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PREVALENCE OF *PLASMODIUM FALCIPARUM* MALARIA IN GWARAM LOCAL GOVERNMENT AREA, JIGAWA STATE, NORTH WESTERN NIGERIA.

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Abstract

Plasmodium.is causative pathogen of malaria disease in tropical and sub-tropical countries, including Nigeria. A prevalence study was undertaken between June and September, 2013 in Gwaram Local Government Area (LGA) of Jigawa State to determine the prevalence of the parasite in males and females of different age groups. Vinus blood was taken from consenting hospital attaindees in four districts viz; (Cottage (A); Tudun Gwaram (B); Basirka (C) and Galambi (D)) districts of the LGA. Thin blood smear method was utilized in the detection using microscopy. The result showed that Districts A, B, C and D had a prevalence of 61.4%, 43.0%,51.6% and 58.2% respectively. Statistical analysis of the four districts in the study showed that the prevalence of the disease was statistically significant in both sexes and age groups (P < 0.05). Accordingly, all age groups were exposed to the risk of the disease as shown by the percentage prevalence. Comparatively, individuals age 60 years above had the highest risk of infection, while individuals 1-9 up to 50 years had lower infection. ANOVA revealed significant difference (P < 0.05) in malaria prevalence among males in the four districts, while females showed no significant difference (P > 0.05). Only district C showed a slightly higher prevalence in females (51.7%) than males (51.5%), this may be due to low level of education about malaria infection, nonchalant attitude displayed towards the use of insecticides treated nets and vulnerability to mosquito breeding sites from the verbal interview conducted in the districts. The results obtained from this study indicated that P. falciparum infection in the districts is a public health problem. Therefore this calls for control against the pathogen and vectors involved.

***Keywords**: Malaria, Prevalence, Gwaram, Plasmodium falciparum*

Introduction

Malaria is a protozoan disease caused by parasite of the genus *Plasmodium*, which is believed to be the most prevalent tropical disease with high morbidity and mortality as well as high socio-economic impact (WHO, 2001). The disease is a serious menace to majority of infants and children under the age of 5 year and pregnant women in most of the developing countries (WHO, 1997b). Pregnant women and children are the most vulnerable group with the highest risk of mortality and morbidity (Wogu *et al.,* 2013). The burden of malaria infection during pregnancy is caused mainly by *Plasmodium falciparum*, the most common malaria species in Africa (World Health Organisation, 1993; Moluneaix and Cramicara, 1980).

It was reported by WHO in 2011 that malaria was regarded as the major health problem in sub-Saharan Africa with approximately 174 million cases and 655, 000 deaths per year. Half of the world's population is at risk of malaria, making it the most important of all the tropical diseases. There are approximately 156 named species of Plasmodium, which infects various species of vertebrates, among which four are known to infect humans; *P. falciparum, P. vivax, P. malariae, P. ovale* (Arora, 2010).

Amadi *et al.,* 2011 reported that among the four species of malaria parasites, *P. falciparum* is the most common in Nigeria. Nigeria accounts for a quarter of all malaria cases in the 45 malaria endemic countries in Africa (Wogu *et al.,* 2013)

The disease is transmitted by mosquitoes of *Anopheles* species (Arora, 2010). Malaria accounts for up to one third of all admissions in most of the hospitals in most African countries (Okiro *et al.,* 2011). Despite all the efforts made by government and other international agencies to prevent the spread of malaria, still malaria is one of the most prevalent diseases in tropical Africa (W.H. O, 2016). The aim of this study is to find the prevalence of the disease in the study area in relation to the other factors that contribute to the high prevalence of the disease, so as to provide the recommendations and data needed to effectively control and reduce malaria especially among the population at risk. Moreover the work will provide recommendations, were necessary in reducing the effect of the disease.

Materials and Methods

Study area and Population

Gwaram Local Government of Jigawa State is located between latitude 6 N and longitude 6 E and lies along Gwaram river of Jigawa State, North Western Nigeria. Gwaram Local Government has a total land area of 2173 sq. Kms. The Population of the Local Government by 2006 Census was 271,368 (National Population Census, 2006). Gwaram is one of the largest Local governments in Jigawa State; there is no proper drainage and sewage disposal system in the study area, during rainy season most part of the area gets flooded which became breeding site for mosquitoes.

The climate of Gwaram is tropical, the area is rocky and riverine with average rainfall of 600mm to 1000mm per annual. Rainfall begins in April and end in October, with heavy rainfall in August. November and December are the driest months of the year. Temperature ranges of the area are 25 ^{o}C to 40 ^{o}C and could be as low as 10-15 ^{o}C during Harmattan season. During rainy season, the ecology of Gwaram area provide a suitable breeding sites for the high rate reproduction of female Anopheles mosquito; A vector that transmit malaria parasite to the inhabitants (Human population) in the area.

Data Collection

Before the data collection, ethical clearance was obtained from the officials in charges of the Gunduma Health System Birninkudu Zonal Directorate. The studies on the prevalence rate of Malaria were conducted at each laboratory of the Hospitals in the four districts of the study area by adopting careful procedures of finger-prick and swabbing area with 70% alcohol.

Blood Samples Examination

The thin blood films were fixed with methanol and stained with 3% Giemsa solution of pH 7.0 for 30 minutes as recommended by WHO (Agomo *et al.,* 2001); the stained slides were examined under the light microscope using ×100 objective lens (oil immersion). During the identification of the parasite, chromatin dot at the margin of the infected red blood cells were observed, showing the presence of *Plasmodium* parasite.

Statistical Analysis

The data collected from this study were subjected to the statistical analysis using Analysis of variance (ANOVA).

Results

The result obtained from this work showed that the two important variables in the categories of individuals particularly males and females were important. All the four district of the study showed high prevalence of malarial infection. Individuals of 60 years and above have the high prevalence of the disease in both males and females, but the decrease in prevalence with decreased age group noticed in the study is not so significant, thus implicating the existence of infection across all age groups. Hence in all the districts studied, prevalence of the disease in all the age groups and sexes was statistically significant. ($P < 0.05$).

Table 1: Prevalence of malaria parasite by age in District A

Age	Number of samples examined	Number positive (%)
1-9	1128	692 (61.3)
10-19	821	504 (61.4)
20-29	350	215 (61.4)
30-39	167	103 (61.7)
40-49	164	100 (61.0)
50-59	103	63 (61.2)
60-69	75	46 (61.3)
70 and above	37	23 (62.2)
Total	**2845**	**1746 (61.4)**

Table 2: Prevalence of malaria parasite by sex in District A

Sex	Number of samples examined	Number positive (%)
Male	1409	865 (61.4)
Female	1436	881 (61.4)
Total	**2845**	**1746 (61.4)**

Table 3: Prevalence of malaria parasite by age in District B

Age (years)	Number of samples examined	Number positive (%)
1-9	468	201 (42.9)
10-19	270	116 (43.0)
20-29	186	80 (43.0)
30-39	121	52 (43.0)
40-49	91	39 (42.9)
50-59	42	18 (42.9)
60-69	30	13 (43.3)
70 and above	21	9 (42.9)
Total	**1229**	**528 (43.0)**

Table 4: Prevalence of malaria parasite by sex in District B

Sex	Number of samples examined	Number positive (%)
Male	532	229 (43.0)
Female	697	299 (42.9)
Total	**1229**	**528 (43.0)**

Table 5: Prevalence of malaria parasite by age in District C

Age (years)	Number of samples examined	Number positive (%)
1-9	239	123 (51.5)
10-19	169	87 (51.5)
20-29	151	78 (51.7)
30-39	130	67 (51.5)
40-49	110	57 (51.8)
50-59	99	51 (51.5)
60-69	81	42 (51.9)
70 and above	48	25 (52.1)
Total	**1027**	**530 (51.6)**

Table 6: Prevalence of malaria parasite by sex in District C

Sex	Number of samples examined	Number positive (%)
Male	464	239 (51.5)
Female	563	291 (51.7)
Total	**1027**	**530 (51.6)**

Table 7: Prevalence of malaria parasite by age in District D

Age (years)	Number of samples examined	Number positive (%)
1-9	158	92 (58.2)
10-19	125	73 (58.4)
20-29	113	66 (58.4)
30-39	91	53 (58.2)
40-49	103	60 (58.3)
50-59	58	34 (58.6)
60-69	57	33 (57.9)
70 and above	37	21 (56.8)
Total	**742**	**432 (58.2)**

Table 8: Prevalence of malaria parasite by sex in District D

Sex	Number of samples examined	Number positive (%)
Male	326	190 (58.2)
Female	416	242 (58.2)
Total	**742**	**432 (58.2)**

P≤ 0.05

Discussion

It was noted from the study that all age groups were exposed to the risk of malaria parasite, but individuals aged 60 years and above of both sexes had higher records of the disease in all the laboratories of the hospitals where the research was carried out, with 61.4%, 43.0%, 51.6% and 58.2% prevalence in districts A, B, C and D respectively. Individuals 1 – 9years and above had lower record of the disease except in district D with 58.2% prevalence. It could likely be that individuals aged 1 – 9 years and above possibly acquired the disease at their houses, at school or playground, in addition, their immune system is expectedly low in fighting the diseases, but as age increased, stronger immunity for the disease is built up due to more exposure to the disease, but decline at older age. This is in consistent with W.H.O (2014) findings which stated that young children in stable transmission areas who have not yet developed protective immunity against the disease develop severe form of the disease. James *et al* (2014) also reported that 95% of cases are predicted to be in children less than 5 years of age.

Generally females had more malaria parasite infection than males in this study with 61.4% and 51.7% in districts A and C respectively; this may be attributed to low level of education about malaria infection, inadequate use of insecticides treated nets, poor housing and vulnerability to mosquito breeding sites as well as lack of general environmental sanitation among the females. This is consistent with that of Prathiba and John (2012) who maintained that areas of low socioeconomic status, often at the periphery of cities, are at particular risk; here poor quality housing, unpaved roads and reduced access to health care provide little protection against the disease.

It was observed from the study that malaria parasites transmitted by the females Anopheles mosquitos still maintain high prevalence in Gwaram Local Government Area; due to the fact that the conditions of Gwaram local government, without proper drainage system, inadequate environmental sanitation, as well as temperature or climatic changes, provide a suitable environment for the development of malaria parasites and its mosquito vectors, thereby enhancing the transmission of malarial parasites to the human population. The high prevalence is in accordance with the Amadi *et al* (2011), who reported that the high prevalence of malaria parasite was due to the ecological conditions of the study area without proper drainage system, which became suitable for the development of mosquito larvae and the parasites. The high prevalence of the parasites recorded in the study area also was attributed to the time of the study which was June to September 2013; this entails that if a longitudinal study had been conducted, the prevalence rate of malaria infections as recorded in the hospitals laboratories would have been higher. This showed that epidemiology of malaria parasite is dependent on the seasons or temperature change of the year; this agreed with the findings of Houben *et al.,* 2013 who assess the malaria prevalence in North- Eastern Nigeria and reported that there is prevalence of the disease within the age group three to less than ten years, he maintain that the study is significantly lower for both children and adult group,

indicating that spatial and temporal differences could account for these, he also added that high prevalence would be expected in village settings at the height of rainy season.

Furthermore the individuals which were diagnosed of malaria parasite are mostly from the rural communities, where there is low level of education, lack of environmental sanitation and access to health care delivery as well as poor housing which indeed must have added to the prevalence of the malaria parasite infection as shown in this study. This is in conformity with W.H.O (2014) which launched a campaign called "small bite big threat" to educate people about vector borne illnesses affecting poor people, especially people living in areas that do not have adequate level of sanitation, drinking water and housing.

References

Agomo, P.U., Okonkwo, C.A; Asianya, O.O; Okoh, H.I. and Nebe, O.J. (2001): Comparative Evaluation of Immuno-Chromatographic Test (ICT) and Parasight ®-F for the Rapid Diagnosis of Falciparum Malaria in Nigeria. *African Journal of Clinical and Experimental Microbiology.,* 2:45

Amadi, E.C; Sunday H.J. and Usip, L. P. E. (2011): Prevalence of malaria parasites in Hospitals of Porthacourt Metropolis, Rivers State, Nigeria. *Nigerian Journal of Parasitology*. 32(2): 215-218.

Arora, D.R. and Arora B.B. (2010): Medical Parasitology, C B S Publishers and distributors pvt LTD. New Delhi India. *Pp 71-85*.

Gwaram. (2008) Profile of Gwaram Local Government of Jigawa State. Pp 11-13.

Houben, C.H; Fleischmann, H. and Guckel, M. (2013): Malaria prevalence in north eastern Nigeria: A cross sectional study. *Asian pacific Journal of Tropical Medicine*. *Pp 866-867.*

James, T.G; Neil, M.F. and Azra, C.G. (2014); Estimate of the Changing age burden of *Plasmodium falciparum* malaria disease in sub Saharan *Africa. Nature Communication (5) 3136.*

Moluneaix, L. and Cramicara, C. (1980): Research on Epidemiology and Control of Malaria in the Sudan Savannah of West Africa. The Garth Project. WHO Geneva.

National Population Census (2006).The population development in Jigawa as well as related information and services.

Okiro, E. A., Bitira, D., Mbabazi, G., Mpimbaza, A., Alegana, V. A ., Talisuna, A. O. and Snow, R.W. (2011). Increasing malaria hospital admissions in Uganda between 1999 and 2009. *Biomedical Centre*, 9:37.

Prathiba, M.D. and John, M.M. (2012): Factors Contributing to Urban Malaria Transmission in sub-Saharan Africa: A systematic review. *Journal of Tropical Medicine*.

Wogu, M.N; Florence, O.N; and Macdonald D.W. (2013): Prevalence of Malaria parasite infection among pregnant women attending Antenatal Clinics in porthacourt, Rivers State, Nigeria. *International Journal of Tropical Disease and Health* 3 (2): 126-127.

World Health Organisation, (1993): Implementation WHO Study Group. General: ISBN 9241208392.

World Health Organization (2010) Basic Malaria Microscopy, WHO press Geneva *Pp 33-37.*

World Health Organization (2011) World Malaria report Geneva. *Malaria Journal.*

World Health Organization (2013) WHO fact sheet number (94) *Pp 1-7.*

World Health Organization (2014) World Health Organization and vector borne zoonotic disease.

World Health Organization (2016). Malaria. World Health Organization Media Centre.

World Health Organization :(1997b): Malaria in tropics disease research. 13th programme report. WHO, Geneva, pp. 40-61.

World Health Organization. (2001): WHO recommended strategies for the prevention and control of communicable disease WHO/CDLS/ CPE/ SMT/ 2001, 13:107-110.