Original Research Article

Prevalence of Malaria among Primary School Pupils in Awka Metropolis, Awka South Local Government, Anambra State.

ABSTRACT

A study on the prevalence of malaria among Pupils in Awka Metropolis, Awka South Local Government, Anambra State, Nigeria was carried out in 2021. A total of 414 pupils of both male and female between the age of 5 and 16 years from five schools participated in the study. The study detected Malaria parasites in their blood through microscopic examination of blood films. Questionnaire and physical observation were used to obtain demographic data of the pupils as well as some influencing environmental factors. Out of the 414 pupils examined, 24(5.80%) were positive for malaria with females having greater prevalence than the males. In addition, parasitaemia was highest 18 (22.2%) in 11-13 years age group and least for both 5-7 years and 8-10 years age groups. Pupils of parents with no formal education had the highest malaria prevalence while pupils of parents with formal education had the least prevalence for malaria. The study revealed that malaria still poses a health risk for primary school children in the study area. There is need for the collaborative efforts of parents and teachers on the proper education of the pupils on the measures to be adopted to protect themselves against mosquito bites and disease transmission. There is also need for the government to provide intervention measures such as provision of long lasting insecticide treated bed nets and sponsoring health awareness programs especially at the primary school level to reduce vector-man contact and ultimately disease transmission.

Key Words: Malaria, primary schools, Awka Metropolis.

INTRODUCTION:

Malaria is a life-threatening preventable and curable disease spread to humans by some types of mosquitoes harbouring the parasite (WHO, 2023). It is of public health importance and is highly endemic in most tropical and sub-tropical regions and countries of the world, including Nigeria Onyido *et al* (2015). At risk group includes Infants, children under 5 years, pregnant women, travelers and people with HIV/ AIDS who are at higher risk of severe infection (WHO, 2023).

The WHO African Region continues to carry a disproportionately high share of the global malaria burden. In 2021 the Region was home to about 95% of all malaria cases and 96% of deaths. Children under 5 years of age accounted for about 80% of all malaria deaths in the Region (WHO, 2023). Worst still, Nigeria accounts for the highest of all Malaria deaths in the African region as four African countries accounted for just over half of all malaria deaths worldwide: Nigeria (31.3%), the Democratic Republic of the Congo (12.6%), United Republic of Tanzania (4.1%) and Niger (3.9%) (WHO, 2023). This shows that the Democratic Republic of Congo and Nigeria account for more than 35% of global malaria deaths (WHO, 2023, Olarewaju, *et al.*, 2018). It raises concern that malaria has been shown to claim the life of a child every two minutes (WHO, 2018a).

There are five *Plasmodium* parasite species that cause malaria in humans they include: *Plasmodium malariae, Plasmodium ovale, Plasmodium knowlesi, Plasmodium falciparum* and *Plasmodium vivax* and two of these species – *Plasmodium falciparum* and *Plasmodium vivax* – pose the greatest threat (WHO, 2023). *Plasmodium falciparum* is the deadliest malaria parasite and the most prevalent on the African continent. *Plasmodium vivax* is the dominant malaria parasite in most countries outside of sub-Saharan Africa (WHO, 2023). Malaria mostly spreads to people through the bites of some infected female Anopheles mosquitoes, Blood transfusion, contaminated needles and congenitally (Cheesbrough, 2006, WHO, 2023). The first symptoms may be mild, similar to many febrile illnesses, and difficult to recognize as malaria but if left untreated, *P. falciparum* malaria can progress to severe illness and death within 24 hours (WHO, 2023).

Predisposing factors to infection with malaria according to Suhrbier (1991) include: extremes of age, pregnancy (especially in the primigravidae, and in the second trimester of pregnancy),

immunosuppression, especially patients on steroids, anti-cancer drugs, and immune-suppressant drugs, immuno-compromised patients with advanced tuberculosis, cancer; and lack of previous exposure to malaria (non-immune) or lapsed immunity and pre-existing organ failure among other factors. Epidemiological studies have shown that the largest burden of malaria infections is felt by communities living in poor regions of developing countries usually at the tropical regions (Brooker, *et.al.,* 2007; WHO, 2023) as malaria places a heavy economic burden on them, contributing to their cycle of poverty and limiting their economic development (Aribodor, 2012).

Nigeria of no doubt is at the forefront of malaria endemic countries, contributing significantly to the world's total cases. It is worthy of note that the Government is out with a lot measures to contain the menace of the disease in country. This study was therefore primarily aimed at determining the prevalence of malaria among primary school pupils in Awka Metropolis, Awka South Local Government Area, Anambra State, Nigeria. The specific objective included the determination of the prevalence, evaluation of the associated risk factors, identification of groups (gender, age and class) mostly affected, and to understand the effects of body mass index (BMI) on the prevalence of malaria among the pupil.

MATERIALS AND METHODS

Study Area

Awka is the capital of Anambra State with an estimated population of two million five hundred (2,500,000) people as at 2018 estimate with coordinates as latitude 6.2127N and longitude 7.0720E of the equator respectively. The people of Awka and Anambra State as a whole are rich in their cultural heritage. According to NIMET (2016), Awka has her mean maximum and minimum temperatures to be 35.02^0 and 24.08^0 respectively and mean maximum and minimum annual rainfall to be 1846mm and 102mm respectively. Awka area consists of low-lying plains of agricultural land and its people are mainly farmers, itinerant traders, craftsmen and civil servants (Iwueze, *et.al.,* 2013). Agricultural crops produced in Awka include yam, cocoyam, cassava, maize, fruits and vegetables. Palm produce, coconut and kolanuts are the main cash crops of the area (Iwueze. *et.al.,* 2013). Farmers also combine crop cultivation with animal rearing especially goat, sheep and cattle. The occupations of individuals living in Awka include mainly traders, few farmers and few civil servants. It may not be wrong for one to say that the

level of education of such individuals especially as regards to parasitic infections may be surprisingly limited.

The community hosts Nnamdi Azikiwe University, Paul University and numerous Secondary and Primary Schools both public and private. These schools are attended by pupils resident in Awka and those from other communities. The health needs of Awka residents are attended to by many health facilities both public and private including Chukwuemeka Odumegwu Ojukwu Teaching Hospital, Unizik Medical Centre, Life Hospital and others. The town is associated with noted facilities such as International Conference Centre, Oby Ezekwesili Women Development Centre, Ekwueme Square, Awka Stadium etc. The major market in the town is Eke-Awka market complimented by major shopping malls like Roban Stores, Radopin Super market, Zara Stores, Every day super market and Stanel World super market.

Advocacy Visits

Prior to the collection of the samples, visitations were made to the Head teachers of the primary schools with a letter of approval from the Anambra State Universal Basic Education Board (ASUBEB) and Nnamdi Azikiwe University Teaching Hospital, Nnewi. Also presented to the Head teachers was a letter of introduction and intent obtained from the Head of the Department of Parasitology and Entomology, Faculty of Biosciences, Nnamdi Azikiwe University, Awka, Nigeria. Permission to screen the pupils for malaria was obtained through the Informed consent letter duly signed by the parent of the pupils. The pupils selected for the study were only those whose parents or guardians approved by signing "yes" in the informed consent.

Selection of study participants

The total population of the sampled schools were two thousand four hundred and forty eight (2,480) pupils. The study targeted five hundred (500) pupils, 100 each from Amamife, Central and ezianto while unizik and Iyiagu were 150 and 50 respectively. However a total of four hundred and fourteen (414) apparently healthy primary school pupils (219 males and 195 females) who did not show any signs and symptoms of malaria were selected for the study (Table 1). The 414 pupils selected for the study are those whose parents/guardians approved by signing "yes" on the informed consent. The age bracket of the pupils was 5- 16 years. The

pupils' biological data such as age, class of study and gender were collected through oral interviews. The study was carried out between December 2021 and December 2022.

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Collection of blood samples

Blood collection was made as described by Cheesbrough (2000). After cleaning the volar surface of the arm with cotton moistened with methylated spirit, using a two milliliters (2ml) needle and syringe, peripheral blood samples was collected from each pupil. The blood was dispensed into Ethylene diamine tetra acetic acid bottle (EDTA bottle) to avoid clotting.

Preparation, Staining and Examination of Thick Blood Film

Preparation, staining and examination of thick blood films were done as described by Cheesbrough (2000). Peripheral blood samples were collected in EDTA containers. Thick blood smears were made from each of these samples, stained with 10% Geimsa for 5 minutes and then examined under the microscope using x100 objective lens in each stained slide. Identification of species was done using the thin blood smear. This was examined using immersion oil estimated on the thick smear under oil immersion and viewed microscopically using x100 objective lens.

Use of Questionnaires

Questionnaires that provided the demographic characteristics (Names, age, class, sex, weight and body temperatures of the subjects) and socio-economic details (parents' occupation, toilet facility, source of drinking water etc) were issued out to the pupils. A total of 500 questionnaires were issued to the pupils and 414 were returned with consent obtained.

Determination of Body Weight of the Pupils

Body weight (Kilogrames) was determined using a weighing scale (WHO, 2023).

Determination of Height of Pupils

Height (Centimetres) was determined using a calibrated metre rule (WHO, 2023).

Determination of Body Mass Index (BMI)

The body mass index (BMI) was calculated according to (WHO, 2023) using their body weight and height measurements by this formular. BMI (kg/m^2) = (Weight/Height squared) and interpreted according to WHO (1995) as $<18kg/m^2$: underweight to anorexic; 19-$27kg/m^2$: healthy; 28-$39kg/m^2$: over-weight; $\geq 40kg/m^2$: severe obesity.

Statistical analysis

All statistical analyses were performed using SPSS version 20. The prevalence of malaria and helminths were compared using Chi-square test. The threshold for statistical significance was at $p<0.05$.

RESULTS

The result indicated that 414 pupils within the ages 5 and 16 years were examined for malaria from the primary schools sampled, 24 (5.80%) pupils were infected with malaria parasites, *P. falciparum*. The highest prevalence of 12(27.05%) for *Plasmodium falciparum* was seen in pupils from Ezinato primary while the least prevalence of 6(4.08%) was observed in Unizik primary. The pupils from Amimife primary had 6(6.25%) while Central and Iyiagu primary recorded zero prevalence for *Plasmodium falciparum.* The statistical difference for the prevalence of malaria in the different schools is significant (Table 1).

Considering the gender, the female had higher malaria prevalence 15(7.69 %) than the male 9(4.11%) in all the schools examined $\chi 2 = 1.600$, df = 2, P =0.45 (Table 2). The age group 14-16 years had the highest malaria prevalence at 6(40.00%) followed by the age group 11-13 years 18 (22.22 %), while the age group 5-7 and 8-10 years had zero prevalence. There was statistical difference between the prevalence of malaria and the ages of the pupils (Table 3). Prevalence of malaria in different classes showed that highest malaria prevalence of 13.58% was observed in Primary six, followed by primary three 6 (8%), primary five 4(3.7%) and Primary one which had the least prevalence for malaria infection at 3(10.00%). $\chi 2 = 10.091$, df = 6, P =0.12 (Table 4). The result of the study on Body mass index also indicated that the prevalence of malaria of 12(12.77%) for Overweigh (t>- 40kg/m2) pupils was highest followed by the Healthy (28-39kg/m2) at 12(9.45%) while the Underweight (19-27kg/m2) recorded zero prevalence There was statistical difference between the prevalence of malaria and the BMI of the pupils (Table 5).

Table 1: Prevalence of malaria parasitaemia among different primary schools in Awka Metropolis

Name of School	Number Examined	Number Positive(+)	Prevalence (%)
Amamife	96	6.0	6.25
Central	90	0.0	0.00
Ezinato	57	12.0	21.05
Iyiagu	24	0.0	0.00
Unizik	147	6	4.08
Total	414	24.0	5.80

$\chi 2$ =32.135, df = 4, P =0.00

Table 2: Prevalence of malaria parasitaemia among gender in the primary schools examined

Gender	No. Examined	Amamife	Central	Ezinato	Iyiagu	Unizik	Total
Male	219	3(1.37)	0(0.00)	3(1.37)	0(0.00)	3(1.37)	9(4.11)
Female	195	3(1.54)	0(0.00)	9(4.62)	0(0.00)	3(1.54)	15(7.69)
Total	414	6(1.45)	0(0.00)	12(2.90)	0(0.00)	6(1.45)	24(5.8)

$\chi 2$ =1.600, df = 2, P =0.45

Table 3: Prevalence of malaria parasitaemia among age in the primary schools examined

Age	No. Examined	Amamife	Central	Ezinato	Iyiagu	Unizik	Total
5-7	102	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
8-10	216	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
11-13	81	6(7.41)	0(0.00)	6(7.41)	0(0.00)	6(7.41)	18(22.22)
14-16	15	0(0.00)	0(0.00)	6(40.00)	0(0.00)	0(0.00)	6(40.00)
Total	414	6(1.45)	0(0.00)	12(2.90)	0(0.00)	6(1.45)	24(5.80)

$\chi 2$ =8.000, df = 2, P =0.018

Table 4: Prevalence of malaria parasitaemia among class in the primary schools examined

Class	No. Examined	Amamife	Central	Ezinato	Iyiagu	Unizik	Total
Primary 1	30	1(3.33)	0(0.00)	2(6.67)	0(0.00)	0(0.00)	3(10.00)
Primary 2	51	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Primary 3	75	1(1.33)	0(0.00)	5(6.67)	0(0.00)	6(7.41)	6(8.00)
Primary 4	69	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Primary 5	108	1(0.93)	0(0.00)	0(0.00)	0(0.00)	3(2.70)	4(3.70)
Primary 6	81	3(3.70)	0(0.00)	5(6.17)	0(0.00)	3(3.70)	11(13.58)
Total	414	6(1.45)	0(0.00)	12(2.90)	0(0.00)	6(1.45)	24(5.80)

$\chi 2$ =10.091, df = 6, P =0.12

Table 5: Prevalence of malaria parasitaemia among BMI in the pupils examined

Body Mass Index	No. examined	No. infected	Prevalence (%)
Underweight(19-27kg/m2)	193	-	0.00
Healthy (28-39kg/m2)	127	12	9.45
Overweight>- 40kg/m2	94	12	12.77
Total	414	24	5.80

$\chi 2$ =22.34, P =0.00

The percentage of the parental occupation of the infected pupils showed that those whose parents/guardian are traders were mostly infected, 40.48%, followed by the children of Artisan 79.33%, Farmers 6.67% and Others 5.56%. The children of skilled parents, Civil servants 1.26% were the lowest prevalence while the children of the Priests had zero prevalent. The parental occupation of the pupils' did show significant differences on the prevalence of malaria (Table 6) Prevalence among the educational status of the parents/guardians indicated that pupils born of parents with tertiary education had a lower prevalence percentage of 4.56% while the pupils from parents with secondary education recorded higher with 9.17%. There was zero prevalence for pupils whose parents/guardians. The result did show a significant relationship with the parental education of the pupils and prevalence of malaria (Table 7).

On the malaria treatment practices of the pupils, Investigations revealed that out of those infected 17(4.11%) do not go for medical checkup while 7(1.69%) do go for medical checkup. Also, the frequency of the checkup by those infected indicated that those with one month checkup were (0.00%), two weeks and always 3(0.73%) and those that cannot remember the last time they went for checkup were 18(4.35). The method of treatment by those infected showed that 4(0.97%) pupils visited hospitals, 16(3.86%) bought drugs from pharmacy shops, while those that made use of self-medication and concoction were 2(0.48%) each. On the use of insecticide treated bed nets as self-protective measures against mosquito bites by the pupils, out of those infected 2(0.48%) use it all night, 4(0.97%) use it always, 12(2.90%) never used it and 6(1.45%) occasionally used it. On those not infected by malaria 62(14.98%) sleep under insecticides treated bed net all night, 250(60.39%) sleep under it always, 30(7.23%) never sleep under it while 48(11.59%) occasionally sleep under it (Table 8).

Table 6: Prevalence of malaria by parents'occupation among the pupils examined

Parent/Guardian's occupation	No examined	No infected	Prevalence (%)
Artisan	75	7	9.33
Civil Servant	159	2	1.26
Farmers	15	1	6.67
Priest	6	0	0.00
Traders	105	11	10.48
Others	54	3	5.56
Total	414	24	5.80

$\chi 2$ =41.139, P =0.00

Table 7: Prevalence of malaria by parents'education status among the pupils examined

Parent/Guardian's occupation	No examined	No infected	Prevalence (%)
Primary school	9	0	0.00
Secondary school	120	11	9.17
Tertiary institution	285	13	4.56
Total	414	24	5.80

$\chi 2$ =11.309, P =0.004

Table 8. Malaria treatment practices of the pupils among the primary school examined

Questions	**Responses**	**Infected**	**Not infected**	**$\chi 2$**	**P-value**
Do you go for medical checkup?	No	17(4.11)	211(50.97)	6.187	.013
	Yes	7(1.69)	179(43.24)		
How often do you go for a medical checkup?	1 month	0(0.00)	39(9.42)	11.750	.008
	2 weeks	3(0.73)	40(9.66)		
	Always	3(0.73)	41(9.90)		
	Cannot remember	18(4.35)	270(65.22)		
How do you take treatment for malaria?	Hospital	4(0.97)	150(66.23)	29.844	0.000
	Pharmacy	16(3.86)	240(57.97)		
	Self-medication	2(0.48)	39(9.42)		
	Use of concoction	2(0.48)	0(0.00)		
How often do you sleep under insecticide treated bed nets?	All night	2(0.48)	62(14.98)	10.891	.012
	Always	4(0.97)	250(60.39)		
	Never	12(2.90)	30(7.23)		
	Occasionally	6(1.45)	48(11.59)		

DISCUSSION

The study recorded malaria overall prevalence of 24 (5.80%) among the primary school pupils in Awka metropolis. The prevalence of 24 (5.80%) from the study is in contrast with the prevalence of 25% recorded by Onyido *et al.*,(2015) among primary school aged pupils in Oko Community in Anambra State. The total prevalence of the infection in the studied population is also far lower than that of Ani (2015) who published prevalence rate of 37.5% in a similar study in Isu Community in Ebonyi State. It is also lower than that reported by Sunday and Imaode (2017) who reported 38.58% in Yenagoa, Bayelsa and as well as that of Iwueze et al (2014) 53% prevalence reported in Onitsha, Anambra State. However, in similarity, the result is lesser like that of Anumudu et al (2006) who reported 17% prevalence rate in eastern Nigeria.

This may be due to the period of the study when active transmission of the parasite is relatively low as the study was carried out during dry season. The prevalence rate of the malaria differs from location due to some topographical nature of the environment. Awka metropolis drainage patterns allows rains to runs through the water collecting channels and give no much rooms for the vectors breeding sites. The relatively low prevalence of malaria in this study could also be due to the educational levels of the parents or guardians and their awareness of the causes and consequences of malaria parasitaemia. Hence, they employ some relatively adequate measures to control the bites of malaria through bed net and insecticides and as well initiate measures for early treatment either at hospital or pharmacists as the need arises.

The gender spread from the study indicated that more females were infected and recorded a greater prevalence of 7.7% when compared to the males at 4% prevalence. This is in contrast with the highest prevalence of 35% reported for males and 15% lower for females as observed by Onyido *et al*., (2015). This may be attributed to women's high work burden done at hours mosquitoes feed in area where mosquitoes are prevalent. Younger females mostly do assist their mothers in household responsibilities including cooking the evening meals outdoors or waking up early to prepare meals and other house chores.

The study showed that the age bracket of 14-16 years recorded the highest prevalence percentage at 40% followed by 11-13 years age bracket at 22.22%. The prevalence among the class sampled also indicated that primary six mainly at age bracket of 11-13 and 14-16 is the highest at 13.58%. The result is similar to Onyido et al.,(2017) which presented the highest prevalence of 17.65%

for 13-16 years age group in a study at Ekwulumili community in Anambra State. Conversely, the result differs to Onyido et al (2015) which recorded the highest prevalence of 37% for age group of 6-7 years. Also, the result is in contrast to that of Abdullahi (2009), in a similar study in Sokoto, Northeast Nigria with high prevalence of malaria among the age groups of 0-5 and 5-10 years. The prevalence of malaria due to age among the different schools sampled was not statistically significant. The reason for the high prevalence in the age bracket of 14-16 and 11-13 years may be attributed to lack of consciousness to the adherence of the usage of malaria protective kits by the age group. The younger age groups are consciously guided by their parents or guardian because of their age to the use of these kits, hence the low record of prevalence. The rate is also explainable to variation in exposure to risk factors as the higher age groups tend to be much involved in outdoor activities than the younger age groups thereby exposing themselves to malaria vector carriers.

The questionnaires generated through the oral interview of the pupils in the primary schools examined in Awka metropolis indicated that knowledge, attitude and practice towards malaria from the pupils and their parents/guardians on treatment and protective measures data, greatly influenced the malaria prevalence low rate. The social economic background of the pupils' parents/guardians in terms of educational levels knowing what to do and when to do them contributed immensely in curtailing the prevalence of the malaria infection. Awka metropolis is on sloppy land enabling the water to find its way after rainfall provides less breeding sites for the malaria vectors thereby resulted to lower malaria prevalence in the metropolis.

CONCLUSION

The prevalence of malaria infections in Awka metropolis indicated that malaria remains a health challenge for primary school pupils in Awka, hence a compliance effort by all to combat it. There is need to increase the routine regular health education by teachers, parent/guardian, trained health personnel, global agencies on the vector of malaria, mode of transmission and as well as preventive practices that help to control transmission of the parasites. Also effort by community leaders, Government at all levels, non-governmental organisations, and philanthropists will go a long way in helping to achieve this goal towards the health

enlightenment of the school children. This approach will certainly help keep malaria infections under control in the Awka metropolis.

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