



TEN-YEAR TREND OF MALARIA PREVALENCE IN KALTUNGO GENERAL HOSPITAL, GOMBE STATE, NIGERIA

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ABSTRACT

Malaria is a killer disease commonly found in many tropical countries including Nigeria. Malaria attacks can cause severe sickness including high fever and body ache and can lead to death if not treated or managed properly. Malaria is commonly transmitted by an infected female *Anopheles* mosquito. The study sought to assess ten years (2012-2021) trend of malaria prevalence in Kalutungo Gombe State, Nigeria. Retrospective data was extracted from the diseases surveillance database of Kalutungo General Hospital, Gombe State, Nigeria. Descriptive statistics were used to analyze the data. A total of 109,123 blood films were tested for malaria in ten years, 16,563 (15.18 %) tested positive. The year 2013 had the highest number of malaria-positive cases 2321 (14.01 %) while 2014 had the least positive cases of 1060 (6.40 %) and the month of October had the highest positive cases 2030 (12.51 %) and the month of May had the least positive cases of 860 (5.19 %) and gender base females had the highest positive cases in ten-years with 8499 (51.31 %) and males with 8064 (48.69 %). The study has revealed the presence of malaria transmission throughout the years under review; hence control and preventive measures should be geared toward months that show high prevalence for effective result.

Keywords: Malaria, Mosquito, Prevalence Surveillance and Transmission

INTRODUCTION

Malaria is caused by *Plasmodium falciparum*, and the mosquitoes *Anopheles gambiae*, *Anopheles funestus*, *Anopheles arabiensis*, and *Anopheles moucheti* are the major vectors that cause year-round transmission in Nigeria (Oguntade *et al.*, 2022). Malaria is endemic throughout most of the tropics; ongoing transmission occurs in 85 countries and territories (WHO, 2022). The World Health Organization (WHO) reported 241 million cases and 627 thousand deaths from malaria in 2020 (WHO, 2022); this is an increase from an estimated 227 million cases and 558 thousand deaths recorded in 2019 (Joel, 2022).

African Region continues to carry an excessively high portion of the global malaria burden. In 2020, Africa about 95% of all

malaria cases and 96% of deaths globally, children under 5 years of age accounted for about 80% of all malaria deaths in Africa. Nigeria had the highest number of malaria cases (27 %) with (32 %) malaria deaths in 2020 globally (WHO, 2021). The country accounted for an estimated 55.2% of malaria cases in West Africa in 2020 (WHO, 2021).

Due to the high level of malaria transmission in Nigeria, every pregnant woman is at risk of malaria infection, the effect of which can cause little damage or severe life threatening damages like spontaneous abortion, stillbirths, premature delivery, low birth weight (LBW), neonatal death and maternal death (FMOH, 2002). The North Eastern region of Nigeria has one of the highest maternal mortality ratios (MMR) in the world, and most of these



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deaths are preventable (Bukar *et al.*, 2013). Moreover, malaria accounts for 60 % of outpatient visits to hospitals and led to approximately 11 % maternal mortality and 30 % child mortality, especially among children less than 5 years in Adamawa state (Kumur *et al.*, 2019).

Early developmental stages of mosquitoes depend mainly on water availability, while the adults' survival relies on temperature and relative humidity (Omonijo *et al.*, 2011) and (Siraj *et al.*, 2014). Rainfall can sometimes hinder the survival and distribution of mosquitoes, particularly when a saturating point is reached. The rainfall saturating effect can cause excess rainfall to reduce the number of mosquitoes by flushing away eggs and larvae in breeding sites and thus interrupt their developmental stages (Akinbobola and Omotosho, 2013), (Devi and Jauhari, 2006) and Goswami *et al.*, 2014).

Despite control interventions established to limit transmission of plasmodium parasites, and its socio-economic impact globally, Nigeria is facing challenges in lowering the intensity of the disease especially in remote areas where there is a lack of good understanding of the disease epidemiology, a weak health system, scarcity of control intervention measures and high poverty level amongst other factors (Ebenezer *et al.*, 2016). There are various control strategies in place to control the threat of the disease.

Such interventions amongst others include dynamic health awareness, free distribution of insecticide-treated nets, indoor residual spray (insecticides), case management with artemisinin-based combination therapy, regular treatment and availability of intermittent preventive therapy in pregnancy (Omonijo *et al.*, 2011). Despite the control measures in place, high poverty levels, low levels of education and health awareness, negative attitudes, cultural practices at the

community level, religious beliefs and political instability constitute a significant hindrance to malaria control in Nigeria (Ojua *et al.*, 2013).

Likewise, the resistance of vectors to insecticides and parasites to drug and spatial variability of weather parameters also hinder vector elimination campaigns in SSA (Sub-Saharan Africa) (Akinbobola and Omotosho, 2013 and Ojua *et al.*, 2013). Malaria has poses a lot of health challenges nationwide. Specific information about malaria cases are unknown because many cases occur in rural areas where poverty is pronounced and people do not have access to hospitals or the means to afford healthcare and as a result, majority of cases are undocumented. It is therefore, the concept of long term retrospective survey is appropriate to document its prevalence in the study area.

MATERIALS AND METHODS

Study Area

This study was carried out in Kaltungo General Hospital, located in Kaltungo town, the headquarters of Kaltungo Local Government Area. The town lies between latitude 90 48'51''N longitude 110 18'32''E, and has a land mass of 999.9km² with population number of 268,600(Population,2022). Kaltungo is located in the southern part of Gombe State and it lies in the savannah zone of Nigeria, with annual average temperature of 30°C.

Study Population and Data Collection

The study covers 109,123 people that were examine for malaria parasite at the laboratory unit of Kaltungo General Hospital from 2012 to 2021. A review of the hospitals records for ten years (January, 2012 to December, 2021) was carried out and data was collected from disease surveillance unit of the hospital. Information on sex and those negative to the

parasite were also collected. The diagnostic methods used in the hospital were RDT and microscopy.

Ethical Clearance

Permission was granted from the hospital management to get access database through disease surveillance officer of the hospital. The data used were exclusive information about secret human subjects which does not require ethical review and clearance.

Data Analysis

The data was analyzed using one-way analysis of variance to determine the significant difference across gender, monthly and yearly cases with the number of blood sample collected in these periods.

RESULTS

A total of 109,123 blood samples from individuals were collected between January 2012 to December, 2021 out of which 16,563 representing 15.18 % were positive to Malaria parasites. The results of the prevalence study for gender specific shows females had the highest malaria cases in ten-years with 8,499 (51.31 %) while males with 8064 (48.69 %) for the period under review (Table 1) there was no significant difference between the gender ($p > 0.05$).

Table 1: Malaria Cases According to Gender

YEARS	MALE CASES	FEMALE CASES	TOTAL CASES	MEAN	SD	%	S.E.M
2012	589	632	1221	122.10	76.54	7.37	24.20
2013	1041	1280	2321	193.42	91.24	14.01	28.85
2014	348	712	1060	96.36	29.62	6.40	9.87
2015	678	826	1504	136.73	59.48	9.08	21.03
2016	734	840	1574	131.17	54.31	9.50	20.53
2017	1093	822	1915	159.58	61.15	11.56	24.97
2018	1094	1224	2318	193.17	102.12	14.00	45.67
2019	569	759	1328	120.73	57.51	8.02	28.75
2020	985	1112	2097	174.75	89.60	12.66	51.73
2021	781	444	1225	102.08	91.33	7.40	64.58
TOTAL	7912	8651	16563	1380.25	373.36	100.00	

$P = 0.19, \alpha = 0.05$

From January 2012 to December 2021, there were 16,563 (15.18 %) malaria cases reported in General hospital Kaltungo L.G.A, Gombe State. The month of October had the highest malaria cases of 2030 (12.51 %) while month of May had the least malaria cases of 860 representing 5.19 % (Table 2) and there was a significant difference with p value less than 0.05.

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Table 2: Malaria Monthly Prevalence

MONTHS	TOTAL BLOOD FILM EXAMINE	TOTAL CASES	MEAN	SD	%	SEM
JANUARY	6789	947	135.29	67.83	5.72	19.580
FEBUARY	7892	1195	119.50	59.73	7.21	17.242
MARCH	7035	1453	145.30	70.74	8.77	21.328
APRIL	5690	981	98.10	58.73	5.92	18.573
MAY	7891	860	86.00	49.34	5.19	16.447
JUNE	12999	1677	167.70	85.70	10.12	30.298
JULY	13789	1448	144.80	76.42	8.74	28.885
AUGUST	12345	1592	159.20	58.23	9.61	23.773
SEPTEMER	11120	1579	157.90	106.03	9.53	47.417
OCTOBER	14034	2030	225.56	114.35	12.26	57.175
NOVEMBER	4759	1772	177.20	72.86	10.70	42.068
DECEMBER	4780	1029	114.33	37.84	6.21	26.758
TOTAL	109123	16563	1656.30	472.54	100.00	

P = 0.00, $\alpha = 0.05$

The year 2013 had the highest number of malaria positive cases of 2321 (14.01 %) throughout the period under review, while year 2014 which had the least positive cases of 1060 (6.40 %), (Table 3). With shows a significant difference with $p < 0.05$.

Table 3: Malaria Yearly Cases

YEARS	TOTAL EXAMINE BLOOD FILM	TOTAL CASES	MEAN	SD	S.E.M	%
2012	7954	1221	1656.3	472.54	149.43	7.37
2013	14679	2321	3190.5	4719.84	1492.55	14.01
2014	9456	1060	3287.11	4995.65	1665.22	6.40
2015	11375	1504	3565.5	5265.41	1861.61	9.08
2016	11657	1574	3860	5615.68	2122.53	9.50
2017	12546	1915	4241	6051.75	2470.62	11.56
2018	12032	2318	4706.2	6645.04	2971.75	14.00
2019	10278	1328	5303.25	7516.58	3758.29	8.02
2020	10356	2097	6628.33	8614.71	4973.71	12.66
2021	8790	1225	8894	10845.60	7669.00	7.40
TOTAL	109123	16563				

p = 0.00 $\alpha = 0.05$

DISCUSSION

The findings in this study revealed that from 109,123 people that were examine for malaria in Kaltungo General Hospital only 16,563 were found positive representing (15.18 %) of the population for the period of this study

which is contrary to the work of Lamogo and Yoriyo (2013) who reported 49.0% malaria prevalence in children less than five years in Kaltungo General Hospital. The overall relative low prevalence could be due to lack



of breeding sites for the malaria vectors in some months of the year.

This study revealed that there was an uneven trend of malaria cases within the period, the irregular patterns of malaria cases could be attributed to unhygienic nature of most people living in the areas where dump sites are not evacuated on a regular bases and poor drainage system that provide breeding spaces for mosquitoes especially during wet season.

Findings of the present study showed a similar prevalence rate among the male (47.77 %) and female (52.2 %), which is consistent with previous studies in Nigeria, Kenya, and Mozambique, which suggests that the distribution of malaria risk is varied (Noland *et al.*, 2014), Temu *et al.*, 2012) and (Brooker *et al.*, 2004). There is no any scientific fact to prove the higher prevalence being related to gender as susceptibility to Malaria infection is not influenced by gender. However, females have the highest prevalence in this study; the high prevalence reported in the study may be because females usually come to the hospital than males when they are sick.

The results revealed the malaria cases were observed throughout the months of the year (during the dry and the wet seasons) with varying degrees of malaria cases within the months in the study area. The prevailing weather conditions may influence this prevalence's. However, there was a reversed shift between the malaria incidence and amount of rainfall across the raining season, especially at the peak of the rainy season (August) and the month preceding it. This could be explained based on the fact that the excess rainfall in this month which may likely wash away the breeding sites of the primary vector.

Hence, this may affect the number of cases recorded in this particular month of the year,

as an increase in rainfall may fail to produce additional cases of malaria. This is consistent with a related study in Nigeria (Akinbobola and Omotosho,2013). Likewise, the plausible reason for the average number of cases observed in June, October and November (peak malaria month) may be the resultant effects of rainfall and other weather conditions in the preceding months. This agrees with a related study in Abuja (Badaru *et al.*, 2014).

The high prevalence recorded in the wet season month and the low malaria cases obtained in the dry season months could be attributed to seasonality effects and also prolonged drought and excessive rainfall may hinder the developmental stages of mosquitoes and eventually reduce the disease cases.

The two major malaria control program in the state are insecticide-treated nets (ITNs) and indoor residual spraying (IRS). This base-line data could be useful in effective planning of suitable prevention and control measures in the Kaltungo Local Government.

CONCLUSION AND RECOMMENDATION

The results of this study portray that during the last ten years, an unstable inclination incidence of malaria cases was observed in the study area. A decrease in the number of malaria cases occurred in 2014, with a minimum number of malaria cases reported in 2019. However, the peak malaria case was observed during 2013. As malaria's incidence upsurges, so too will morbidity and mortality rates, the study therefore recommend that, there should be malaria control programs which will have a significant effect on the

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