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Prevalence of Malaria and Available Practice for Its Prevention Among Patients with Febrile Illness Attending Ahmadu Bello University Teaching Hospital, Zaria, Nigeria

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Abstract

Malaria is a major public health challenge in Nigeria and causes negative impacts on the economy of the country and other endemic areas. Cross sectional Hospital base study to determine the prevalence and practice available for malaria prevention was undertaken among patients with febrile illness attending GOPD of Ahmadu Bello University Teaching Hospital Shika-Zaria, Nigeria. Questionnaires were administered to subjects to obtained demographic data and venous blood sample was collected. Blood smear (Giemsa stained thick and thin films) were used for microscopic investigation of malaria parasites. The study revealed that, of the 216 febrile patients, 45.4% had malaria, of which, 35.7% were males and 64.3% were females. High prevalence of 66.7% was recorded in age group >60 years (X^2 =1.98, P>0.05). Exactly 30.1% use mosquito treated net for protection against malaria, whereas 28.2 uses insecticide, and only 6.5% practice good sanitary. *Plasmodium falciparum* shows highest prevalence of 80.6% and no infection was cause by *Plasmodium ovale.* The study showed that the incidence of malaria among febrile patients was high in spite of various control measures. These data will therefore be found useful in planning intervention healthcare preventive programs especially on public enlightenment to strengthen and scale up various malaria control programs.

Keywords

Malaria, *Plasmodium falciparum*, Giemsa Stain, Prevalence, Microscopic

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1. Introduction

Malaria is the most detrimental infectious disease in tropical and subtropical regions of the world as well as community health challenge in Nigeria [1]. According to WHO report in ninety one countries, an estimates of 216,000,000 cases of malaria was recorded in year 2016 with 445 000 deaths due to malaria globally [2]. In Africa, malaria is the second cause of death after HIV/AIDS and claim more lives than in any other continent, with over 90% of deaths recorded worldwide [1; 3; 4]. Children below 5 years account for 74% of all deaths [5]. The disease inflict heavy burden on economic development with social consequences [6; 7].

Insects are major vectors that transmit several diseases

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especially in the tropics [8]. *Anopheles gambiae* and *Anopheles arabiensis* are the main species that transmit malaria [9; 10]. Malaria can be transmitted from one host to another via sporozoite carrying female anopheles mosquitoes, transplantation, congenital transmission, blood or blood products transfusion, needle sharing among intravenous drug addicts and accidental nosocomial transmission [11, 12].

Plasmodium falciparum and *Plasmodium vivax* causes the most severe form of malaria with major death while *P. ovale* and *P. malariae* usually cause a milder form of malaria that is hardly lethal [13]. *P. falciparum* is responsible for high mortality and morbidity associated with fever, severe anaemia, loss of body weight, cerebral malaria and parasitemia affecting people of all age groups [14-18]. In spite of all effort by WHO, government and private organizations, malaria parasites remains endemic in the tropical region [19].

It is necessary to distinguish all cases of fever and diagnose them correctly to identify their causative agents in other to treat appropriately. Malaria is a major factor that causes renal and hepatic mal-functioning in countries where malaria particularly occurs [20-22]. The seriousness of malaria has been connected with a rise in the level of liver enzymes in the body [23]. The Nigeria National Malaria Therapy Surveillance Report shows high prevalence of the disease (39.5% to 75%). This study was carried out to determine the prevalence of malaria and the practices available for its prevention among patients attending Ahmadu Bello University Teaching Hospital, Shika-Zaria-Kaduna State, North West Nigeria.

2. Methodology

2.1. Study Area

The study was carried out in Ahmadu Bello University Teaching Hospital, Zaria of Kaduna state, North West Nigeria. The coordinates are along latitude 10°.20'N and longitude 7°.45'E. Kaduna State is located at the centre of Northern Nigeria.

2.2. Study Design

The study was a cross-sectional hospital based to determine the prevalence of malaria in Ahmadu Bello University Teaching Hospital, Zaria, Kaduna State.

2.3. Target Population

All patients attending the General Out Patients Department (GOPD) at ABUTH with febrile illness were recruited for the study. A total of 216 subjects comprising of 75 males and 141 females presenting with malaria were enrolled for the study.

2.4. Inclusion Criteria

Patients of both sexes and all age groups with febrile illness attending Ahmadu Bello University Teaching Hospital, Shika, Zaria, North West Nigeria, were included in the study.

2.5. Exclusion Criteria

Patients that do not manifest any sign and/or symptom suspected to be malaria were excluded from the study. Patients that do not give their consent to participate in the study were excluded

2.6. Data Collection

Research assistants were trained in basic interviewing techniques. The structured questionnaire was pre-tested for flow of questions and for validity. The structured questionnaire were given to patients/guardians who gave their consent in order to get information concerning their socio-demographic details, symptoms of the disease and protective measures to prevent infection.

2.7. Sampling Techniques

A purposive sampling technique was used.

2.8. Sample Collection and Handling

Blood sample was collected at GOPD of ABUTH Shika, Kaduna State, Nigeria, between the months of August to November, 2016. Each participant's upper arm was fastened with a tourniquet, the site for blood collection was wiped with cotton wool soaked in methylated spirit to clean and sterilized the area. A 5 ml syringe with a 21 g needle was used to withdraw 4 mls of blood from each patient and was transfer into an EDTA (Ethylene Diamine Tetra-acetic Acid) bottle for malaria parasite determination. A dry cotton wool was placed at the point of venepuncture while the needle was gently removed and sharps were safely disposed in the sharp box.

2.9. Diagnosis of Malaria Parasites

Thick and thin film stained with Giemsa was prepared for the microscopic examination of the malaria parasite. The thin films were fixed with methanol and all films were stained with 3% Giemsa stain of pH 7.2 for 45 min [24]. Blood films were examined microscopically using 100X (oil immersion) objectives as described by [25]. The thick films were used to determine the parasite densities while thin films were used to identify the parasite species and infective stages. For thick films, the ring form, trophozoites and gametocytes was looked for. The presence of *Plasmodium species* at one per 100 high-power thick fields was considered to be substantial under oil immersion by a train microscopist.

2.10. Statistical Analysis

Data from all the questionnaires was coded, entered and analyzed using statistical package for social science (SPSS), version 23. Chi-square was used to determine the significant relationship between the demographic data.

3. Results

The results showed that the overall prevalence of malaria as determined by microscopy in the study area was 45.4%. With respect to gender discrepancy, 35.7% were males and 64.7% were female (Tables 1).

Table 1. Frequency and distribution of malaria infection with respect to gender.

Sex	No. Examined (%)	Malaria Parasites (%)
Male	75 (34.3)	35 (35.7)
Female	141 (65.7)	63 (64.3)
Total	216	98

Table 2 shows the distribution pattern of malaria among participants with respect to age, educational background and marital status. Those in the age group greater than 60 years had the highest incidence of malaria infection of 66.7% while the age group 51-60 years had the least incidence rate of 33.3%. On the educational status, those that have tertiary education had the highest prevalence of malaria 52.0%, with 49.0% females and 59.0% males while the primary had the least 34.0% (Table 2). In the marital status, the married had 49.0% prevalence of malaria while the single had 42.0%.

However, among the weight group, the highest prevalence of malaria 63.0% was recorded among 41-50 weight group (Table 3). Also, the Yoruba ethnic group had the highest prevalence of malaria 54.0% than other tribes. In the occupational groups, the unemployed had the incidence of 46.0% compared to the employed 44.0% (Table 3).

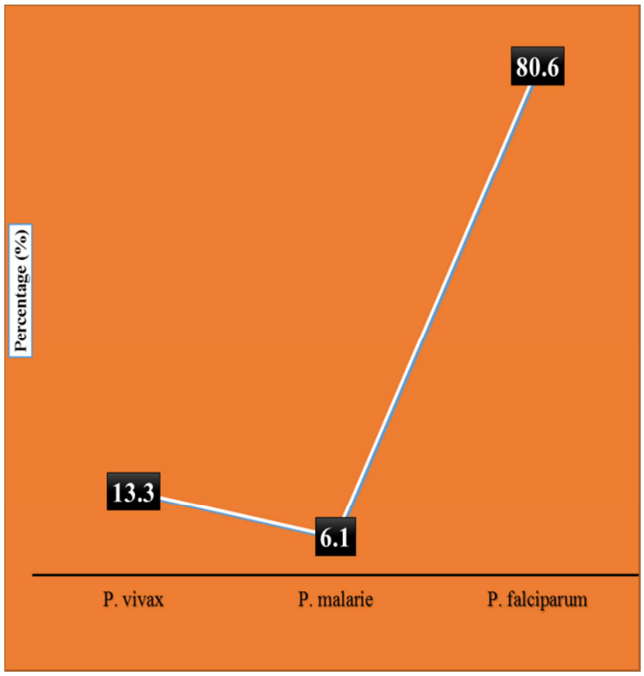

Figure 1. Prevalence of *plasmodium* species observed in the study area.

On the prevalence of *Plasmodium* species observed in the study area, the result reveals that *P. falciparum* was 80.6%, *P. vivax* was 13.3% and *P. malarie* was 6.1% (Figure 1). Also, Figure 2 shows the practice available for protection against malaria infection by respondents. The result revealed that, 30.1% of the study subjects uses mosquito treated nets, 28.2% uses insecticides at home. 10.6% reported that they treat with drugs, 6.5% reported good sanitary measures and 5.1% uses save food and water (Figure 2).

Table 2. Distribution of malaria among participants with respect to age, education and marital status.

Age group (years)	No. Examined	No. Positive (%)	Male Examined	Male Positive (%)	Female Examined	Female Positive (%)
1-10	38	13(34)	11	6(54.5)	27	7(25.9)
11-20	52	20(38)	26	7(26.9)	26	13(50)
21-30	55	29(53)	15	10(66.7)	40	19(48)
31-40	38	22(58)	10	6(60)	28	16(57)
41-50	18	7(38.9)	6	3(50)	12	4(33.3)
51-60	9	3(33.3)	3	1(33.3)	6	2(33.3)
>60	6	4(66.7)	4	2(50)	2	2(100)
Total	216	98(45)	75	35(46.7)	141	63(45)
Education	$X^2 = 4.6$,		df =3	P>0.05		
Non-formal	36	15(42)	10	2(20)	26	13(50)
Primary	44	15(34)	16	7(44)	28	8(28.6)
Secondary	65	31(48)	27	13(48)	38	18(47)
Tertiary	71	37(52)	22	13(59)	49	24(49)
Total	216	98(45)	75	35(47)	141	63(45)
Marital Status	X^2 =5.05	df = 1	P > 0.05			
Married	110	54(49)	29	14(48)	81	40(49)
Single	106	44(42)	46	21(46)	60	23(38)
Total	216	98(45)	75	35(47)	141	63(45)

X^2 =1.98, d.f. = 6, P>0.05 for age group

Table 3. Prevalence of malaria among participants with respect to weights, ethnicity and occupation.

Weights	No. Examined	No. Positive (%)	Male Examined	Male Positive (%)	Female Examined	Female Positive (%)
11-20	10	1(10.0)	3	0(0.0)	7	1(14.3)
21-30	36	11(31)	14	7(50)	22	4(18.2)
31-40	25	12(48)	12	4(33.3)	13	8(61.5)
41-50	35	22(63)	9	4(44.4)	26	18(69)
51-60	42	24(57)	19	11(58)	23	13(57)
60-70	28	14(50)	10	4(40)	18	10(56)
70-80	22	9(41)	3	3(100)	19	6(31.5)
81-90	14	5(35.7)	4	2(50)	10	3(30)
91-100	4	0(0.0)	1	0(0.0)	3	0(0.00)
Ethnicity	X^2= 2.52	df = 3		P>0.05		
Hausa Fulani	136	65(48)	53	23(43)	83	42(51)
Yoruba	24	13(54)	6	3(50)	18	10(56)
Igbo	7	1(14.3)	1	0(0.0)	6	1(16.7)
Others	49	19(39)	15	9(60)	34	10(29)
Total	216	98(45)	75	35(47)	141	63(45)
Occupation	X^2= 16.1	df =1	P > 0.05			
Employed	75	33(44)	31	17(55)	44	16(36)
Unemployed	141	65(46)	44	18(41)	97	47(48)
Total	216	98(45)	75	35(47)	141	63(45)

X^2 = 8.93, df = 8, P > 0.05 for Weight group

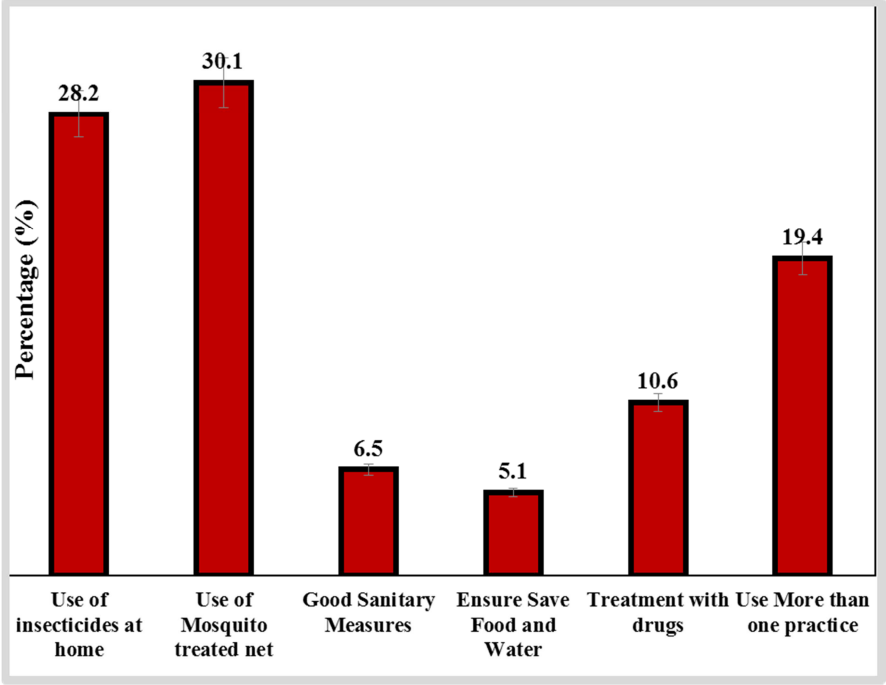

Figure 2. Practice available for protection against malaria infection in the study area.

4. Discussion

Malaria is an infectious disease and is one of the most widely spread health hazards in tropical and subtropical regions [1]. It is ranked among the most frequent causes of morbidity and mortality especially among children [26; 27]. From this study, the result shows that the prevalence of malaria (45.4%) in the region under investigation is still relatively high among the study group. Thus, the prevalence is possibly related to stagnant waters which are good breeding ground for different species of anopheles vectors, warm temperatures [28], exposure to malaria parasites, occupational activity like agriculture and poor environmental condition. The prevalence of malaria based on gender have been reported by several researchers [14; 16; 29; 30]. Some researchers have reported higher prevalence in male [27] while other in females [31; 32]. More females had malaria than males and could probably be because males are either more immune to malaria than females or due to environmental and social factors.

The prevalence as reported in this study is similar to the result obtain by Afolabi *et al.*, [33] who recorded a prevalence of 45.79% in Akure, Nigeria. However, the

prevalence rate is lower than the result reported by Udoh *et al.,* [34] with 71.4% in Calabar, Cross River State but significantly higher than the figures obtain by Onyido *et al.*, [35], Alhassan *et al*., [36], and Shukla *et al.*, [37] with 20%, 17%, and 18% in Anambra, Sokoto and India respectively. The difference in the prevalence rate between this study and that of Onyido, *et al*., Alhassan *et al*., and Shukla *et al.*, [35; 36; 37] could probably be because their study was conducted during the dry season. Three species of *Plasmodium* were identified (*Plasmodium falciparum, Plasmodium vivax and Plasmodium malarie*) of which *Plasmodium falciparum* which causes the most serious type of malaria was highest among the study subjects with 80.6% *falciparum* malaria (Figure 1). Olasehinde *et al*. [38] and Okonkwo *et al*., [39] reported an incidence rate of 80.5% and 69% respectively in South-western Nigeria. The high incidence rate could result to cerebral malaria in children, maternal anaemia and low birth weight and death as reported in earlier studies [38; 40; 41].

Age-specific prevalence shows that infection rates increased and then decreased with increasing age. The vulnerability of malaria among the age groups reveal that those in the age groups >60 years might have low immune response against malaria infection or could be attributed to inappropriate use of mosquito treated net. It could be that there were exposed to adverse environmental and climatic conditions which make them vulnerable to attacks. The low prevalence among the age groups 51-60 years could be attributed to the cautious habit of protecting themselves from the bite of the vector.

However, when prevalence rates obtained from this research were ranked on the basis of occupation, the unemployed had the highest prevalence of infection (46%). This could probably be because they often move from place to place in search of jobs and trade and thus expose them to adverse conditions which make them more vulnerable to attacks by mosquito vectors and other disease-causing agents. The rate of malaria infection among the weight group increases and then decreases with increase in weight as those in the weight group 41-50 had more malaria (63%) and those in the weight group 90-100 do not have malaria. One possible reason could be that the weight group with the highest incidence were within the age vulnerable age group.

The use of insecticide, healthy life style, personal hygiene, healthy environment and sleeping under unbroken net will in no doubt help to reduce the transmission rate among the populace. In this study, the participants use more of mosquito treated net (30.1%) followed by the use of insecticides at home (28.2%) with few having good sanitary measure (6.5%) and those that ensure save food and water were 5.1%. This practice has been recommended to minimise the transmission rate of malaria among the populace [42]. This study emphasized the need for enlightenment campaign to further educate the people on malaria prevention in other to reduce the mortality and morbidity associated with the disease.

5. Conclusion

In this study, the incidence of malaria among febrile patients was high in spite of various control measures. Hence, there is need to strengthen and scale up various malaria control programs while ensuring proper implementations of programs and activities through effective monitoring and evaluation. There should be an enlightenment programme in the study area because some do not observe this malaria preventive measures.

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Informed Consent

Written informed consent was sought from participants/guardian preceding enrolment into the work

Ethical Approval

Ethical clearance for this study was obtained from Health Research Ethics Committee of Ahmadu Bello University Teaching Hospital (ABUTH) Shika, Zaria, Kaduna State, Nigeria. (Protocol number; ABUTH/HREC/U10/2016)

Competing Interests

Authors have declared that no competing interests exist.

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