African Journal of
Medicine, Surgery and Public Health Research

ISSN: 3434-3567

Index: Harvard, Boston, Sydney University, Dimensions, Lens, ResearchGet Scilit, Semantic, Google Scholar, Base etc

https://doi.org/10.58578/AJMSPHR.v2i1.4745

Factors Associated with Persistence of Malaria Prevalence Among Under Five Children in Maiha Local Government Area, Adamawa State, Nigeria

Chidama Ibrahim Mohammed[1], Chinda Ndumari Kirchinga[2], Aliyu Idris[3], Mohammed Hayatu Girei[4]

[1,2,3]Adamawa State College of Education Hong, Nigeria

[4]Education Support Services TETFund, Abuja, Nigeria

chidamaibrahim@gmail.com; ndumarichindak@gmail.com

Article Info:

Submitted:	Revised:	Accepted:	Published:
Dec 22, 2024	Jan 6, 2025	Jan 18, 2025	Jan 23, 2025

Abstract

The research determined the factors associated with persistence of malaria prevalence among UN5 in Maiha Local Government Area, Adamawa State, Nigeria. Consecutive sampling method was employed to enroll a total of 2822 UN5 who attended the sampled health facilities from 19th September, 2024 to 31st October, 2024. These UN5 were subjected to malaria diagnostic tests using both mRTD and microscopy. The caregivers of these UN5 were interviewed using a structured questionnaire for data collection on factors influencing the persistence of malaria among UN5. Data collected was analyzed using descriptive and logistic regression model for the prevalence of malaria. mRTD and microscopy results revealed malaria prevalence of 76.47% (2158). Logistic regression result on demographic factors was (R^2 = 0.6849) with Age of the child, Marital Status of caregiver, Educational Qualifications of caregiver, Income of caregiver and Occupations of caregiver all had positive coefficient and were all significant at 1%. The contributory Environmental factors was (R^2

AJMSPHR Journal is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License

=, 0.5533), and its components were drainage pattern, Bushes around houses and garbage heaps were all significant at 1% as a factor influencing persistence of malaria. Care giver factors influencing malaria was (R^2 =0.6826) This disclosed that care givers knew that mosquito bite causes malaria and high body temperature was a symptom of malaria as logistic regression results shows positive and is significant at 1%. Similarly, care givers in the study area don't often use mosquito net as the result revealed shows positive coefficient. Similarly, the house hold factors has (R^2 = 0.7681) having all the four household factors that are captured in this study which are the nature of houses,, time for going to bed, source of light and diet, all had positive coefficient and were significant at 1%.. Recommendations was made for a well-planned and resourced health education and promotion interventions by the government and other concerned malaria prevention organizations that focus on prevention and treatment of malaria burden amongst UN5 in Maiha local government area of Adamawa state, Nigeria

Keywords: Prevalence, Demographic, Environmental, Caregiver, Household

INTRODUCTION

Malaria is one of the world's most deadly diseases caused by an infection with single celled parasitic female anopheles mosquito. According to the World Health Organization 2023 report, sub-Saharan Africa accounts for 94% of global malaria cases and 95% of all malaria deaths Approximately 80% of all malaria deaths are recorded in children under the age of five in the region. A report on malaria in Nigeria by the World Health Organization 2022 shows malaria accounts for approximately 27% of the world's malaria cases, making it the country with the largest malaria burden. This remains a burden despite all the efforts put in by the various countries to control and eradicate the disease in these areas. At least one child under five dies of malaria in Africa every 75 s (Castro, 2017). Its problem has further contributed to low economic and social progress especially among countries that have been affected by the disease (Ricci, 2012). The prevalence of malaria in Nigeria is influenced by climate (Weli and, Efe, 2015) and environmental factors (Castro MC 2017). . So also, other significant risk factors, including poverty and low socioeconomic status, with 40% of the population living below the national poverty line (World Bank, 2024). Poor households are more vulnerable to malaria due to inadequate living conditions, a lack of preventive measures such as insecticide-treated nets, and overcrowding, which can increase vector interactions and allow mosquitoes to enter easily (Ricci, 2012).

Nigeria is implementing a malaria elimination program with the goal of eliminating the diseases by 2025 (NMSP, 2024). To assess the progress of this program, the prevalence and factors associated with malaria particular among the vulnerable group especially under five age children should be evaluated over time and in different areas. This draws attention from various researchers, ranging from Epidemiologist, Pediatricians, Ecologists, Etiologists, Parasitologists, Environmentalists, Biologists and the like. For example, Romay – Barja M., et al. (2016) studied factors influencing Malaria among under five years children Bata district of Equatorial Guinea. The study found that about 65% of rural care givers were un aware as to how malaria is transmitted. A study that was conducted in Bolifamba, Cameroon by Antonio-Nkondjio C., et al., (2019) found that, there was a high positive correlation between swamps, stagnant pools and malaria parasite prevalence(r=0.82,P=0.001)while bushes and garbage were highly positively correlated(r=0.56,P=0.OO1). A study by Ovadje and Nringu (2016) revealed about 65% people believe that toomuch exposure to the sun is a risk factor for malaria. Conrad and Rosenthal (2021) found that in Kano only about 19% of ITNs distributed were in active use A study by Conrad and Rosenthal (2019) on malaria prevalence among younginfants in Africa showed 64.74% of rural people were unaware of malaria transmission patterns. These studies are deficient as they looked at just one factor at a time. The studies failed to study concurrently the cumulative factors responsible for the prevalence of Malaria among under five aged children

In addition the government's long term objective on sensitization, prevention, prophylaxis and chemotherapy measures to combat Malaria such as education of individuals and families to sleep under insecticide treated nets, vector control through spraying (IRS), eliminating breeding places, and reducinginfections through prophylaxis and treatment with ACTs, Roll back malaria (ICCM), integrated management of childhood illness (IMCI) and training of VHTs to offer curative malaria treatment at community level objective to ensure total eradication of malaria among children in all endemic areas of the country has not been effectively achieved (UNICEF, 2022). Repeating the same measures without identifying the factors militating against the success of such laudable programs is worrisome.

From the existing literature, there remain a lot to be done on the prevalence of Malaria. This study therefore, will investigate the **factors in malaria prevalence among under five children in Maiha Local Government Area, Adamawa State, Nigeria.**

MATERIALS AND METHODS

Study Area

Maiha is both a town and a Local Government Area in Adamawa State, Nigeria. It has a landmass of 1346 Kilometer square and an estimated population of 188,942 inhabitants (NPC, 2023). The climatic condition of the area favors the breeding mosquitoes which have become deterrent to humans especially children below the age of five (Media Nigeria 2018).

Research and Experiment Design

In this assessment quantitative cross- sectional survey design was used because the design is cost effective and easier to use. This assessment was conducted in some purposively and randomly selected Health facilities (survey site) in the sampled parts of the local government area.

Source of Data Collection

Blood sample from under five years children was used for both mRDT and microscopy to collect data on prevalence of malaria and the Caregivers of children of under five years were the primary source of data on factors in malaria prevalence in this assessment.

Ethical Clearance

Letter for ethical clearance that permits the collection of blood sample for mRDT and microscopy was issued by Maiha Local Government Primary Health Care Development Agency (PHCDA)

Sampling Techniques

Stratified sampling technique was used to divide the study area into stratum, then a Simple random sampling technique was employed to sample out six wards, three from each stratum. Central Maternity Clinic of each of the sampled wards was used in data collection

Procedure for data Collection

This assessment employed a consecutive sampling method that enrolls all the care givers of children below the age of five to participate in the assessment. Children below five years who came to the sampled Health facilities were first seen by a clinician and those who had the signs and symptoms of Malaria were sent to the laboratory for Malaria test using both mRDT and microscope. The clinical staff working in a laboratories of each of the sampled

health facility were used as research assistants for sample collection and examination.

The caregivers of these children were then requested to participate in this study. Those willing to participate were interviewed by research assistants using the questionnaire that was provided by the researcher. The questions were interpreted by the research assistants in indigenous local languages.

Method of Data Analysis

Data collected was analysed using descriptive and logistic regression model for the prevalence of malaria.

Logistic regression for demographic factors model is expressed as:-

$Y = \beta_0+\beta_1X_1+ 2_1X_2+ \beta_3X_3+ \beta_4X_4+ \beta_5X_5+ \beta_6X_6$

Where.,

Y = Prevalence (if Prevalence = 1, Not Prevalence = 0)

X_1= Age of the Children (in Months)

X_2 = Sex (If male = 1,female = 0)

X_3= Marital status of parents (If married = 1, otherwise = 0)

X_4= Educational Qualification of parent (Number of years spent in school)

X_5= Monthly income of parent (₦)

X_6= Occupation of parents (Farming = 1, other = 0)

Logistic regression model for environmental factors is expressed as:-

$Y = \beta_0+\beta_1X_1+ 2_1X_2+ \beta_3X_3+ \beta_4X_4$

Where.,

Y = Prevalence (if Prevalence = 1, Not Prevalence = 0)

X_1=Drainage pattern(Good = 1, Poor = 0)

X_2 = Clearing Stagnant water(If Yes = 1, No = 0)

X_3 =Presence of bush around house(If Yes = 1, No = 0)

X_4 =Garbage heaps very close to house(If Yes = 1, No = 0)

Logistic regression model for household factors is expressed as:-

$Y = \beta_0+\beta_1X_1+ 2_1X_2+ \beta_3X_3+ \beta_4X_4$

Where.,

Y = Prevalence (if Prevalence = 1, Not Prevalence = 0)

X_1= Nature of House (Concreate = 1, Otherwise = 0)

X_2 =Time for going to bed (If early = 1,Otherwise = 0)

X_3 =Source of light (If Electricity = 1, otherwise = 0)

X_4 =Diet (Good = 1, Poor = 0)

Logistic regression model for household factors is expressed as:-

$Y = \beta_0+\beta_1X_1+ 2_1X_2+ \beta_3X_3+ \beta_4X_4+ \beta_5X_5+ \beta_6X_6$

Where.,

Y = Prevalence (if Prevalence = 1, Not Prevalence = 0)

X_1= Mosquito bite transmit malaria (If Yes = 1, No = 0)

X_2 = Sleeping under mosquito net control malaria(If Yes = 1, No = 0)

X_3 = High body temperature is a sign of malaria(If Yes = 1, No = 0)

X_4 = Spraying house with insecticide(If Yes = 1, No = 0)

X_5 = Destroying breeding sites(If Yes = 1, No = 0)

X_6 = Headache is a sign of malaria(If Yes = 1, No = 0)

β_0- β_n = are coefficients

RESULTS

A total of 2822 UN5 have attended the sampled health facilities from 19th September, 2024 to 31st October, 2024. mRTD and microscopy results shows 76.47% (2158) of the patients were found with malaria while 23.53% (664) without malaria. The logistic regression result of demographic factors associated with the persistence of malaria prevalence as revealed by the value of R^2 was 0.6849. Environmental factors value of R^2 was 0.5533. Caregiver knowledge has R2 = 0.6826 and the house hold factors value of R^2 was 0.7681

Table 1: mRTD and microscopy results on the prevalence of malaria among UN5 in Maiha Local Government, Adamawa State, Nigeria

	Frequency	**Percentage**
With Malaria	2158	76.47
Not With malaria	664	23.53
Total	**2822**	**100**

Source: Laboratory experiment, 2024

Table 2. Logistic Regression Result of Demographic factors associated with that prevalence of Malaria among UN5 in Maiha local government area

Variables	**Odds Ratio**	**Std. Err.**	**Z**	**P> z**
Constant	16.6591	4.372	10.72	0.000
Age	2.038333	0.284	5.11	0.000
Sex	.9679401	0.005	-6.54	0.472
Marital Status	1.008711	0.012	0.72	0.009
Educational Qualification	1.008467	0.003	2.62	0.000
Income	2.137827	0.227	7.14	0.000
Occupation	.8685162	0.014	-8.68	0.000
Pseudo R^2	0.6849			

Source: Computed Values, from stata, 2024

Table 3. Logistic Regression Result of Environmental factors associated with malaria prevalence among UN5 in Maiha local government area

Variables	Odds Ratio	Std. Err.	Z	P> z
Constant	11.13067	3.811	7.04	0.000
Drainage pattern	1.878907	0.253	4.69	0.000
Stagnant water	.9617441	0.005	-8.27	0.454
Bush around house	1.003315	0.004	0.75	0.009
Garbage heaps	2.086229	0.217	7.07	0.000
Pseudo R^2	0.5533			

Source: Computed Values, from stata, 2024

Table 4. Logistic Regression Result of care giver factors that make malaria prevalence among UN5 in Maiha local government area

Variables	Odds Ratio	Std. Err.	Z	P> z
Constant	17.16343	6.255	7.80	0.000
Mosquito bite transmit malaria	1.991419	.275	4.99	0.000
Using mosquito net	.9679372	.006	-5.74	0.000
High body temperature	.8689211	.014	-8.67	0.000
Using Insecticide	1.001925	.007	0.28	0.783
Destroy breeding site	1.005688	.005	1.25	0.210
Headache is a sign	2.1274	.226	7.11	0.000
Pseudo R^2	0.6826			

Source: Computed Values, from stata, 2024

Table 5. Logistic Regression Result of House hold factors are associated with malaria prevalence among UN5 in Maiha local government area

Variables	Odds Ratio	Std. Err.	Z	P> z
Constant	8.697812	1.198	10.72	0.000
Nature of House	1.910053	.259	4.77	0.000
Time for going to bed	.8560326	.014	-9.58	0.000
Source of light	.9868634	.005	-2.60	0.009
Diet	2.145847	.226	7.26	0.000
Pseudo R^2	0.7681			

Source: Computed Values, from stata, 2024

DISCUSSION

Microscopy and mRDT results on the prevalence of malaria among UN5 in Maiha Local Government, Adamawa State, Nigeria revealed a prevalence 76.47%. this entails UN5 in the study area are susceptible to malaria.

Logistic regression result of demographic factors associated with the prevalence of malaria in children UN5 in Maiha local government area. The results in table 4.2 shows the value of R^2 was 0.6849 which signifies that 68% were the demographic factors in the model that contribute to the prevalence of malaria in the study area while the remaining 32% are due to other factors that were not captured in the model. Five variables out of six were significant. Age was positive and is significant at 1%. This entails that there is likelihood for the prevalence of malaria in children of UN5 in Maiha local government area. Similarly, marital status was positive coefficient and is significant. This might be due to number of children owned by the household in the study area as most of the respondents are married. The educational qualification was significant at 1%, as they had low level of education they likely experience more malarial attack in the area. However, sex was not significant in association with the prevalence of malaria in the study area. This finding agreed with the findings of Hyacinth et., al (2012) and Humphrey Wanzira et al, (2017) whose studies showed that there were no statistically significant differences in chances of having paresitaemia for gender, The study however, contradicts the findings of Oluwafemi et., al (2024) Who found that gender prevalence of malaria was 30/4% for male and 21.8 %. For female among under five in secondary care level in Ondo state of Nigeria,

The income of the member of the household which determine the purchasing power of an individual was positive coefficient and significant at 1%. This indicates with the low income earning children of the household are more susceptible to malaria attack. The result agrees the findings of Ricci F (2012) who documents that Poor households are more vulnerable to malaria due to inadequate living conditions. The respondents' occupation had also positive coefficient and significant at 1%.. This implies that as most of the occupation of the respondent was farming, their children of UN5 are likely exposed to malaria attacks which make it more prevalence.

The logistic regression results in Table 3, shows the environmental factors that influence the persistence of malaria prevalence within UN5 in Maiha local government area. The results shows the value of R^2 was 0.5533 which signifies that 55.33% were the environmental factors in the model that contribute to the prevalence of malaria in the study area while the remaining 44.67% are due to other environmental factors that were not captured in the model. Three variables out of four were significant. The results shown that the drainage pattern in the study area was positive and is significant at 1% being a factor influencing the persistence of malaria. This entails that with the nature of drainage pattern there is likelihood for the spread of malaria in children of UN5 in Maiha local government area. The presence of bushes around house had positive coefficient and was significant. This signifies that bushes around house lead to an increasing spread of malaria as it hosts the vectors that transmit malaria. Garbage heaps had positive coefficient and was significant. This disclosed with the availability of garbage heaps harbor mosquitoes which add to the prevalence of malaria as they transmit it. The result further revealed stagnant water in the area was not associated with the persistence of malaria in the study area. Probably stagnant water in the area was used to be treated with chemicals that retard the growth and development of malaria in the study area. This study is in line with the study of Theresa N.K et. al (2006) who revealed that inhabitants of houses surrounded by bushes or garbage heaps and swamps or stagnant water showed higher malaria prevalence and densities compared with those from cleaner surroundings

In Table 4, it shows the logistic regression result of care giver factors that make malaria prevalence among UN5 in Maiha local government area. The results shown the value of R^2 was 0.6826 which signifies that 68.26% were the care giver factors in the model that contribute to the prevalence of malaria in the study area. the remaining 31.74% are due to other factors that were not captured in the model. Four variables out of six were

significant. Care givers knowledge on Mosquito bite as a factor for spread of malaria had positive coefficient and was significant at 1%. This disclosed that care givers knew that mosquito bite contributes to the prevalence of malaria in UN5. Similarly, care givers in the study area don't often use mosquito net as the result revealed shows positive coefficient at 1%. This implies that there is shortage or non usage of mosquito net in the study area. High body temperature of the patient had positive coefficient. This indicates that care givers had knowledge on high body temperature of children was a sign and symptom of malaria.. care givers in the study area also knew that headache is a symptom of malaria having a positive coefficient at at 1%.

Table 5, shows the results of logistic regression of house hold factors that make malaria prevalence among UN5 in Maiha local government area. The results shown the value of R^2 was 0.7681 which signifies that 76% were the house hold factors in the model that contribute to the prevalence of malaria in the study area while the remaining 24% are due to other house hold factors that were not captured in the model. All the four household factors that are captured in this study were significant.

The results shown that the nature of house in the area which were mostly not concrete is significantly associated with malaria prevalence among UN5 in Maiha local government area at 1% level of confidence. The time for going to bed had positive coefficient and was significant. This signifies that going to bed lately in houses that were not concrete may increase the risk of malaria as it hosts the vector that transmit malaria through bite. This might be due to the fact that the patients do slept late and eventually exposed to malaria attack which make it prevalence. The source of light had positive coefficient and was significant at 1%. This signifies that fluctuation of light source is favorable to mosquitoes which cause the persistence of the prevalence of malaria as most of the household don't have access to electricity but uses the other source such as lantern, candles, firewood among others. The study agreed with the study of Llergo,. et al., (2024 who documents that artificial night time lighting can influence malaria prevalence . Diet in the household had positive coefficient and significant at 1%. This indicates with the diet intake of UN5 make them more susceptible to malaria which make it more prevalence. This study is in line with the findings of Sady (2023) whose study revealed that malnutrition may increase the risk of malaria infection.

CONCLUSION

.The factors associated with persistence of malaria prevalence among UN5 in the study area included Age of the child, Marital Status of caregiver, low level of Educational Qualification of caregiver, poor Income of caregivers nature of occupations of caregivers, drainage pattern of the study area, presence of, Bushes around houses, garbage heaps, shortage or non usage of mosquito nets ,non concretes nature of houses,, time for going to bed, source of light and poor diet. Generally the study revealed children from low socio-economic backgrounds are at greater risk of malaria infection than their counterparts.

Well-planned and resourced health education and promotion interventions by the government and other concerned malaria prevention organizations that focus on prevention and treatment of malaria could reduce malaria burden amongst UN5 in Maiha local government area., Adamawa state, Nigeria. This could by achieve through

1. Strengthening and supporting the activities of environmental sanitation and hygiene promotion unit of the Health department of the local government council. This will go along with strong legislature and enforcement of environmental laws of the land so the vectors of malaria will have no hidden place in our residential compounds
2. Continuous health education and public health interventions by the government and other health related nongovernmental organizations; interventions to educates individuals and families to sleep under insecticide treated nets, vector control through spraying (IRS), eliminating breeding places of mosquitors, and reducing infections through prophylaxis and treatment with ACTs, Roll back malaria (ICCM), integrated management of childhood illness (IMCI) and training of VHTs to offer curative malaria treatment at community level will reduce the risk of malaria and improve the health and well-being of UN5 in this study area.
3. Collaboration among the management of the local government council, Local health authority and the community organizations is also crucial for integrated malaria control and prevention.. This involves community mobilization and behavior change communication campaigns to promote consistent net usage and malaria prevention practices. Maternal education programs are vital for malaria prevention, early symptom recognition, and timely treatment, empowering families to take proactive measures.

REFERENCES

Antonio-Nkondjio C., et al.,(2019) Review of malaria situation in Cameroon: technical viewpoint on challenges and prospects for disease elimination. Parasites & vectors, 2019. 12(1): p. 1–23.

Castro MC. (2017) Malaria transmission and prospects for malaria eradication: the role of the environment. Cold Spring Harb Perspect Med. 2017;7(10).https://doi.org/10.1101/cshperspect.a025601.

CDC (2019) -malaria- about malaria disease control and prevention. Web.14.oct.2019.<http://www.Cdc.dgov/malaria/about/history

Conrad M.D. and Rosenthal P.J.,(2019) Antimalarial drug resistance in Africa: the calm before the storm? The Lancet Infectious Diseases, 2019. 19(10): p. e338–e351.

Conrad M.D. and Rosenthal P.J (2021) under nutrition and malaria among underfive children: Findings from the 2018 Nigeria demographic and health survey. Pathogens and Global Health, 2021.

Humprey Wanzira, Henry Katamba, Allen Eva Okullo, Bosco Agaba, Mathias Kasule andDenis Rubahika (2017) factors associated with malaria parasitaemia among children under age of five years in Uganda, malaria journal 16:191DOI:101186/s12936-017-18888847-3

Hyacinth I.H, Oguche S, and Yilgwan C.S (2012) summary description of 24 cases of neonatal malaria seen at a tertiary health centres in Nigeria. Iran J Pediatr 2012; 2;87-91

Llergo, J.L, Garuti, M, Lopez, C. et al., (2024 artificial nighttime lighting impacts plasmodium falciparum mature stage V gametocytes infectivity in Anopheles stephensi. *Malaria Journal 23, 42 (2024)*

Media Nigeria (2018). Adamawa state population restrieve November, 28th November 2019 from www.medianigeria.com/what-is-adamawa-state-population

National Malaria Strategic Plan (2024) Malaria Eradication in Nigeria. The state of the Nation. Implication and Challenge. Retrieved from www.National Malaria Strategic Plan 20204.gov.ng.

National Population Commission (2023) Population Implication and Challenge. Retrieved fromwww.population.gov.ng.

Ovadje, L, Nriagu, I, (2016) Multidimensional knowledge of malaria among Nigerian caregivers: implications for insecticide treated net use by children. *Malar J/15, 516 (2016), https://doi.org/10.1186/512936-016- 1557-2*

Ricci F (2012). Social implications of malaria and their relationships with poverty, 2012. https://doi.org/10.4084/MJHID.2012.048

Romay- Barja M, Ncogo P, Nseng G, Santana-Morales MA, Herrado Z, Berzosa P, et al., (2016) Caregiver's malaria knowledge, Beliefs and Attitudes and related factors in the Bata Distric, Equitorial Guinea. Plos ONE 11(12):e0168668 doi:10,1371/journal.pone.0168668

Sady, H., Chaima, D., Hallamaa, L. et al. (2023) Effect of dietary intervention on the prevalence of asymptomatic malaria among 6-18-months-old children in rural Malawi. Mmalar J **22,** 266 (2023)

Theresa N.K, Nelson N,N, Maze B.N and Helen K Environmental factors affecting malaria parasite prevalence in rural Bolifamba, south-west Cameroun. African journal of Health sciences 13(1)

United Nations Children Fund (2024) Malaria in Africa- UNICEF. Retrieved from www.unicef.org.

World Bank (2024). Nigeria releases new report on poverty and inequality in country, May 2020. Accessed: Apr. 10, 2024. [Online]. Available:https://www.worldbank.org/en/programs/lsms/brief/nigeria-releases-new-report-on-poverty-and-inequality-in-country

World Health Organization (WHO). World malaria report 2023, Geneva, Dec. 2023. Accessed: August 13, 2024. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/malaria#:~:text=The%20WHO%20African%20Region%20carries,

World Health Organization (2023) World malaria report global technical strategy for malaria 2016 – 2030 2023 update. Retrieve from https://www.who.int/malaria/world_malaria_report 2023

World Health Organization (WHO). Report on malaria in Nigeria 2022, Geneva, Dec. 2022. August 13, 2024. [Online]. Available:https://www.afro.who.int/countries/nigeria/publication/report-malaria-nigeria-2022#:~:text=Malaria%20is%20a%20major%20public,

WHO world malaria report (2016) global technical strategy for malaria a,https://www.who.int/malaria/world_malaria_report

World Health Organization-malaria fact sheet (2017)www.who.int>mediacentre>factsheets