A Retrospective Study on the Prevalence of Plasmodium falciparum Malaria among Patients Attending University of Maiduguri Teaching Hospital. Between January, 2013 to December, 2016, Maiduguri, Borno State, Nigeria.

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ABSTRACT

This research study was undertaken to determine the prevalence and monthly distribution of Plasmodium falciparum malaria in University of Maiduguri Teaching Hospital, Maiduguri, Nigeria. January, 2013 to December, 2016 in order to generate baseline information. A total of 1346 were examine in 2013, 1164 (86.4%) were infected, in 2014, 1294 were examined 988 (76.35%) infected, in 2015, 641 were examined, 544 (84.87%) were infected and 922 were examined in 2016 and 719 (77.98) were infected. In the year 2013 and 2014 highest prevalence rate were recorded in the month of October, while in 2014, the highest prevalence was recorded in the month of August, while in 2016 highest prevalence rate was recorded in the month of September. Infection rate according to age showed that in 2013 to 2016 subjects within the age group 0-15 had high rate of infection. The gender specific infection rate showed that males had higher infection rate than females in 2013. Similar trends was also observed in 2014 and 2016 respectivly. The study has revealed to presence of malaria transmission throughout the study period i.e. 2013-2016 in Maiduguri, Borno State and the infection rate can be considered as high.

Key words: Prevalence, Malaria, Plasmodium, Patients

Introduction

Human Malaria is a tropical protozoan disease caused by Plasmodium species which are transmitted by the bite of the female mosquito of the genus Anopheles. Malaria is the most significant of all the tropical diseases in terms of morbidity and mortality as it is so deadly that it can kill within hours (World Health Organization, 2005).

In sub-Saharan Africa malaria, it is the second highest disease burden (WHO, 2000). It is endemic in 50 countries with the greatest number of cases occurring in Nigeria, Democratic Republic of

Congo, Tanzania and Ethiopia (WHO, 2005). In Nigeria, malaria is endemic throughout the country with up to 90% of the population living in areas with stable malaria with a national prevalence of 2.0%. Malaria accounts for 60% of outpatient visits in hospital and 15-31% of admissions (Federal Ministry of Health, National malaria control program, 2005).

In Nigeria, malaria is endemic and stable, being a major cause of morbidity and mortality, resulting in 25% infant and 30% childhood mortality (FMH, 2005a). It was ranked as the highest cause of death in 1978 and 1982 (Osisanya, 1985). Tragically, the health and status of children under the age of five and women has remained a major barrier of Nigeria's development. It is estimated that about 100 children under one year and 203 children under five years out 1000, respectively, die annually (WHO, 2003). In other words, one out of every five Nigerian children dies before his/ her fifth birthday (RBM, 2000). Among pregnant women, malaria is responsible for more than one in 10 deaths and accounts for considerable proportion of low birth weight babies born to these mothers. These babies born with low birth weight are usually at higher risk of dying from infant and childhood illnesses (RBM, 2005). Malaria is endemic throughout Nigeria with seasonal variation in different geographic zones of the country. More than 90% of the total population is at risk of malaria and at least 50% of the population suffers from at least one episode of malaria each year. Beyond the impact on children and pregnant women, it affects the general population (RBM, 2005; FHM, 2005b). The disease is the commonest cause of outpatient attendance across all age groups with about 66% of clinic attendance due to malaria (FMH, 2000) and thus constituting a great burden on the already depressed economy.

The Plasmodium species responsible for malaria infections in Nigeria are Plasmodium falciparum, Plasmodium malariae, and Plasmodium ovale.Over 80% of malaria infections are caused by P. falciparum change it to falciparum malaria and less than 50% are caused by P. ovale infections. Mixed infections with P. falciparum is common (Federal Ministry of Health, 1990. Although P. vivax and P. malariae had achieved the widest global distribution, today P. malariae has lost its predominance and P. vivax and P. falciparum with the remaining cases being caused by the other three strains. P. vivax is now the most geographically widespread of the human malarias, estimated to account for 100-300 million clinical cases across much of Asia, central and South America, the middle east, where 70-90% of the malaria burden is of this species and the rest due to P. falciparum (WHO, 2003).

Epidemiological patterns of malaria are widely different from one place to another (Himeiden et al., 2005). Specific data of a place collected can help in the making of a tailor-made design of improved programme for strategic malaria control for a particular location, there are available effective low-cost strategies for the treatment, prevention and control of malaria. But any attempt to prevent or control a disease such as malaria in any area or in a locality should first of all be preceded by an extensive evaluation of the magnitude of the prevailing situation. Malaria has been the subject of study in many parts of Nigeria (Molineaux and Natulya (2004).

Prevalence of Malaria at Global Level in Africa

Malaria is presently endemic in a broadband around the equator, in areas of the Americas, many parts of Asia, and much of Africa; in Sub-Saharan Africa 85 - 90% of malaria fatalities occur (Iaynesp et al., 2006). An estimate of 2009 reported that countries with the highest death rate per 100,000 of population were Ivory Coast (86.15), Angola (56.93) and Burkina Faso (50.66). (Provost et al., 2011). A 2010 estimate indicates the deadliest countries per population were Burkina Faso, Mozanbique and Mali (Murray et al., 2012). The malaria Atlas project aims to map global endemic levels of malaria, providing a means with which to determine the global special limits of the disease and to assess disease burden (Guerra. et at., 2007; Hay et al., 2010). Malaria is the most prevalent infectious disease in the tropic and sub-tropical regions of the world in addition to being the major cause of morbidity in the tropics. (Mishra et al., 2013), Umar et al., (2007), WHO (2008) Mia et al., (2011).

Plasmodium falciparum is the most predominant parasite species accounting for about 98% of malaria cases in the country. P. malariae usually occurs is the main vector of malaria in Nigeria, but Anopheles funestus 0.5% and Anopheles Arabiansis 2.0% are also commonly encountered. Anopheles malariae is found in the coastal areas. (WHO, 2010). In severe cases of surviving children can be left with seizures, speech disorders or partial paralysis. Recurrent boats of fever drain a child's capacity to learn (Breman, 2001; WHO, 2005).

In Nigeria, Malaria is endemic throughout the country with up to 90% of the population living in areas with stable malaria with a National Prevalence of 2.0%. Malaria alone account for 60% of outpatient visits in Hospitals and 15-31% of admission (Federal Ministry of Health, National Malaria Control Programme, 2005).

(WHO, 2005; WHO 2006) had reported higher prevalence of malaria in males than females. Gills and Warell (1993), reported that there is no scientific evidence to higher prevalence being related to gender as susceptibility to malaria infection is not influence by gender, but the higher prevalence rate among male could just be by chance.

Objectives of the Study

The objective of the study are:

1. To determine the trends of malarial infection in the study area (UMTH) with gender.
2. To determine the trends of malarial infection in the study area (UMTH) with age.
3. To determine the prevalence of malaria parasite infection among patients attending the UMTH, Maiduguri from January 2013 to December 2016.

Study Area

Maiduguri is the Capital of Borno State, the state lies approximately between latitude $10^0$2'N and 13^0 4N and Longitude$9^0$8 E and $14^0$4'E, while Maiduguri Lies on latitude 11^0 40'N and $13^0$5E longitude. The state occupies the grater apart of the Chad basing and is in the North eastern part of Nigeria, the state borders with the Republic of Niger to the North, Chad to the North east and Cameroon to the East. Within Nigeria, the state shares boundaries with Adamawa state to the south, Gombe state to the west and Yobe state to the North West. It is located in the Sahel Savannah region of north- east Nigeria. The climate of Maiduguri is favorable, with a mean annual rainfall and temperature of about 650 mm and 32°C respectively. The month of March and April are the hottest periods of the year with temperatures ranging between 30°C and 40°C. It is usually cold and dry during the Harmattan, November to January being the coldest months. (Borno State Ministry of Information. 2015).

Study Sample and Source of Data

January 2013 to December, 2016 I took a record of four thousand two hundred and three samples from the Medical record book of University of Maiduguri Teaching Hospital, Maiduguri. Consent to undertake the study was obtained and parasitology. Before enrolment, information about objectives, significance and procedures was provided and explain to the authorities.

Study Subject

The Study design is a case control study. A total of four thousand two hundred and three of sexes, children and adult were enrolled in this study. Subjects were systematically selected from the medical record of the study area.

A case was defined as malaria positive individual, while the control were malaria negative individual. Socio-demographic data (age and sex) was also recorded for each of the study subjects.

Ethical Clearance

Prior to the commencement of the field work, ethical clearance was obtained from the Head of Department of Microbiology and Parasitology, University of Maiduguri Teaching Hospital Maiduguri, to carried out a retrospective data from medical record book of the Hospital in accordance with (WHO, 2003).

Statistical analysis

Data collected were subjected to descriptive statistics using the statistical package for social sciences SPSS version 20.0 (Armand and Jon peck, 2011) and analytical software statistics version 8.0 (Microsoft, 2003). Measure of central tendencies (standard deviation percentages) were determined. Charts were drawn using Microsoft excel (2010) and the correlation on the relationship between Plasmodium falciparum malarial and the duration of study (2013-2016). Difference was considered significant when $P \leq 0.01$ or 0.05.

Results

The gender-specific infection rate showed that males had the higher infection rate of 580 (88.82 %) than females, who had a total 584 infection (84.27 %) in 2013. Similar trend was also observed in 2014, 2015 and 2016 (Table 1). Results presented in table 2 showed the prevalence of malaria in the study population in 2013, 2014, 2015, and 2016 were 1164 (86.48%), 988 (76.35%), 544 (84.87%) and 719 (77.98%) as indicated in table 2.

The study according to age showed that the prevalence of Plasmodium species from age group 0-5 year to 50 > years was significant at 5% (Table 2). Results presented in Table 3 shows statistical significant of Plasmodium falciparum among subject. Higher mean rate 84.81 ± 54.1 of infection was recorded in 2013 followed in 2014 with mean rate 79.81 ± 35.9 respectively. Out of total I346

sample in 2013 from individual between Januarys to December in 2013. A total number of 1163 were positive for Plasmodium falciparum. The result resented in figure 1 revealed that negative significant correlation exist between the prevalence of Plasmodium falciparum malaria and the duration of the study (2013 - 2016) with (r^2 = 0.3934, P = 0.005). The results of the prevalence rate was recorded in months of October 230 (19.7) followed by months of August 124 (16.58%) while least was recorded in months of October 230 (19.7) followed by months of August 124 (16.58%) while least was recorded in months of march 9 (1.24%^). Similar trend was observed in 2015. In 2016 highest rate of rate of infection was recorded in months of July 99 (12.40 and October 99 (23.6) figure 2.

Table 1. Prevalence of malaria According to Gender in UMTH Maiduguri.

Sex/Year	Examine	Infected	Prevalence %
2013			
Male	653	580	88.82
Female	693	584	84.27
Total	1346	1164	86.48
2014			
Male	644	490	76.09
Female	650	498	76.62
Total	1294	988	76.35
2015	300	262	87.33
Male	341	282	82.69
Female	641	544	84.87
Total			
2016	361	353	97.78
Male	561	366	65.24
Female	922	719	77.98

Total

Table 2: Malaria Prevalence in UMTH Maiduguri According to Age.

Age	Examine				Infected				Pair T.Test
(Years)	2013	2014	2015	2016	2013	2014	2015	2016	
0 – 5	123	131	58	72	99	104	48	60	*
6 – 10	119	125	63	90	110	91	53	75	*
11 – 15	114	127	53	82	87	105	47	70	*
16 – 20	109	126	89	71	105	62	72	57	*
21 – 25	120	121	55	85	116	96	53	68	*
26 – 30	121	151	79	77	114	121	63	62	*
31 – 35	234	146	66	98	177	111	60	67	*
36 – 40	128	110	69	93	113	90	39	70	*
41 – 45	109	115	44	102	102	86	42	65	*
46 – 50	92	79	36	81	77	60	34	66	*
51>	78	51	29	71	64	62	33	59	*
Total	**1346**	**1294**	**641**	**922**	**1164**	**988**	**544**	**719**	*

Key * Significant

Table 3: Test Statistics for the Difference in the Mean Response from the Subjects in Four Years.

Years	Mean	SD		T. Test	P. Value	Significant
2013						
Examine	101.09	±	69.6	0.873	0.001	**
Infected	84.81	±	54.1			
2014	98.63	±	69.8	0.692	0.005	*
Examine	79.81	±	35.9			
Infected						
2015	49.72	±	35.1			

Examine Infected	38.18	±	30.1	0.970	0.001	**
2016	73.90	±	25.5	0.318	0.005	NS
Examine Infected	56.27	±	17.5			

Key ** highly significant * Significant "NS" non-significant

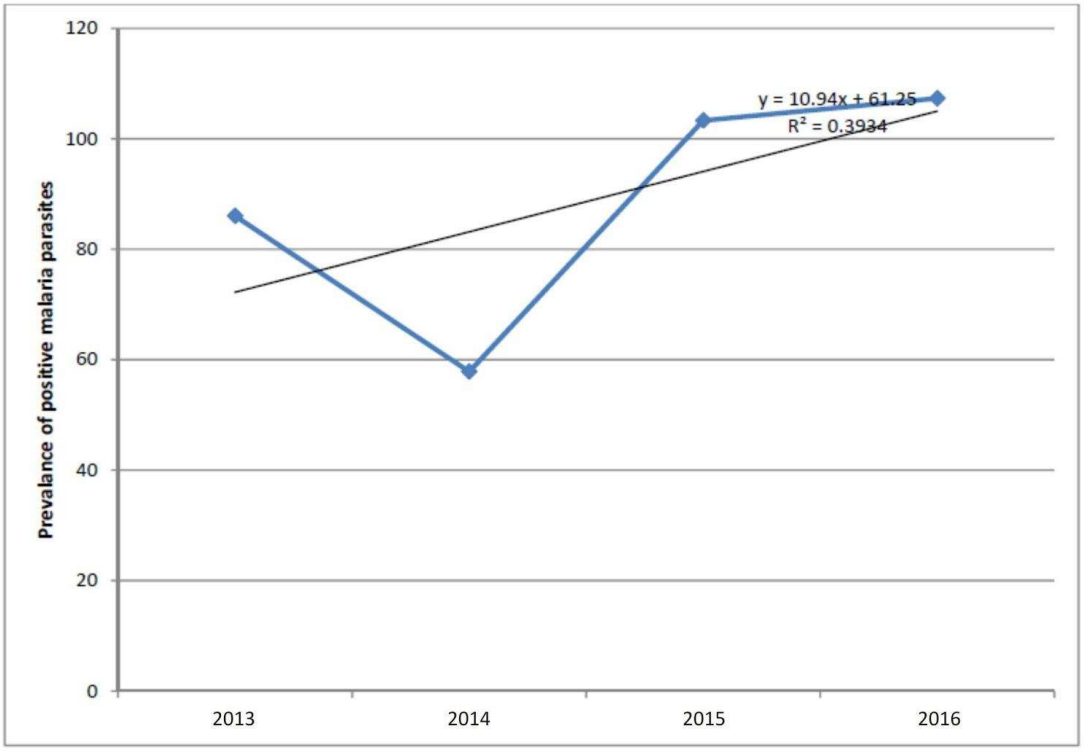

Fig 1: Showing correlation (r^2) between malaria positive across the years at UMTH from January 2013- December, 2016.

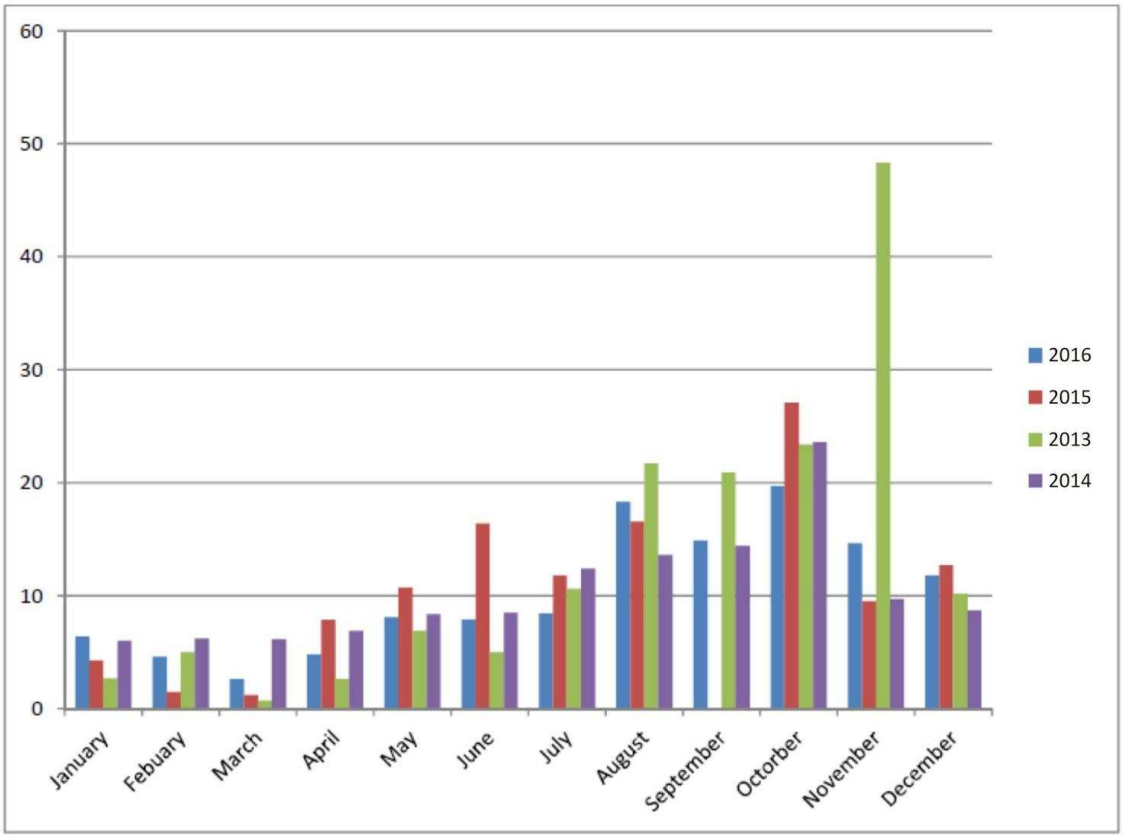

Fig 2: Prevalence Plasmodium falciparum Malaria at UMTH from January 2013- December, 2016

Discussion

The prevalence of malaria in the study population was 3415 (81.25%) for a disease like malaria that debilitate, it can be described as moderately high. This finding is consistent with, WHO 2010 but, the result is lower than that of Anumudu et al., (2006). The gender specific infection rate showed that males had the high infection rate 580 (88.82%), 262 (87.33%), and 353 (97.78%) in 2013, 2015 and 2016 respective as indicate in table 1. Compared with their female counterparts that how prevalence of 584 (84.68%), 282 (82.69%) and 366 (65.24%) in 2013, 2015 and 2016 respectively. Similar reports had indicated higher prevalence in females than males (WHO, 2005b; WHO 2006), there no scientific evidence to prove the higher prevalence being related to gender as susceptibility to malaria infection is not influenced by gender (Gies and Warrell, 1993). The higher prevalence rate could just by chance, or due to the fact the females engage in activities which make the more prone to infective mosquito bites as compared to their male counterparts that are mostly

at home and protected from such infective bites, this further buttressed such claims made by World Health Survey, 2006. The higher prevalence of malaria among children age group 0-5 and 6-10 years seen in this study is in line with several studies (WHO, 2005b). The higher prevalence of malaria among children age group 0-5 and 6-10years seem in this study is in line with several studies (WHO, 2005b; Ukpai and Ajoku, 2001). Therefore, it is not surprising the situation is the same in Sokoto. Children born to immune mothers are protected against the diseases during their first half year of life by maternal antibodies. As they grow older, after continued exposure from multiple infections with malaria parasites over time, they build up an acquired immunity and become relatively project against disease and blood stage parasite (Hill, 2000) hence lower prevalence of malaria among the older age groups. The difference between infection rate and the age group 0-5 years was statistically significant with $p < 0.05\%$.

Prevalence of Plasmodium falciparum in Maiduguri is in line with the report of Breman, (2001). At temperature below 20^0c, Plasmodium falciparum cannot complete its life cycle in the Anopheles mosquito. Even within tropical and sub-tropical areas, transmission will not occur at high altitudes, during cooler seasons in some area in deserts 9exclusing the oasis) and in some Islands in the Pacific Ocean which have no local Anophles species capable of transmitting malaria. In some countries, transmission have been interrupted through successful eradication.

Conclusion and Recommendation

From the result of this research, out of 4203 sample size 3415 (81.25%) individuals were infected with malaria parasite infection, out of which children between the age 6-10 were observed to have highest prevalence malaria infection, follow by 0-5 and 11-15 respectively as shown in table 2.

Therefore, the following recommendation were made:

i. Public health education campaign for mothers and health care givers to create awareness that may control the disease especially in young children.

ii. Children should be treated with anti-malaria drugs every three months to prevent malaria and to kill (if any), the early stage of malaria infection

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