Malaria Parasite Infection Status of Patients attending Police Force Headquarters Clinic, Abuja, Nigeria

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Abstract:
Background: *Malaria is a life threatening disease caused by Plasmodium sp that are transmitted to people through the bite of infected Anopheles mosquitoes. A study on the status of malaria parasite infection was carried out on patient visiting the Police Force Headquarters Clinic in Abuja from the month July to October, 2019 and also to investigate the risk factors and the most effective method of diagnosis.*
Materials and Methods: *A total of 250 persons were examined and grouped according to their ages, sex, blood group, and genotype. Blood samples were collected from patients using venepuncture method. Thick blood smears were prepared and stained with field stain technique after which the microscopy was done using oil immersion x100 objective lens. Rapid diagnostic test (RDT) was also employed to determine the prevalence of malaria.*
Result: *The overall prevalence of the study was 71.6%. Age group 21 – 30 years had the highest infection rate of 79.5%. However, there were no significant differences in the rate of infection in these categories (P < 0.05). Among the different blood group examined in this study, O group had the highest prevalence rate of 79.1%. In relation to sex, females were more infected (77.2%) than males (69.9%) with no significant difference (P < 0.05). Genotype AA recorded the highest rate (72.4%). This study observed higher positivity rate for microscopy than RDT.*
Conclusion: *It is suggested that health education and proper control measures should be intensified*
Key Words: *Health Education, Infection; Malaria Parasite; prevalence, mosquito.*

I. Introduction

Malaria is a mosquitoes-borne disease caused by protozoan parasites of the Genus Plasmodium that can be transmitted by the bite of the Anopheles mosquito or by a contaminated needle or transfusion, thereby transmitting one of four protozoan parasites of the Plasmodium family; Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale and Plasmodium malariae[1]. Of these, Plasmodium falciparum is the most common and deadly[2].

Malaria is one of the most severe global public health problems worldwide, particularly in Africa, where Nigeria has the greatest number of malaria cases. This may be due to the large population; approximately 140 million inhabitants[3]. Studies reported that in Nigeria, there are approximately 60% of outpatient hospital visits in Nigeria, 30% of hospitalizations, 30% of under-five mortalities, 25% of infant mortalities and 11% of maternal mortalities[4]. In the last decade, the fight against malaria and its propagating agents in Nigeria and across Africa has not been very effective due to the emergence of resistant species of the parasites[5]. Data revealed that the country's population densities, environmental temperature of between 18°C to 29°C and suitable humidity etc. also contribute towards the spread of the disease. These also include residence and leisure activities within close proximity to stagnant bodies of water, public exposure to rural lavatories, general neglect for routine check-up or screening, monthly rainfall, etc.[6].

Malaria continues to be a major public health problem in 97 countries and territories in the tropics and subtropics[7]. Globally, approximately 214 million cases of malaria occur annually and 3.2 billion people are at risk of infection. Approximately 438,000 deaths were attributed to malaria in 2015, particularly in sub-Saharan Africa, where an estimated 90% of all malaria deaths occur. Nigeria suffers the world's greatest malaria burden, with approximately 51 million cases and 207,000 deaths reported annually[8]. Malaria transmission occurs primarily between dusk and dawn because of the nocturnal feeding habits of anopheles mosquitoes, the parasite is transmitted by female anopheles mosquitoes[9].

In many endemic countries including Nigeria, patients are usually clinically diagnosed and only a small proportion of malaria cases are tested, owing to a lack of diagnostic capabilities therefore raising a considerable uncertainty surrounding the estimate of the number of cases and deaths.

The number of RDTs available in the market has grown rapidly since their introduction in the late 1990s. It is estimated that there are over 60 brands and over 200 tests commercially available today, with an estimated 50-70 million tests used in 200810. However, of the 27 products fully evaluated for rapid diagnostic of Plasmodium sp, only 6 are designed to detect P. falciparum the major cause of morbidity and mortality in sub-Saharan Africa.

Microscopy has been the corner stone of diagnosis and is recommended for malaria diagnosis where its quality can be maintained, but the need for trained personnel, adequate reagents and equipment limit its availability and accessibility to many people in malaria-endemic areas[10].

In Nigeria, the federal ministry of health in conjunction with the millennium development goals (MDG) had proposed the goal of reducing the malaria associated rate of mortality and morbidity by half as at 2013[11]. With the inability to achieve the set target at the end of the set project date, it is necessary to conduct community-wide malaria surveys as a means of monitoring the impact and effectiveness of malaria control measures and programs at different levels[12].

II.   Material And Methods

Sample area: The study was carried out at police force headquarters clinic, Louis Edet House, Area 11, Garki, Abuja FCT Nigeria. The Nigeria Police Medical Services was established in 1975, and its primary function is rendering healthcare services to serving members of the force, retirees of the force, their immediate families, detainees in Police cells and civilians working in the establishment. The Nigeria Police Medical Services also renders health care services to the general public in cases of emergency arising from road traffic accidents, robbery attacks, fire disasters, and similar occurrences

Sample collection: Patients presenting themselves for malaria tests were informed on the significance of the study and their consents were been given before collection of blood sample. The method of blood sample collection that was employed was venipuncture technique.

Microscopic examination: The collected blood samples were analyzed within 1-2 hours of collection. Thick blood films and field staining techniques were carried out after which microscopy was done. A drop of oil immersion was placed on the stained thick films and was examined under a microscope using x100 objective. The examination was made using standard keys of Edington and Gills[13] as follows:

Many ring forms or crescent – shaped gametocytes indicate *P. falciparum.* In this way the blood films was examined and the *Plasmodium species* abundance will be noted and the results will be recorded as follows: (+) low, (++), moderate and (+++) high parasitaemia.

RDT techniques:
i.   Whole blood sample wasdispensed into the sample well of the test cassette along with a few drops of buffer into the diluent well to ease the migration of the blood sample
ii.   The kit will be left for 15 minutes before the result will then be read and recorded.

Blood group test procedure
i.   One drop each of Anti A,B, and D reagents was dropped on the white tiles at separate areas.
ii.   Patient's whole blood sample in an EDTA tube was picked by the pipette and a drop of the blood was dropped on each of the reagents on the white tiles.
iii.   A stirrer was used to mix each of the mixture to ensure a homogenous mixture.
iv.   The white tile was then held with both hands and swirled.
v.   As the white tile was been swirled, there would be a careful observation for agglutination.

Genotype Test Procedure
i.   One drop of blood sample and the AS control sample was dropped on the white ceramic tiles and mixed with water to dissolve hemoglobin
ii.   Filter paper was used to dry the acetate paper picked from the electrophoresis machine
iii.   The mixed blood samples were transferred into the cellulose acetate paper and were place immediately on the electrophoresis climber.
iv.   Readings were taking according to the visible line.

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

III.   Result

A total number of 250 patient were examined and findings were presented in the following tables:
The **Table no 1** below shows the percentage distribution of malaria parasite. An overall prevalence of 179(71%) was observed out of the 250 patients examined, however 28.4% were not infected.

Table no 2 shows the prevalence of malaria infection in relation to sex. Female record higher prevalence rate of 77.2% (44/57) than male 69.9% (135/193). However no significant difference was observed in malaria prevalence among the sexes.

Table no 1. Overall prevalence of plasmodium infection in Police Force Headquarter clinic.

Sample Site	Number Examined	Number Infected (%)	Number Uninfected (%)
PFQ Clinic	250	179 (71.6)	71 (28.4)

Table no 2: Plasmodium infection in relation to sex

Sex	Number Examined	Number Infected	Prevalence (%)
Male	193	135	69.9
Fe male	57	44	77.2
Total	250	179	71.6

There is no significant difference in the rate of infection in relation to sex, p = 0.287

Table no 3 shows the prevalence of malaria infection in relation to age. The highest prevalence rate was observed among the age group 21 – 30 and 31 – 40 with 79.5% (70/88) and 71.4% (35/49) respectively. However no significant difference was observed in malaria infection among the different age group.

Table no 4 shows the prevalence of malaria infection in relation to blood group. Patient with blood group O recorded the highest prevalence rate with 79.1% (102/129), followed by blood group A with 69.4% (41/59). The least prevalence rate was observed among patients with blood group B 56% (22/39). However, a significant difference was observed in malaria prevalence and blood group.

Table 3: Prevalence of plasmodium infection in relation to age

Age group	Number Examined	Number Infected	Prevalence (%)
0-10	22	15	68.6
11-20	58	41	70.6
21-30	88	70	79.5
31-40	49	35	71.4
41-50	20	13	65.0
51-60	8	3	37.5
61-70	5	2	40.0

There is no significant difference in the rate of infection in relation to age, p = 0.111

Table no 4: Prevalence of plasmodium infection in relation to blood group

Blood Group	Number Examined	Number Infected	Prevalence (%)
A	59	41	69.4
B	39	22	56.0
AB	23	14	60.8
O	129	102	79.1

There is a significant difference in the rate of infection in relation to blood group, p = 0.001

Table no 5 shows the prevalence of malaria infection in relation to genotype. Patient with genotype AA recorded the highest prevalence rate with 72.4% (134/185), followed by genotype AS with 71.4% (45/63). The least prevalence rate was observed among patients with genotype SS 0.0% (0/2). However no significant difference was observed in malaria infection among the different genotype.

Table no 6 shows the comparison between Rapid Diagnostic Test and Microscopy in detecting plasmodium. Of the 50 examined, only 13 were found positive and 37 were negative using RDT while microscopy had all the 50 patients' positive.

Table no 5: Prevalence of plasmodium infection in relation to genotype

Genotype	Number Examined	Number Infected	Prevalence (%)
AA	185	134	72.4
AS	63	45	71.4
SS	2	0	0.0

There is a no significant difference in the rate of infection in relation to genotype, p = 0.078

Table no 6: Comparison between Rapid Diagnostic Test and Microscopy in detecting plasmodium infection

Method	Number Examined	Number Positive	Number Negative
RDT	50	13	37
Microscopy	50	50	0

IV. Discussion

The result showed an overall prevalence of 71.6% (Table 1).The overall prevalence of 71.6% recorded in this work is lower than the prevalence of 80.44% observed by Sylvia and Sidney[14], at the barrack of the Nigeria Army 2 Amphibious Brigade, Port Harcourt in River State. This wide range of difference may be attributed to three distinct factors namely; inconsistency in weather pattern, the sub-standard living conditions of some officers and general habit of the barrack residents which promote mosquito breeding and susceptibility of the people to vector bites.

The sex of persons examined showed that females had the highest infection rate of 77.2% while males had 69.9% infection rate (Table 2). This however agreed with the study of Ocheje and Dogara[15] in Jigawa state with females 52.8% and males 48.9% infection rate. The observed high parasitaemia in age group 21 – 30 years with infection rate of 79.5 (Table 3) could be attributed to the fact that individuals within this age group are physically active and as such spend longer hours outside their homes. Thus, they face higher risk of exposure to the diseases vector.

In assessing the distribution of malaria in relation to ABO blood grouping, this study showed that blood group O had the highest infection rate of 79.1% (Table 4) this agreed with the previous studies of Tekeste and Petros[16], Otajevwo[17] and Singh *et al*.[18] which reported that O blood group was the most prevalent in association with malaria infection.

This study showed that genotype AA had the highest infection rate of 72.4%. Genotype SS had the least infection rate of 0.0% (Table 5). This agreed with the study of Tidi *et al*.,[19] where the genotype AA had the highest infection with malaria. This could be attributed to fact that blood genotype AA red blood cells unlike AS and SS red blood cells contain normal hemoglobin both in quantity and structure, thereby resulting in more oxygen binding capacity and fueling of the malaria parasite duplication and replication process. This is the major reason why malaria parasite (*falciparum* malaria) survives and thrives well in AA genotype compared to other genotypes.

This study observed higher positivity rate for microscopy than RDT (Table 6). This agreed with the studies of Garba *et al*.,[20] which reported that there is higher positivity rate for microscopy than RDT.

V. Conclusion

In conclusion malaria is complex but can be cured and prevented if the disease is detected early and adequately treated. This study determined the prevalence of malaria among 250 randomly selected patients at the Police Force Headquarters Clinic. Findings revealed a prevalence of 71.6%, thus indicating that malaria is still endemic in the study area.

This call for proper control measures as the transmission causes high mortality rate especially in young officers. Homes and surrounding environment should be kept clean: sewages must be properly disposed, weeds must be cleared often and stagnant water in gutters and cans should be kept dried.
Therefore, publicizing the awareness of malaria, it causes, effects, treatment and prevention is essential.

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