



## Prevalence of Malaria Parasite among Children in Adazi-Enu, Anambra State, Nigeria

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### Authors' contributions

This work was carried out in collaboration among all authors. Author CAI designed the study, collected samples and carried out the laboratory analyses of the study. Author JCO performed the statistical analysis, wrote and proof-read the manuscript. Authors IN, OPO and CUU managed the literature searches and wrote the protocols. All authors thoroughly proof read and approved the final manuscript.

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### ABSTRACT

**Aim:** Malaria caused by plasmodium parasites is a life threatening disease that are transferred to humans through the bites of infected female *Anopheles* mosquitoes. This study was carried out to determine the prevalence of malaria parasite among children in Adazienu, Anaocha Local Government Area, Anambra State, Nigeria.

**Methodology:** The blood sample of the children were collected and examined using routine parasitological technique involving thick blood film microscopy. The Chi-square data analysis was carried out to determine the prevalence of malaria among children in the area and its association other factors. The level of significance was set at  $P < 0.05$ . All analysis was carried out using Statistical Package for Social Sciences (SPSS) version 20 Statistical software package.

**Results:** Out of one hundred and fifty (150) children examined, sixty-eight (68) were infected which gave a prevalence of 45.3%. Similarly, out of thirty-five (35) children within the age group of 3 - 6 years examined, 10 were infected, which gave a prevalence of 28.6%. Moreover, out of 39 children

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examined within the age group of 7 - 9 years, 17 were infected which gave a prevalence of 43.6%. Furthermore, out of the 36 children examined within the age group of 10 -12 years, 16 were infected which gave a prevalence of 44.4%. Finally, out of 40 children examined within the age group of 13 -15 years, 25 were infected which gave a prevalence of 62.5%. The prevalence of malaria infection according to the sex of the children showed that the highest prevalence was observed among the females where 78 were examined and 36 (46.2%) were infected while the least prevalence was observed among the males where 72 were examined and 36 (44.4%) were infected. The knowledge, attitude and practices to malaria observed showed that the people have average knowledge and practices about malaria.

**Conclusion:** There is need to prevent malaria infection among children as malaria in children can be fatal. Children should always sleep with protective clothing and use bed nets at night to avoid mosquito. The environments in and around the household should constantly be kept neat and overgrown bushes, stagnant waters should always be cleared to destroy breeding sites of mosquitoes.

**Keywords:** Prevalence; malaria parasite; children; Adazienu; Anambra State; Nigeria.

## 1. INTRODUCTION

Malaria is a disease caused by *Plasmodium* parasites that are transmitted to persons via the bites of infected female *Anopheles* mosquitoes [1]. Majority of the mortality are caused by *P. falciparum*, while *P. vivax*, *P. ovale* and *P. malariae* usually cause a slighter form of malaria, *P. knowlesi* infrequently causes disease in humans [2]. Malaria is still a foremost worldwide health problem, causing a projected 435,000 deaths worldwide in 2017, of which more than 60% of them occurred in children under five [3]. The first symptoms usually fever, headache and chills may be mild and hard to identify as malaria. Children with severe malaria regularly develop one or more of the following symptoms which comprise severe anaemia, respiratory distress or cerebral malaria [4]. Children aged less than 5 years are the major susceptible group to malaria. In 2019, children represented 67% of all malaria deaths globally [5]. Malaria is the main cause of anaemia in endemic places, and in areas of higher transmission, malaria is one of the key concerns for blood transfusion. The chief elements of malaria transmission intensity are the density, permanence, biting behaviours and effectiveness of the indigenous mosquito vectors [5]. Malaria is a main health apprehension particularly in the tropics where knowledge and awareness of malaria and its vectors, health amenities and human resources for health are pitiable [6]. Approximately half of humans in the world are at risk for malaria infection, nonetheless children and pregnant women in Africa are predominantly susceptible. According to the World Health Organization, a projected 198 million cases of malaria happened worldwide in 2013 and the disease produced 584,000

deaths, which represented an increase in malaria case incidence and mortality rates [2]. The burden is weightiest in Sub-Saharan Africa, where a projected 90% of all malaria deaths happen with children aged less than 5 years accounting for 78% of all deaths [2]. In children, the burden of malaria include anaemia, brain damage, nutritional deterioration, morbidity and mortality. Severe malaria displays itself in symptoms such as severe anemia, renal failure, cerebral malaria and respiratory problems [7]. In view of the burden of malaria especially in children this study was conducted to determine the prevalence of malaria parasite among children in Adazi-enu, Anaocha Local Government Area, Anambra State, Nigeria.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

The study area is Adazi-Enu town in Anaocha Local Government Area of Anambra State. The town has geographical co-ordinates of 6°12' North and 7°04' East. The town is home to members of the Igbo ethnic and is located in the tropical zone with marked differences in the ecological seasons, which include the dry and the wet seasons. There are about eight months of wet season and four months of dry season in the town. The town has relative humidity of about 70% reaching 80% during rainy season and an annual rainfall of about 2000 mm. The temperature of the area during dry period ranges from 36.5°C maximum to 26°C minimum which lasts from November to March. During rainy season, the temperature ranges from 30°C to 21°C minimum, spanning from March to October.

## 2.2 Study Design

This study was carried out between June – September, 2021 in order to determine the prevalence of malaria in children in Adazi-enu, Anaocha local government area, Anambra State. A healthcare centre in the area was accessed for the purpose of this study where blood samples were collected from children who accessed the health centre. These samples were examined using parasitological methods of screening blood samples in order to detect the presence of malaria parasite. The blood samples were collected by laboratory scientists when these children accessed the health care centre. Subsequently, malaria test were carried out on blood samples obtained and recorded. A designed questionnaire was administered during the course of the study to parents/guardians in order to determine the various factors responsible for the spread of malaria parasite in children in the area.

## 2.3 Sampling Method

A total of 150 children were sampled for the purpose of this study, blood samples collected from the children were labelled accordingly with their age and sex to enable determination of the prevalence of malaria among the sampled children vis -a -viz the age and sex of the children. The children were selected randomly and sampled, provided they were children within the ages of 3 -15 years.

## 2.4 Sample Collection and Examination

The blood samples were collected from the study population, the thick blood film method of plasmodium detection in blood samples was carried out. The thick film method was carried out using the blood specimen, field stain A, field stain B, plastic pipette, glass slide, draining rack and timer. The smear consists of many layers of red and white blood cells. During staining, the haemoglobin in the red blood cell dissolves so that large amount of blood can be examined quickly and easily. When present, malaria parasites are more concentrated in thick film than in thin film and are easier seen and identified. A drop of blood is made on a clean slide and

spread in a circular motion to make a smear. The slide is kept to air dry in a dust free area at room temperature. The dried thick film is dipped in field stain A and allowed for 5 seconds. Then the back of the slide is carefully rinsed with water. It is then dipped into field stain B and allowed for 3 seconds. The back of the slide is carefully rinsed and wiped. Then placed on a rack and allowed to air dry. A drop of oil immersion is made on the film and viewed under the microscope with X100 objective lens.

## 2.5 Administration of Questionnaire

The questionnaire was given to the parent / guardian of the children whose samples were collected and labelled. The questionnaire got information on the potential factors responsible for the spread of malaria in children in the area and the knowledge, attitude and practices of parents/guardians and children about the prevention and control of malaria.

## 2.6 Data Analysis

The Chi-square data analysis was carried out to determine the prevalence of malaria among children in the area and its association with age and sex. The level of significance was set at  $P < 0.05$ . All analysis was carried out with Statistical Package for Social Sciences (SPSS) version 20 Statistical software package. The resulting output was presented in tables.

## 3. RESULTS

### 3.1 General Prevalence of Malaria in Selected Children

A total of 150 children aged between 3-15 years were randomly selected and sampled for this study. The malaria test carried out on their blood samples showed that 68 were infected (positive) with malaria parasite representing 45.3% of the study population while 82 were uninfected (negative) having 54.7% of the study population. The overall prevalence of malaria is 45.3% (Table 1).

**Table 1. General prevalence of malaria in selected children**

Number Examined	Number Uninfected	Number Infected	% Prevalence
150	82	68	45.3

### **3.2 Prevalence of Malaria in Selected Children According to Age**

Table 2 summarized the prevalence of malaria in the selected children according to their age. The ages of the children were grouped at interval and the prevalence determined according to it. A total of 35 children were examined within the age group of 3 - 6 years and 10 were infected representing 28.6%. Similarly, out of 39 examined children within the age group of 7 - 9 years, 17 children were infected giving 43.6% prevalence. Moreover, out of the 36 children examined within the age group of 10 -12 years, 16 were positive which represents 44.4% prevalence. Furthermore, out of a total of 40 children aged 13 -15 years examine, 25 were infected with malaria parasite giving a 62.5% prevalence. The highest prevalence observed was within the age group of 13 -15 years (62.5%) while the least was observed within the age group of 3 - 6 years (28.6%).

### **3.3 Prevalence of Malaria in Selected Children According to Sex**

Table 3 summarized the prevalence of malaria parasite among the selected children according to their sexes. Out of the 150 children examined, 72 were male while 78 were female. A total of 32 male children were infected out of the 72 male children examined, which gave 44.4% prevalence for males children. The number of infected female children were 36 out of 78 female children examined, which gave a 46.2% prevalence for female children. The highest prevalence according to sex of the children was observed among the females (46.2%) while the least prevalence was among the males (44.4%).

### **3.4 Knowledge and Attitude of Parents / Guardians in Relation to Malaria in Children**

The knowledge and attitude of parents and guardians were assessed using a designed questionnaire for the study. From the information gathered from the questionnaire as summarized in Table 4, it was observed that 98.7% of the participants are aware of malaria parasites which represented the highest percentage. Similarly, Sixty-eight percent (68%) of the participants are aware that malaria is transmitted from the bites of an infected mosquitoes. Moreover, twelve

percent (12%) of the population indicated that malaria is transmitted from eating contaminated food while 9.3% indicated that malaria is transmitted by close contact with infected persons. The response on the signs of malaria showed that 28.2% indicated body weakness, 26.4% indicated headache, 17.2% indicated loss of appetite, 16% indicated chills and cold while 12.2% indicated high fever. Eight percent (8%) of the study population does not know the time when mosquitoes bite, but 69.3% indicated that mosquitoes bite at night while 22.7% indicated that they bite anytime of the day. About 65.3% of the study population do not agree that poor sanitation and hygiene contributed to malaria transmission. Furthermore, 62% of the participants indicated that they employ self-medication when their child has fever, 21.3% visited the pharmacy, 11.3% visited a clinic while 5.3% indicated that they prayed and fasted about it. Forty -eight percent (48%) of the participants use their mosquito net very often, 46% often use their own while 6% do not make use of their nets. A greater percentage of 74.7% make use of waste bin to dispose their waste sachets while 12.7% and 9.3% use the gutters or throw around the vicinity respectively. Eighty five point three percent (85.3%) store water for a long term for future use due to water scarcity while 14.7% store for a short term (Table 4).

### **3.5 Occupation of Parents in Relation to Prevalence of Malaria in Children**

The occupation of the parents were also observed in association with the prevalence of malaria in children. The occupation of the parents considered were farming, trading and civil servants. The response obtained showed that the parents whose occupation is farming was 25 (16.7%), traders was 78 (52.0%) while civil servants was 47 (31.3%) (Table 5).

### **3.6 Education level of Parents in Relation to Prevalence of Malaria in Children**

The educational level of the parents in relation to prevalence of malaria in children showed that those with primary level of education was 20(13.3%), those in the secondary level was 58 (38.7%) whereas those in tertiary level were 59 (39.3%). Parents who were not educated were 13 (8.7%) (Table 6).

**Table 2. Prevalence of malaria in selected children according to age**

Age Groups (years)	Number Examined	Number Positive	% Prevalence
3 - 6	35	10	28.6
7 - 9	39	17	43.6
10 -12	36	16	44.4
13 -15	40	25	62.5
Total	150	68	45.3

$$\chi^2 = 8.78; P = 0.32; P < 0.05$$

**Table 3. Prevalence of malaria in selected children according to sex**

Sex	Number Examined	Number Positive	% Prevalence
Male	72	32	44.4
Female	78	36	46.2
Total	150	68	

$$\chi^2 = 0.044; P = 0.834; P < 0.05$$

**Table 4. Knowledge and attitude of parents/guardians in relation to malaria in children**

Questions	Responses	Percentages
Have you heard about malaria?	Yes:148	98.7%
	No:2	1.3%
How is malaria transmitted?	Drinking contaminated water:6	4.0%
	Eating contaminated food:18	12.0%
	Mosquito bite:102	68.0%
	Contact with infected persons:10	6.7%
	Close contact with infected persons:14	9.3%
What are the basic signs of malaria *(Multiple responses included)	High fever:52	12.2%
	Chills and cold:68	16.0%
	Headache:112	26.4%
	Loss of appetite:73	17.2%
	Body weakness:120	28.2%
When do malaria mosquitoes bite?	Anytime of the day:34	22.7%
	During night hours: 104	69.3%
	Do not know:12	8.0%
Do poor sanitation and hygiene contribute to malaria?	Yes:52	34.7%
	No:98	65.3 %
What do you do when your child have fever?	Self-medication: 93	62.0%
	Visit the clinic:17	11.3%
	Patent shop/Pharmacy:32	21.3%
	Pray and fast:8	5.3%
How often do you use mosquito net?	Very Often:72	48.0%
	Often:69	46.0%
	Never:9	6.0%
How do you discard used water sachets and plastic containers?	Burn them:5	3.3%
	Use of waste bin:112	74.7%
	Throw outside:14	9.3%
	Use of gutters:19	12.7%
How long do you store water?	Long term:128	85.3%
	Short term:22	14.7%

**Table 5. Occupation of parents in relation to prevalence of malaria in children**

Occupation	Number Observed	Percentage
Farmers	25	16.7
Traders	78	52.0
Civil servants	47	31.3
Total	150	

**Table 6. Education level of parents in relation to prevalence of malaria in children**

Education Level	Number Observed	Percentage
Primary	20	13.3
Secondary	58	38.7
Tertiary	59	39.3
Not educated	13	8.7
Total	150	

#### 4. DISCUSSION

From the result obtained in this study, the overall prevalence of malaria among the children was 45.3%. The result showed similar prevalence with the study done to determine the prevalence of malaria infection in children in Anambra state which recorded 46.30% [8]. The highest prevalence was observed within the age group of 13 -15 years (62.5%) while the least was observed within the age group of 3 - 6 years (28.6%). This result is not in agreement with the prevalence of *Plasmodium* infection among the age groups and sex in Igbo-Eze South local government of Enugu State and Umuchieze, Uturu in Abia State, all in Nigeria [9,10].

The highest prevalence according to sex of the children was observed among the females (46.2%) while the least prevalence was among the males (44.4%). The result is in agreement with the findings of [11] who reported that malaria infection in Awka North Local Government Area of Anambra State was not gender based. The result of this study is not in agreement with the study of [12] in communities in South-western Nigeria, which reported that the prevalence of malaria is higher in males than in females.

The response on the attitude and behaviour of parents/guardians of these children is an indicator of the level of awareness to malaria and ways they handle both prevention and treatment in children. The occupation and educational level of parents also influenced the infection of malaria in children as children are mostly under the care of their parents. Lower levels of education resulted in higher risk of malaria infection in children. Children whose parents do not have

formal education are at higher risk of malaria disease. Ninety-eight point seven percent (98.7%) of the participants are aware of malaria while 68% are aware that malaria is transmitted by bites from female *Anopheles* mosquitoes. Sixty five point three percent (65.3%) do not agree that poor sanitation and hygiene contributed to malaria infection. Twelve point seven percent 12.7% still discard sachets and plastics in gutters and these block water canals leading to stagnant waters found in the area. These sachets hold water which are favourable breeding sites for mosquitoes. Use of mosquito nets are essential in both children and adults to avoid vector to human contact by mosquitoes. It was observed from the study that 46% of the participants often use their mosquito nets while 6% indicated that they never used their mosquito net. Sleeping under insecticide treated net helps prevent contact by mosquitoes and thus prevents incidents of malaria.

#### 5. CONCLUSION

Malaria is still very much prevalent among the children in the study area. Children should always sleep with protective clothing and use bed nets at night to avoid vector contact. Also, surroundings in and around the home should always be kept neat. Overgrown bushes and stagnant waters should always be cleared to destroy breeding places of mosquitoes. I believe with these measures in place the prevalence of malaria in children in the study area will be reduced to the barest minimum.

#### CONSENT AND ETHICAL APPROVAL

Informed consent was obtained from clinically suspected malaria patient and approval for the

study was obtained from the management of the health centre used. Confidentiality was maintained in accordance with standard of medical practice. Consent was also sought from the parents/guardians to help fill out the questionnaire for the survey.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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