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Assessment of Environmental and Sociocultural Determinants of Malaria Incidence at Household Level in Bade LGA, Yobe, Nigeria

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Abstract

Malaria is one of the most serious health challenges, causing illness and deaths, especially in sub-Saharan Africa. The study investigated the effects of environmental and sociocultural factors on malaria incidence at the household level. Data for the study were derived from a questionnaire survey in which 385 household heads participated. The results showed that out of 22 variables, only seven—distance from house to water bodies, distance to farmland, distance to shrubland, distance to dumpsite, present condition of walls, present condition of roofs, and outdoor sleeping—were significantly associated with the history of malaria in the household ($p < 0.05$). These identified risk factors should be integrated into developing effective malaria control strategies in the area.

Keywords: ***environmental factors, malaria, multiple linear regression, Yobe state***

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Introduction

Globally, malaria remains one of the challenging public health problems. It is caused by the protozoan parasites of the genus *Plasmodium* transmitted through the bite of female anopheles mosquitoes (Cox, 2010). Four species of *plasmodium* typically cause human malaria*;* they are *p. falciparum, p. malariae, p. ovale,* and *p. vivax.* Among these species, *p. falciparum* is the most powerful and deadly form of malaria, posing severe health risks, particularly in sub-Saharan Africa, where it predominates (Cox, 2010; WHO, 2018). Although malaria is both preventable and treatable, it continues to have a significant impact on global health, with children and pregnant women are most vulnerable population group at risk of malaria (WHO, 2018).

Globally, an estimated 3.2 billion people are at risk of contracting malaria annually (WHO, 2015). In 2020, there were approximately 241 million malaria cases across the world resulting in 627, 000 deaths (WHO, 2021). The greatest burden of the disease was reported by the WHO African Region with an estimated 228 million cases (95%). Nigeria carries the bulk of malaria burden more than any other country of the world, it contributes 27% and 32% of global cases and deaths (WHO, 2021). In 2022, the country recor an estimated 68 million cases and 194,000 deaths resulting from malaria (WHO 2023).

Malaria is endemic in all parts of Nigeria, with year-round transmission. Transmission rates differ from place to place, being slightly lower in Sahelian areas and high in mountain areas of the plateau (National Population Commission, National Malaria Control Programme, and ICF International, 2012). About 76% of the population in Nigeria are residing in high transmission zones and 24% in low transmission zones (WHO, 2017). However, significant regional geographic variations in malaria incidence occurs in the country, with the highest rate recorded in the Northwest Geo-political zone (19.6%) and the lowest recorded in the Southeast (14.6%) Geo-political zone, indicating localised spatial trends (Okunlola and Oyeyemi, 2019).

Moreover, National Malaria Eradication Programme {NMEP}, National Population Commission, {NPopC}, National Bureau of Statistics {NBS} and ICF International (2016) reported that hospitalization due to malaria accounts for 30% in Nigeria, while outpatient visit to Nigerian hospitals represents 60%. Beyond morbidity and mortality, malaria presents an enormous social and economic burden in the country. It retards the gross domestic product (GDP) by 40% annually and costing approximately 480 Billion Naira in the form of treatment costs, prevention costs, and loss of income due to failure to work during illness (Federal Ministry of Health {FMoH} and NMEP, 2014). This clearly verifies that malarial disease presents serious health and socio-economic problems in the country, and it is indeed becoming an increasingly interesting area of research by many disciplines (Lawan *et al.* 2024; Lubango *et al.* 2024; Chen *et al.* 2025 and Ogbozor 2025).

Malaria transmission intensity and seasonality are influenced by several factors such as environmental and socioeconomic (Adefemi *et al.* 2015). Among the physical environmental elements are favourable climate, a low elevation that is relatively flat, vegetation cover, rivers, and still or standing water. Many other studies (Sharma *et al*. 2015; Gunathilaka *et al.* 2016; Mokuolo *et al.* 2016; Ngatu *et al.* 2019; and Mohan *et al.* 2021) indicated housing type, occupation pattern, household size, outside water source, open drainage, wetlands, indiscriminate garbage dump, and inappropriate sanitation among others as socioeconomic factors associated with malaria incidence.

Bade is one of the Local Government Areas (LGAs) in Yobe State known for having high occurrence of malaria due to favourable transmission factors. Among the factors are favourable climate, availability of breeding grounds such as standing water bodies, garbage dump sites allowing mosquitoes to breed in and transmit the disease they carry. However, there is dearth of malaria studies in the area. Malaria prevalence studies conducted in Yobe state (Daskum and Ahmed, 2018; Khanam, 2022; Saleh and Timothy, 2023;

Zubair *et al*. 2024) concentrated in other local government areas. The aim of this study was to investigate the environmental and sociocultural factors influencing continued occurrence of malaria at household level in Bade Local Government Area, Yobe State. This could help to design an evidence-based malaria control and intervention strategies in the area.

Literature Review

The word malaria originated from Italian terms "mal" (which means "bad") and "aria" (which means air). The Romans believed that the sickness was brought by the foul fumes that came from swamps and stagnant pools, and in 1897 Sir Ronald Ross confirmed that the disease gets to humans through mosquito bites (Cox, 2010). Malaria is caused by *Plasmodium* parasites which is transmitted through the bite of female anopheles mosquitoes. Four major species of *plasmodium* are associated with human malaria, they are: *Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale*, and *Plasmodium malariae* (Hill and Meek, 2007). Malaria prevalence and transmission is influenced by environmental, and sociocultural factors.

An increasing number of studies have conducted to explore the influence of environmental, sociocultural, and demographic factors on malaria transmission. Recently in modern research, it was revealed that poor socioeconomic status and lack of access to health care facilities enhance malaria transmission in economically disadvantage region of northwestern and southern parts of Tanzania (Animut *et al*. 2025). Studies by Alghamdi (2025), Nankabirwa *et al*. (2024), Musiime *et al.* (2022), Olivera *et al*. (2022), Tairou *et al.* (2022), Okpara *et al.* (2021), Nguela *et al.* (2020) identified housing characteristics as major determinants of malaria transmission. Furthermore, Okin *et al*. (2024), Okpara *et al.* (2021), Tokunbo-Daniel *et al.* (2018), Tukura *et al.* (2018), Mokuolu *et al.* (2016), Suleiman *et al.* (2015) noted that locating dump sites close to residential areas can cause serious health implications especially transmission of vector borne disease like malaria.Many other studies investigated the association between malaria incidence and proximity to an active/potential breeding ground or water bodies (Tairou *et al.* (2022), Maseko and Nunu (2020), Ngadjeu *et al.* (2020). Studies by Ashaba *et al*. (2025), Shah *et al.* (2022) examine the influence of agricultural activities and living close to shrub lands on the incidence of malaria in a community.

Methodology

Study Area

Bade Local Government area is located in the northeastern part of Nigeria, specifically Yobe North. The area is limited within longitudes 10º 02ˈE and 11º 11ˈE of the Greenwich Meridian and latitudes 12º 48ˈN and 12º 88ˈN of the Equator with an elevation of 229 m above sea level; and with a total land area of about 772 km^2. Bade Local Government Area shares border with Karasuwa LGA to the north, Yusufari LGA to the North-East, and South-East and to the East with Bursari LGA; to the South with Jakusko LGA, and to the West with Jigawa State (Figure 1).

Bade Local Government Area is marked by high temperature and seasonal rainfall (usually last for less than four months). The mean minimum temperature ranges between 10-12ºC in the coolest months (December - January) while the mean maximum temperature is about 37-42ºC in the hottest months (March - June). The period of rainy season lasts for about 120 days (June to September). The mean rainfall ranges from 300 mm to 500 mm per year (Alhassan *et al.* 2018).

The main vegetation type in Bade Local Government Area is Sahel Savannah consisting of open thorny Savannah with some short trees and grasses. The trees are about 5m to 10m high (Alhassan*et al,* 2018). The relief of the area can be described as generally low land with some undulation in some parts having an elevation of 229 m above sea level (Ibrahim, 2017 and Suleiman, 2007). According to the National Population Commission 2006, Bade Local Government Area has a total population of 139, 804 (FGN, 2007) and area was projected to have 331 000 (NBS, 2017). Bade Local Government Area like any other LGAs in Nigeria has been divided into ten political wards for administration purpose with each delineating people of same or similar life styles and cultures. The division has influence on distribution and management of health, educational, agricultural and other forms of managerial activities in the Local Government.

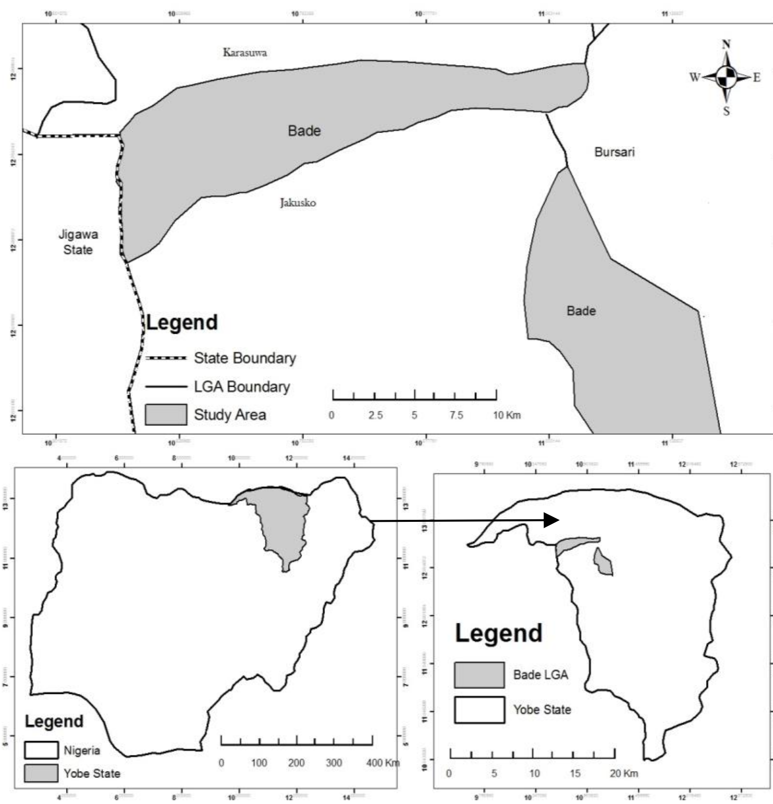

Fig. 1: Bade Local Government Source: NASRDA, 2012

Study Design and Population

This is a community-based cross-sectional survey. The study population consists of people who were 18 years and above living in Bade local government area. People belonging to this population group are expected to give reasonable information required by this study. Due to the unavailability of the breakdown of population at locality level, the researcher decided to use total registered votes as population sampling framework. Based on the record of the Independent National Electorate Commission, there were 104, 472 registered individuals (INEC 2019).

Sample size and Sampling Technique

A total of 385 household heads were selected for the study. The sample size was determined using Australian vet-epidemiology calculator. The Australian epidemiology calculator is provided by the Australian Bureau of Statistics and is important for determining the appropriate sampling size in household survey. This ensures the survey results are reliable and representative of the population being studied. The calculator help the researcher achieve desired levels of precision and confidence leading to more accurate findings. The Australian epidemiology calculator uses the formula in equation

Where, $n = \dfrac{N \times X}{(X + \mathrm{N} - 1)}$ 1

X = Z α /22 −*p*(1-p) / MOE2,and Z α /2 is the critical value of the Normal distribution at α /2 (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96), MOE is the margin of error, p is the sample proportion, and N is the population size. Note that a Finite Population Correction has been applied to the sample size formula.

To determine the number of respondents to be selected for questionnaire administration from each political ward, the stratified sample formula by Stat (2012) was employed, the formula is given in equation 2.

$ni = \dfrac{Ni}{N} \times n$ 2

Where: **n** represent sample size from general population (registered votes) =385; **ni** represent registered votes for the individual wards, **Ni** represent the ward registered votes; **N** represent overall registered votes for the study area

Multistage sampling technique was employed to select the study participants. In the first stage, the area was grouped into ten clusters based on political wards. The second stage was the determination of sample size for each political ward using Stat's (2012) formula. The third stage was the selection respondents, which was done using systematic random sampling method. In each of the selected houses only one household head was considered for the study. Table 1 contains information on the total registered votes as at 2019) and sample size of each political ward.

Table 1: Registered votes and sample size by ward

S/N	Ward Name	Eligible respondents	No. of respondents chosen
1	Dagona	7761	29
2	Gwio Kura	6487	24
3	Katuzu	8051	30
4	Lawan Audu (Sabon Gari)	19330	71
5	Lawan Musa	10787	40
6	Lawan Fannami	14923	55
7	Sarkin Hausawa	9140	34
8	Sugum/Tagali	6067	22
9	Usur/Dawayo	10182	37
10	Zango	11744	43
	Total	104472	385

Source: INEC (2019) and Author's computations (2023)

Data Collection Instrument

The data was collected using structured questionnaires administered to the heads of the household and with the help of the research assistant the copies of questionnaire were administered with 30 days (November/December, 2023). The instrument consists of both open and closed ended questions. The tool comprises of two sections viz: A and B. Section 'A' captured information on demographic characteristics of respondents, such as age, gender, level of education, family size among others. Section B on the other hand invites responses on malaria incidence in the household, environmental and sociocultural determinants of malaria like proximity related factors such as distance to stagnant water, distance to shrublands, distance to health facility, distance to forest, distance to farmlands, nearness to wetlands and characteristics of housing units like type of house, condition of roof, conditions of walls, condition of floors, type of drainage system in the neighborhood, keeping of water in containers inside the house etc. In addition, the instrument invites responses on the number of malaria cases occurred in the last six months in the household. The number of malaria cases experienced in each of the sampled household was determined by respondent's verbal report on clinical/laboratories test's result and prescribed drugs.

Validity and reliability is an important test used to measure the accuracy and consistency of research instruments (especially questionnaires) among health and social science (Bolarinwa, 2015). The instrument used in this study was validated by medical geographer, Entomologist and Parasitologist who are all lecturers in Aliko Dangote University of Science and Technology, Wudil. The questionnaire sensitivity was achieved by adopting 5-likert scale. The test-retest reliability was established by comparing the alpha coefficient of the questionnaire. In addition, pilot testing was carried out on 20 respondents before the main data collection. The essence of the pilot testing is to ensure the content of the instrument has no problem with the language used. Results of the pilot study were not however used in the analysis and households tested were excluded from the main field survey. On the other hand reliability of the instrument was measured using Cronbach alpha which yielded coefficient value of 0.67 (Table 2). This result shows that the questionnaire is reliable going by the assumption of Bolarinwa, (2015) who stated that reliability coefficient (alpha) of 0.70 or higher is considered acceptable with sample size of 385 and 46 proportion of valid response.

Table 2: Test reliability for questionnaire (Cronbach result)

Reliability Statistics

Cronbach's Alpha	Cronbach's alpha based on standardized items	N of Items
.678	.596	46

Source: Author's computation/SPSS output (2023)

Data analysis

Descriptive and inferential statistics were used in the analysis of the results. Descriptive statistics using frequency table was employed to summaries the result. Multiple Regression Analysis on the other hand was applied to explore the relative effects of environmental and sociocultural factors on the incidence of malaria at household level. Twenty-two factors were assessed to identify which among the factors best predict malaria incidence in the area as given in Table 3.

Table 3: Factors that determine the malaria incidence in Bade LGA

Factors	Independent Variables	Variable Type
Nearness to stagnant water body	X1	Ordinal
Nearness to wetland	X2	Ordinal
Nearness to agricultural land	X3	Ordinal
Nearness to forest	X4	Ordinal
Nearness to shrub land	X5	Ordinal
Nearness to garbage dump site	X6	Ordinal
Nearness to healthcare facilities	X7	Ordinal
Type of house	X8	Ordinal
Type of material used for wall building	X9	Ordinal

Factors	Independent Variables	Variable Type
Present condition of the wall	X10	Ordinal
Type of roofing materials	X11	Ordinal
Present roofing condition	X12	Ordinal
Type of materials used for floor	X13	Ordinal
Present condition of floor	X14	Ordinal
Type of windows in the house	X15	Ordinal
Type of toilet facility in the house	X16	Ordinal
Source of water in the house	X17	Ordinal
Storing water in an open container in the house	X18	Ordinal
Type of drainage around the house	X19	Ordinal
Travelling to other areas and spend night there	X20	Ordinal
Frequency of travelling to other areas	X21	Ordinal
Sleeping outdoor during hot weather condition	X22	Ordinal

Multiple linear regressions can be expressed using the equation:

$$Y = \beta o + \beta 1x1 + \beta 2x2 + \ldots + \beta mxm + eij \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where Y represents the dependent variables, *x1* to *xm* represents the multiple independent variables, β0 to βm represents the regression coefficients, and *e* represents the random error.

Number of malaria cases occurred in the household in the last six months before the date of the survey was considered i.e. (November/December, 2023) as the dependent variable while the 22 variables mentioned above represent the independent variables.

Prior to the above analysis, preliminary assumption testing was conducted to ensure that assumptions of normality, linearity, and equality were met. All Statistical analyses were performed using SPSS Version 21.

Results and Discussion

Profile of Respondents

Table 4 reveals that of the total 385 study participants, 282 (73.2%) were male while the remaining 103 were female. The age groups 26 - 35 and 36 - 45 accounted for the highest proportion (30.9% and 26.5%) of participants. Most of the study participants (74%) were married. Majority of the participants (60.8%) had between 1 - 3 number of children with only 2.3% having 8 number of children or more. About two-third of the surveyed individuals attained secondary school education and above with only 8.1% having no formal education. The data on type of occupation shows that 35% and 21.6% of the respondents were farmers and civil servants respectively. Results on monthly income revealed that more than half of the study participants earned less than 31, 000 Naira in a month.

Table 4: Demographic and socioeconomic characteristics of respondents

Variables	Frequency	Percentage
Gender:		
Male	282	73.2
Female	103	26.8
Age (years):		
18 - 25	68	17.7
26 - 35	119	30.9
36 - 45	102	26.5
46 - 55	57	14.8
56 and above	39	10.1
Marital Status:		
Married	285	74.0
Single	81	21.0
Widow	11	2.9
Divorced	8	2.1
Number of Children:		
None	112	29.1
1 - 3	234	60.8

Variables	Frequency	Percentage
4 - 7	30	7.8
8 and above	9	2.3
Educational Attainment:		
No formal Education	31	8.1
Islamic Education	84	21.8
Primary Education	14	3.6
Secondary Education	110	28.6
NCE/ND	103	26.7
B SC/HND	43	11.2
Type of Occupation:		
Farming	135	35.1
Fishing	33	8.6
Rearing	27	7.0
Civil Service	83	21.6
Trading	64	16.6
Others	43	11.1
Monthly Income:		
N15,000 and below	113	29.3
N16,000 - N30,000	102	26.5
N31,000 and above	170	44.2

Source: Field Survey, 2023

Malaria Incidence at Household Level

Occurrence of malaria cases at household level in the last six months was determined by a verbal confirmation of positive malaria case based on clinical test from health facilities/laboratories (Table 5). Table 4 showed that, malaria cases at household level ranged from 1 - 12, with an average of 6.7 cases. This result indicates that malaria cases occurred in all the surveyed households. The result of the study further shows variability in the number of malaria cases among the sampled households. This variation could be related to differences in the level of vulnerability to malaria risks among the studied households.

Table 5: Cases of malaria occurred at household level

Number of cases	Frequency	Percentage
Less than 5	121	31.4
5 - 9	231	60.0
10 and above	33	8.6
Total	385	100

Source: Field Survey, 2023

Influence of Environmental and Sociocultural factors on malaria incidence

Data generated on the 22 independent variables was subjected to multiple regression analysis. Before applying multiple linear regressions classical assumption were checked for validity of the results. Based on the collinearity diagnostic table obtained, none of the models dimensions has conditional index about the threshold limit 30.0, none of the tolerance values is smaller than 0.10, and none of the VIF statistics is less than 10.0. This is to assess the relative effect of each independent variable on malaria incidence at household level. Results from the Table 6 reveal that, the analysis yielded 0.872 as correlation coefficient value between the dependent variable (malaria cases in the last six months) and predictors (environmental and sociocultural variables), and an R^2 value of 0.764 indicating that independent variables have jointly contributed for 76.4% of the malaria incidence in the area. The significant *p-value* of 0.000 indicates that our model is a good fit.

Table 6: Model summary for environmental and sociocultural factors

R	.872
R Square	.764
Adj. R Square	.645
Std. Error of the Estimate	6.199
Durbin Watson	1.798
Sig. F Change	.000

Source: Author's computation, 2023

The result of this study revealed that investigated variables accounted for more than three quarter to the incidence of malaria in the area. Other variables not included in the model such as climatic variables, topographic features, dating and other night activities, among others accounted for the remaining 14%. This finding is in accordance with Animut *et al.* (2025); Alghamdi (2025); Cheng *et al.* (2025) and Ogbozor (2025); Lubango *et al*. (2024); Ngatu *et al*. (2019); Essendi *et al.* (2019); Saha *et al.* (2019) who in their studies found that environmental/social factors were the major factors of malaria incidence in their respective studies.

The standardized regression coefficients of the predictors is shown in Table 7, and the results revealed that seven (7) variables out of 22 are discovered to be statistically significant predictors of malaria incident at household level ($P< 0.05$). These variables are: nearness to stagnant water body (β=0.013, p=0.011), nearness to agricultural land (β=0.001, p=0.013),, nearness to shrub land (β=0.013, p=0.049),, nearness to garbage dump site (β=0.046, p=0.042),, present condition of house's wall (β=0.157, p=0.022),, present condition of house's roof (β=0.134, p=0.048),, and sleep outdoor during the hot weather condition (β=0.075, p=0.023).

Table 7: Standardized regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	14.218	4.57		3.111	0.002
	NSW	0.729	0.929	0.046	0.785	0.043
	NWL	0.495	0.469	0.118	1.054	0.293
	NAG	-0.081	0.401	-0.013	-0.201	0.049
	NFR	-0.872	0.477	-0.209	-1.829	0.068
	NSH	-0.01	0.584	-0.001	-0.017	0.013
	NGD	-0.882	1.145	-0.046	-0.77	0.042
	NHF	-0.129	0.483	-0.016	-0.268	0.789

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	
TH	-0.301	0.228	-0.083	-1.32	0.188
MBW	0.59	0.64	0.063	0.922	0.357
PCW	-1.101	0.477	-0.157	-2.31	0.022
RM	0.385	0.362	0.065	1.062	0.289
CR	0.956	0.504	0.134	1.896	0.048
FM	-0.125	0.545	-0.016	-0.23	0.819
CF	-0.656	0.454	-0.097	-1.444	0.15
TW	0.343	0.258	0.081	1.328	0.185
TC	-0.021	0.399	-0.003	-0.052	0.959
SW	0.466	0.349	0.083	1.334	0.183
SWOC	0.03	0.279	0.006	0.108	0.914
TDS	-0.016	0.278	-0.003	-0.058	0.954
TOA	-0.355	2.278	-0.009	-0.156	0.876
FT	-0.21	0.3	-0.041	-0.698	0.486
SOD	-0.379	0.32	-0.075	-1.184	0.023

Source: Author's computation, 2023. NSW= Nearness to stagnant water, NWL= Nearness to wetland, NAG= Nearness to agricultural land, NFR= Nearness to forest, NSH= Nearness to shrub land, NGD= Nearness to garbage dumpsite, NHF=Nearness to healthcare facility, TH= Type of house, MBW= Materials used building walls, PCW= Present condition of wall, RM= Type of roofing materials, CR=Present condition of roofing, FM= Type of materials used for floor, CF= Present condition of floor, TW= Type of windows in the house, TC= Type of toilet facilities, SW= Source water, SWOC= Frequency of Storing water in open container, TDS= Type of drainage system around the house, TOA= Travelling to other areas and spending night there, FT= Frequency of travelling to other areas, SOD= Sleeping outdoor during hot weather.

This study established an association between nearness to stagnant water, garbage dump sites and malaria incidence at household levels. These habitats are among the suitable breeding grounds for mosquito. It is therefore expected to have high population density of mosquitoes around the breeding sites and subsequent transmission of malaria. People living closed to these habitats are at high risk of malaria infection. The finding of this study is in line with other works (Suleman *et al*. 2015; Mokuolu *et al.* 2016; Ibor and Okoronkwo 2017; Agegnehu *et al.* 2018; Tokunbo-Daniel *et al.* 2018; Tukura *et* *al*. 2018; Okpara *et al*. 2021; Tairou *et al.* 2022; Okin *et al.* 2024;) who also established association between malaria infection and nearness to the vector breeding sites and water bodies.

The finding of this study also revealed a positive relationship between distance to agricultural and shrub lands with malaria incidence in the area. Agricultural and shrub lands served as hide out. Houses located near these habitats are more prone to mosquito bite than those far away. As a result, they may contract with malarial disease compared to other people who stay far away vegetation cover. The finding of this study supported the results found Ashaba *et al.* (2022), Shah *et al.* (2022) who discovered a significant relationship between malaria incidence and presence of vegetation.

The nature of dwelling unit has some implications for malaria transmission as unimproved traditional houses provide less malaria protection compared to modern and improved houses. Majority of the houses in the the area of this study are made of of local materials. Walls of most of the houses are cracked thereby providing an easier entry point and served as hide out for mosquitoes and other disease vectors. Similarly, roof of the majority of houses are local one made up of thatch and timber. This type of roofing material also gives room for mosquitoes to stay especially during the day and move out for blood sucking in the night. In this study, types of materials used for wall and roof are associated with malaria occurrence in the area. This finding is in agreement with the results reported by Alghasmdi (2025), Olivera *et al.* (2025), Nankabirwa *et al.* (2024), Musiime *et al.* (2022), Tairo *et al.* (2022), Okpara *et al.* (2021) and Nguela *et al*. (2020) that improved houses are associated with lower malaria incidence.

Conclusion

The study established a link between malaria incidence at household level and environmental and sociocultural factors in Bade local government area. Seven factors are identified as the most significant predictors of malaria incidence in the area. Nearest to shrub lands, present condition of the wall of houses, and attitude of sleeping outdoor during the hot weather conditions are the strongest predictors. The study recommends that priority should be given to vector control mechanism and public health awareness on appropriate use of intervention measures to reduce transmission of the disease. Inhabitants of the area should also be encouraged to use mosquito net in every night to reduce their contact with the mosquitoes.

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