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PREVALENCE OF MALARIA PARASITE INFECTION AMONG SELECTED COMMUNITIES LIVING AROUND NEW MILLENNIUM CITY, KADUNA

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ABSTRACT

Malaria is an infectious disease caused by the protozoan parasite Plasmodium transmitted by female anopheles. Malaria affects 3.3 billion people or half of the world population in 106 countries and territories. This study is aimed at determining the prevalence of malaria infection among selected communities living around new millennium city of Kaduna, Nigeria. Blood samples obtained by vein puncture of 132 patients who attended Danhonou Community Health facility New Millennium city Kaduna; were collected and analyzed microscopically using X100 light microcope for malaria parasite infection between October 2015 to January 2016. 64.39% of the patients examined were positive for malaria parasite infection. Among patients from the four communities, Danbushiya community showed a significantly higher prevalence of 88.10% ($P<0.05$). With regards to age groups, high prevalence of malaria was encountered in children 0 – 10 years (81.82%) ($P<0.05$). The male gender prevalence of malaria parasite infection was 67.65% and not significantly different from females (60.93%) ($P>0.05$). The study showed that there is higher prevalence of malaria parasite infection in the month of October (84.85%). There was significant association between month of study and prevalence of malaria parasite infection ($P<0.05$). The study therefore, reports for the first time the prevalence of malaria parasite infection among the four selected communities and recommend proper sanitation and removal of possible breeding sites of the vectors to reduce the prevalence of the disease.

Keywords: Malaria, prevalence, Danbushiya, Kaduna Metropolis.

1.0 INTRODUCTION

Malaria is an infectious disease caused by the protozoan parasite *Plasmodium* transmitted by female anopheles mosquitoes of which there are five main species namely; *Plasmodium vivax*, *Plasmodium ovale, Plasmodium falciparum*, *Plasmodium malariae* and *Plasmodium knowlesi* which was originally a monkey species has been reported to caused human malaria in some part of the world (McCuthan *et al*., 2008, Auta *et al*., 2013). Since year 2000, the estimated number of malaria deaths worldwide has declined from 839,000 to 438,000 in 2015, a 48% reduction (Katchy, 2017). According to Nigeria Malaria fact sheet by the US Embassy in Nigeria, Malaria affects 3.3 billion people or half of the world's population in106 countries and territories. World Health Organization estimates 216 million cases of malaria occurred in 2010, 81% in the African region. WHO estimates there were 655,000 malaria deaths in 2010, 91% in the African Region and 86% were children under five (5) years of age (NMIS, 2010). One child dies of malaria somewhere in Africa every twenty seconds and there is one malaria death every twelve seconds. Malaria kills in one year what Acquired Immune Deficiency Syndrome (AIDS) kill in fifteen years. Malaria ranks third among the major infectious diseases causing deaths after pneumococcal acute respiratory tuberculosis.

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It is projected that by the turn of the century, malaria will be the number one infectious killer, accounting for 26% (2.6%) of the total disease burden of the world and is responsible for loss of more than a million lives each year. Every year more than thirty thousand visitors to endemic areas develop malaria and one percent of them may die. Estimated worldwide expenditure on malaria research is at $58 million, one thousand of the $56 billion research annually, estimated worldwide expenditure per malaria fatality is $65 million (MMWR, 1997).

Nigeria bears up to 25 percent of the malarial disease burden in Africa, hence contributing significantly to the one million lives lost per year in the region, which mostly consists of children and pregnant women. Malaria in Nigeria is endemic and constitutes a major public health problem despite the curable nature of the disease. Malaria-related deaths account for up to 11 percent of maternal mortality. Additionally, they contribute up to 25 percent of infant mortality and 30 percent of under-5 mortality, resulting in about 300,000 childhood deaths annually. The disease overburdens the already-weakened health system: nearly 110 million clinical cases of malaria are diagnosed each year and malaria contributes up to 60 percent of outpatient visits and 30 percent of admissions. Malaria also exerts a huge social and economic burden on families, communities and the country at large, causing an annual loss of about 132 billion naira in payments for treatment and prevention as well as hours not worked (Jimoh *et al*., 2007).

In spite of the concerted efforts being made by several countries and agencies to eradicate malaria parasite, malaria remains enigmatic and continues to rank among the foremost killer disease of our time, especially in young children and pregnant women. In certain locations the malaria situation is deteriorating as a result of environmental changes, including global warming. Increasing travel and increasing drug resistance. Malaria is a major contributory factor to poverty and is a serious impediment to progress. The clinical symptoms of malaria are caused by the development of the parasite in red blood cells. The principal symptom of malaria is fever, others are headache and in acute cases, paroxysm, high fever, chills, fatigue, chest and abdominal pain and nausea. In malignant malaria, enlargement of the spleens, kidneys and liver occurs. *P. falciparum* malaria is the most dangerous form of the disease resulting in life threatening complications such as anaemia, cerebral malaria, renal disease, black water fever, pulmonary edema and dysenteric malaria (Markell and Voge, 1992). The disease also impairs physical and mental development in children, as such a major cause of death due to anaemia in young children (Ademola, 1989; Najera *et al*., 1993; Miller *et al*., 1994).

The problem of malaria is compounded by the declining sensitivity of *Plasmodium* species notably *Plasmodium falciparum* to the array of available anti-malarial drugs. Resistance to chloroquine has been widely documented in Nigeria, (Anon, 1989). One of the key strategies of the Roll Back Malaria (RBM) initiative of the World Health Organization (WHO) in endemic countries involved mapping anti-malarial drug resistance (Auta *et al.,* 2013). This strategy is useful for providing the necessary evidence for national malaria treatment policy formulation. It is also vital for achieving primary health care objectives for combating malaria induced morbidity and mortality through the use of effective anti-malarial drugs (Molta *et al*., 2004). A combination of treatment, diagnosis and prevention programs have reduced prevalence of malaria to around 32%, according to the National Malaria Elimination Programs, (NMIS, 2010).

Malaria remains the single most important infection causing morbidity and mortality in the world. It is one of the biggest impediments to progress in Africa. In Nigeria, malaria is endemic and constitutes a major public health problem despite the curable nature of the disease (Summary of Notifiable Diseases 1997). This study was aimed at assessing the prevalence of malaria among communities living around new millennium city, a suburb in Kaduna Nigeria. Malaria is a deadly parasitic disease of mankind and result in death. Although so much work have been published on the prevalence of malaria in major cities of Nigeria but little information is available about the prevalence of this disease in the suburbs or outskirts of major cities, where although transmission is unstable but

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high as a result of topography, attitude, rainfall, poor drainage system and high human-vector contact to mention a few. This work is therefore aimed at assessing the prevalence of malaria parasite infection among selected communities living around the New Millennium City, a suburb in Kaduna, Nigeria.

2.0 MATERIALS AND METHOD

2.1 Study Area

The geographical entity known as Kaduna is the capital of Kaduna State in the North Western region of Nigeria in Sub Saharan Africa. Kaduna State is located between Latitude 10^{o} 30^{1}59"N of the equator and Longitude 7^{o} 29^{1}47"E of the Greenwich Meridian. Kaduna is approximately 162km away from Abuja, the capital city of Nigeria. Kaduna town is centrally located at the epicenter of the northern region notably between the ancient city of Kano and Abuja (Saleh, 2015). Kaduna Metropolis covers an area of about 25km long from Kawo in north to the oil refinery in the south up to an average width of 8-10km (Max Lock Group, 2003).

The study area, the New Millennium city is a suburb along Kaduna river flood plain in Kaduna Metropolis. It is located between latitude 10^{o} 31^{1} 24"N of the equator and Longitude 7^{o} 29^{1} 47"E of the Greenwich Meridian. The inhabitants of the area are predominantly farmers and traders, with few civil servants and others who engaged in properties.

The study sample consisted of a total of 132patients from four selected communities around the New Millennium City, i.e; Danhonu I (26), Danhonu II (28), Danbushiya (42) and Kadage (36) who consult the Danhonu Community Maternity and Health Care Hospital in Danhonu II, New Millennium City Kaduna, between October 2015 to January 2016. They were selected based on the Doctor's request for malaria parasite diagnosis.

2.2 Data Collection

Patient personal data such as age, sex and address were obtained from the medical record office. About 2ml of blood was obtained from the patient by vein puncture and transferred into EDTA bottle containing anticoagulant to prevent the blood from clotting. The samples were taken to the laboratory of FOMWAN Specialist Hospital and Maternity Kaduna for examination.

2.3 Preparation of Thick Films for Malaria Parasites

At the laboratory a drop of each blood sample was deposited on a clean, grease free slide that has been labeled. It was spread with the corner of another slide to make a circular patch of a moderate thickness that could allow observation through it. The films were allowed to dry.

2.4 Staining and Microscopy Procedure

The dried slides were stained using field stain A and B. Each slide was dipped into field stain A in a staining dish and was allowed to act for 30 seconds. The slide was washed gently by dipping once into clean water in a dish. The slide was then dipped into field stain B and washed gently by dipping once into another clean water. The slide was placed in an upright position in a draining rack to air-dry. The slides were examined under an X100 oil immersion objective of the light microscope. A slide is classified as negative when no parasite was seen.

2.5 Statistical Analysis

The data generated was statistically analysed using Chi-square (x^2) Test for Independence to determine if there is significant relationship in the prevalence of malaria parasite infection between communities, sex, age and month.

3.0 RESULTS

The findings of this study showed that out of 132 persons examined, 85 (64.39%) were infected with malaria parasite. Table 1 shows that out of the four selected communities living around the New Millennium City, Danbushiya appeared to have the highest prevalence of 37 (88.10%) while the least infection rate was recorded in Danhonu II community with prevalence of 12 (42.86%). The Chi-square test shows that there is high level of

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association between the prevalence level of malaria infection and the communities, which is statistically significant using both 95% (0.05) and 99% confidence interval. This indicates that the level of infection in Danbushiya is significantly higher than the other communities (P< 0.05).

Table 1: Prevalence of Malaria Parasite Infection among Four Communities living around the New Millennium City Kaduna.

Name of Communities	Number Examined	Number of +ve	(%)
Danbushiya	42	37	88.10
Kadage	36	22	61.11
Danhonu I	26	14	53.85
Danhonu II	28	12	42.86
Total	**132**	**85**	**64.39**

(p <0.05)

Table 2 shows the age specific of malaria parasite infection among the inhabitants living around the New Millennium City. The age related prevalence revealed that 27 (81.82%) of the children in the age group of 0 - 10 years recorded the highest prevalence while the least prevalence of12 (46.15%) was recorded in the age group above 50 years. From the analysis of the association between the age group and malaria prevalence, the study found very significant association between the two variables. The results returned a significance value of 0.000 which is indicating a higher prevalence in malaria parasite infection among the age groups 0 – 10 (P< 0.05).

Table 2: Prevalence of Malaria Parasite Infection according to Age among the inhabitants living around the New Millennium City Kaduna.

Age Group (Years)	Number Examined	Number of +ve	(%)
0-10	33	27	81.82
11-20	24	18	75.00
21-30	9	6	66.67
31-40	21	13	61.90
41-50	19	9	47.37
Above 50	26	12	46.15
Total	**132**	**85**	**64.39**

(P < 0.05)

Table 3 shows the prevalence of malaria parasite infection according to age among the inhabitants living around the New Millennium City. Out of the positive cases 46 (67.65%) were males while 39 (60.94%) were females. The Chi-square analysis conducted for a linear association between gender and malaria prevalence, indicated that there was no significance relationship between the gender and prevalence as both genders stand equal chance of being infected by the parasite (P > 0.05).

Table 3:Prevalence of Malaria Parasite Infection according to Sex among the inhabitants living around the New Millennium City Kaduna.

Sex	Number Examined	Number of +ve	(%)
Male	68	46	67.65
Female	64	39	60.94
Total	**132**	**85**	**64.39**

(P > 0.05)

Table 4 shows the monthly prevalence of malaria infection among the inhabitants living around the new millennium city Kaduna, for the month of October to January. The highest prevalence rate of 28 (84.85%) was recorded in the month of October, while the least prevalence of 15 (45.45%) was recorded in the month of January. The Chi-square test for independence indicated that the month is significantly related or associated to the rate of malaria infection; with some months exhibiting higher prevalence. From the data analyzed, the prevalence of the infection reaches its peak in the last quarter of the year, and reaches the least value from the first quarter of the succeeding year. The analysis shows that the rate of infection in October is significantly higher than the other months (P < 0.05).

Table 4:Prevalence of Malaria Parasite Infection Monthly Among the inhabitants around the New Millennium City Kaduna.

Months	Number Examined	Number of +ve	(%)
October	33	28	84.85
November	33	23	69.70
December	33	19	57.58
January	33	15	45.45
Total	**132**	**85**	**64.39**

(P < 0.05)

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4.0 DISCUSSION

The result of this study has revealed a high prevalent of malaria parasite infection in the selected communities living around New Millennium City Kaduna, Nigeria. This high prevalence could be a reflection of the high exposure to bites of malaria vectors in the communities as a result of stagnant water around and other environmental factors that promote the breeding of vectors to attain populations capable of sustaining disease transmission.

The difference in prevalence of malaria parasite infection among the four selected communities revealed a higher prevalence in Danbushiya. The study indicated that there was a significance association between community and prevalence, this may be explained by the fact that there is no proper drainage system resulting to stagnant water around the community which created favorable breeding site for anopheles mosquito. The study shows a significant association between age and prevalence of malaria parasite infection. Age-specific prevalence shows that infection rates decreased with increasing age. This is in line with Nwuba *et al*. (2002), where it was found that parasitaemia declined with age. The acquisition of immunity by age may be due to gradual buildup of immunological memory covering higher and larger parts of the parasites antigenic repertoire, or to a physiological effect of age, which makes adults more effective in combating disease. This coroborates with the findings of Menendez (1995), Matteelis *et al*. (1997) and Ricke *et al.* (2000) who variously reported that adults enjoy substantial protection against malaria parasite infection than children. The higher malaria infection prevalence observed in children could be due to the fact that their immune system is not fully developed yet, thus predisposing them to malaria parasite infection.

The prevalence of malaria infection in this study shows a slightly higher infection rate in males in relation to their female counterpart. Therefore, the study indicated there was no significance relationship between gender and prevalence as both genders stand equal chance of being infected by the parasite. While the table shows the Male gender having the higher prevalence, such infection could be as a result of some other external factors and are not necessarily a function of the gender. This could have emanated from the fact that both genders are exposed to the same environment, epidemiologic and ecologic factors associated with transmission of malaria in the communities. A similar position was given by WHO (2000) to explain the equal chances males and females are exposed for malaria infection.

This study shows a higher prevalence of malaria parasite infection in the month of October. The month coincided with the end of raining season which offered improved breeding condition for malaria vectors. This explains the significant association between month of study and malaria prevalence.

5.0 CONCLUSION

This study revealed that there is high prevalence of malaria infection among the selected communities living around the New Millennium City Kaduna, Nigeria. Therefore the null hypothesis is hereby rejected. The study also reveals that, age and month are associated with the prevalence of malaria parasite infection while there is no significant association of malaria infection with respect to sexes.

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