



MALARIA CONTROL MEASURES ASSESSMENT AND DETERMINANT FACTORS AMONG RESIDENTS OF SOME RURAL COMMUNITIES IN BAYELSA EAST, NIGERIA

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ABSTRACT

Aim/Objective: Malaria is public health challenge in rural communities due to poor surrounding conditions that encourage mosquitos breeding ground. This study assess malaria control/ determinant factors among residents of rural communities in Bayelsa East. **Methods:** Descriptive cross-sectional study was adopted to select all 249 participants through simple random methods. Data collected were documented in a structured questionnaire and analyzed using SPSS version 25.0. **Results:** Observation from the study indicate that 96.00% participants were aware malaria been transmitted through mosquito bites, while 94.80% agreed that stagnant water encourages mosquito breeding. Additionally, 75.10% slept under insecticide-treated nets, 88.80% regularly cleared bushes, and 85.10% disposed household waste regularly. Furthermore, 84.70% reported that distance to health facilities affected malaria treatment, while 85.50% agreed that the cost of preventive tools limited usage. **Conclusion:** Although knowledge and preventive practices were relatively high, environmental and socioeconomic barriers hindered effective malaria control. We hereby recommend that intensified environmental sanitation and provision of subsidized malaria preventive measures should be in place by the government through the various health facilities to the various rural communities in the study areas.

Keywords:

Control, Communities, Environment, Malaria, Nets.

INTRODUCTION

Malaria is among the deadly disease plaguing humans worldwide. The female anopheles mosquito transmits the protozoan to the plasmodium. Rural areas require diagnosis that is accurate for repetitive sampling and determinant factors (Adebayo *et al.*, 2015; Okeke & Uzochukwu, 2018; Adela *et al.*, 2020). Malaria is a public health concern in Nigeria with an estimate of about 263 millions affected incidence in Africa resulting in 94% in worldwide cases in 2023 (WHO, 2023). Observable determinant factors of malaria spread includes the humidity, temperature, rainfall that are common in an environment (Ahorlu *et al.*, 2019; Gouvide *et al.*, 2025). Despite interventions regarding ongoing malaria control in Bayelsa State, malaria remains endemic, suggesting possible gaps in the implementation and utilization of existing control measures, as well as the influence of local determinant factors (Bayelsa State Ministry of Health, 2021). Olatunde and Ojo (2021) observed that environmental factors, such as stagnant water and poor drainage are significant predictors of malaria prevalence in the State. The study emphasized the need for community-based environmental management including biomedical interventions. Studies conducted in rural communities have shown that farming/ fishing activities expose residents to mosquito bites during morning/evening periods increasing the risk of malaria despite the use of nets (Deressa *et al.*, 2008; Adela *et al.*, 2020; Ekanem *et al.*, 2020; NMEP, 2022). study conducted by Hassan *et al.* (2021) in Nigeria noted that cultural sleeping patterns and household overcrowding affected utilization of net. Some households prioritize the protection of children and pregnant women leaving other members unprotected. Study conducted in Ethiopia showed that proximity to stagnant water bodies significantly increased malaria risk regardless of individual preventive behaviors. This finding is particularly important to riverine communities like Bayelsa State. Indoor residual spraying involves applying long-acting insecticides to interior walls and ceilings. IRS is effective in killing mosquitoes that rest indoors after feeding. However, its effectiveness depends on high coverage, community acceptance, and insecticide resistance management (Alemu *et al.*, 2011) WHO, 2023). Several studies conducted in Bayelsa State have consistently reported high malaria prevalence rates especially among rural dwellers with poor drainage/housing structures (Olatunde & Ojo, 2021).

MATERIALS AND METHODS

Study Design

This study adopted a descriptive cross-sectional design. The design was considered appropriate because it allows for the assessment of malaria control measures and determinant factors among residents of the communities considered for this study at a single point in time. The cross-sectional approach enables the collection of data on malaria preventive practices, environmental factors, socio-demographic characteristics, and other determinants influencing malaria control without manipulating variables.

Study Area

The study was carried out in Otabagi, Otakeme and Otuogidi communities in Ogbia LGA, located in the Niger Delta region and is characterized by a tropical climate with high rainfall, humidity, and temperature, conditions that favor mosquito breeding. The area consists of rural communities, with residents primarily engaged in fishing, farming, trading, and civil service. Ogbia LGA has several primary healthcare centers and one or more secondary health facilities that provide malaria prevention and treatment services.

Study Population

The study population comprises of adult residents in the study Communities.

Inclusion Criteria

Males and females who have lived in the communities for at least one year prior to the study.

Exclusion Criteria

Residents who are visitors or who declined consent were excluded from the study.

Sample Size

This was determined using Cochran's sample size formula, (Cochran, 1977).

The formula is expressed as:

$$n = (Z^2 \times p \times (1 - p)) / e^2$$

Where:

n= minimum required sample size

Z = standard normal deviation

p = estimated prevalence proportion. Previous studies have shown a prevalence proportion rate of 18.1% individuals affected by malaria among residents in some rural areas in Bayelsa State (Charles *et al.*, 2024)

(1 – p) = complement of the estimated proportion

e = margin of error (desired level of precision)

Substituting;

$$n = (1.96^2 \times 0.18 \times (1 - 0.18)) / 0.05^2$$

$$n = 3.8418 \times 0.18 \times 0.82 / 0.0025$$

$$n = 0.6915 \times 328$$

$$n = 226.648$$

Adjusting for non-response rate of 10%

$$n = 10/100 \times 226.648$$

$$n = 226.648 + 22.66$$

$$n = 249 \text{ Participants}$$

Sampling Technique

A simple random sampling technique was employed in this study.

Instrument for Data Collection

Data were collected using a structured, interviewer-administered questionnaire developed by the researcher based on literature and malaria control guidelines. The questionnaire consisted of the following sections:

A: Socio-demographic characteristics

B: Knowledge of malaria transmission and prevention

C: Malaria control measures (use of insecticide-treated nets, indoor residual spraying, environmental sanitation, use of antimalarial drugs)

D: Determinant factors affecting malaria control (education, income, housing conditions, environmental factors, access to healthcare)

Data Collection

Data collection was done by the researchers who were fluent in English and the local language. The study objective was made known to participants before administering the questionnaire through face to face interviews.

Analysis

Data were analyzed using SPSS version 25.

Ethical Consideration

Approval was obtained from the research/ethics committee while permission was also sought from community leaders and local authorities.

RESULTS

Presentation of Demographic Data

Table1 presents respondents characteristics that participated in the study. The findings shows that 121(48.60%) respondents were within the age range of 18–24 years, 53(21.30%) were between 25–30 years, 44(17.70%) 31–35 years, 16(6.40%) 36–40 years, 7 (2.80%) 41–45 years, while 8(3.20%) were above 46 years. However,89(35.70%) respondents were male, while 160(64.30%) were female. 127(51.00%) respondents were single, 85(34.14%) were married, 17(6.83%) were divorced, while 20(8.03%) belonged to other marital categories. 11 (4.50%) respondents has no formal education, 15(6.00%) had primary education compared to 71(28.50%) with secondary education and 152(61.00%) tertiary education. 12(4.80%) respondents were farmers, 35(14.10%) were traders, 53(21.30%) were civil servants, while 149(59.80%) engaged in other occupations.

Table 1: Distribution of Demographic Data of participants

S/N	Variable	Response Categories	Frequency (n = 249)	Percentage (% = 100.0)
1	Age	18-24	121	48.60
		25-30	53	21.30
		31-35	44	17.70
		36-40	16	6.40
		41-45	7	2.80
		>46	8	3.20
2	Sex	Male	89	35.70
		Female	160	64.30
3	Marital Status	Single	127	51.00
		Married	85	34.14
		Divorced	17	6.83
		Other	20	8.03
4	Educational Status	None	11	4.50
		Primary	15	6.00
		Secondary	71	28.50
		Tertiary	152	61.00
5	Occupation	Farmer	12	4.80
		Trader	35	14.10
		Civil Servant	53	21.30
		Other	149	59.80

Table 2 dwells knowledge of malaria transmission and mosquito breeding. The observation shows that 239 (96.00%) residents accepted malaria is transmitted through mosquito bites compare to 10(4.00%) that disagreed. Observation also shows 236 (94.80%) participants agreed that stagnant water encourages mosquito breeding compare to 13(5.20%) who disagreed.

Table 2: Distribution of Response on Knowledge of Malaria

S/N	Variable	Response Categories	Frequency (n = 249)	Percentage (% = 100.0)
1	Malaria is transmitted by mosquito bite	Yes	239	96.00
		No	10	4.00
2	Stagnant water encourages mosquito breeding	Yes	236	94.80
		No	13	5.20

Table 3 addresses the control measures adopted by respondents. Results shows 187(75.10%) respondents slept under insecticide-treated nets while 62(24.90%) did not. This shows most respondents utilized ITNs for malaria control. 97(38.96%) participants reported always using mosquito net, 113(45.38%) used them sometimes, while 39(15.66%) never used mosquito nets. 221(88.80%) respondents regularly cleared bushes around their houses, while 28(11.20%) did not. 179(71.90%) respondents applied mosquito insecticide sprays before sleeping, while 70(28.10%) did not. 180(72.30%) respondents always cleaned their kitchens, 36(14.50%) cleaned once daily, while 33(13.30%) cleaned every two days. 212(85.10%) respondents disposed household waste regularly, while 37 (14.90%) did not. 194(77.90%) respondents did not leave their house doors open at night, while 55(22.10%) did. 205(82.30%) respondents had window nets installed in their houses, while 44(17.70%) did not.

Table 3: Distribution of Response on Malaria Control Measures

S/N	Variable	Response Categories	Frequency (n = 249)	Percentage (% = 100.0)
1	Do you sleep under insecticide-treated net (ITN)?	Yes	187	75.10
		No	62	24.90
2	How often do you use mosquito nets?	Always	97	38.96
		Sometimes	113	45.38
		Never	39	15.66
3	Do you clear bushes around your house regularly?	Yes	221	88.80
		No	28	11.20
4	Do you always apply mosquito spraying insecticide to your apartment before sleeping?	Yes	179	71.90
		No	70	28.10
5	How often do you clean your kitchen?	Always	180	72.29
		Ones daily	36	14.46
		Every two days	33	13.25

6	How often do you dispose your household waste?	Regular	212	85.10
		Not Regular	37	14.90
7	Do you always leave your house door open at night?	Yes	55	22.10
		No	194	77.90
8	Do you have windows nets?	Yes	205	82.30
		No	44	17.70

Result in table 4 revealed that 133(53.40%) respondents reported the presence of poor drainage around their residence, while 116(46.60%) disagreed. 211(84.70%) participants accepted distance to health facility affects malaria treatment, while 38(15.30%) disagreed. 107(43.00%) respondents indicated that dumpsites were close to their residences, while 142(57.00%) disagreed. The respondents also reported different frequencies of environmental fumigation, 91(36.500%) respondents fumigated monthly, 51(20.50%) fumigated twice monthly, 62(24.90%) fumigated every two months, while 45(18.10%) did not fumigate at all. 131(52.60%) respondents indicated that they carried out fumigation themselves, while 118(47.40%) did not. Among those who received assistance, 65(26.10%) were assisted by sanitary officers, 74(29.70%) did it themselves, 37(14.90%) were assisted by their children, while 73(29.30%) did not fumigate at all. 213(85.50%) respondents agreed that the cost of preventive tools limits their usage, while 36(14.50%) disagreed.

Table 4: Distribution of Response on Determinant Factors

S/N	Variable	Response Categories	Frequency (n = 249)	Percentage (% = 100.0)
1	Do poor drainage exists around your residence?	Yes	133	53.40
		No	116	46.60
2	Distance to nearest health facility affects malaria treatment	Yes	211	84.70
		No	38	15.30
3	Is waste disposal dumpsite close to your residence?	Yes	107	43.00
		No	142	57.00
4	Do you regularly fumigate your surroundings?	Monthly	91	36.50
		Twice-monthly	51	20.50
		Every-two-months	62	24.90
		Not at all	45	18.10
5	Do you do it alone?	Yes	131	52.60
		No	118	47.40
6	If no, with who?	Sanitary Officers	65	26.10
		Myself	74	29.70
		My children	37	14.90
		Not at all	73	29.30

7	Do cost of preventive tools limits usage	Yes	213	85.50
		No	36	14.50

Discussion

The observations from this study have shown that the participants have knowledge regarding malaria transmission and mosquito breeding. Most subjects correctly identified mosquito bites as the main mode of malaria transmission and identify stagnant water as a breeding site for mosquitoes. This finding is in congruent with Pulford *et al*, (2011) who reported high awareness of malaria prevention and transmission among rural dwellers in Kenya. Also, Adebayo *et al*. (2020) observed many Nigerians have sufficient knowledge of malaria transmission and prevention despite variations in preventive practices. These findings also support studies by Noor *et al*. (2014), who observed that malaria awareness campaigns and public health interventions across Africa have significantly improved community knowledge regarding mosquito transmission and environmental sanitation. However, Pulford *et al*. (2011) further emphasized that knowledge alone may not necessarily translate to effective preventive behavior without addressing behavioral and environmental obstacles. This shows that despite respondents' demonstration of good knowledge, consistent application of preventive measures remains essential. The findings indicate that health education campaigns and malaria awareness programs within study area may have contributed positively to respondents' understanding of malaria transmission and environmental risk factors.

The findings from this study have also shown that large proportion of respondents practiced malaria preventive measures such as sleeping under insecticide-treated nets, clearing bushes, regular waste disposal, and using window nets. The finding that 75.10% of respondents used ITNs agrees with Lengeler (2004), who reported that insecticide-treated nets significantly reduce malaria morbidity and mortality when properly utilized. Similarly, Bhatt *et al*. (2015) found that increased LLIN coverage contributed substantially to reduced malaria incidence across Africa. However, the study further shows inconsistent usage of mosquito nets, as many respondents reported using them only sometimes. This agrees with Noor *et al*. (2014) that reported ownership of LLINs does not translate to consistent utilization most often. The findings also support Adebayo *et al*. (2020), who identified heat discomfort and behavioral factors as barriers to regular net usage in Nigeria. The high level of environmental sanitation practices observed among respondents corresponds with Olatunde and Ojo (2021), who emphasized that proper waste disposal and elimination of stagnant water help reduce mosquito breeding and malaria transmission. Similarly, the use of window nets and insecticide sprays aligns with Tusting *et al*. (2017), who reported that improved housing structures and vector control measures reduce indoor mosquito exposure and malaria prevalence. The findings suggest that respondents adopted multiple malaria control strategies, although consistent utilization of preventive tools remains necessary for effective malaria prevention.

Further findings from this study also revealed that environmental, economic, and healthcare-related factors significantly influence malaria control practices among respondents. The presence of poor drainage around residences agrees with Alemu *et al*. (2011), who reported that stagnant water and poor drainage systems increase mosquito breeding and malaria transmission. Similarly, Olatunde and Ojo (2021) identified environmental conditions eg poor drainage and stagnant water as significant predictors of malaria prevalence in Bayelsa State. The finding that distance to healthcare facilities affects malaria treatment aligns with Onwujekwe *et al*. (2019), reported that proximity to health facilities significantly influences prompt malaria treatment-seeking behavior in Nigeria. Worrall *et al*. (2007) also found that poor households often delay seeking treatment due to cost and accessibility barriers. The findings further revealed that cost limits the use of malaria preventive tools. This corresponds with studies conducted across Sub-Saharan Africa, where socioeconomic challenges were identified as major barriers to consistent use of preventive interventions such as ITNs and indoor spraying. The inconsistent fumigation practices observed among

respondents may contribute to persistent mosquito breeding within the community. This agrees with Ekanem *et al.* (2020), who reported that environmental and occupational exposure in riverine communities increases malaria risk despite ownership of preventive tools. Overall, the findings suggest that malaria prevention within the study area is influenced not by individual behavior but also by environmental conditions, healthcare accessibility, and financial limitations.

CONCLUSION

Despite the relatively good level of knowledge and preventive practices, several determinant factors including poor drainage systems, inadequate environmental sanitation, long distance to healthcare facilities, and high cost of preventive tools is major factor hindering effective malaria control measures within the study area. Hence effective malaria prevention requires not only adequate knowledge and personal preventive practices but also improvement in environmental management and healthcare accessibility within rural communities.

Conflict of Interest: None declared

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