MALARIA INFECTION AMONG UNDER- FIVES AND MOTHERS: A RETROSPECTIVE STUDY AT MODEL PRIMARY HEALTH CENTRE, OZUOBA, RIVERS STATE, NIGERIA.

ABSTRACT

Malaria is one of the most prominent and ancient diseases with greatest burdens to mankind with mortality rate unmatched by any other modern disease other than tuberculosis. It is a major public health problem and cause of suffering and premature death in tropical and subtropical countries. The population groups considered to be at higher rate of contacting malaria and developing severe include infants, children under 5 years of age, pregnant women and patients with HIV/ AIDS, as well as non- immune migrants, mobile populations and travelers. There is a need for constant research to be carried out to evaluate the prevalence. This study determined malaria infection among under-fives and mothers (18- 40years) that attended Model Primary Health Centre, Ozuoba, Rivers State, Nigeria between 2016- 2020.Records with medical diagnoses of all children 0 – 5 years and mothers aged 18- 40 years that attended the health facility from 2016 – 2020 were collected. Data was analyzed with logistic regression, frequency, mean, standard deviations, and percentages using SPSS version 21.0 statistical software. The result of this study showed that the overall malaria infection rate in under-fives and mothers (18 - 40years) that attended Model Primary Health Centre, Ozuoba, Rivers State were 46.7% and 35.4% respectively. Yearly infection rates of malaria infection also considered among under-five children were within 44% to 59% within the five years studied. The largest infection rate (58.6%) for malaria in under-fives occurred in 2016. For the mothers, malaria infection rate was highest (44.6%) in 2019. Age was found to be a significant factor for malaria infection ($p< 0.0001$, $\chi^2=434.3$) among the studied under-fives. The ≥12 months old had less malaria infection rate (38.5%) while 48 months (4years) had the highest rate of infection (56.8%). Sex of the under-fives did not have significant impact on malaria infection rate ($p = 0.205$, $\chi^2=1.606$), while that of mothers did ($p = 0.006$, $\chi^2=12.597$). Education level of mothers also influenced infection rate ($p = 0.0001$, $\chi^2=10.388$), as it was highest for those with tertiary education (38.9%) compared to the secondary and primary levels at 36.8% and 36.7% respectively. The occupation of mothers was also found significant ($p = 0.0001$, $\chi^2=25.585$) with malaria infection being highest among farmers (44.4%), followed by the unemployed at 37.7%, but lowest with students (29.7%).The result of this study showed very high prevalence of malaria infection among the most vulnerable, and hence the need for improved access to all malaria interventional measures like quality and affordable malaria drugs and insecticide treated nets.

I. INTRODUCTION

Malaria is one of the biggest impediments to progress in Africa and the biggest killer in Africa with 90% of the global malaria deaths occurring in this continent (Bulter, 1997; Rotimi, Duke,

Georgeand & Adesuwa, 2018). According to WHO, the African Region continues to carry a disproportionately high share of the global malaria burden with 93% of malaria cases and 94% malaria deaths in 2018 with 6 countries accounting for more than half of all malaria cases worldwide – {Nigeria (25%), the Democratic Republic of the Congo (12%), Uganda (5%), Cote d' Ivoire, Mozambique (5%) and Niger (4%)} (WHO, 2019).

In Nigeria, malaria accounts for approximately 60% of outpatient hospital visits,30% of hospitalization, 30% of under- five mortalities, 25% of infant mortalities and 11% of maternal mortalities (Noland, Graves, Sallau, Eigege, Emukah, Patterson et al., 2014; Oladele, Onuoha, Hamafyelto, Onisope, Fauziyya, Akindigh, et.al., 2018). The financial loss due to malaria annually is estimated to be about 132 billion Naira in form of treatment cost, prevention, loss of man- hours, and so on (Nigerian Demographic and Health Survey, 2011; Chukwuocha, 2012). Children with severe malaria frequently develop more one or more of the following symptoms; severe anaemia, respiratory distress in relation to metabolic acidosis or cerebral malaria. In adults, multi- organ failure is frequent (WHO, 2019).

Despite global economic development, people are still dying from malaria. In Nigeria, several setbacks have been encountered which have actually made effective and sustainable control of the disease a mirage. The Federal Ministry of Health in conjunction with the then Millennium Development Goals (MDG) had proposed the goal of reducing the malaria associated rate of mortality and morbidity by half as of 2013 (Federal Ministry of Health, 2010; Oladele, Onuoha, Hamafyelto, Omisope, Fauziyya, Akindigh, et.al., 2018).With the inability to achieve the set goal at 94%, there is therefore a need for constant research to be carried out to evaluate the prevalence. Health facility based prevalence studies can be used to enhance understanding of the

status of malaria in an area/ region, hence this study on malaria infection among under-fives and mothers (18- 40years) that attended Model Primary Health Centre, Ozuoba, Rivers State between 2016- 2020.

II. MATERIALS AND METHODS

A facility- based, retrospective study was employed for this study. The facility used in this study was Model Primary Health Centre, Ozuoba, Port Harcourt, Rivers State, Nigeria.

Study Setting

This study was carried out at Model Primary Health Centre, Ozuoba located in Obio/ Akpor Local Government Area of Rivers State. Ozuoba is one of the communities in the Akpor clan. Akpor is located east of the REO (Rumuji/Emohua/Ogbakiri) group, south of the Ishiali group and west of Obio. The clan has ten communities: Ozuoba, Choba (Isoba), Ogbogoro, Rumuosi, Rumuolumeni, Rumuokparali, Rumualaogu, Rumuokwachi, Rumuekini and Alakahia (Wikipedia contributors, 2019).

Ozuoba is in Ward 16 and it consists of four communities namely; Ogbogoro divided into Ozodo and Mgbaraja, Rumukparaeli, Rumuokwachi. The principal inhabitants of the communities are the Ikwerres, although a good number of other ethnic groups such as the Igbos, Yorubas, Hausas, Ijaws, Ibibios, also inhabit some part. The major language spoken is Ikwerre, although English is also widely spoken in schools, offices, and markets. Crop farming (e.g. yam, cassava, maize and vegetables) is the principal source of livelihood. The people live in scattered compounds with economic trees (banana, Plantain, mango, pear, etc). Apart from agriculture, the people engage in trading, some of their agricultural products are sold for money. There are also rivers, streams,

and creeks which make fishing one of the occupations. These water bodies link the various communities to each other. The nature of their occupation (farming) and surrounding water bodies predisposes them to frequent mosquito bites.

Model Primary Health Centre, Ozuoba is a government owned health facility under the management of the Rivers State Primary Health Care Management Board (RSPHCMB). The facility has the following units; Records Unit, Reproductive Unit (Ante- natal, Maternity and Family Planning), Treatment of minor ailments, Pharmacy Unit (Essential drugs/ Roll back malaria drugs), Laboratory Unit/ TB Unit, HIV Unit (Counseling and testing) which is basically PMTCT site. The facility provides services to people and communities around, as it was built in an easily accessible area.

Study Population

The population of study consisted of the medical records of under- fives and mothers (18-40years) who had presented themselves to the Model Primary Health Centre, Ozuoba, Rivers State, Nigeria from 2016- 2020.

Sampling Size and Sampling Methods

Secondary data of results on diagnostic report on blood films and socio- economic report in patients' registration book for the period of 2016 to 2020 was collected and used for the research. The results of blood samples analysis whether positive or negative for malaria parasites as well as the levels of parasitemia was collected.

Methods and Techniques for Data Analysis

The data was checked for completeness, coded and classified. Data was analyzed with logistic regression, frequency, mean, standard deviations, and percentages using SPSS version 21.0 statistical software. Crosstabs were used to get the frequency distribution of variables. Socio-

economic factors of nominal categories were summarized using qualitative data analysis. A p-value of < 0.05 was used to decide significance of association.

Ethical Consideration/ Informed Consent

A letter of introduction from the Department of Public Health, School of Health Technology, Federal University of Technology, Owerri was obtained and submitted to Medical Officer of Health, Obio/ Akpor Local Government Authority. Additionally, a letter of consent was given from the local government authority which was presented at the Health Facility, granting permission for collection of data. No written informed consent was required as no patient's personal information was used for the study.

III. RESULTS

Socio- demographic Characteristics

A total of 4,215 mothers and 17,469 under-fives for the period of 5 years (2016 – 2020) was obtained from Model Primary Health Centre, Ozuoba, Rivers State Nigeria. Their socio-demographic characteristics indicate that the mean age for the under-fives studied was 1.81 months, at a standard deviation of 1.01months. The largest number of the children recorded at the Health Centre were the less than 12 months old children (8306: 47.6%), followed by the 12.1 to 24 months (6337: 36.3%). The 48.1 to 59 months were the least of all the children at 625 (3.6%). In terms of gender, 9,513 (54.5%) were male while 7,956 (45.5%) were female children (Table 1).

The Average age of the Mothers = 29.9 years. (Std. dev = 5.55) the youngest mothers were aged 18 years while the oldest were aged 40 years. The largest age group of the mothers was the 26 –

30 years with 1,384 (32.8%), followed by the 31 – 35 years old with 1,097 (26.0%), while the least was the 36 – 40years at 754 (17.9%).

Large number of the mothers (1,787: 42.4%) has secondary education, but over a quarter (1,080: 25.7%) did not state their educational level status, while 562 (13.3%) and 785(18.6%) had primary and tertiary education level respectively. Up to 1,526 (36.2%) were self-employed, 1,024 (24.3%) were students, 896 (21.3%) were employed, 681 (16.2%) were unemployed, the remaining 45 (1.1%) and 43 (1.0%) were respectively involved in farming and business (trading) activities.

Malaria Infection for the Under-fives

Within the years assembled in the study (2016 -2020), a total of 8,154 (out of 17,469) of the under-five children that attended Model Primary Health Centre, Ozuoba, Rivers State Nigeria were found to be positive for malaria parasite at the Centre, leading to an overall infection rate of 46.7% within the study period (Table 3). The remaining 9315 (53.3%) had no malaria infection.

Table 1: Socio- demographic Characteristics of the study population

Characteristics	Number	Percent
Child Age (mean: 1.81± 1.01 Months)		
Less than 12.0	8306	47.6
12.1 -24.0	6337	36.3
24.1 -36.0	1336	7.7
36.1- 48.0	865	5.0

48.1 – 59	625	3.6
Total	17469	100
Child's Gender		
Male	9513	54.5
Female	7956	45.5
Total	17469	100
Mothers Age in years:		
Mean = 29.9 ± 5.55; min= 18, max =40		
18 - 25	980	23.3
26-30	1384	32.8
31- 35	1097	26.0
36 - 40	754	17.9
Total	4215	100.0
Mothers Educational Level		
Primary	562	13.3
Secondary	1787	42.4
Tertiary	785	18.6
Not Given	1080	25.7
Total	4215	100
Mothers Occupational Status		
Business (Trading)	43	1.0
Employed	896	21.3
Farming	45	1.1
Unemployed	681	16.2
Self employed	1526	36.2
Student	1024	24.3
Total	4215	100

Table 2: Overall Malaria Infection for the Under-fives

Malaria Infection	**Number of Under- fives**	**Percent (%)**

Positive	8154	46.7
Non Positive	9315	53.3
Total	17469	100

Yearly Infection Rate of Malaria for the Under-fives

Malaria infection rate for the under-five children were from 44% to 59% within the five years (2016 -2020) studied. 2016 recorded a prevalent rate of 58.6%, 2017 recorded 50.4%, 2018 recorded 44.4%, 2019 recorded 51% and 2020 recorded 45.9%. Clearly the largest infection rate for malaria in under-fives occurred in 2016 at 58.6%, followed by 51.0% that had in 2019. The year that recorded the lowest infection of the disease was 2018 at 44.4% for the under-fives (Fig.1).

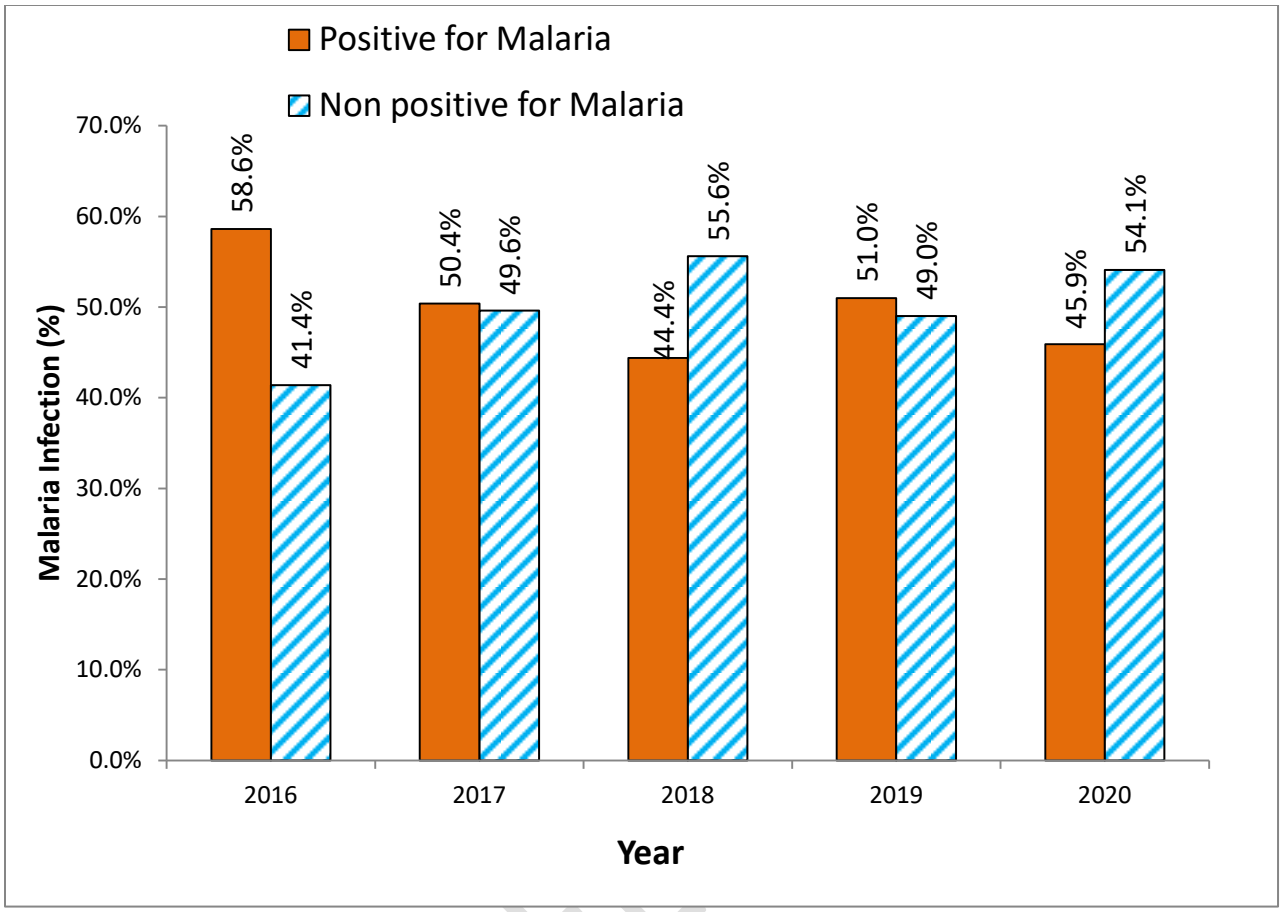

Figure 1: Yearly Infection Rate of Malaria for the Under-fives that attended Model Primary Health Centre, Ozuoba, Rivers State (2016 – 2020).

Infection Rate of Malaria among Mothers (18- 40 years)

For the 4,215 mothers that attended Model Primary Health Centre, Ozuoba, Rivers State Nigeria between 2016 to 2020, a total of 1,493 (35.4%%) were positively infected with malaria while 2,722 (64.6%) were not with malaria (Table 3).

Table 3: Overall Infection Rate of Malaria among Mothers 18- 40 years.

Malaria Infection	Number of Mothers	Percent (%)
Positive	1493	35.4
Non Positive	2722	64.6
Total	4215	100

Yearly Infection Rate of Malaria for Mothers (18 – 40 years)

Malaria infection rate of the mothers in 2016 was 26%, and in 2017 it was 34.6%, in 2018 it was 31.3%, in 2019 it recorded 44.6% and in 2020 was 33.7%. 2019 had the highest malaria infection rate of 44.6%, followed by 34.6% in 2017 while the lowest infection rate was in 2016 (26%) (Figure 2).

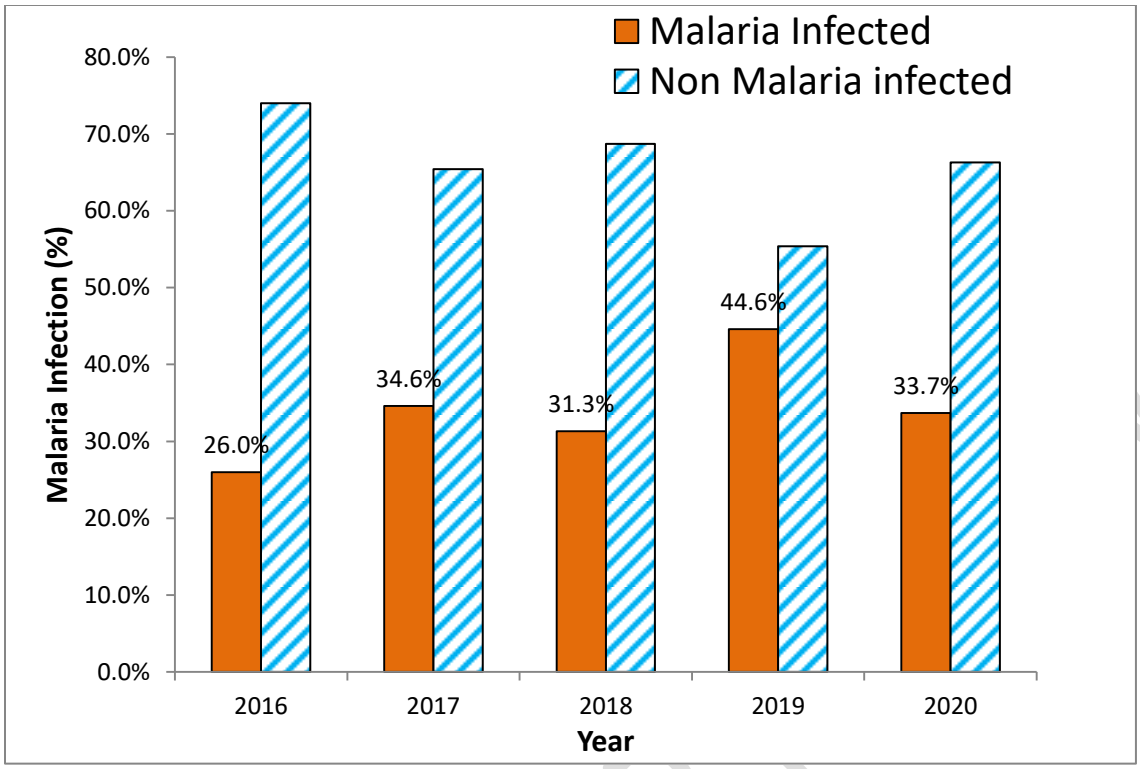

Figure 2: Yearly Infection Rate of Malaria for Mothers that attended Model Primary Health Centre, Ozuoba, Rivers State, Nigeria (2016 – 2020).

Average Monthly Malaria Infection and Non-infection Rates of the Under-fives and the Mothers at Model Primary Health Centre, Ozuoba, Rivers State, Nigeria (2016- 2020)

For the under-fives, malaria infection was loudest in the month of March (54.4%) followed, closely by the months of July, April and May at 53.9%, 51.6% and 51.3% respectively. The infection was lowest during August (34.9%), followed by September (40.1%) and January (41.5%). February, June, October, November and December had 47.8%, 47.9%, 45.7%, 45% and 43.6% respectively (Fig. 3).

On the contrary, the mothers recorded largest malaria infection in the month of October (42.4%), followed by the month of July (41.8%). They recorded the lowest malaria infection rate in January (25.2%). February, March, April, May, June, August, September, November and

December had 29.8%, 35%, 33.9%, 36.2%, 39.9%, 28.6%, 38.6%, 39.3% and 33.6% respectively (Fig.3).

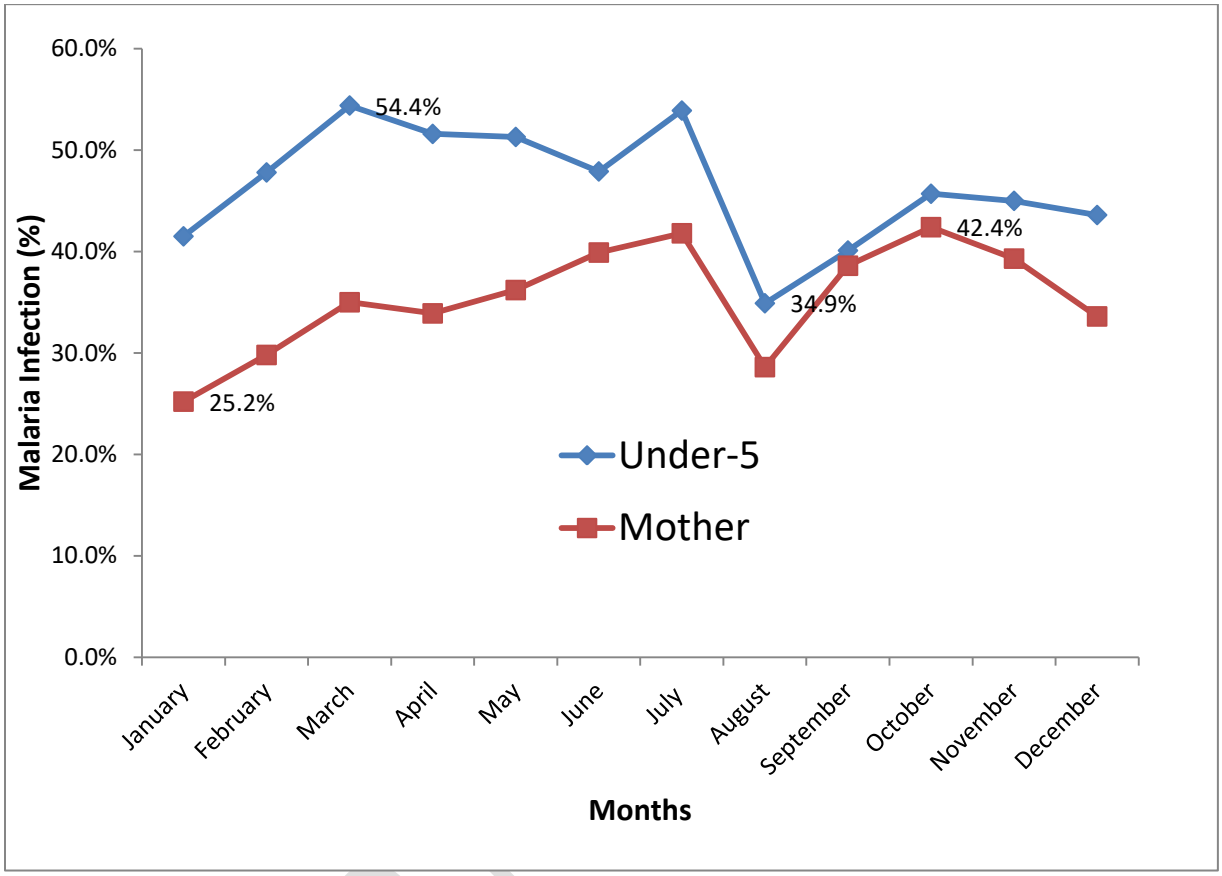

Figure 3: Average Monthly Malaria infection for the Under-fives and Mothers that attended Model Primary Health Centre, Ozuoba, Rivers State, Nigeria (2016- 2020).

Malaria Infection Rate in Relation to the Demographic Characteristics of Under- fives and Socio- Demographic Characteristics of Mothers

Age of the child was found as a significant factor for malaria infection ($p< 0.0001$, $\chi^2=434.3$). The less than 12 months old were less infected (38.5%) than other age groups with the 36.1 – 48 months having highest rate of infection at 56.8%. The age group 12.1 – 24months had 53.3%, 24.1 -36.0 months had 56.7% and 48.1- 59months had 53.4% infection rate respectively. The

infection rate was slightly higher in the males (47.1%) than in the females (46.7%) but no evidence of significant influence of gender was found ($p = 0.205$, $\chi^2=1.606$) (Table 4).

Mother's age showed significant association with malaria infection ($p = 0.006$, $\chi^2=12.597$), with mothers of 31- 35years recording higher infection rate (37.7%) than the 18-25 years mothers (30.8%). The 26- 30years and 36- 40years age group had 36.1% and 36.9% respectively. Education Level is also another factor that showed significant association with malaria infection ($p = 0.0001$, $\chi^2=10.388$). The disease infection rate was highest for the tertiary education level mothers (38.9%) compared to the secondary and primary levels at 36.8% and 36.7% respectively.

The occupation of the mothers was also found significant ($p = 0.0001$, $\chi^2=25.585$).Across the study period, malaria infection was highest among farmers (44.4%), followed by the unemployed at 37.7%. It was lowest among students (29.7%) (Table 4).

Table 4: Malaria Infection in Relation to the Characteristics of Under- fives and Mothers that attended Model Primary Health Centre, Ozuoba, Rivers State, Nigeria (2016- 2020).

Characteristics	Total	Malaria Infection				χ^2	P
		Yes	%	No	%		
Child's Age (Months)							
Less than 12.0	8306	3197	38.5	5109	61.5		
12.1 -24.0	6337	3375	53.3	2962	46.7		
24.1 -36.0	1336	757	56.7	579	43.3		
36.1- 48.0	865	491	56.8	374	43.2		
48.1 – 59	625	334	53.4	291	46.6		
Total	17469	8154	46.7	9315	53.3	434.31	<0.0001
Child's Gender							
Male	9513	4482	47.1	5031	52.9		
Female	7956	3672	46.2	4284	53.8		
Total	17469	8154	46.7	9315	53.3	1.606	0.205
Mothers age class							
18 - 25	980	302	30.8	678	69.2		
26-30	1384	499	36.1	885	63.9		
31- 35	1097	414	37.7	683	62.3		
36- 40	754	278	36.9	476	63.1		
Total	4215	1493	35.4	2722	64.6	12.597	0.006
Mothers Education							
Primary	562	206	36.7	356	63.3		
Secondary	1787	657	36.8	1130	63.2		
Tertiary	785	305	38.9	480	61.1		
Unknown	1081	325	30.1	756	69.9		
Total	4215	1493	35.4	2722	64.6	10.388	< 0.0001
Occupation							
Employed	896	357	39.8	539	60.2		
Self employed	1526	540	35.4	986	64.6		
Farming	45	20	44.4	25	55.6		
Business/Trading	43	15	34.9	28	65.1		
Unemployed	681	257	37.7	424	62.3		

Student	1024	304	29.7	720	70.3		
Total	4215	1493	35.4	2722	64.6	25.585	< 0.0001

IV. DISCUSSION

The prevalence of malaria among under- fives in this study was a clear indication that children are highly susceptible to malaria infection. The average infection rate in the under-fives was lower as compared to the 66.3% reported in Cross-River State by Inah et.al., (2016) and 64% reported in Ethiopia (Abay et.al., 2019). The average annual infection rate recorded the lowest infection rate in 2018 (44.4%) which was lower than the 47.1% reported in Jigawa State (Sa'idu et. al., 2021) but higher than the 20.5% reported in North Ethiopia (Meresa et. al., 2018). However, the infection rate in 2017 was higher than 21% reported in South Ethiopia (Abossie et.al., 2017). In 2020, the overall infection rate was lower than 85.1% reported in Aba, Abia State (Onyearugha et.al., 2020). The disparity observed in the prevalence rate of malaria in this study could be attributed to the study area and method of data collection employed. When average monthly malaria infection rate was also considered, this study revealed malaria infection was higher in the month of March followed, closely by the months of July, April and May. The infection was lowest during August, followed by September and January.

Age was found to be a significant factor the under-fives for malaria infection ($p<0.0001$, $\chi^2=434.3$). The less than 12 months old were less infected than other age groups which could be attributed to innate immunity from the maternal blood that protects the newborn from malaria during the early months of life. This result is in conformity with earlier study (Nmadu et.al, 2015) which indicated that children between the ages of 2-5 years had the highest prevalence

compared with other age groups. However, this study contradicts the findings of Inah et.al., 2017 which reported higher rate of malaria among children 0- 12months than other age groups but the difference was statistically not significant.

The infection rate was slightly higher in the males than in the females but no statistical difference was established ($p = 0.205$, $\chi^2=1.606$).This result corroborates earlier studies (Inah et. al., 2017, Okafor and Oko-Ose, 2017, Nmadu, et.al., 2015, and Meresa et al., 2018) which indicated that male children are more vulnerable than the females. However, this study contradicts the findings of Nas et.al., 2017 which found that females may be more prone to malaria infection than the males.

For the mothers, the overall prevalence of malaria infection including the monthly and yearly averages were high in this study. October had the highest rate followed by July. Rainy season in the Southern part of country begins from March to November with high humidity, optimal temperature and season of incessant water collection that support the breeding of female anopheles mosquito- the vector of malaria parasite. These results in growth of vegetation, collection of pools of water in containers/ environmental objects, and poorer sanitary environment which encourage breeding of mosquitoes abound. All these factors may be attributed to the variations during these months. Although during heavy rains, most of these collections will be washed of. The differences in monthly variations observed between the children and mothers may be due to exposure to infective bites. Typically, mothers allow their child to stay indoors during the rains and often the children sleep under treated nets, and this accounts for variation in monthly infection rates.

Mothers age showed significant association with malaria infection (p = 0.006, χ^2=12.597). The result was in line with findings of Eke *et. al.*, (2018) that reported the highest parasitaemia was recorded among 31 to 35 years age group with parasite density of 50 (83.33%) Education level also showed significant association with malaria infection (p = 0.0001, χ^2=10.388). The disease infection rate was highest for those with tertiary education compared to those that had either secondary or primary education. This may be due to the fact that the highly educated visit health facilities more than those of lower education level. There may be more of the later in the communities who prefer self-medication with native herbal concoctions.

The occupation of the mothers was also found significant (p = 0.0001, χ^2=25.585). This result corroborates the study by Nas et. al., 2017 which recorded a high infection rate among farmers (93%), housewives (89%), students and children (92%) showing that those involved in agricultural activities may spend more time outdoors during peak biting activities of mosquitoes to sustain livelihood and infection rate is higher where mosquito breeding and transmission is intense.

CONCLUSION

The result of this study showed high malaria infection rate among the under-fives and mothers (18 -40years) that attended Model Primary Health Centre, Ozuoba, Rivers State between 2016-2020. Age played a significant role in malaria infection. Education level and occupation proved to be significantly associated with malaria infection in this study. Children less than five years are the most vulnerable to malaria infections. Malaria infection is no respecter of socioeconomic status. Therefore, the findings of this study can help the Centre to intensively work on the distribution of insecticide treated nets and other prevention and control modalities to eliminate

the burden of malaria. Government and Non- Governmental Organization should improve on their commitments in mitigating malaria transmission. There should be improved access to all malaria interventions like quality and affordable malaria drugs and insecticide treated nets which are considered as most potent weapons against malaria. Treatment with antimalarial drugs should be done every three months to prevent malaria and to kill (if any) the early stages of malaria parasite. Government should give more attention to building drainages that flow to curb blockage and retention of water. Regular sanitation exercise should be carried out to reduce breeding sites.

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