Prospects for improved mass-rearing techniques towards release programmes. *Parasit. Vectors*, 12, 210.

Ducrotoy, M. J., Revie, C. W., Shaw, A. P., Musa, U. B., Bertu, W. J. and Gusi, A. M. (2017). Wealth, household heterogeneity and livelihood diversification of Fulani pastoralists in the Kachia Grazing Reserve, northern Nigeria, during a period of social transition. *PLoS One*, 12(3), e0172866.

Editors of Encyclopaedia Britannica (2022). *Fulani*. Encyclopaedia Britannica, 2022.

Folarin, O. F., Kuti, B. P. and Oyelami, A. O. (2021). Prevalence, density and predictors of malaria parasitaemia among ill young Nigerian infants. *Pan. Afr. Med. J.*, 40, 25.

Mkali, H. R., Reaves, E. J., Lalji, S. M., Al-mafazy, A. W., Joseph, J. J. and Ali, A. S. (2021). Risk factors associated with malaria infection identified through reactive case detection in Zanzibar, 2012–2019. *Malar J.*, 20, 485.

Mkom, J. (25 April 2023). *Flood Submerges 300 Houses In Taraba*. Retrieved 23 September, 2023.

National Malaria Elimination Programme (NMEP) (2021). Nigeria Malaria Indicator Survey Report. Abuja, Nigeria: Federal Ministry of Health.

Nyasa, R. B., Fotabe, E. L. and Ndip, R. N. (2021). Trends in malaria prevalence and risk factors associated with the disease in Nkongho-mbeng; a typical rural setting in the equatorial rainforest of the South West Region of Cameroon. *PLoS ONE*, 16, e0251380.

Ochogu, P., Adeyemi, A. and Onah, C. (2020). Barriers to healthcare access among nomadic communities in Taraba State, Nigeria. African *Journal of Health Sciences*, 17(2), 78-89.

Sani, N. (2022). Malaria transmission and asymptomatic malaria during rainy Season among nomads, North-eastern Nigeria. *Int. J. Trop. Dis. Health*, 43(23), 1-9.

Talapko, J., Škrlec, I., Alebić, T., Jukić, M. and Včev, A. (2019). Malaria: The past and the present. *Microorganisms*, 7, 173-179.

Tarekegn, M., Tekie, H., Dugassa, S. and Wolde-Hawariat, Y. (2021). Malaria prevalence and associated risk factors in Dembiya district, North-western Ethiopia. *Malar. J.*, 20, 372.

Tetteh, J. A., Djissem, P. E. and Manyeh, A. K. (2023). Prevalence, trends and associated factors of malaria in the Shai-Osudoku District Hospital, Ghana. *Malar. J.*, 22, 131-137.

WHO (2022). *Global Malaria Programme*. World Health Organization (WHO) 2022 World Malaria Report: Geneva.

Woday, A., Mohammed, A., Gebre, A. and Urmale, K. (2019). Prevalence and associated factors of malaria among febrile children in Afar Region, Ethiopia: A health facility based study. *Ethiop. J. Health Sci*., 29, 613–622.