PATTERN OF PLASMODIUM FALCIPARUM INFECTION IN RUMUODOGO COMMUNITY, EMOHUA LOCAL GOVERNMENT AREA, RIVERS STATE, NIGERIA

Abstract
Studies on the patterns of *Plasmodiumfalciparum* infection was conducted in two villages, Rumuodogo 1 and Rumuodogo II of Emohua Local Government Area, Rivers State, Niger Delta, between September 2019 and April 2020. About 2mls of intravenous blood samples were collected from the cubital veins of the arm from 360 randomly selected individuals and examined using routine microscopy after processing with standard parasitological techniques. From the total number examined, 183(50.8%) were found to be positive for *P.falciparum*. It was observed that Rumuodogo II has a higher prevalence of 85(53%) than Rumuodogo I, 78(49%). The difference in infection rates in the two villages was not statistically significant (Chi- Square (x^2) =P<0.05). Ages 1-9 and 10-19 had the highest prevalence rate of infection 87.5% and 83.3% respectively while the lowest infection rate was recorded in age 70 and above. The researchers advocate proper environmental sanitation, waste disposal and health education.

Comment [i-[1]: P value less than 0.05 is considered as statistically significant

Keyword: Pattern, Plasmodium, Parasitological techniques, Rumuodogo

Introduction

Malaria is life-threatening disease especially in the tropics and subtropics where transmission is very high. It is casual by a single protozoan parasite belonging to the genus Plasmodium, transmitted from man to man through the bite of an infected female anopheles mosquito during a blood meal (WHO 2016). In Nigeria, malaria has consistently posed a public health challenge, accounting for more clinical cases and death than any other country in the world (Shittu *et al*, 2018). It is estimated that 97.0% of the population is at risk with an over 100million cases and over 300,000 deaths per year. Statistics showed that mortality rate are 25% for children below 5years, 30% childhood and 11% of maternal (Yohanna *et al*, 2019).

Malaria in man is caused by four species of *Plasmodium* which included *P.falciparum*, *P.vivax*, *P.ovale* and *P.malariae.* But recently, a fifth species has been discovered, *P.knowlesi*, whose usual host is the kra monkey, has been found to infect man. Of all the five species of malaria parasite, *P.falciparum* is the most common and virulent in Nigeria. It infects human of all sexes

and social class with its attendant economic burden on the state and household individual (Sarka *et al*, 2009; Njilmal*et al*, 2019). It has been observed that prevalence of malaria infection has continued to increase in areas where environment is undergoing serial transformation and modification (Amadi et al, 2009). Although many studies have been conducted on the prevalence of malaria in different parts of Nigerian environment (Chukwu et al, 2006), Amadi et al 2009), there is paucity of published information on the occurrence of *P.falciparum* in Emohua Local Government area of Rivers State, Nigeria.

The present study is aimed at providing additional information on the pattern of falciparum malaria in Rumuodogo Community, Emohua Local Government Area of Rivers state, Nigeria. It is hoped that data arising from this work would assist in the treatment of all social economic groups infected by malaria in the study area.

Materials and Methods.

Study Area

The study was carried out in Runuodogo Community in Emohua Local Government Area of Rivers State, Nigeria. It is located at $4^0$53'0 North and $6^0$52'0 East of the Greenwich. There is a non -functional Health care and primary schools in both Rumuodogo 1 and II. The vegetation is rainforest and the humidity is very high. The Community is surrounded by both fresh and saline waters and the major occupation of the people are subsistence farming and fishing.

Collection and examination of blood samples

Prior to the collection of blood samples, consent was obtained through the Paramount Ruler, Community Development Committee (CDC) chairman and the various youth organizations in

the community. As volunteers turned up, 2 mills of blood samples were collected intravenously from the cubital vein of the arm of each volunteer using sterile syringe and the specimen was transferred into EDTA bottle and later taken to the laboratory for examination of *P. falciparum*. The examination of blood samples was done, using the routine thin and thick microscopic techniques after the blood samples were duly stained in 10% Giemsa solution. In the identification of *falciparum* malaria, the infected red blood cell (RBC) does not increase in size, often with 2 or more rings (early trophozoite) but large numbers of merozoites were produced and gametocytes, if present have crescent shape, which is quite distinctive of *P. falciparum*.

Statistical Analysis

The chi-square (X^2) test was used to analyze tables 1,2,3, and p = 0.05 was taken as acceptable level of significance (X^2, df = 1, p = 0.05) in determining the prevalence rate of *falciparum* infection, the numbers of individuals positive were divided by the total number of individuals examined and expressed as percentages.

Results

The overall prevalence of *P. falciparum* infection recorded in the two communities was 180 (50.8%). The infection rate was higher in Rumuodogo II 85(53%) then Rumuodogo I community with 98(49%). The difference in the prevalence rates of the parasite in the two communities was not statistically significant (p <0.05) (table I). In males the highest prevalence rate of 13(65.0%) was observed in 10 – 19 years old individuals, while in the females, the same age bracket had the highest prevalence rates of 18(64.3%). The least infection rate occurred in aged individual from 60+ years and above individuals (Tables 2 and 3). The difference in prevalence rate of *P.*

Comment [i-[2]: Check it

falciparum infection were statistically significant for the communities age and sex of the volunteers (p.> 0.05)

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Table 1: Patterns of *Plasmodium falciparum* infection in Rumuodogo 1 and II

Study communities	No examined	No (%) Positive
Rumuodogo 1	200	98(49%)
Rumuodogo II	160	85(53%)
Total	360	183(50.8%)

Table 2: Pattern of *Plasmodium falciparum* infection in age

Age (yrs)	No examined	No (%) Positive
1-9	40	35 (87.5%)
10-19	48	40 (83.3%)
20 -29	168	85 (50.5%)
30 – 39	36	201 (55.6%)
40-49	32	19 (59.3%)
50-59	18	8(44.4%)
60-69	10	3(30.8%)
70-above	8	2 (25%)

Table 3: Pattern of *Plasmodium falciparum* infection by age and gender

Age	Male		Female		total	No % positive
	No examined	No % positive	No.examined	No % positive		
1-9	28	15 (53.6%)	12	7 (58.3%)	40	22 (11.1%)
10-19	20	13 (65.0%)	28	18 (64.3%)	48	31 (13.3%)
20-29	78	30 (35.5%)	90	40 (44.4%)	168	70 (46.7%)
30-39	15	9 (60.0%)	21	10 (47.6%)	36	19 (10.0%)
40-49	12	6 (50.0%)	20	8 (40.0%)	32	14 (8.9%)
50-59	7	2 (28.6%)	11	5 (45.5%)	18	7 (5.05%)
60-69	3	1 (33.3%)	7	2 (28.6%)	10	3 (2.8%)
70- above	2	0 (0.0%)	6	2 (33.3%)	8	2 (2.2%)
Total	165	76 (46.1%)	195	92 (47.2%)	360	163 (46.7%)

Discussion

The prevalence of *P.falciparum* infection in Rumuodogo I and II was high(50.8%). It was observed that the ecological conditions prevailing in the study communities are suitable for the biological development of the parasite and its mosquito victor, thereby enhancing transmission of the parasite in the human population. This high prevalence rate is consistent with the finding of Akinboro et al (2010) and Kalu et al 2012. The prevalence rate recorded in the research was attributed to the period of the study, which was August-April when the raining season was low. Perhaps, if a longitudinal study had been conducted, the prevalence rate would have been higher than what was recorded. This shows clearly, that epidemiology of malaria infection dependent on the season of the year. This observation agrees with Amadi et al, 2009 and Emerton 1992, who reported that the overall clinical impact of malaria in infected individuals showed seasonal variation. Emerton (1992) recorded highest infection rate during the peak of the raining season

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when there is more abundance of mosquito vectors involved in the transmission of the parasites than during the onset of the dry season when most breeding habits for the mosquito vector would have dried up. The prevalence of *P. falciparum* varied among the two communities, Rumuodogo II a rural community had more infection than Rumuodogo I. According to Iwuala (2004) such differences could be as a result of the difference in the level of health care delivery services. Rumuodogo I community enjoy such facility more than Rumuodogo II hence lower prevalence rate was recorded in the area.

The pattern of *P.falciparum* showed no gender differences. This may be as a result of the sampled population. This study disagrees with Nebe*et al*. (2003) that recorded a difference in the gender pattern of *P.falciparum* which could be attributed to occupational activities and magnitude of exposures to infected mosquitoes' bites. The *P.falciparum* infection rate in this study was found to decrease with increasing age, this is in agreement with the Nigeria malaria indictor survey (MIS) conducted in 2010 reported with much higher prevalence of 42% among under five children in a community based survey (Nigeria field epidemiological laboratory training program, Nigeria Centre for disease control 2013), this high rate could be due to inadequate protection against mosquito bites or insufficient knowledge about transmission of malaria, lack of protection against mosquito bites or lack of knowledge of malaria transmission or both. According to Njimal*et al*. (2019), the significantly higher prevalence recorded among the youngest age group 0-5 years is understandable because of the low immunity of the age. Also, in the report by Aribode*et al*. (2009) that children under five years are more susceptible to malaria which is in complete agreement with this study, with a significantly higher rate among 1-9 years age group of school aged children

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Conclusion

This study recorded a higher prevalence infection rate in both villages especially among the younger age groups. The high prevalence of malaria parasites in Rumuodogo I and II once more brings to knowledge the endemicity of malaria in some parts ofRivers states, which is in the South-South, Nigeria, thus a good environment for breeding, especially in the raining season, poor environmental sanitation favorable to the breeding of mosquitoes in the study villages. In order for malaria to be eliminated in the population, it is important for the government to empower the population economically and also ensure that health education is a part of the efforts that are put in place to fight malaria. Once the population is empowered, then preventive strategies for malaria elimination can then be implemented successfully and if the population is educated, then it is able to understand better the strategies in elimination, protection and implement them successfully.

Contributions; Chukwu, H.O designed the study, performed the statistical analysis and wrote the final draft. Ofuru, R.O wrote the protocol and managed the literature searches while Goodhead, D.A wrote the first draft and managed the analysis of the entire study. We the authors read and approved the final manuscript.

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