Acta Scientific Clinical Case Reports

Volume 4 Issue 4 April 2023

Case Report

Haemoparasites Infection in Rural Agrarian Communities in Akwanga LGA of Nasarawa State, Nigeria

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Received: January 24, 2023

Published: March 07, 2023

Abstract

Communities in rural areas bear greater challenges and burden with parasitic infections due to conducive factors in their environs which supports the survival and transmission of parasites. To this end, we undertook the study on haemoparasites infection in some selected rural communities in Akwanga LGA of Nasarawa State, Nigeria. Field stained A and B venous blood samples were collected from 202 individual volunteers and screened parasitologically for presence of malaria parasites and trypanosomes. Only 38 (18.81%) individuals were infected with *Plasmodium falciparum* while trypanosome infection was not found. Of the five communities investigated, Akwanga East had the highest infection rate of 23.25% followed by Agyaga, Andaha, Ancho-Nighaan and Ancho-Baba communities respectively in the order 20.51%, 19.04%, 17.50% and 13.15%. Most subjects in the age group 20-29 years were malaria positive and no individual in age group 60 years and above had malaria infection. Infection was higher in the females than males but the difference was not significant ($P > 0.05$). The zero prevalence of trypanosome infection observed in the study area hitherto known to be that Human African Trypanosomiasis endemicity may be linked to changes in the habitat of the *Glossina* vectors resulting from deforestation, expansive agricultural land use and increase in new rural settlements leading to the elimination of the vectors which directly hinders transmission. This study has provided insight to the burden of haemoparasite infection recorded among the rural communities studied and the need for continued sustenance of control measures against malaria infection.

Keywords: Haemoparasites; Infection; Human Populations; Rural Communities; Akwanga LGA

Introduction

Pathogenic Parasites diseases of blood of humans are rampant in the tropics because of favourable climatic, environmental and socio-cultural factors which permit the development and transmission of the parasitic diseases for greater part of the year [1]. These parasitic diseases, whether water-borne, vector-borne, soil transmitted or those that result from some poor sanitary or social habits provide some of the many public health problems in the tropics [2]. Many of the most prevalent and lethal human diseases like African sleeping sickness, amoebic dysentery and malaria are caused by protozoan parasite infection [3]. This study assessed the prevalence of haemoparasites infection in some selected rural communities of Akwanga Local Government Area (LGA), Nasarawa State, Nigeria.

Materials and Methods

Study area

The study was conducted in Akwanga LGA, Nasarawa State in North Central Nigeria. Akwanga LGA lies between latitude 8° 54'

22.65"N and longitude 8° 24' 30.57"E. It has an area of 996 km^2 and a population of 113,430 at the 2006 census [4]. Historically, Nasarawa State has been an agricultural State which is known for the production of groundnut, yam, maize, etc. as well as minerals. Akwanga people are predominantly farmers and civil servants with few business men and women.

Ethical approval

Ethical approval for the study was granted on the 22nd of March 2021 by the Akwanga Local Government Council (LGC) through the Nasarawa State Primary Healthcare Development Agency Department. Also, informed consent was sought from the volunteered subjects. But those who did not sign the consent were, however, not recruited into the study.

Sample size determination

The sample size was determined by the formula given by Yamane [5].

$n= N/1+N(e)^2$

Where:

N= Population size

e = level of precision (0.05)

n = sample size

Sample size for the 5 selected wards was 181

Sample collection

Blood samples were collected aseptically from 202 individuals between the ages of 20 to 70 years old, from 5 different communities including Akwanga East, Andaha, Agyaga, Ancho-Nighaan and Ancho-baba. Blood samples were collected by a trained Medical Laboratory Scientist. 2.0ml of venous blood was collected and transferred into EDTA bottle for screenings in the laboratory.

Questionnaire administration

A well–structured questionnaire was administered to consenting participants, to obtain information on socio-demographic characteristics such as age, sex, sanitary habits and other predisposing factors.

Samples Processing: Wet, thin and thick blood smears examination

Wet blood smear were examined for live trypanosomes in blood as described by Cheesbrough [6]. A drop of fresh blood was taken on a clean slide. The drop was immediately covered with a clean thin cover slip. The edge of the cover slip was sealed with petroleum jelly to avoid evaporation. The film was examined under low power magnification. If the parasites are present, even in small number, their presence can be detected by active movement.

The thin blood smear was prepared according to Cheesbrough [7]. A drop of blood on a labelled clean, grease-free glass slide. A spreader inclined at an angle of 60° was used to spread the blood to obtain a smooth tail. The smear was then air-dried and fixed with methanol for 1-2 minutes. Then, the smear was flushed with water and stained with Field Stain A and B for 3-5 seconds before rinsing and allowing to air-dry.

For the thick blood smear preparation, 2-3 drops of blood were used, and stained in similar fashion as the thin blood smear. Both stained thin and thick blood smears were immersed with oil and examined for parasites through 100x objective of the light microscope. Parasitological colour atlases were used in the identification of parasites in the blood smears [6].

Data analysis

Data obtained was analyzed using R console version 4.1.1. Descriptive simple percentage was used to determine proportions of infectivity among subjects. Pearson's Chi-square test was used to analyze the difference in infection rate in relation to age, gender as well as across communities respectively. Response to predisposing risk factors to parasitic infection was also analyzed using Pearson's Chi-square test. The level of significance was set at $P < 0.05$.

Results

Prevalence of haemoparasite in the study area

A total of 202 volunteers from five electoral wards in the study area were screened for *Plasmodium falciparum* and trypanosomes out of which 38(18.81%) were infected with *Plasmodium falciparum* while none was Infected with trypanosomes (Table 1). Akwanga East had the highest burden of infection (23.25%) while Ancho-Baba had the least burden (13.15%). However, there was no significant difference (χ^2 = 1.0188, df = 4, P = 0.9069) in the numbers of infected individuals in relation to communities.

Communities	No. Examined	No. Infected	% Infected
Akwanga East	43	10	23.25
Andaha	42	8	19.04
Agyaga	39	8	20.51
Ancho-Baba	38	5	13.15
Ancho-Nighaan	40	7	17.70
Total	202	38	18.81

Table 1: Prevalence of *Plasmodium falciparum* in the selected communities.

Prevalence of haemoparasites in relation to age and sex

P. falciparum infection in the communities in relation to age and sex of the population is shown in table 2. Individuals within the age bracket 20 – 49 years were infected the more than those whose age was 50 years and above. Malaria infection was highest (20.70%) in individuals of age 20- 29 years and 30 – 39 years respectively while the uninfected age group was 60 years and above. However, there was no significant difference (χ^2 = 4.0019, df = 4, P = 0.4057) in the malaria prevalence in relation to age groups. Apparently infections occurred more in females than in males. Although, malaria prevalence in relation to sexes showed no significant difference (χ^2 = 0.2527, df = 1, P = 0.6151).

Age group (years)	Sex			
	Male		Female	
	No. Examined	No. Infected (%)	No. Examined	No. Infected (%)
20-29	39	7 (17.94)	58	12 (20.70)
30-39	24	8 (33.33)	29	6 (20.70)
40-49	17	0 (0.00)	11	3 (27.30)
50-59	9	1 (11.11)	7	1 (14.30)
≥60	5	0 (0.00)	3	0 (0.00)
Total	94	16 (17.02)	108	22 (20.37)

Table 2: Prevalence of *P. falciparum* in relation to Age and Sex.

Response to Predisposing Risk Factors to *Plasmodium falciparum* Infection

The response to predisposing risk factors to *Plasmodium* infection in the different communities is shown in Table 3. The high number 162 (80.20%) of individuals that make use of insecticide treated bed nets (ITNs) had a low transmission risk of 16.04% while the few respondents 40 (19.80%) that don't make use nets were more infected with a prevalence of 30%. However, the difference in their infection rate was not significant (P = 0.105).

Also, subjects whose locality have no pond were few 66 (32.67%) but more people were infected 26.60% in comparison with those that have pond in their area 136 (67.33%) being infected a little lower 16.17%. Nonetheless, malaria prevalence between areas that have and have no ponds showed no significant difference (P = 0.2607).

Factors	No. of Respondents (%)	No. Infected	% Infected	P-value
Use of net				0.105
Yes	162 (80.20)	26	16.04	
No	40 (19.80)	12	30.00	
Presence of ponds				0.2607
Yes	136 (67.33)	22	16.17	
No	66 (32.67)	16	26.60	

Table 3: Response to predisposing factors for *Plasmodium* infection in the study areas (n = 202).

Discussion

The absence of Human African Trypanosomiasis (HAT) infection observed in the study area may be linked to changes in the habitat of the *Glossina* vectors due to deforestation, expansive agricultural land use and increase in new rural settlements, leading to the elimination of the vectors which is directly proportional to no transmission This agrees with the finding of Belinda., *et al*. [8], Karshima., *et al*. [9] and Selby., *et al*. [10] who recorded prevalence rate of 0.0% in Kachia Local Government Area of Kaduna state, Ukum in Gboko local government area of Benue state and North West Uganda but it is contrary to the findings of Mumba., *et al*. [11], Henry and Abdulfatah [12] and Karshima., *et al*. [9] who reported prevalence rate of 0.3%, 45.5% and 1.8% in Democratic Republic of Congo, Kano and Gboko LGA of Benue State respectively.

The 18.81% prevalence of *P. falciparum* among human population in the studied communities could be due to high human-vectors contact as a result of the presence of successful transient breeding sites and bushy vegetation as at the period of this research which was the rainy season as well available rivers and ponds that gave rise to high emergence of adult malaria vectors. The prevalence recorded in this study is however lower than that of Nassar., *et al*. [13], Richard., *et al*. [14] and Nwosu., *et al*. [15] who reported a prevalence of 41.7%, 44.3% and 77.9% in Osogbo, Rivers State and Nsukka all in Nigeria respectively. Lower prevalence of 8.3% was reported by Muoneke., *et al*. [16] in a study conducted in Lagos, South-west Nigeria.

The lack of variation observed in the prevalence of *P. falciparum* in the selected communities indicates that the infection is not specific to a particular location. This disagrees with the findings of Umeanaeto., *et al*. [17] and Richard., *et al*. [14] who reported variation in prevalence rate of malaria by location in their study areas.

The prevalence of *P. falciparum* in respect to age shows that the younger age groups (20-49 years) are more infected/susceptible than the older age groups (≥50 years). This could be attributed to staying outdoors late to interact and play with their peers which is common among the younger age groups in rural communities. The findings of this study is in agreement with the findings of Umeanaeto., *et al*. [17], Nassar., *et al*. [13] but in contrast with findings of Nwosu., *et al*. [15].

Both sexes are susceptible to *P. falciparum* infection. Although, infection occurred more in females than in males. This is in accordance with the finding of Ombugadu., *et al*. [18] in a study among people resident in Lafia metropolis of Nasarawa State. Also, similar findings was reported by Umeanaeto., *et al*. [17] in Enugu East, Enugu State but in contrast with the findings of Nassar., *et al*. [13] who reported prevalence to be more in males than in females in Osogbo, South-west Nigeria.

Individuals that make use of ITNs were less infected compared to individuals that don't use it. This is in agreement with findings of Henry and Abdulfatah [12] in Kano State. The concept of using nets was considered as one of the protective factor against the mosquito bites and hence reduce the prevalence of malaria among communities. The findings of this study could be attributed to staying outdoors after sunset by individuals in the communities which may increase contact between individuals and the malaria vector. This agrees with the report by Ombugadu., *et al*. [19] who recorded high chances of mosquito-borne infections among inhabitants of a peri-urban area due to outdoor nocturnal activities.

The communities whose individuals acknowledged the absence of rivers/ponds were more infected because there is less flooding or water run-off that could have washed away stagnant mosquitoes breeding grounds hence resulting to high number of emerging adult mosquitoes that swarm and move into houses for blood meal. This is in line with the finding of Lapang., *et al*. [20] who showed that mosquitoes breed successfully due to availability of stagnant water bodies. Also, Henry and Abdulfatah [12] reported similar findings in Kano State, Nigeria that the presence of ponds and stagnant water serves as an idle breading site for the *Plasmodium* vector.

Conclusion

Plasmodium falciparum is the only haemoparasite found in this study and it is the major public health problem in the selected communities. Also, it was found out that malaria transmission was low among the majority of individuals who made use of ITNs and vice-versa. Furthermore, the subjects from locations without ponds were just few in number yet they were more infected with malaria. There is a need for more rigorous control measures such as regular and adequate provision of ITNs as well as regular sanitation programmes in rural communities so as to bring about reasonable reduction in malaria burden in the area.

Acknowledgement

We deeply appreciate the great support shown to us during the study by the management of Akwanga Local Government Council (LGC) and Nasarawa State Primary Healthcare Development Agency Department.

Conflict of Interest

Authors declare no conflict of interest.

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