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RAPID DIAGNOSTIC DETECTION OF MALARIA PARASITES AMONG PRIMARY SCHOOL PUPILS OF AJIYOLO VILLAGE, DEKINA LOCAL GOVERNMENT AREA, KOGI STATE, NIGERIA

[1]Gabriel Unekwu Amana, *[2,3]Clement Ameh Yaro, [2]Udeme Udo Afia, [1]Joshua Idakwo and [1]Lucky Enemona Ocheje

[1]Department of Animal and Environmental Biology, Faculty of Natural Sciences, Kogi State University, Anyigba, Kogi State, Nigeria
[2]Department of Animal and Environmental Biology, University of Uyo, Akwa Ibom State, Nigeria.
[3]Department of Zoology, Ahmadu Bello University, Zaria, Kaduna State, Nigeria

*Corresponding Authors' Email: acyarocity@yahoo.com, clement.yaro12@gmail.com

ABSTRACT
An epidemiological study of malaria prevalence carried out in Ajiyolo community of Dekina Local Government Area of Kogi State, Nigeria. Blood samples were obtained from 214 consented asymptomatic participants from two (2) Primary Schools in Ajiyolo community. Rapid Diagnostic Test kits were used to detect malaria parasites in the blood. From the 214 participants examined, 80 (37.38%) were positive with malaria parasites. The group under age ten (U10) years had the highest malaria prevalence of 50.0% than the age-group of above ten (A10) with prevalence of 29.55%. The females (37.50%) had a higher prevalence than males (37.27%). There is no significant difference in prevalence between male and female, and also between males and females aged below 10 and above 10. The study has revealed that malaria disease can affect all age groups and both males and females' sexes. Due to the high prevalence of asymptomatic malaria in this area, public enlightenment efforts need to be intensified towards the prevention of malaria, future interventions should be directed toward controlling malaria; thus, large-scale distribution of insecticide-treated nets or use of indoor residual spraying should be encouraged, and school aged children should be screen for malaria at interval, curative and prophylactic dose should be administered to pupils.

Keywords: Prevalence, age, gender, asymptomatic.

INTRODUCTION

Malaria is one of the world greatest threatening disease, it remains endemic in 106 countries with a global burden of 3.3 billion people with almost half of the world's population at risk (WHO, 2019). Malaria is endemic in tropical and sub-tropical regions including America, Asia, and Africa. It is more prevalent in sub-Saharan Africa where 85% to 90% of malaria death occurs (Cabe, 2001; Oko *et al.*, 2014; Michael *et al.*, 2017). It is estimated that more than one million children living in Africa die yearly from direct or indirect effect of malaria infection (Fawole and Onadeko, 2009).

Malaria is a major public health burden in Nigeria, with 97% of the population at risk for malaria. In 2014, the country reported more than 7.8 million confirmed cases of malaria and more than 6,000 malaria deaths (WHO, 2015). About 21 percent of deaths among children under five in Nigeria are caused by malaria. Malaria accounts for approximately 60 percent of outpatient visits and 30 percent of hospitalizations among children under five (WHO, 2015). Malaria is a large burden on the health system and has severe social and economic costs, costing approximately 480 billion naira (USD $1.3 billion) in out-of-pocket treatments, prevention costs, and loss of productive labour (FMoH and RBM, 2014).

Plasmodium falciparum is the predominant parasite species (95.1%) in the country, followed by *P. malariae* (1.6%), *P. ovale* (0.2%), and mixed species (4.1%) (WHO, 2012). Approximately 85 percent of Nigerians live in areas of mesoendemic transmission, and about 15 percent live in areas of hyper-holoendemic transmission (National Malaria Elimination Programme [NMEP], National Population Commission [NPopC], National Bureau of Statistics [NBS], & ICF International, 2016). In 2015, the national prevalence of malaria among children under five was 27 percent (via microscopy) (NMEP, NPopC, NBS, & ICF International, 2016). There are wide geographical differences in malaria prevalence, however, with the percentage of children under five with malaria (via microscopy) as high as 64 percent in Kebbi State and 63 percent in Zamfara State in the North West region, and as low as 5 percent in Imo State in the South East region and Kogi State in the North Central region, and near zero prevalence in Lagos (NMEP, NPopC, NBS, & ICF International, 2016).

Information on the status of malaria infection among school-aged children are lacking in Dekina Local Government. Therefore, this study was carried to investigate the status of malaria infection among primary school pupils in Ajiyolo community, Dekina Local Government, Kogi State.

MATERIALS AND METHODS

Study Area

The study was carried out in two primary schools in Ajiyolo community; Attaidu Memorial Primary School (7º34′24.2″N and 7º5′44.5″E) and LGEA/RCM Primary School (7º20′20.7″N to 7º3′33″E). Ajiyolo is a village in Dekina Local Government Area of Kogi State, Nigeria. Its geographical coordinates are 7º62′N to 7º09′E (Fig. 1). Ajiyolo is a riverine area characterized by two seasons, rainy and dry seasons. The wet season begins toward the end of March and last till October or early November, while the dry season begins in November and last till late March with an average annual temperature and rainfall of 27˚C and 1260mm respectively. The vegetation of the area is typical of the derived savannah. However, the top sequence is covered with grasses and scattered shrubs.

Study Population

The study population involves a total number of 210 asymptomatic pupils from the two (2) Primary schools in Ajiyolo village with age ranging from 5 to 15 years. The low sample size was due to the limitation of the study to the study community alone. All school children in the two schools that consented were examined for malaria parasite. The study focused on variation in prevalence of infection between children above the age of 10 years and under the age of 10 years.

Ethical Consideration

The study was approved by the Kogi State Ministry of Health, Lokoja. Ethical approval letter with reference number; MOH/KGS/1376/1/89 was delivered to the Head of the schools and letter of consent for pupils to participate were written to the parents/guardians of pupils.

Materials

The materials used for the practical work of this project research included blood lancet, menthylated spirit (methanol), cotton wool, disposable pipette, hand gloves, alcohol pre-pad, buffer solution (Epidi *et al*., 2008).

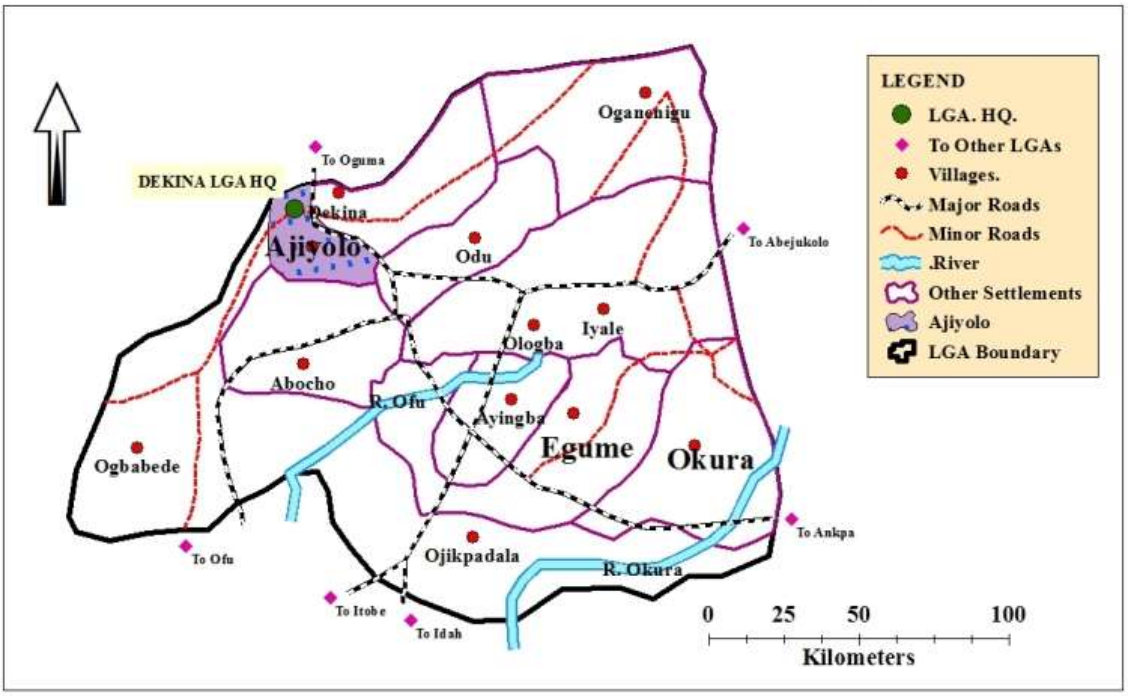

Fig. 1: Map of Ajiyolo, Dekina L.G.A., Kogi State, Nigeria.
Source: GIS LAB, Department of Geography and Planning, Kogi State University (2016).

Data Collection

Schoolchildren that consented were asked of their age and sex.

Using the manufacturer's guideline for the rapid qualitative detection of malaria using CareStart^{TM} Malaria HRP2 (histidine rich protein 2)(pf) in human blood.

All sampled children were tested for malaria prevalence using blood samples collected from the fingertips. The fingertips of the pupils were cleaned with alcohol swab, and pricked using a lancet, a drop of blood (5µl) was collected from each pupil using a disposable micropipette and was transferred into the 'S' well, a part of the test strip. Each kit was labeled with the pupil's identification number. A 60µl assay buffer solution (which comes with the kit) was added into the 'A' well on the strip. The test results were read in 20 minutes as directed by the manufacturer. The test strip contains a labeled antigen-antibody complex test-specific reagent that was pre-deposited during manufacture. The test is invalid if the line in the control area does not appears; if this occurs, the test was repeated for that child. Appearance of two colour bands, one on the control

region and the other on the test region indicate a positive; appearance of only one band of colour in the control area indicate a negative (Yaro *et al.,* 2017).

Statistical Analysis

Data analysis was carried out using simple percentage for the data collected from the study sample. Chi-square and Pearson t-test was performed to determine if there were significant differences in parasite infection in relation to sex and in age groups. Analyses were performed using Statistical Package for Social Sciences (SPSS) software (Version 22.0 for Windows; SPSS Inc., Chicago, IL, USA).

RESULTS

Demographic Characteristics of the Study Population

A total of 214 children from two primary schools in Ajiyolo community were enrolled in the study comprising of 110 males and 104 females with age ranging from 5 to 15 years. A total of 40 male pupils were below ten years (U10) while 70 male pupils were above ten years (A10). Also, 42 female pupils were below the age of ten (U10) while 62 female pupils were above ten (A10) years.

Overall Prevalence of Malaria

The overall prevalence of malaria infection in Ajiyolo community is 37.38%. Prevalence between the two schools sampled did not differ significantly ($p>0.05$), with L.G.A. primary school having a higher prevalence of 38.68% than Attaidu memorial primary school with prevalence of 36.11% (Table 1).

Prevalence According to Age of Pupils

The prevalence of malaria infection according to the age groups revealed that U10 children were infected more than A10 children with prevalence of 50.0% and 29.55% respectively. U10 children from both Attaidu Memorial Primary School and L.G.A./R.C.M Primary School with prevalence of 55.56% and 45.65% respectively were more infected than A10 from both schools with prevalence of 36.39% and 33.33% respectively. No significant difference ($p>0.05$) in prevalence between the age groups in both schools (Table 2).

Prevalence According to Sex of Pupils

The prevalence of malaria infection according to sex of pupils revealed no significant difference ($p>0.05$). Female pupils (37.50%) had a higher prevalence than male pupils (37.27%). Male pupils from L.G.A./R.C.M. primary school (41.07%) had a higher prevalence than male pupils from Attaidu Memorial primary school (33.33%) while female pupils from Attaidu Memorial primary school (38.89%) had a higher prevalence than female pupils from L.G.A./R.C.M. primary school (36.00%) (Table 3).

Prevalence According to Sex and Age of Pupils

In Males, U10 pupils (50.00%) were observed to have a higher prevalence than A10 pupils (30.00%) while in females, U10 pupils (50.00%) had a higher prevalence than A10 pupils (29.03%).

U10 Males had equal prevalence of 50.00% in both schools while A10 Males from L.G.A./R.C.M. Primary school (34.38%) had a higher prevalence than Attaidu Memorial Primary School (26.32%).

U10 females from Attaidu primary school (60.00%) had a higher prevalence than U10 females from L.G.A./R.C.M. Primary school (40.91%) while A10 females from L.G.A./R.C.M. Primary School (32.14%) had a higher prevalence than A10 females from Attaidu Memorial Primary School (26.47%).

No significant ($P>0.05$) difference between U10 and A10 in both sexes (Table 4).

Table 1: Prevalence of Malaria among pupils of Primary Schools in Ajiyolo, Dekina Local Government, and Kogi State

Name of School	Number Examined	Number Positive (%)
Attaidu Memorial Primary School	108	39 (36.11)
L.G.A./R.C.M. Primary School	106	41 (38.68)
Total	**214**	**80 (37.38)**
	Chi-square	**0.151**
	df	**1**
	p Value	**0.698ns**

Table 2: Age Prevalence of Malaria among pupils of Primary Schools in Ajiyolo, Dekina Local Government, and Kogi State

Name of Primary School	Under Ten (U10)		Above Ten (A10)	
	Number Examined	Number Positive (%)	Number Examined	Number Positive (%)
Attaidu Memorial	36	20 (55.56)	72	19 (36.39)
L.G.A./R.C.M.	46	21 (45.65)	60	20 (33.33)
Total	**82**	**41 (50.00)**	**132**	**39 (29.55)**
t – test		**4.597**		
df		**1**		
p value		**0.136ns**		

Table 3: Sex Prevalence of Malaria among pupils of Primary Schools in Ajiyolo, Dekina Local Government, Kogi State

Name of Primary School	Male		Female	
	Number Examined	Number Positive (%)	Number Examined	Number Positive (%)
Attaidu Memorial	54	18 (33.33)	54	21 (38.89)
L.G.A./R.C.M.	56	23 (41.07)	50	18 (36.00)
Total	**110**	**41 (37.27)**	**104**	**39 (37.50)**
t – test		**-0.046**		
df		**1**		
p value		**0.971ns**		

Table 4: Age and Sex Prevalence of Malaria among pupils of Primary Schools in Ajiyolo, Dekina Local Government, Kogi State

Name of Primary School	Male				Female			
	U10		A10		U10		A10	
	Number Examined	Number Positive (%)	Number Examined	Number Positive (%)	Number Examined	Number Positive (%)	Number Examined	Number Positive (%)
Attaidu Memorial	16	8 (50.00)	38	10 (26.32)	20	12 (60.00)	34	9 (26.47)
L.G.A./R.C.M.	24	12 (50.00)	32	11 (34.38)	22	9 (40.91)	28	9 (32.14)
Total	**40**	**20 (50.00)**	**70**	**21 (30.00)**	**42**	**21 (50.00)**	**62**	**18 (29.03)**
t – test		**4.876**				**1.708**		
df		**1**				**1**		
p value		**0.129ns**				**0.337ns**		

DISCUSSION

The high rate of malaria infection among primary schoolchildren in Ajiyolo village is quite worrisome. Several studies have shown high prevalence of malaria infection among primary schoolchildren. A study by Salako *et al.* (1990) reported prevalence as higher as 74% in Nigeria, they attributed the high prevalence to climatic factors. Also, Okeke *et al.* (2006) states that environmental factors such as wet and dry seasons influence the prevalence of malaria parasite. In this study, the high infection could be attributed to high temperature and humidity as well as presence of stagnant water in the community coupled with the use of open water storage system which provides habitat for the breeding of mosquito larvae, this is similar to the report by Jamieson *et al.* (2006). Gomez-Elipe *et al.* (2017) related malaria epidemics with climatic condition like rainfall patterns, temperature and humidity. Transmission is seasonal with the peak during the raining season (Gomez-Elipe *et al.*, 2007). Also Keiser *et al.* (2004) in their study on malaria reported that malaria infection can occur both in rural and urban setting. A similar study carried by Iyaji *et al.* (2015) in Egume, Dekina Local Government revealed low prevalence, the difference in prevalence might be due to the fact their study was carried out in the dry season.

Infection prevalence among the males and females was not significantly different (p>09.05). This agrees with the findings of Mbanugo and Ejim (2000) who reported that sex did not affect the prevalence of malaria parasites and that malaria can affect all age groups and both male and female sexes.

This study also revealed that malaria parasite prevalence was higher in children under the age of ten (U10) than children above the age of ten (A10). This is in agreement with the findings of Hay *et al.* (2005) and Ibekwe *et al.* (2009) in Southeastern, Nigeria. This might be due to the fact there is increased immunity as the age of the pupils increases. A report by Nkuo-Akenji *et al.* (2006) in Cameroon gave similar reasons.

CONCLUSION

Malaria exert significant burden in Ajiyolo community with a prevalence of 37.38%. Children below the age of 10 years are prone to more infection in Ajiyolo community. This study has therefore demonstrated that malaria parasite infection is common among children 5– 15 years living in Ajiyolo community.

Malaria control efforts should concentrate on early treatment of young children through their mothers in the villages and on appropriate referral to the peripheral health centers in case of non-response. In addition, protection of all young children with insecticide treated nets should be promoted in this area.

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