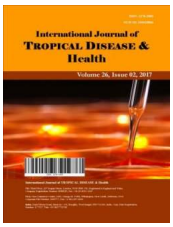

International Journal of TROPICAL DISEASE & Health

27(4): 1-7, 2017; Article no.IJTDH.35340
ISSN: 2278–1005, NLM ID: 101632866

The Prevalence of Malaria Infection among Patients Attending the Health Centre of the Federal University of Technology, Akure, Nigeria

E. T. Obimakinde[1*] and I. A. Simon-Oke[1]

[1]Department of Biology, Federal University of Technology, Akure, Nigeria.

Authors' contributions

This work was carried out in collaboration between the two authors. Author ETO managed the analyses of the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author IASO designed the study. The two authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2017/35340
Editor(s):
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Complete Peer review History: http://www.sciencedomain.org/review-history/22204

Original Research Article

Received 8th July 2017
Accepted 21st November 2017
Published 8th December 2017

ABSTRACT

Aim: This study determined the prevalence of malaria among patients having malaria symptoms that reported for malaria test at the Health Centre of the Federal University of Technology, Akure.
Place and Duration of Study: The research was carried out in the Health Centre of the Federal University of Technology, Akure, Ondo State, Nigeria between January to December 2015.
Methodology: Prior the commencement of the research work, approval was given by the Health Research Ethics Committee (HREC) of the University. A total of 2,616 patients were examined, with the ages of patients ranging from 4 years to 65 years. Demographic information such as sex, age, status (Student and Staff) and date of collection of each patient whose blood sample was collected were recorded. Malaria parasite screening was done using the thick blood film microscopy

**Corresponding author: Email: ebenobim@gmail.com;*

technique with Giemsa stain while Chi-square analysis was used to analyze the data obtained from the study.

Results: The results showed that the highest prevalence of 82 (91.1%) was recorded among the children aged 1-10, followed by age 21-30 having the prevalence of 926 (79.7%) while the lowest prevalence of 21 (56.8%) was recorded among the age group above 60 years. Also, high prevalence of 79.7% was recorded during wet season (March to October), while a lower prevalence of 75.4% was recorded during dry season (November to February) with significant difference at P = 0.001.

Conclusion: The result showed that there was high prevalence of malaria infection throughout the year among the patients. There is the need for constant check on all possible predisposition factors like breeding site of the mosquito vector. This could be achieved through public enlightenment on effective malaria control programs such as the use of insecticide treated nets, environmental management and sanitation and perfect engineering works.

Keywords: Prevalence; malaria infection; patients; health centre; Nigeria.

1. INTRODUCTION

Human malaria is a protozoan disease that is widely distributed in the tropics [1]. It is caused by the protozoan parasite of the genus *Plasmodium*. The disease is transmitted to man through the bite of an infected arthropod vector of some species of *Anopheles* mosquito.

Five species of *Plasmodium* protozoans namely, *Plasmodium falciparum*, *P. vivax, P.* ovale, *P. malariae* and *P. knowlesi* cause malaria in humans [2]. Out of the five, most deaths are caused by *Plasmodium falciparum* while the other four generally cause a milder form of malaria [2,3]. In Africa, *P. falciparum* is the major cause of the most severe form of malaria which accounts for over 60% of outpatient visits and 30% of hospital admissions in Nigeria [4].

Malaria is a complex disease that varies widely in epidemiology and clinical manifestation in different parts of the world. This variability is caused by factors such as the species of malaria parasites that occur in a given area, their susceptibility to commonly used or available antimalarial drugs, the distribution and vectorial capacity of mosquito vectors, climate and other environmental conditions and the behaviour and level of acquired immunity of the exposed human populations. In particular, young children, pregnant women, and non-immune visitors to malaria endemic areas are at greatest risk of severe or fatal illness [5].

With the rate of deaths; approximately 40% of the world's total population, mostly those living in the world's poorest countries are at risk of malaria, and is found throughout the tropical and sub-tropical regions of the world. More than three hundred million (300 m) acute illnesses and at least one million (1 m) deaths are been recorded annually due to malaria infection, there is therefore a need for constant research to be carried out in endemic areas to know the prevalence of this infection and all possible factors that could be responsible.

2. MATERIALS AND METHODS

2.1 Study Area

Federal University of Technology (FUTA) is located in Akure the capital city of Ondo State, Southwest Nigeria. Akure is located in the rain forest zone between latitude 7°15'0"N and longitude 5°11'42"E. Akure has two seasons, which includes the rain (wet) season that ranges from March to October and the dry season that ranges from November to February. Akure has an average annual rainfall of 2378 mm, with temperatures ranging from 25.2 to 28.1°C and relative humidity of 80%. The University Health Centre is located at Obakekere region of the Campus which attends to both Staff and Students of the University, also, it attends to pupils and students of FUTA primary and secondary schools.

2.2 Ethical Clearance

Prior the commencement of the research work, approval was given by the Health Research Ethics Committee (HREC) of the University, the chief medical director of the health Centre and from patients for collection of blood who were clearly informed on the aims and objectives of the research.

2.3 Blood Sample Collection

Patients who were in the health centre within the time frame of the research for malaria test were

selected for sampling. With the use of needle and syringe, through the vein, two to three milliliter of blood were collected from patients who came for malaria test in the Health Centre. The collection was done through the help of the laboratory technologist. After collection, the blood samples were transferred into an Ethylenediamine tetra-acetic acid (EDTA) container to prevent coagulation of the blood sample. Daily blood collection was done from January 2015 to December 2015.

2.4 Malaria Parasite Screening

Thick blood film microscopy was done for malaria screening. With the use of pasteur pipette, two drops of blood from the EDTA bottle was taken and placed on a clean grease-free glass slide, after which it was stained with Giemsa stain and allowed to dry for 15 minutes [6]. After 15 minutes, the stain was washed off rapidly with distilled water and allowed to dry. Two drops of immersion oil was added to the film and then viewed under the microscope at x100 objective lens for characteristic features of malaria parasite [7].

2.5 Weather Data Collection

Data of average rainfall and temperature of each month in year 2015 was obtained from the meteorology Department of the Federal University of Technology, Akure.

2.6 Statistical Analysis

Prevalence was calculated using the formula; Prevalence= $\frac{NumbersofPositiveSamples}{TotalNumberExamined}$×100.

The data generated were analyzed using the Statistical Package for the Social Sciences (SPSS) version 19. The statistical parameter that was used for the analysis of the data was the Pearson's Chi-Square Test, P at 0.05. All charts were created using Microsoft Excel.

3. RESULTS

3.1 Prevalence of Malaria among Patients

A total of 2,616 patients who were symptomatic were tested for malaria parasite, out of which 2,058 (78.7%) were positive for malaria parasite. Their results were taken to the medical Doctors and were given appropriate prescriptions of drugs.

3.2 Monthly Prevalence of Malaria Infection in Relation to Mean Rain Fall and Temperature

The month of November with an average rainfall and temperature of 78 mm and 27.2℃ respectively recorded the highest prevalence of 95.6% of malaria infection while the month of October with an average rainfall and temperature of 287 mm and 26.2℃ respectively recorded the lowest prevalence of 45.2% of malaria infection. Statistical analysis revealed that there was a significant difference (P = 0.01) in the prevalence of malaria for the months (Fig. 1a and Fig. 1b).

3.3 Prevalence of Malaria Infection in Relation to Sex

A total of 1,253 (47.9%) male and 1,363 (52.1%) female patients were tested out of which 973 (77.7%) and 1,085 (79.6%) were positive respectively. There was significant difference in the prevalence of malaria infection between the sexes (P = 0.001) (Fig. 2).

3.4 Prevalence of Malaria Infection in Relation to Status (Staff and Students)

Fig. 3 shows the Prevalence of Malaria infection in relation to Status. A total of 1,878 (71.8%) Students were tested out of which 1,592 (84.8%) were positive while out of 738 (28.2%) Staff that were tested 466 (63.1%) were positive. Statistical analysis showed that the prevalence of malaria was statistically significant (P = 0.001).

3.5 Prevalence of Malaria Infection in Relation to Age Group

Table 1 shows the prevalence of malaria infection in relation to age group. The highest prevalence of malaria infection of 91.1% was recorded in the age group 1-10 years, followed by age groups 21-30 (79.7%), 11-20 (79.2%) while the lowest prevalence rate was recorded in age group above 60 years (56.8%). Statistical analysis revealed that there was a significant difference (P = 0.027) in the prevalence of malaria in the age groups.

3.6 Seasonal Prevalence of Malaria Infection among Patients

From November to February 2015 (dry season), a total of 601 (23.0%) patients were tested for malaria parasite out of which 460 (75.4%) were

positive; while between the months of March to October (wet season), a total of 2,006 (76.7%) patients were tested for malaria parasite out of which 1,598 (79.7%) were positive. Statistical analysis showed that the prevalence of malaria was statistically significant between the seasons (P = 0.001) (Fig. 4).

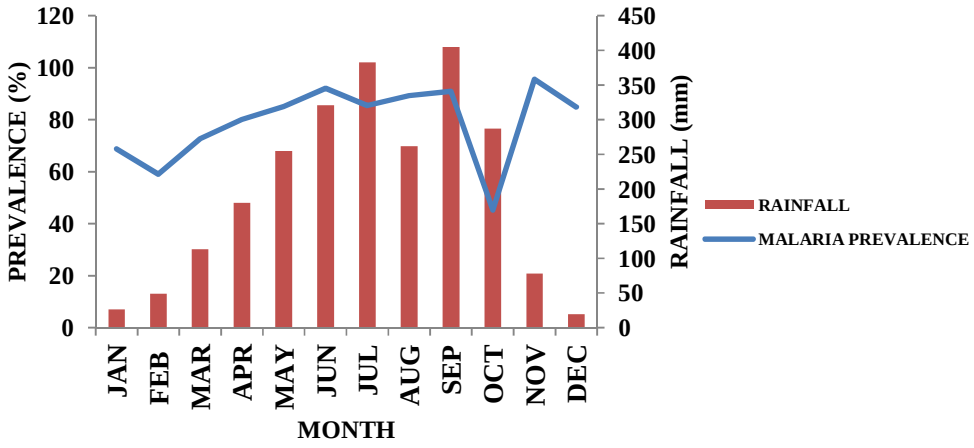

Fig. 1a. Monthly prevalence of malaria infection among patients in relation to the monthly mean rainfall in the study area

x^2=333.943, df = 1, P = 0.001

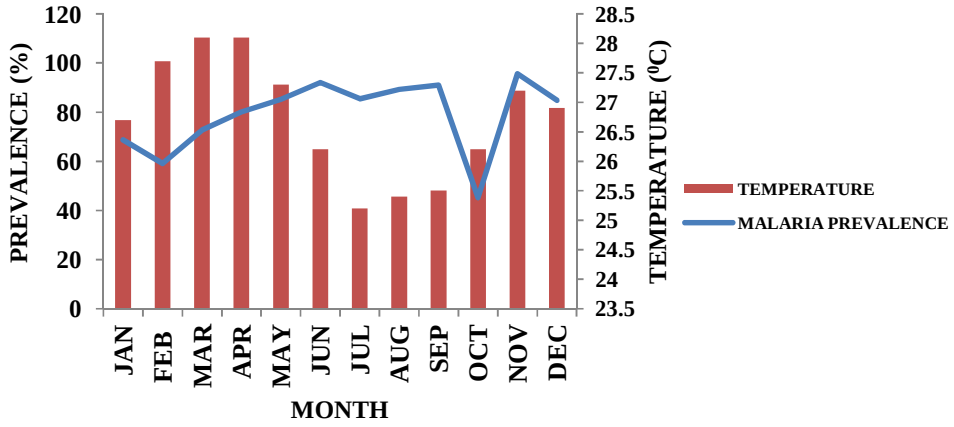

Fig. 1b. Monthly prevalence of malaria infection among patients in relation to the monthly mean temperature in the study Area

x^2=333.943, df = 1, P = 0.001

Table 1. Prevalence of malaria infection in relation to age group

Age group	Number examined	Positive	Negative	Prevalence rate (%)
1-10	90	82	8	91.1
11-20	654	518	136	79.2
21-30	1162	926	236	79.7
31-40	258	202	56	78.3
41-50	218	165	53	75.7
51-60	197	144	53	73.1
Above 60	37	21	16	56.8
Total	2616	2058	558	78.7

x^2= 14.294, df = 6, P = 0.027

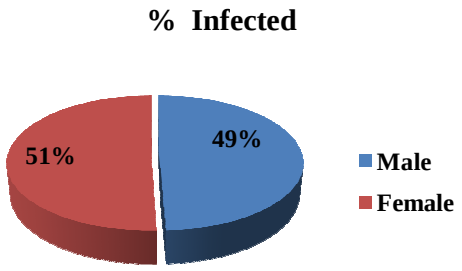

Fig. 2. Prevalence of malaria infection in relation to sex
x^2=117.901, df = 1, P = 0.001

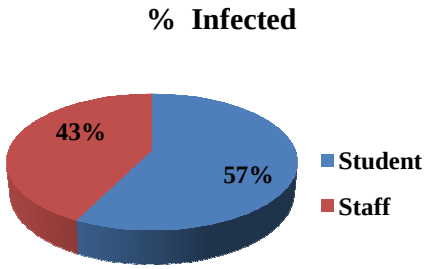

Fig. 3. Prevalence of malaria infection in relation to status
x^2=117.901, df = 1, P = 0.001

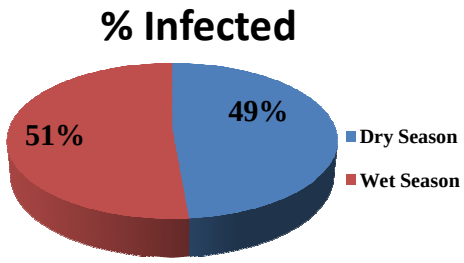

Fig. 4. Seasonal prevalence of malaria infection among patients
x^2=117.901, df = 1, P = 0.001

4. DISCUSSION

The prevalence and distribution of malaria was evaluated among patients that reported for malaria test at the Health Centre of the Federal University of Technology, Akure between January to December 2015. During the study, *Plasmodium falciparum* was the only species found which has been reported to be the major cause of malaria in Africa [1].

The 78.7% overall prevalence of malaria infection recorded among the patients is high which correlates with 76.8% prevalence recorded by [8] among students in Igbinedion University Okada and 77.4% prevalence recorded in Owerri, Nigeria by [9]. However, the result is dissimilar to 4.5% prevalence recorded by [1] in Edo State and 6.0% prevalence recorded in Maiduguri by [10]. The variation in the prevalence of malaria infection in different parts of the country might be attributed to different climatic factors [1]. The high prevalence of 78.7% of malaria infection in the study area might be attributed to several factors such as indiscriminate disposal of waste, poor water drainage system, abandoned wells, and vegetation which harbour and serve as breeding sites for female *Anopheles* mosquito [11].

For the year 2015, the World Health Organization epidemiological profile stated that, in Nigeria high transmission was 139,000,000 while the low transmission was 43,000,000 with *A. gambiae, A. funestus, A. arabiensis* being the major *Anopheles* species and *P. falciparum* 100% [12]. The pattern of distribution of malaria infection between January to December, 2015 (Fig. 1a and 1b) revealed that there was high level (78.7%) of infection throughout the year. The highest prevalence of infection was recorded in the month of November with low average rainfall and high average temperature. This could also be attributed to the presence of *Anopheles* species such as *Anopheles funestus* that thrives well during little or no rainfall [13]. The month of October with high average rainfall and low average temperature recorded the lowest prevalence, compared to the month of November; this could be as a result of a situation known as premunition which is a condition in which there is presence of parasitaemia but the disease is absent and sometimes individuals carry the parasites in their blood without disease manifestation [1].

Comparing the prevalence of malaria infection between male and female patients, it was observed that prevalence of malaria among the female patients was higher than the prevalence among the male patients, which is similar to the previous report of [8]. The difference in prevalence among the sexes could be as a result of the Genotyping in the patients as previously

reported that people with genotype AA are highly susceptible to malaria infection compare to people with genotype AS or SS. Also, their exposure to their immediate environment could be a factor since females are in constant touch with the immediate environment through their daily job or activities.

High prevalence of infection was recorded among students than staff which is similar to the high prevalence also recorded by [8] among students of Igbinedion University Okada, Nigeria. This high prevalence might be caused by the student's behavioural habits such as indiscriminate dumping of used cans, unkempt environment, improper disposal of refuse that can lead to blockage of drainages, the presence of stagnant pool of water and so on which serve as breeding sites for *Anopheles* mosquito vectors. Other likely pre-disposing factors might be as a result of overcrowding in hostels which could increase the chance of malaria parasite transmission through infected mosquitoes bite and unavailability or lackadaisical attitudes towards the use of nets or insecticide treated nets.

Among the age groups, it was observed that pattern of prevalence of malaria infection within age decreases as the age group increases with the exception of the age group 11-20 and 21-30. It was observed that age group 11-20 had lower prevalence than age group 21-30 which is the age group category of the students. Though all the age groups were susceptible to the infection, differences in habits could be as a result of the different prevalence values within the different age group [1]. The highest prevalence that was observed among children (age group 1-10) could be as a result of absence of acquired immunity, which makes them to be more susceptible to the infection; this reason could also be the cause of high prevalence among patients within age group of 11-20 [1]. The higher prevalence that was recorded among the age group (21-30) than the teenage group (11-20) could be as a result of level of exposure of the latter to the former to their environment. Older age groups that recorded lesser prevalence could be as a result of the adult having acquired immunity which they might have developed due to previous exposure to the infection [13].

5. CONCLUSION

This research has revealed that there was high prevalence of malaria infection in the study area. The study showed that patients within the children age group (1-10) are most susceptible to malaria infection, also, patterns of distribution of the disease in different seasons and among different groups is in a very high rate. Therefore, there is a need for constant check on all possible predisposition factors that could be responsible for the high prevalence, which could be achieve through public enlightenment on effective malaria control programs such as the use of insecticide treated nets, environmental management and sanitation and perfect engineering works.

CONSENT

It is not applicable.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

ACKNOWLEDGEMENT

Authors are grateful to Dr. M. O Oniya and the entire staff and corp members of the Medical Laboratory of FUTA Health Centre for their support towards the accomplishment of this research.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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The peer review history for this paper can be accessed here:
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