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Prevalence of Malaria Infection among Children Attending Specialist Hospital Yola, Adamawa State, Nigeria

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ABSTRACT

Malaria is an urgent public health priority and has resulted families in a cycle of illness, suffering and poverty. This study was tending to determine the prevalence of malaria infection within gender, age of the children and in relation to socio demographic characteristics of parents/guardians. The study was hospital based and considered only out-patient children attending Specialist Hospital Yola from July to November 2015. Ethical Clearance was obtained. Thick and Thin blood smear were made and stained using standard parasitological procedures. Of the total sample examined, prevalence of malaria infection was 50.6%. Female subjects (54.9%) were more infected than the male (47.0%). Age-group 5 to 9 years (58.3%) recorded highest infection rate and was statistically not significant (p>0.05). Children whose parents/guardians have others profession (60.0%), attended secondary education (53.4%) and resides in quarters (54.5%) had the highest prevalence rate but this was statistically not significant (p>0.05). However, parents/guardians socio demographic characteristics such as occupation and place of residence have a great effect in reducing malaria infection among children which are the vulnerable group.

Key words: Children, parents/guardians socio demographic, Place of residence, *Plasmodium falciparum*, Malaria infection and Yola.

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INTRODUCTION

Despite a great diversity of geographical, economic, cultural and political landscapes, countries in Africa share the common challenges of a high disease burden and relatively weak health systems (Malaria Consortium, 2016). The Sub-Saharan Africa region has the greatest number of people exposed to malaria transmission and the highest malaria morbidity and mortality rates in the world (WHO, 2005). About 91% of all malaria deaths occur in Africa (WHO, 2006, 2008). Malaria accounts for 25 to 45% of all outpatient clinic attendances, between 20 and 45% of all hospital admissions and cause 17% of under-five mortality in African region (WHO, 2006, 2008). It is widely appreciated that there may be considerably seasonal and between year variations in all malariometric indices such that assessments undertaken in a population in different seasons or years may produce dramatically different results (Kalu et al., 2012). The epidemiology of malaria and the ecological and social-linked distribution of malaria vectors are complicated by both seasonal and periodic variation (Thomson et al., 1996). Ezeanya (1998) reported prevalence rate of 59.8% while Mbanugo and Ejims (2000) reported 58.3%

out of 400 children and only *Plasmodium falciparum* were found.

In other African Countries Chiabi et al. (2009) recorded 29.8% in Yaounde Specialist Hospital while Ogah et al. (2013) recorded 29.8% in Kampala International University Teaching Hospital, Bushenyi, Western Uganda. Transmission depends on climatic conditions that may affect the number and survival of mosquitoes, such as rainfall patterns, temperature and humidity (WHO, 2014; NCBI, 2014). Other factors that tend to increase the rate of malaria transmission include unsanitary environmental condition, poverty, ignorance, poor behavioral attitudes and inadequately planned socio-economic projects (Robert et al., 2003; Anothonio-Nkonjio et al., 2006). Human immunity is another important factor, especially among adults in areas of moderate or intense transmission conditions. Partial immunity is developed over years of exposure, and while it never provides complete protection, it does reduce the risk that malaria infection will cause severe disease. For this reason, most malaria deaths in Africa occur in young children, whereas in areas with less transmission and low immunity, all age groups are at risk (WHO, 2014; NCBI, 2014). Malaria especially *falciparum* malaria, is acknowledge to be by far the most important tropical parasitc disease, causing great suffering and loss of live (Ukpai and Ajoku, 2001). Nigeria is made up of several hundreds of communities and settlements with their own indigenous people, microclimate, topography, population densities, cultural practice and general way of live (Umaru and Uyaiabasi, 2015). People in the lower socio-economic classes are most exposed to malaria and its complication and limited access to health care which further worsen their poverty (Gallup and Sachs, 2001). Poor health service delivery and ignorance associated with cultural beliefs have been identified as contributory to childhood mortality due to malaria. It has been suggested that social and cultural determinants of behavior may account for the gap between awareness of modern health measures and health-seeking behavior (Feyisetan et al., 1997). This presents study assess the prevalence of malaria infection in relation to children epidemiological data (gender, age) and parents/guardians socio demographic characteristics such as occupation, educational qualification and place of residence.

MATERIALS AND METHODS

Study Area

This study was carried out at Specialist Hospital, Yola is a referral hospital situated in the State Capital, Adamawa State, Nigeria. The area has a tropical climate, marked by dry and rainy seasons. The rainy season commences around May and ends in the middle or late October, rainfall is characterized by a single maximum with a mean total rainfall of 1113.3 mm, August and September being the wettest months about 25% of the total annual rainfall. The dry season starts in late October and ends in April (Adebayo and Tukur, 1999). Temperature in Yola can reach 40ºC, around April, while minimum temperature could be as low as 18.3ºC between December and early January. Relative humidity in the area is about 26% in the months of January while February is the lowest; with high relative humidity values of 58, 69, 79, 77, and 66, respectively could be recorded during the months of May to October, particularly during the months of July and August as the peak, with about 80% relative humidity (Adebayo and Tukur, 1999). These favours the breeding and spreading of parasitic diseases. The vegetation in Yola and environs is secondary type due to human activities through construction, farming, wood gathering for fuel and grazing have altered the natural vegetation (Adamawa State Ministry of Information, 1994; Akosim et al., 1999). Yola North LGA is the Administrative Centre of the State. Most indigenes of Yola are civil servants, farmers, fishers, petty traders, poultry and livestock keeping.

Study Design and Population

This study was hospital based and it considers only out-patient children who were referred to Haematological Laboratory Unit, Specialist Hospital, Yola for confirmatory malaria diagnosis from the month of July to November 2015. A total of Three Hundred and Ten (310) randomly selected children aged 6 months to 15 years were screened. Prior to blood sample collection, the consent of parents/guardians of the children were sort. Children epidemiological data (gender, age) and parents/guardians socio demographic characteristics (occupation, educational qualification and place of residence) were obtained using questionnaires.

Sample Collection and Parasitological Examination

Licensed Medical Laboratory Scientists assisted in the collection of blood sample. Blood was collected using finger prick and venipuncture techniques alternatively (Cheesbrough, 2006). Each blood sample was labeled and correctly tallies with the subjects number on the questionnaires. The sample collected was processed within the Hospital Laboratory (Haematological Unit). Thick and Thin blood smear were prepared according to the technique outlined by Cheesbrough (2006) for malaria microscopy and stained with 10% Giemsa stain pH 7.2 for 10 min (WHO, 2000) and examined microscopically using X100 objective. The slides were read by Medical Laboratory Scientists and were confirmed by experience Medical Laboratory Scientist.

Ethical Clearance

Prior to sample collection, introductory letter was

Table 1. Prevalence of malaria infection according to gender.

Gender	No. examined	No. (%) Infected
Male	168	79 (47.0)
Female	142	78 (54.9)
Total	310	157 (50.6)

Table 2. Prevalence of malaria infection in relation to age of the children.

Age group	No. examined	No. (%) Infected
6 months to 4 years	134	67 (50.0)
5 to 9 years	84	49 (58.3)
10 to 14 years	81	38 (46.9)
≥15 years	11	3 (27.3)
Total	310	157 (50.6)

Table 3. prevalence of malaria infection according to parents/guardians occupation.

Parents/guardians occupation	No. examined	No. (%) Infected
Civil servant	88	46 (52.3)
Business/trading	99	43 (43.4)
Farming	63	35 (55.6)
Unemployed	30	15 (50.0)
Others	30	18 (60.0)
Total	310	157 (50.6)

obtained from Department of Zoology, Modibbo Adama University of Technology Yola to Adamawa State Ministry of Health where Ethical clearance was obtained for the research and Specialist Hospital, Yola Management were informed about the research and their permission sort and obtained. Importance of the study was explained to the parents/guardians before seeking their consent. Confidentiality was also maintained.

Data Analysis

IBM Statistical Package for Social (SPSS) version 20 (SPSS, Inc., Chicago, IL, USA) for Windows was used for data analysis. Chi-square test was carried out to assess the association between variable. $p<0.05$ was considered level of significance.

Inclusion and Exclusion Criteria

Only Out-Patient children aged 6 month - ≥15 years that were referred to Laboratory for confirmatory malaria test and have not taken any anti-malaria drug from the onset of symptoms and only parents/guardians that their consent was sort were included in this study. While infants < 6 months and children 16 years and above were excluded from the study.

RESULTS

A total of 310 children were screened for malaria parasite in this study. Of the sample examined 157 (50.6%) were infected with only *P. falciparum* specie. The gender-related prevalence of malaria infection is shown in Table 1. Prevalence of malaria infection was higher in females (54.9%) than males (47.0%) counterparts. There was no significant difference between gender and malaria infection ($p>0.5$). Table 2 outlines the prevalence of malaria infection among age-group. The result reveals that children age group 5 to 9 years (58.3%) had the highest infection followed by 6 months to 4 years (50.0%), 10 to 14 years (46.9%) and ≥15 years (27.3%) had the least, this was not statistically significant ($p>0.05$). Prevalence of malaria infection in children according to parents/guardians occupation is shown in Table 3. There was significantly higher prevalence among children whose parents/guardians had other profession (60.0%), followed by those children whose parents/guardians were farmers (55.6%), civil servant (52.3%), unemployed (50.0%) and the least was among business/trading (43.4%). Chi-square analysis shows no significant difference between parents/guardians occupation and infection rate ($p>0.05$). Prevalence of malaria infection according to parents/guardians educational qualification is highlighted in Table 4. Children whose parents/guardians attended secondary education (53.4%) recorded with highest prevalence rate of malaria infection. This was followed by those children, whose parents/guardians attended non-formal education (51.7%), tertiary education (51.0%) while primary education (43.5%) had the least infection rate. There was

Table 4. Prevalence of malaria infection according to parents/guardians educational qualification.

Parents/guardians educational qualification	No. examined	No. (%) Infected
Tertiary	104	53 (51.0)
Secondary	73	39 (53.4)
Primary	46	20 (43.5)
Non formal	87	45 (51.7)
Total	310	157 (50.6)

Table 5. Prevalence of malaria infection according to place of residence.

Place of residence	No. examined	No. (%) Infected
Housing estate	13	5 (38.5)
Quarters	33	18 (54.5)
City/Town setting	185	95 (51.4)
Village setting	79	39 (49.4)
Total	310	157 (50.6)

no significant difference between parents/guardians educational qualification and malaria infection ($p>0.05$). Prevalence of malaria infection according to place of residence is shown in Table 5. Children residing in quarters (54.5%) had the highest malaria infection, following by city/town setting (51.4%), village setting (49.4%), while those residing in housing estate (38.5%) recorded the least malaria infection. Analysis indicates no significant difference between place of residence and infection rate ($p>0.05$).

DISCUSSION

Of the 310 samples screened, the prevalence of malaria infection was 50.6%. This finding was lower when compared to Nwaorgu and Orajaka (2011) reported 58.2% in Akwa North Local Government Area, Anambara State South East Nigeria and Ezeigbo et al. (2014) reported 65.0% in Aba, South Eastern Nigeria while Obonyo et al. (2007) reported 82.5% in Western Kenya. The figure in this study is however higher when compared with other findings by Jombo et al. (2010) reported 32.3% in Markudi City, North Central Nigeria, Umaru and Uyaiabasi (2015) reported 35.7% in North-West Nigeria, Kuadzi et al. (2011) reported 24.3% among children in Ghana while Ogah et al. (2013) recorded 29.8% in Kampala International University Teaching Hospital, Bushenyi, Western Uganda. However in Nigeria the 6 geopolitical zones, each has its own peculiar geographic and weather features and required strategic, well planned control intervention methods and tools targeted at individual settings in order to achieve the projected goal of 50% reduction in burden of malaria (National Population Commission, 2009), hence this observe differences in prevalence rate among those stated zones in Nigeria. The prevalence rate in this study was quit higher indicating high level of malaria infection among children. This could attribute to the fact that the study was conducted during the raining season from the month of July to November. The number of malaria cases detected was high in the month of October and November indicating high malaria transmission was elevated as a result of blockage of water due to the poor drainage system and inadequate waste disposal and sanitation in Yola among other factors. This could have led to ecological changes that might have affected mosquito vectors to breed for possible malaria transmission.

This view is in accordance with Bhutta et al. (2014) in many endemic areas transmission is seasonal, with peak during and just after the raining season. *P. falciparum* was the only *Plasmodium* specie identified in this study, which is the most virulent and also has the greatest propensity for developing resistance (Happi et al., 2009; WHO, 2010). Malaria cases in West Africa are almost exclusively due to *P. falciparum* (World Malaria Report, 2014). This finding is consistent with the findings of Mbanugo and Ejims (2000), Ariboder et al. (2003), Oladeinde et al. (2012). Coluzzi (1997), Lucas and Gills (1998) reported that *P. falciparum* is the main specie found in tropical and sub-tropical Africa and parts of Central America and South America. *P. falciparum* cause most of the severity and death attributed to malaria which is most present in Africa South of Sahara, where Nigeria has the largest population (Alaba and Alaba, 2003). Infection rate based on gender showed that females had a higher prevalence of malaria than the males which was statistically insignificant ($P>0.05$), although there were 168 male (54.2%) and 142 female (45.8%) participants. This present study confirms with Ezeigbo et al. (2014) that females were more infected than males, but differs from Benisheikh et al. (2014), Umaru and Uyaiabasi (2015) they reported higher prevalence rate in males than their females counterparts. This varied finding may be explained by Abdullahi et al. (2009) and Okonko et al.

(2012) stated there is no scientific evidence to prove higher prevalence being related to gender as susceptibility to malaria infection is not influence by gender. This implies that malaria infection depends on the person's exposure to infectious bites of mosquito vectors. However, children and pregnant women are biologically more susceptible to malaria; there are compounded gender differences due to sociocultural norms and expectations that influence patterns of exposure, decision making, and economics (Ministry of Health Malaria Control Unit, 2015). Reduction in the prevalence rate among 6 months to 4 years might be that more attention and care are given to those children and were significantly more likely using malaria preventive measures put in place such as sleeping under ITNs than the age group 5 to 9 years who had highest prevalence rate. However, malaria infection decreases with an increasing age as shown among age group 10 to 14 years and ≥15 years which could be due to previous exposure to malaria infection. In areas where endemicity of *P. falciparum* malaria is stable, severe malaria most commonly occurs in children up to 5 years of age, while is less common in older children and adults because of the acquisition of partial immunity (Alessandro and Lorenzo, 2012.

The high infection rate amongst Children whose parents/guardians have other profession could be attributed to proper knowledge on malaria control measures is lacking or their income is below average which may result them unable to buy malaria preventive measures used against mosquito vectors or both. Mosley and Chen (1984) remarked that parents educational level relate strongly to the occupation and household income which will eventually affects health outcome. Parents/guardians levels of education may also affect malaria treatment seeking and preventive behaviors. High infection rate of 53.4 and 51.7% was seen among those children whose parents/guardians attended secondary education and non-formal education, respectively. This high infection rate may likely associated with poverty, limited knowledge, traditional believe on the malaria transmission and deficient maternal home technology on measures to prevent parasitic diseases among others factor. This is also in line with researchers in Ghana identified a relationship between knowledge of the cause of malaria and educational status where 63% of those with tertiary education believed that malaria is caused by mosquito bite as against 45% of those with no formal education (Appiah-Darkwah and Badu-Nyarko, 2011). Ani (2004) asserts that illiteracy and ethnic belief among rural dwellers can further encourage the transmission of malaria parasites. Observation of high rate of malaria infection was found among those children that live in quarters (54.5%). However, there is no clear cut demarcation between some official quarters and the surrounding communities where stagnant water and water lock drainage where mosquito vectors breed. This can enhances the proliferation of *Plasmodium* species which may probably be the cause of high infection rate. Compared to those children that resides in housing estate had the least malaria infection. However, this was not statistically significant ($p>0.05$).

The vulnerability of the urban poor to the impact of malaria as a strong association between socio-economic status and disease prevalence (Ronald et al., 2006), this could partly reflect greater exposure to infected mosquitoes through poor quality house construction, or greater infection risk due to crowding (Bates et al., 2004). The least prevalence rate in this study was consistent with previous report from various part of Nigeria by Olasehinde et al. (2010) and Cheesed et al. (2013), they obtained 52.2 and 17.1%, respectively among children that live in housing estate. They both pointed out that, it is essential to avoid stagnant pools and poor environmental conditions, which encourage the breeding of mosquitoes which is in accordance with children whose parent's lives in clean and hygienic environment and well laid out housing estate.

CONCLUSION

The prevalence rate of malaria infection in this study still showed malaria is still a burden in Nigeria, particularly in Yola, Adamawa State. Parents/guardians socio demographic characteristics such as occupation and place of residence have a great effect in reducing malaria infection among children which are the vulnerable group.

LIMITATION OF THE STUDY

The study considered only one hospital though is a referral Centre and the study period was not extended to dry season to determine the variation in the prevalence rate.

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