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Prevalence of Malaria with Respect to Age, Gender and Socio-Economic Status of Fever Related Patients in Kano City, Nigeria

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ABSTRACT

Malaria has been a major public health problem in sub-Saharan Africa. Globally, approximately 214 million cases of malaria occur annually and 3.2 billion people are at risk of infection. The study was aimed to determine the prevalence and incidence rate of malaria among fever related patients attending General out-patients department of Murtala Muhammad Specialist hospital, Kano State, Nigeria. A total of three hundred and seventy (370) subjects were used in this study. Blood samples from each of the subjects were collected for determination of malaria parasite microscopically. A total of 311 samples of the blood were found to be infected with *Plasmodium* corresponding to prevalence 84%. The result shows that more female subjects are recorded in this study i.e. 194 (52.4%) with prevalence rate of 54%, while male patients are 176 (47.6%) with prevalence rate of 46%. The infection rate was 37.6% in subjects > 10 years of age, and 28.3% in subjects 10-18 years. Above 18 years old, the prevalence of malaria is 34.1%. However, the highest incidence is found among subjects with less than 10 years of age (87%). The incidence rate is also higher among rural dwellers compared to urban dwellers. Statistical analysis of the result shows no significant different on the prevalence of malaria among age categories used in the study and between male and female subjects. There is a need for a comprehensive strategy for preventing malaria transmission such as effective use of insecticide treated bed nets, proper environmental sanitation and use of drugs.

Keywords: Malaria; Prevalence; Incidence; *Plasmodium*.

INTRODUCTION

Malaria is currently affecting more people in the World than any other disease. It is currently endemic in over 100 countries and is one of the 10 most prevalent and deadly diseases in the world (WHO, 2009). The disease is caused by tropical parasite that kills people more than any other communicable disease except tuberculosis. Globally, approximately 214 million cases of malaria occur annually and 3.2 billion people are at risk of infection (WHO, 2011). Approximately 438,000 deaths were attributed to malaria in 2015, particularly in sub-Saharan Africa, where an estimated 90% of all malaria deaths occur (WHO, 2011). As a critical target of the Millennium Development Goals, in 2005, the World Health Assembly established a goal of reducing malaria cases and deaths by 75% between 2005 and 2015 (NPC). Hence, over the past decade, there has been greatly renewed interest in research and innovations in diagnostic methods, drugs and vaccines, and the development of control measures to eradicate malaria (Nolan *et al.*, 2014). As a result, between 2000 and 2013, the incidence rates of malaria fell by 30% globally, and by 34% in Africa (FMOH, 2010). Nigeria suffers the world's greatest malaria burden, with approximately 51 million cases and 207,000 deaths reported annually (approximately 30% of the total malaria burden in Africa), while 97% of the total population (approximately 173 million) is at risk of infection (FMOH, 2008). Moreover, malaria accounts for 60% of outpatient visits to hospitals and led to approximately 11% maternal mortality and 30% child mortality, especially among children less than 5 years (Aina *et al.*, 2013).

In Nigeria alone, 60 million people experience Malaria attack at least twice in a year, with no less than 80% of the population exposed to the disease (WHO, 2009). Scott *et al.* (2002) ascribed 90% of health problem caused by Malaria to environmental conditions. To corroborate this, Paul, (1997) emphasized the role of temperature on the

range, development, timing and intensity of Malaria outbreak. He described mosquito as hot weather insects that have fixed thresholds for survival. For instance, Anopheles mosquito and falciparum malaria transmission are sustained only where the winter temperature is kept above 16 °C. In Kano metropolis, a detailed study of 278 households made up of 3071 individuals that inhabit around ten (Maigari, 2005) non-water outlet ponds from various segments of the metropolis revealed that Malaria is the most common sickness among them. On the average, about two members of a household suffered from malaria fever monthly, with females and children having high frequencies of and vulnerable to malaria attack (Maigari, 2005). A number of factors determine the prevalence of Malaria risk namely: rainfall, temperature, stagnant pond water, open gutters, waste and many more (Tukur, 2010).

This study was conducted to determine the prevalence of malaria with respect to age, gender and socio-economic status of fever patients attending General out-patient department of Murtala Muhammad specialist hospital Kano city, Kano Nigeria.

MATERIALS AND METHODS

The study area

The study was conducted at General out-patient department of Murtala Muhammad Specialist Hospital which was located at the centre of Kano city in Kano Municipal Local Government Kano State, Nigeria. The hospital is usually attended by very low and moderate socio-economic groups and therefore, it's affordable and accessible to most dwellers of Kano city and neighbouring Local Government being the largest state owned hospital in the state. Kano State is located in the North Western part of the country between longitude 8.5°E and latitude 11.5°N; it occupies a total surface area of 20,131 km² (77,773 m²) and has a total population of approximately 11 million. The state consists primarily of Sudan savannah type vegetation, with an annual mean rainfall of 800-900 mm, a temperature that ranges between 25–40 °C (mean approximately 26 °C), and a relative humidity of 47.43 %. The climate of the study area is a tropical dry and- wet season type typical of West African savannah. The wet season lasts from May to October, while the dry season extends from November to April (Olofin, 1987).

Ethical approval

Ethical approval for the study was obtained from the Health Services Management Board, Kano State based on the consent of the Murtala Muhammad specialist hospital Ethical Committee.

Sample size determination

The sample size was calculated using the prevalence rate of malaria in Kano State, Nigeria was found to be 60% as reported by Salwa *et al.* (2016). A standard epidemiological formula (Fisher's formula for cross-sectional descriptive study) was used to calculate the sample size as follows;

$$N = \frac{Z^2 pq}{d^2}$$

Where N = Sample size

Z = standard normal distribution at 95% confidence level = 1.96

Therefore $Z^2 = 1.96^2 = 3.8416$

P = prevalence rate of 60% = 0.60

q = 1 - p, therefore q = 1 - 0.40 = 0.40

d = maximum value of probability (allowable error taken as 5%) = 5/100 = 0.05

Therefore $d^2 = 0.05^2 = 0.0025$

$$N = \frac{3.8416 \times 0.60 \times 0.40}{0.0025}$$

$$N = \frac{0.921984}{0.0025}$$

Therefore, $N = 368.79 \approx 369$
369 is the minimum sample size for the study.

Study populations

The subjects for the study were fever related patients. A total of 370 blood sample were collected from fever related patients attending General out-patient department (GODP) of Muhammad Specialist Hospital Kano city, Kano state Nigeria between May to September, 2016.

Blood sampling and examination

Blood samples were collected by pricking a clean finger with a sharp sterile needle. The following drops of blood, obtained by gentle squeezing of the finger were then collected on a glass slide. Using a forceps, the smeared slide was then transferred on to a racket and a Leishman's stain was applied on the dried filmed slide. It was then allowed to stay for 2 minutes and then washed with distilled water and was allowed to dry again for 8 minutes. The stained slide was placed on the stage in the microscope, the stage was lowered to the maximum distance from the objective revolver with the aid of coarse adjustment, a drop of oil immersion was placed on the slide and the results were observed and recorded.

Statistical analysis

The presence of malaria parasite was expressed as positive and absence was expressed as negative results in form of percentage. Mean of the data obtained from the subjects were analyzed by using paired T- test to determine the significant different between the data obtained.

RESULTS

Prevalence based on gender

This study involved two hundred and fifty (370) individual patients, 176 males (47.6%) and 194 females (52.4%), with ages ranging from 0 - 73years. Overall, 311 participants (84%) out of the total (370) were found to be positive for malaria while 59 subjects (16%) were negative for malaria as shown in Table 1. The female patients were 194 (52.4%) with prevalence rate of 54% while male patients were 176 (47.6%) with prevalence rate of 46%.

Table 1: Showing prevalence of malaria in respect to Gender

GENDER	NUMBER (%)	MALAR.+VE (%INCIDENCE)	% PREVALENCE
Male	176 (47.6%)	143(81%)	46%
Female	194 (52.4%)	168(87%)	54%
Total	370 (100%)	311	100%

Prevalence based on age

Table 2 shows the number of malaria positive cases with respect to age group distribution. The infection rate was 37.6% in subjects > 10 years of age, and 28.3% in subjects 10-18 years. Above 18 years old, the prevalence of malaria is 34.1%. However, highest incidence is found among subjects with less than 10 years of age (87%).

Table 2: Number and percentage of malaria positive cases with respect to age group distribution

AGE (YEARS)	NUMBER (%)	MALAR.+VE (%INCIDENCE)	PERCENTAGE (%)
< 10	135(43%)	117(87%)	37.6%
10– 18	105(35%)	88(83%)	28.3%
> 18	130(22%)	106(81%)	34.1%
TOTAL	370 (100%)	311	100%

Prevalence based on settlement

Table 3 below shows the prevalence of malaria with respect to settlement of the patients. Most subjects attending the hospital are urban dwellers (52.4%) due to the location of the hospital with prevalence rate of 54.3%. Rural dwellers accounted for 47.6% of the patients with prevalence rate of 45.7%.

Table 3: Showing prevalence of malaria in respect to settlement

LOCATION	NUMBER (%)	MALAR.+VE (%INCIDENCE)	PERCENTAGE
Rural	158 (47.6%)	142(90%)	45.7%
Urban	212 (52.4%)	169(80%)	54.3%
Total	370 (100%)	311	100%

Prevalence based on socio-economic status

Table 4 below shows the prevalence of malaria with respect to their socio-economic status. High incidence was recorded among rural dwellers with low income compared to urban dwellers; farmers (93%), Housewives (89%) students and children accounted for 92% each. On the other hand, the incidence recorded among urban dwellers is considerably lower; civil servant (71%), traders (67%) and so on.

Table 4: Prevalence of malaria with respect to socio-economic status of the patients

SOCIO-ECONOMIC STATUS	NUMBER	MALARIA+VE (%INCIDENCE)	PERCENTAGE (%)
Rural/ farmers	15	14(93%)	4.50%
Rural/civ. Servants	03	01(34%)	0.32%
Rural/ traders	05	04(80%)	1.29%
Rural/ house wives	35	31(89%)	9.97%
Rural/students	49	45(92%)	14.47%
Rural/children	51	47(92%)	15.11%
Urban/ farmers	03	03(100%)	0.96%
Urban/ civ. Servant	21	15(71%)	4.82%
Urban/traders	15	10(67%)	3.21%
Urban/ house wives	36	28(78%)	9.00%
Urban/ students	65	54(83%)	17.35%
Urban/children	72	61(85%)	19.01%
TOTAL	370	311	100%

DISCUSSION

This study involved two hundred and fifty (370) individual patients, 176 males (47.6%) and 194 females (52.4%), with ages ranging from 0 - 73years. Overall, 311 participants (84%) out of the total (370) were found to be positive for malaria while 59 subjects (16%) were negative for malaria. Therefore, the overall prevalence of 84% reported in this study was quite high. High prevalence (84%) recorded in this study is due the following reasons; the study was conducted during rainy season where mosquito are actively reproducing and growing. Secondly, the subjects of study are fever related patients. Several studies on malaria prevalence were conducted across Nigeria. The result of this study was inconformity with the result reported by Ekong *et al.* (2011) on prevalence of Malaria in Calabar Cross Rivers (South south) of Nigeria who recorded a prevalence of 71.4% (3013). A study conducted on Prevalence of Malaria among Children 1 – 10 Years Old among Communities in Awka North Local Government Area, Anambra State (South East) Nigeria by Nwaorgu and Orajaka, (2011) reveals that that 582 (58.2%) out of 1000 children involve in the study were positive for malaria parasites in their blood while children (1 - 3 years old) have high infection prevalence of (76.40%). The result of this study also supported a study on the prevalence of malarial parasites among pregnant women attending sir Muhammad Sunusi specialist hospital, kano, Nigeria by Taura and Oyeyi, (2009) in which the result showed that 155 (51.7%) out of 300 subjects were found to be malaria positive, while 145 (48.3%) were negative. However, the prevalence found in this study was higher than the figures obtained in Abia (Southeast) and Plateau (North central) states in Nigeria who reported prevalence of 36.1 % and 36.6 %

respectively (Nolan *et al.*, 2014). The large difference between our study and others could probably be because their study was conducted during the dry season, rather than in the raining season when malaria transmission is much higher.

In this study, Prevalence based on gender showed that more female participants were screened, and had higher prevalence of the disease. The female patients are 194 (52.4%) with prevalence rate of 54% while male patients are 176 (47.6%) with prevalence rate of 46%. The incidence of malaria is also higher among female patients (87%) compared to male patients who accounted for 81%. This may be due to the reason that, females' particularly pregnant women usually lose their resistance when they become pregnant. However, this study contradicts the findings of Nwaorgu and Orajaka (2011) who found that males may be more prone to the disease than the females.

The age distribution of patients under study (Table 2), for age group 0-10, has the highest prevalence which accounted for 37.6% with incidence rate of 87%. Age category of 10 – 18 years has the least prevalence of 28% with incidence rate of 83%. The lowest incidence rate (81%) was recorded among adult patients (above 18 years). In consistence with W.H.O report 2002, malaria cases mostly affect children below five years old. WHO (2009) maintains that children less than 5 years are more at risk of the disease because they may not have developed protective immunity against the disease and its most severe form. The prevalence of malaria decreases with increase of age. This could be attributed to the fact that individual of higher age have developed immunity against plasmodium parasite.

On the settlement and socio-economic status of the subjects, the result shows that majority of them are from urban settlement due to the fact that the hospital is located there. Urban dwellers consists of 212 (52.4%) of the subjects with 54.3% prevalence while rural dwellers accounted for 158 (47.3%) of the subjects with prevalence rate of 45.7%. However, the incidence rate of malaria according to this study is higher among rural dwellers (90%) compared to Urban dwellers (80%), and this is attributed to better health facility and good environmental sanitation in urban area than in rural area. Higher incidence was recorded among rural dwellers; farmers (93%), Housewives (89%) students and children accounted for 92% each. On the other hand, the incidence recorded among urban dwellers is considerably lower; civil servant (71%), traders (67%) and so on. This study was in line with the findings of George *et al.* (2015) on Prevalence of malaria parasitaemia among asymptomatic women at booking visit in a tertiary hospital, North central Nigeria in which the results shows that the prevalence of malaria parasitaemia is usually higher in the rural areas where mosquito breeding and transmission is intense.

CONCLUSION AND RECOMMENDATIONS

The result of this study showed that, malaria disease with high prevalence and incidence rate in Kano state, Nigeria which affect children mostly below 10 years old with prevalence and incidence rate of 37.6% and 87% respectively. The disease was found to affect more females (54%) than males (46%). The result also shows that the disease is more pronounced among individual in rural areas with low income compared to those from the urban centres. This is an indication that malaria is one of the most prevalent and deadly diseases in the world especially in developing countries.

It is recommended that much attention should be given to population living in rural areas, towns and villages where there are absent of good health care facilities. Such areas should be designated as high priority targets for malaria intervention and control programmes. These efforts should be doubled during the malaria transmission season which coincides with the rainy season. Government and Non Governmental organizations (NGO's) should also ensure that these communities have access to quality and affordable malaria drugs and insecticide treated nets which are considered as one of the most potent weapons against malaria.

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COMPETING INTEREST

The authors declare they have no competing interest

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