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Original Research Article

Comparative Studies on the Plasmodium Falciparium Infection in Five Communities of Odegu Clan in Emohua Local Government Area, Rivers State, Nigeria

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Abstract: Malaria is a great public health challenge among the people in the rural communities. They lack adequate knowledge of the infection, preventive strategies regarding to contact with the vector species and better treatment implementation. Studies on the comparative studies on the plasmodium falciparum infection was conducted in five villages of Odegu clan of Emohua Local Government Area, Rivers State, Niger Delta between September 2021 and April, 2022. About 2mls of intravenous blood samples were collected from cubital veins of the arm from 1252 randomly selected individuals and examined using routine microscopy after processing with standard parasitologic techniques. The study revealed Plasmodium falciparum was only species of malaria found during the study with an overall prevalence of 709 (56.6%) across the five study areas. It was observed that Rumuji has a higher prevalence of 16.5%, followed by Rumuodogo with 15.4% prevalence, while the least prevalence of 4.5% were recorded with Eveku community. Result from age-related prevalence shows 20-29 years age brackets were observed to be most infected with 13.5%, while least prevalence were observed with age 80+. Study participant in sex-related prevalence shows female recorded 58.5% prevalence while male recorded 53.6% prevalence. The study indicates that malaria is still prevalence in the rural areas. Environmental sanitation is highly needed to prevent the breeding of vector host in the study area. There is need to empower the people through education and awareness to understand better on strategies in elimination, prevention and control measures.

Keywords: Comparative, Plasmodium falciparium, Clan, Odegu, Emohua.

INTRODUCTION

Malaria is a serious public health problem in many part of the world. Attacks due to the disease can be severe and lead quickly to death if untreated [1]. It is the commonest cause of out-patient attendance at health centres, ranking top three in causes of death. From the world malaria report, current estimates show that about 229 million cases are due to malaria resulting in about 409,000 deaths globally [2]. The data shows 3.2 billion people are at risk of malaria worldwide, where 97 countries have an ongoing malaria transmission with 35% of malaria deaths occurring in Nigeria and the Democratic Republic of Congo [3]. The report further indicated that in Angola and Ghana, about 16,000 and 13,000 deaths were attributed to malaria alone in 2016 [4].

Malaria in man is cuased by five species of plasmodium, which include; *P. falciparum, P. malariae, P. vivax, P. ovale* and *P. knowlesi* earlier known to cause malaria infection in long-tailed Macaque monkeys. Of all the five species of malaria parasite, *P.* falciparum is the most common and virulent in Nigeria. It infects humans of all sexes and social class, with its attendant economic impact on the working population [5, 6].

Most common symptoms include chills, fever, sweating, headache, fatigue, anorexia, nausa and vomiting, but in severe cases, it could lead to anaemia, haemoglobinuria, low blood pressure, acute kidney failure, hyper-parasitaemia, metabolic acidosis and hypo-glycaemia. It has also been reported to affect neurological cognition in children with subsequent

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effects on short-term impairment of memory and language friction [7]. According to (8 and 9), children with severe anaemia may present symptoms and signs of cardiac failure dyspnea, tachycardia, gallop rhythm, basal crackles, hepatomegaly, and splenomegaly and raised jugular pressure.

It has been noted that prevalence of malaria infection has continued to increase in areas where the environment is undergoing serial transformation and modification. Although, many studies on prevalence of malaria have been conducted in different parts of Nigerian environment. There is paucity of published information on the occurrence of *P. falciparum* in Emohua Local Government Area at Rivers State, Nigeria. This study is aimed at providing additional information on the comparative studies on the Plasmodium falciparum pattern in five communities of Rivers State. It is believe that information arising from this work would assist in the management of malaria in all socio-economic groups infected by malaria in the study area.

MATERIAL AND METHODS

Odegu is a major community in Emohua Local Government Area of Rivers State. It consists of five main villages. Its neighbours included not just the people of Ikewerre but also the people of Kalabari and Abua. On the East, it is bounded by the people of Emohua communities, on the West by the Rundele Community, on the North by the Ibaa Community and on the South, the community is separated from the Kalabari people by a river called Avergi Odugbo. It is worth mentioning that its land stretches from the South West to the Abua and Odua communities. The villages that make up Odegu clean are Rumuodogo, Rumuji, Rumuewhor, Ovogo and Eveku.

Collection and Examination of Blood Samples

Before the collection of blood samples, consent was obtained from the community heads. As the volunteers turned up, 2mls 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 bottles and later transported to the parasitology laboratory, Rivers State University for examination of *P. falciparum.* The examination of blood samples was done using the routine thin and their microscopic techniques after the blood samples were duly stained with 10% giemsa solution. For the identification of falciparum malaria, the infected Red Blood Cell do not increase in size, often with 2 or more rings which is the early trophozoites, but large numbers of merozoites were produced and gametocytes, if present have crescent shape, which is quite distinctive of *P. falciparum.*

Statistical Analysis

From the sample 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 individual positive were divided by the total number of individuals examined and expressed as percentages.

RESULTS

Plasmodium falciparum was the only species observed during the study. The overall prevalence of *P. falciparum* infection recorded across the five study communities was 709 (56.6%). Amongst five communities examined, infection rate was shown to be higher in Rumuji with 206(16.5%). This was followed by Rumuodogo with an infection rate of 193(15.4%), Rumuewhor 156(12.4) while Ovogo and Eveku had 98(7.8%) and 56(4.5%) respectively. The difference in the prevalent rates of the parasite in the five communities was not statistically significant (P<0.05) (Table 1&2). Age prevalence in (Table 3), shows 20-29 years age bracket were observed to be most infected with 170(13.5%) prevalence of Plasmodium falciparum, followed by age bracket 30-39 which recorded 133(10.6%), 10-19 age bracket recorded 125(9.9%), age bracket 1-9 recorded 75(5.9%) while 70-79 and 80+ age bracket recorded 29(2.3%) and 18(1.4%) respectively. Sex-related prevalence in (Table 4), shows females infected were 399(58.5%) and males 310(53.6%). Comparing sex-related prevalence with age brackets shows, female and male age bracket 20-29 recorded high prevalence of 90(13.2%) and 80(13.9%) respectively, male and female age bracket 30-39 recorded 48(8.3%) and 85(12.5%) prevalence respectively. Also male and female age bracket of 10-19 recorded 45(7.8% and 80(11.8%) respectively. Least prevalence of 10(1.7%) and 8(1.2%) were recorded with male and female age 80+. The difference in prevalence rates of *P. falciparum* infection were statistically significant for the communities, age and sex of the volumteers (P<0.05).

Table 1: Types of Plasmodium Species Involved in Malaria Parasitaemia among the Volunteers in Five Communities Species of Plasmodium

Species of Plasmodium	NP (%)	NN (%)
P. falciparum	709	543
P. malaria	0	0
P. vivax	0	0
P. ovale	0	0
P. knonlesi	0	0
Total	**709 (56.6%)**	**543 (43.4%)**

NP---------- Number positive
NN ---------- Number negative

Table 2: Prevalence of Plasmodium Falciparum Infection per Community

Study Communities	No. Examined	No. (%) Positive
Rumuodogo	360	193 (15.4%)
Rumuji	389	206 (16.5%)
Rumuewhor	250	156 (12.4%)
Ovogo	155	98 (7.8%)
Eveku	98	56 (4.5%)
Total =	**1252**	**709 (56.6%)**

Table 3: Overall Age Prevalence of Plasmodium falciparum from the Study Areas

Age group (yrs)	No. Examined	No. Positive	No. (%) Positive
1 – 9	150	75	5.9
10 – 19	200	125	9.9
20 – 29	250	170	13.5
30 – 39	300	133	10.6
40 – 49	110	64	5.1
50 – 59	86	51	4.0
60 – 69	75	44	3.5
70 – 79	50	29	2.3
80+	31	18	1.4
Total	**1252**	**709**	**56.6**

Table 4: Sex-related prevalence of Plasmodium falciparum compared with Age group

	Male		Female	
Age Group (yrs)	**No. Examined**	**No. Postive (%)**	**No. Examined**	**No. Positive (%)**
1 – 19	85	35(6.0)	65	40(5.9)
10 – 19	89	45(7.8)	111	80(11.8)
20 – 29	120	80(13.9)	130	90(13.2)
30 – 39	100	48(8.3	200	85(12.5)
40 – 49	58	33(5.7)	52	31(4.5)
50 – 59	40	25(4.3)	46	26(3.8)
60 – 69	35	19(3.3)	40	25(3.6)
70 – 79	30	15(2.6)	20	14(2.0)
80+	18	10(1.7)	13	8(1.2)
Total	**575**	**310(53.56)**	**677**	**399(58.5)**

DISCUSSION

This study was conducted in five communities in Odegu clan of Emohua LGA, namely Rumuodogo, Rumuji, Rumuewhor, Ovogo and Eveku. A total of 1252 subjects were examined each with a specific number of subjects.

The study revealed that *Plasmodium falciparum* is the only specie found and none of the volunteers in the five communities were positive for Plasmodium malaria,

Plasmodium vivax, Plasmodium ovale and Plasmodium knowlesi infections. These findings were in agreement with other studies by (10 and 11and 12) that *Plasmodium falciparum* is the main species found in tropical and subtropical Africa and parts of Central America and South America.

Across the study communities result revealed that prevalence of *P. falciparum* infection in Rumuji and Rumuodogo were high 16.5% and 15.4% respectively. Rumuewhor community had a prevalence infection rate of 12.4%, while Ovogo and Eveku communities had an infection rate of 7.8% and 4.5% each. It was observed that the ecological conditions prevailing in the study communities are suitable for the biological development of the parasites and its mosquito vectors, thereby enhancing transmission of the parasites in the human population. The high prevalence rate is consistent with the previous studies of [11, 12]. This prevalence rate recorded in this study may be attributed to the period of the study which is when the wet season was ending. It may be that if a longitudinal study had been conducted, the prevalence rate would have been higher than recorded. Prevalence according to [13], could be attributed to bushy surroundings, housing pattern of the people and dumps around their environments, which could favour vector species development. This is an indication that epidemiology of *P. falciparum* infection is dependent on the season of the years. This study is in agreement with [14-12]. These authors had reported higher infection rate at the peak of the raining season. They recorded higher infection during the peak of the raining seasons, when there is more abundance of mosquito vectors involved in the transmission of the parasite than during the dry season. According to (14), the overall clinical impact of malaria in infected individuals showed seasonal variations on set of dry season, when most breeding habitats for mosquitoes' vector have dried up.

The *P. falciparum* infection rate in this study was found to be highest (13.5%) in ages 20 – 29, followed by ages 30 – 39 that had 10.6%. Ages 1 – 9 had a prevalence rate of 5.9. This result disagrees with [12], that found that the prevalence rate of *P. falciparum* decreases with increasing age. It also disagrees with the Nigeria Malaria Indicator Survey (MIS) conducted in 2010 that reported much higher prevalence of 42% among under five years children in a community based survey [15]. The high rate in ages 20 – 29 and 30 – 39 could be as a result of their activeness and exposure to mosquito bites. This study is in agreement with (15) where ages 21 – 30 had a prevalence rate of 17.2% and 31 – 40 had 10.7% respectively. The reasons may be due to the exposure to mosquitoes during their routine work, especially the males that are usually out for farming and fishing work.

CONCLUSION

This study recorded a higher prevalence infection rate in three out of the five villages. The higher prevalence of malaria parasites in the study area once more brings to knowledge the endemicity of malaria in some parts of Rivers State, which is in South-South Nigeria, thus a good environment for breeding especially during the wet season. Environmental sanitation is also very poor which is favourable to the breeding of mosquitoes in the study area. For the elimination of malaria from the population, it is pertinent that government empower the population economically and 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 be implemented successfully and if the population is educated and are able to understand better strategies in elimination, prevention and control, they can confidently and efficiently implement either individually or collectively the various ways to cope with the menace associated with malaria challenge.

Consent/Ethical Approval: Patient(s) and head of Clan written consent has been collected and preserved by the authors.

Competing Interest: Authors have declared that no competing interest exist.

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