ORIGINAL RESEARCH ARTICLE

Plasmodium sp. infection among the people of Suleja, Niger State, Nigeria.

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Abstract: Malaria infection is a major public health problem in the sub-Sahara Africa. A study on the status of malaria parasite infection was carried out on patients visiting the Government General Hospital and Citizen Hospital (a private hospital) in Suleja Local Government Area, Niger State, Nigeria from the month of January to April, 2014. A total of 500 persons were examined, 250 persons from each of the two hospitals and grouped according to their ages, zones, occupation and sexes. The private hospital recorded the highest infection rate of 75.2% while the government hospital recorded a lower rate (41.6%) and the overall prevalence of the study was 58.4%. Madalla zone which is nearer to the centre of the town recorded the highest rate (97.5%), age group 0-10 years had the highest infection rate of 66.9%. Among the different occupations examined in this study, students had the highest prevalence of 79.7%. However, there were no significant differences in the rate of infections in these categories (P>0.05). In relation to sex, females were more infected (62.8%) than the males (53.1%) with a significant difference (P< 0.05). It is suggested that health education on the transmission, prevention and control of *Plasmodium* infection in schools, market and public places should be intensified.

Key words: Health education; Infection; Malaria parasite; Prevalence; Suleja.

Introduction

Malaria is one of the most common infectious disease and an enormous public health problem. It is commonly associated with poverty, but is also a cause of poverty and a major hindrance to economic development. Malaria infection is a major public health problem in the sub-Sahara Africa and it is estimated that the disease is responsible for 3 million deaths and 500 million infections annually worldwide (UNICEF, 2000). It is a vector borne infection disease caused by protozoan parasite of the genus *Plasmodium*. The disease also contributes greatly to anaemia among children and adult, a major cause of poor growth and development (UNICEF, 2000). A combination of factors such as large population, climate change, poor sanitation, anti-malaria drug resistance, poor planning of development programs as well as unsatisfactory health problem like malaria, grossly affects the morbidity and mortality rate as well as the economy of the developing countries such as Nigeria (Ozumba and Ozumba, 2004). Malaria parasite has been reported to have effects on some haematological parameters in many part of the world (Lesi and Adenuga, 1996). The gold standard use for malaria parasite diagnosis in Nigeria is the peripheral thick and thin blood film method. This is because it is most economical, reliable, sensitive and specific but the reliability, specificity and sensitivity of this method depends on the efficiency of the microscopist (WHO, 1991). To reduce malaria related deaths in future particularly in rural Africa strategies on quick diagnosis and treatment should be adopted. This study examined the rate of malaria infection in Suleja, Niger State, Nigeria and its relationship to sex, age, occupation and locality of the residents.

Materials and Methods

Study Area: Suleja, a Local Government Area of Niger State Nigeria is located between latitude $9^0 11'$ North and $7^0 11'$ East or 9.183^0 and 7.183^0 East, it is a city bordering the Federal Capital Territory (Abuja) with a population of 216, 578 as of 2006 Population Census. The study was carried out on individuals visiting Government General Hospital and Citizen Hospital from the month of January to April, 2014. The weather condition is a long wet season starting in mid-March and lasting till July. The short dry season, also known as the August break, lasts for about a month between July and August. The short wet season follows the August break and lasts from September to October. The long dry season follows and continues from November to mid-March. Suleja has a daily temperature range of between 21^0C to 36^0C and an average relative humidity of about 50% to reaching 70% during the rainy season. Suleja is hilly with little streams, few trees in the remote areas. Its inhabitants consist of apprentices, factory workers, civil workers and few farmers. Suleja, with recent modernization have some improvements in sewage disposal, gutters/drainage systems.

Sample population: The sample collection was carried out on in and out patient of a General Hospital and Citizen Private Hospital in Suleja local government area of Niger State. A total of 500 persons were examined, 250 persons from each of the two hospitals and grouped according to their ages, zones of residence, occupation and sexes.

Sample and data collection: The thumb was sterilized using cotton wool soaked in methylated spirit and then prick with a needle to collect blood

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sample. The sample was then spread on a clean grease free slide to make either a thin or a thick film or used on the RDT cassette. The slides, RDT cassettes were labelled appropriately with the patients' identification numbers and the data (which include their age, sex, occupation and address) were recorded.

Sample analysis: Preparation of thin film for microscopy (using the Leishman stain) was carried out as follows: A drop of the venous blood sample was collected from pricked thumb and placed at the edge of one slide and with the help of the second slide as a spreader, the blood sample is spread across the slide to make a thin film at an angle of 45^0. The thin film was allowed to air dry for some minutes (2 to 4 minutes). A Leishman stain was then poured on the film on the slide with the aid of a pipette and allowed to stain or act on the film for 8mins (to fix or preserve the red blood cells) after which the film was washed with clean water and allowed to drain dry. Examination of parasite was under X100 (objective lens) with oil immersion. The ring form or gametocytes of the *Plasmodium* species were observed (WHO, 1991).

Preparation of thick film for microscopy (using Giemsa stain) was carried out as follows: A drop of the venous blood sample was placed at the middle of the slide to achieve a coin shape. The smear was allowed to dry on a laboratory bench overnight. Giemsa stain was poured or flooded on the film with the aid of the pipette and allowed to stain or act for 45mins after which it was washed with clean water and allowed to drain dry, oil immersion at X100 objective lens was used to observe the ring form or gametocytes of the *Plasmodium* species (WHO, 1991). 2.4.3 Use of Rapid diagnosis test (RDTs) Kit

A drop of venous blood sample was collected from the lancet method into a sample well. Two drops of assay buffer was dropped into Assay Buffer well. The test result was read after 20min. The presence of two colour bands indicates a positive result to *Plasmodium falciparum.* The presence of only one band within the result window indicates a negative result. This procedure was in line with the manufacturer's instructions (WHO, 1991).

Statistical Analysis
All data collected were subjected to Chi-square analysis and value of $p \leq 0.05$ was considered significant.

Results and Discussion
A total of five hundred blood samples were collected from two (2) hospitals; Government General Hospital and Citizen Private Hospital, Suleja, Niger State. The result showed an overall prevalence of 58.4%. The private hospital recorded the highest infection rate of 75.2% while the government hospital recorded a lower rate (41.6%) infection (Table 1). The high prevalence rate recorded among patients in the private hospital could be attributed to the use of the microscopic thick and thin film method which is the golden standard for carrying out malaria diagnosis test, while the government hospital recorded the lower prevalence because rapid diagnosis test was used which rarely detect low and medium infestation. Among the four zones, Madalla which is nearer to the centre of the town recorded the highest rate (97.5%) followed by Rafinseyin (89.7%) which is at the other end of the town, then Maje (63.6%) which is at the extreme end of Rafinseyin and Kamba with the least prevalence (48.9%) is the main town (Table 5). The high prevalence rate recorded in Madalla could be attributed to poor management of waste generated by the urban dwellers. Since there usually exist no hygienic dumping site in the centre of the town, Madalla and Rafinseyin located at the outskirt of Suleja readily become dumping sites and they are further characterized by poor drainage system, this may have contributed to preponderance of mosquitoes and ecological allies. The high prevalence of *P. falciparum* malaria recorded in Maje could be attributed to the farming activities found in the area. This is true as their major source of livelihood is farming. The overall prevalence of 58.4% recorded in this work is lower than the prevalence of 87.00% observed by Ukapi and Ajoku (2001), in two rural communities in Owerri and Okigwe. This wide range of difference may be attributed to difference in climatic factors and behavioral patterns of people in the area which promote mosquito breeding and susceptibility of the people to vector bites. The result of this work is similar to the prevalence of 55.50% recorded by Mbanugo and Ejims (2000) in four different locations in Awka, Anambra state. The observed high parasitemia in age group 0-10 years with infection rate of 66.9% (Table 3) agrees with the study of Salako (2006) who reported higher prevalence among age group 0-15 with 70.0% in Ibeju Lekki LGA in Lagos state but does not agree with the finding of a similar study carried out by Ike (2000) in Abakaliki, Ebonyi state of Nigeria which showed that malaria prevalence was higher among elderly people 61-70 years with 65.0% infection rate. The sex of persons examined showed that females had the highest infection rate of 62.8% while males had 53.1% infection rate (Table 2). This however agreed with the study of Kalu *et al.* (2012) in Abia state with females 91.2% and males 80.8% infection rate. The highest rate of infection which was observed among student with 79.7% was not in agreement with the result of Chuwuezi (1991) in Owerri, Imo state where traders had the highest rate of infection. However, this study is similar to the view of the World

Health Organization on the World Malaria Day of 25th April, 2014 held at the General Hospital, Suleja, Niger State who stated that children are more at risk to malaria (most of the children fall under the category of student) due to the fact that their immune system is still developing.

Table 1: Overall prevalence of *Plasmodium* infection in Suleja

Sample site	No Examined	No Infected	Prevalence (%)
General hosp.	250	104	41.6
Private hosp.	250	188	75.2
Total	500	292	58.4

Table 2: Overall prevalence of *Plasmodium* infection in relation to sex

Sex	Number Examine	Number Infected	Percentage (%)
Male	226	120	53.1
Female	274	174	62.8
Total	500	292	58.4

There is a significant difference in the rate of infection in relation to sex, $p = 0.01$.

Table 3: Overall prevalence of *Plasmodium* infection in relation to age

Age group	Number Examine	Number Infected	Percentage (%)
0 -10	206	144	66.9
11 – 20	61	34	55.7
21 – 30	115	66	57.3
31 – 40	61	33	54.o
41 – 50	36	7	19.4
51 – 60	21	8	38.1
Total	500	292	58.4

There is no significant difference in the rate of infection in relation to age, $p = 0.831$

Table 4: Overall prevalence of *Plasmodium* infection in relation to occupation

Occupation	Number Examine	Number Infected	Prevalence (%)
Apprentices	93	44	47.3
Traders	107	54	50.5
Civil servant	65	21	32.3
Student	187	149	79.7
Other	48	24	50.0
Total	500	292	58.4

There is no significant difference in rate of infection in relation to occupation $p = 0.484$

Table 5: Prevalence of *Plasmodium* infection in relation to location

Location	Number Examine	Number Infected	Prevalence (%)
Madalla	80	78	97.5
Kwamba	90	44	48.9
Rafinseyin	58	52	89.7
Maje	22	14	63.6
Total	250	188	

There is no significant difference in rate of infection in relation to different locations, $p = 0.216$

Conclusion
In conclusion malaria is complex but curable and preventable disease. Lives can be saved if the disease is detected early and adequately treated.

This research work has shown that there is high rate of malaria parasite transmission in Suleja, the suburbs have high infection rate when compared with the centre of the town and children and females were more vulnerable to the disease. This call for proper control measures as the transmission causes high mortality rate especially in children and pregnant women and untold misery to people. Government and health agencies should try as much as possible to improve the sanitary and sewage disposal system in these areas in order to reduce breeding places of vectors of malaria parasite. The technology to prevent, monitor, diagnose and treat malaria now exist but this needs to be adapted to local conditions and applied through local and national malaria control programmes. Health education on the transmission, prevention and control of *Plasmodium* infection in schools and market places should also be intensified.

Acknowledgement

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