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FREQUENCY AND ARRAY OF MALARIA INFECTION AMONG UNDER FIVE YEARS PYRETIC CHILDREN ATTENDING EMERGENCY PAEDIATRIC UNIT OF UNIVERSITY OF MAIDUGURI TEACHING HOSPITAL, MAIDUGURI, BORNO STATE

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Abstract: Malaria has continued to be a major public health challenge in Nigeria with the under-five aged- children and pregnant women being the most affected. The recent epidemiological profile of the disease is vigorous owing to the continuous variant in various determinants however, there is need for periodic re-evaluation. The study aimed to determine the frequency of malaria infection among under-five age children and the effect of various determinants. In this cross-sectional study, 160 in and outpatients aged below 5 years with fever or history of fever within 72hours were enrolled. Relevant information was obtained and recorded using a questionnaire. Thick blood films were prepared from a finger or heel prick for each of the patients and subjected to microscopy. The frequency of malaria infection was 119(74.4 %.) Age, sex, socioeconomic class, temperature at presentation as well as ownership of insecticide treated nets had a significant effect on the frequency of malaria infection. Only P. falciparum was seen in all the positive slides. The parasite density was generally high with 67(56.3%) having parasite densities ≤100/µl and only 8.4% had a parasite density of ≥1000/µl. Parasite density increased meaningfully with increasing age as well as other studied factors had significant effect on parasite density. A Prevalence of malaria infection was high in the population studied. It is characterized by high density parasitaemia and hence the need to interpret positive results with carefulness. There is need to toughen and scale up countless malaria control programs while ensuring proper implementations of programs and activities through active monitoring and assessment.

Keywords: Parasitaemia, Parasite density, a malaria parasite. Nigeria.

The Background of the study

Malaria is one of the most significant causes of morbidity in the world. It is a vector borne infectious disease caused by a protozoan genus *Plasmodium.* The disease is transmitted by female Anopheles mosquitoes which carry infective sporozoite stage of the parasite in their salivary glands (Akinleye, 2009). It is transmitted from one person to another through the bite of a female Anopheles mosquito that is infected with one of the four species of Plasmodium: *Plasmodium ovale, Plasmodium falciparum, Plasmodium vivax* and *Plasmodium malaria*. In Nigeria, malaria is endemic in a rural areas as well as in an urban settings. In the southern part of the country the transmission rate is approximately uniform throughout the year (Nwaorgu and Orajaka, 2011).

Agricultural activities which takes place frequently during the rainy season period of the year favors the breeding of mosquitoes and this makes the effects of malaria apparently evident in rural areas due their proximity to farmlands (Kalu *et al.,* 2012). The degree of malaria infestation varies from region to region in Nigeria (Onwuemele, 2014). Globally, the disease caused estimated 453 000 under – five deaths in 2013. Between 2000 and 2013, an expansion of malaria interventions helped to reduce a malaria incidence by 30 % globally, and by 34% in Africa. During the same period, malaria mortality rates decreased by an estimated 47% worldwide and by 54 % in Africa.

In <five age group, mortality rates have dropped by 53 % globally, and by 58 % in Africa (WHO, 2014). WHO noted that progress in adopting and rolling out preventive therapies for children has been even slower than ever? In 2013, only six of 16 countries where WHO recommend preventive therapies for children under five have adopted the treatment as national policy. Only one country has accepted the recommendation on preventive therapy for infants (WHO, 2014).

In sub-Saharan Africa, infectious diseases continue to be a serious public health threat (Marotta, Di Gennaro, Pizzol,

Madeira, Monno, Saracino, Putoto, Casuccio, & Mazzucco, 2018). Malaria is one of the commonest infections, disproportionately affecting children and pregnant women. In 2019, estimated 409, 000 people died of malaria, out of which 274, 000 were young children, and 94% of the infections and deaths happened in Africa (Communicable Disease Control [CDC], 2019; World Health Organization, 2020).

Although several *Plasmodium* species are liable for malaria, only a few of them cause most infections. Each year, there are estimated 300-500 million clinical cases. Malaria is estimated to kill more than 1 million people annually, the majority of whom are young children. Ninety per cent of malaria cases in the world occur in Africa south of the Sahara. Children under 5 years of age are the worst affected by malaria. It is one of the leading causes of death among young children, (Akindele, 2017). Nigeria bears 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 (World Health Organization, 2014). Moreover, malaria accounts for 60% of out-patients visits to hospitals and led to approximately 11% maternal mortality and 30% child mortality, especially among children less than 5 years (WHO, 2014; Nigeria Federal Ministry of Health National Malaria Control Programme, [NFMHNMCP], 2013). Malaria is caused by plasmodium falciparum, and the mosquitoes Anopheles gambiae, Anopheles funestus, Anopheles arabiensis, and Anopheles mouchetti are the major vectors that cause year-round transmission (WHO, 2015; Kar, Kumar, Singh, Carlton & Nandu, 2014). The devastating disease affects the country's economic productivity, resulting in an estimated monetary loss of approximately 132 billion Naira (about 700 million USD) in treatment costs, prevention, and other indirect costs (Federal Ministry of Health, 2012; WHO, 2012).Children under five years are one of the most susceptible groups affected by malaria, severe anemia, hypoglycemia and cerebral malaria are features of severe malaria more commonly seen in children than in adults (WHO, 2019). Children's susceptibility to diarrhea, respiratory infections, and other illnesses increases when they develop repeated malaria infections (Greenwood, 2017). An estimated 2% of children who recover from cerebral malaria develop learning impairments and disabilities, including epilepsy and spasticity, resulting from the brain damage caused by the infection (Murphy & Breman, 2011). In general, malaria could cause severe outcomes in children in three major ways: First, since children do not usually have acquired immunity, they are more likely to develop severe malaria manifested by seizures or coma (cerebral malaria), which can cause emergency death. Second, they are also likely to develop it through complications related to repeated infections such as anemia. Finally, it causes low birth weight when it happens during pregnancy and increases the risk of death in the first mouth of life (WHO, 2018).

With all the above complications associated with a malaria *parasitaemia* infection in mind, the prevalence and pattern of malaria *parasitaemia* among under five years febrile children at the University of Maiduguri, Teaching Hospital Maiduguri

Results

160 subjects were recruited in the study, with 45.6% male and 54.4% female. The prevalence rate of the parasites was 74% with an average parasite density count of 5640ul as in table 1. The occurrence of the disease in relation to age, shows that children within 7-12 months old has the highest population of 25.6% with an infection rate of 21%, followed by 55.60 months old with16.3% and an infection rate of 20.2% table 2. According to clinical details which represent the happenings as always with fever has the highest 70.6% followed by headache 50% and the least was vomiting with 20.6. The temperature was graded as normal with 34.4%, low grade 45% and high grade 20.6% respectively. The prevention and control measures was focused on the use of treated net with 90%, self-repellent 21.3%, mosquito coil 49.4%, use of clothes 43.8% and draining of drainage 12.5%. Table 3. The Parasites density count of the various age group in months shows that at 100ul of those between0-12months old has the highest followed by 13-24months old and the least was 37-48 months at 100-999ul. While the parasite density in relation to gender shows female has the highest at 100-999ul table 4. The economic toll of both preventive and curative measures of malaria on families may enhanced with the following factors such as environmental pollution contribute the highest with 95.6% while lack of awareness contribute least.

Table 1; Distribution of Malaria infection among Under 5 Children Attending EPU of UMTH Maiduguri.

Gender	No. Examined	Positive (%)	Parasite Density	Negative (%)
Male	73 (45.6%)	56(47.1%)	2,8000µl	18(43.9%)
Female	87(54.4%)	63(52.9%)	2,840µl	23(56.1%)
Total	160(100%)	119(74%)	5,640µl	41(26%)

Table 2; Occurrence of malaria infection in relation to age and sex of patients in the study area

Age(months)	No .Examined (%)	Gender (%)		Result (%)	
		Male	Female	Positive	Negative
0 – 6	16(10)	8(10.9)	8(9.2)	14 (11.8)	2(4.9)
7-12	41(25.6)	14(19.2)	27(31)	25(21)	16(39)
13-18	14(8.8)	9(12.3)	5(5.7)	9(7.6)	5(12.2)
19-24	27(16.9)	13(17.8)	14(16.1)	22(18.5)	5(12.2)
25-30	13(8.1)	7(9.6)	6(6.9)	9(7.6)	4(9.8)
31-36	13(8.1)	5(6.8)	8(9.2)	9(7.6)	4(9.8)
37-42	2(1.3)	1(1.4)	1(1.2)	1(0.8)	1(2.4)
43-48	4(2.5)	3(4.1)	2(2.3)	2(1.7)	2(4.9)
49-54	4(2.5)	2(2.7)	2(2.3)	4(3.4)	0(0)
55-60	26(16.3)	11(15.1)	15(17.2)	24(20.2)	2(4.9)
Total	160(100)	73(45.6%)	87(54%)	119(74%)	41(26%)

Table 3. Distribution based on clinical details of patients in the study area

Clinical details	**Always (%)**	**Response sometime (%)**	**Not available (%)**
Fever	113(70.6%)	25(15.6%)	22(13.8%)
Headache	80(50%)	28(17.5%)	52(32.5%)
General body pain	71(44.4%)	28(17.5%)	61(38.1%)
Refusal of food	48(30%)	32(20%)	80(50%)
Diarrhea	41(25.6%)	25(15.6%)	94(58.8%)
Vomiting	33(20.6%)	31(19.4%)	96(60%)
Abdominal pain	37(23.1%)	38(23.8%)	85(53.1%)
	Normal	**Low-grade**	**High grade**
Temperature	55(34.4%)	72(45%)	33(20.6%)
Prevention/Control			
Use of T/Net	Yes =144(90%)	No =16 (10%)	
Self-repellant	Yes =34(21.3%)	No = 126(78.8%)	
Mosquito coil	Yes =79(49.4%)	No = 81(50.6%)	
Clothes	Yes= 70 (43.8%)	No= 90(56.2%)	
Drainage	Yes= 20(12.5%)	No= 140(87.5%)	
Treatment	Treated (%)	Not Treated (%)	
	117(73.1%)	43(26.9%)	
Prescribed drugs	Yes = 40(25%)	No = 120(75%)	
Antibiotics	YES 30 (18.8%)	NO 130 (81.2%)	

The above indicates clinical factors that might be responsible for malaria infection in Maiduguri.

Table 4. The parasite´s density of a various age group among the population in the study area

Age in months	**Parasite density**		
	100ul	**100-999ul**	**1000ul**
0-12	24	11	4
13-24	13	15	3
25-36	10	7	1
37-48	2	1	0
49-59	18	8	2
Male	27	20	2
Female	32	33	7

Table 5. An Economic toll of both preventive and curative measures of malaria on families

Factors	**Yes (%)**	**No (%)**
Environmental pollution	153(95.6%)	7(4.4%)
An Open water source in household	140(87.5%)	20(12.5%)
Availability of antimalarial drugs,	71(44.4%)	89(55.6%)
Poverty	141(88.1%)	19(11.9%)
Lack of awareness	110(68.8%)	50(31.3%)
Awareness campaign	110(68.8%)	50(31.3%)
Parent/guardian occupations of patients in study area		
Farmer	13(8.1%)	
Skilled laborer	34(21.3%)	
Business	66(41.3%)	
Civil servant	47(29.4%)	

Discussion

The frequency of malaria infection of 27.7% in this study suggests that malaria remains a major cause of morbidity among the under-five aged-group in Maiduguri and environs despite several control measures. The observed prevalence is similar to 26% report by (Ben-Edet *et al.,* 2004) from Lagos and 27-29.5% by (Ikeh *et al.,* 2002) from Jos, Nigeria. However, other studies have found higher prevalence. This is not surprising as the lower care health facilities are the first point of contact, while the tertiary facilities being referral centers may be seeing patients who might have had previous treatment, including antimalarial Although age is an important determinant of malaria parasitaemia in malaria, stable area, the prevalence of malaria infection in this study did not differ significantly between the age groups.

The results showed a high prevalence of malaria infection among the aged group 7-12 months 25(21%) and equally at 54-59 months aged group with 24(20.2%), also showed the high level of malaria cases, among the aged group 36-42 months representing 1(0.8%), and 42-48 months aged group representing 2(1.7%), a low level of malaria infection among male compared to female children.

The results shown a high level of malaria infection at aged of 7-12 months with 10 representing (22.2%) and equally at 19-24 months aged group with 8 representing (17.8%) also showed the high level of malaria cases, aged group 43-48 months with 2 representing (4.4%) an equivalent to the aged group 49-54 with 2 representing (4.4%) had low level of malaria infection among male children. This finding may not be surprising as contrast was within the under-five years who are known to share the same immunological features regarding immunity to malaria. This is similar to the findings of (Akinbo *et al*., 2009) from Benin City, Nigeria. Other studies comparing under-five children with older children and adults have consistently shown a higher prevalence of malaria infection among the under-five group. However, Ikeh and Teclaire 2008 reporting from Jos, Nigeria found significant difference in the prevalence of malaria parasitaemia within the under-five age group. The reason for the difference in finding is

not clear. On the other hand, parasite density increased significantly with increasing age. In malaria, stable area like Nigeria, most children experience their first malaria infections during the first or two years of life. It is known that the pyrogenic threshold of parasite density in a malaria adolescent individual increases in increasing numbers of clinical episodes of malaria until premunition is attained.

The above indicates clinical factors that might be liable for malaria infection in the study area, Such as fever 113 of the respondents representing (70.6 %) said their children always had fever when they were infected with a malaria parasite, 25(15.6%) of the respondents said their children had fever sometime, while 22(13.8%) of the respondents said their children do not show any sign when they are infected with malaria. The results also indicate that 80 representing (50%) half of the respondents said their children always had headache when they were infected with malaria parasite, 28 representing (17.5%) of the respondents said their children had a headache sometime, only 52(32.5%) of the respondents said their children do not had a headache even when they were infected with malaria parasite. Seventy-one representing (44.4%) of the respondents said their children always had General body pain when they had malaria infection, while 28 representing (17.5%) said their children do sometimes had general body pain,61 (38.1%), of the respondents said their children do not had general body pain when they were infected with malaria parasite. Forty-eight 48 representing (30%) of the respondents said their children always refusing food when they are infected with malaria parasite, 32 representing (20%) said their children do Refused of food, sometimes when infected with malaria parasite while ,80 representing (50%) half of them are not refusing food even when infected with malaria parasite.

Still on the same table 5 which shown that 41 representing (25.6%) of the respondents agreed that their children always had Diarrhea , while 25 representing (15.6%) of the respondents agreed their children had Diarrhea sometimes when they are infected with malaria , a large percentage of the respondents do not experienced an episode of Diarrhea 94 representing (58.8%). A small number of respondents experience Vomiting always with 33(20.6%), Also very small of the respondents said their children had Vomiting sometime(19.4%), then 96 representing (60%) of the respondents do not experienced vomiting at all-time even when infected with malaria parasite. Thirty-seven of the respondent representing 37(23.1%) agreed their children had abdominal pain always when infected with malaria ,38 representing (23.8%) of the respondents said their children sometimes developed Abdominal pain, while a majority of them 85 representing (53.1%) do not experienced abdominal pain at all when infected with even when infected with malaria, then a majority of the patients had fever 72 representing (45%) 0f the children had a low grade temperature even when they were infected with malaria parasites, while 55 of them representing (34.4%) of the children had level of normal temperature, followed by 33 representing (20.6%) of children had high grade temperature when they are infected with malaria parasite. Still on table 5 which shows the prevention and control measures of malaria infection. The results indicate that a majority of the respondents one hundred and forty-four representing (90%) of the respondents said they do used insecticide treated bed net for preventing and control of the mosquitoes, while only 16 (10%) of them are not using insecticide treated net. Thirty-four of the respondents representing (21.3%) said they do used tropical repellant, while a majority of 126 representing (78.8%) of them do not used tropical repellant for prevention and control against mosquitoes .Seventy-nine of the respondents representing (49.4%) said they do used mosquito coil for preventing and control of the mosquitoes, while half of them 81(50.6%) of the respondents said they do not used mosquito coil for preventing and control of the mosquitoes. The results also indicate that 20 representing (12.5%) of the respondents said they do drained water from their households for preventing and control of the mosquitoes, while a majority of the respondents 140 (87.5%) said they do not drained water in their households for preventing and control of the mosquitoes. Seventy (43.8%) said their children wear a clothes that covers a most part of their body, while, 90 (56.3%) said their children do not wear a clothes that cover a most part of their body. Still on the Table 4.3, shows the treatment of malaria infection among children. The results shows a majority of the respondents one-hundred and seventeen (73.1%) said do give drugs to their children before bringing them to the hospital, while only 43 of the respondents representing (26.9%) do not administered drugs to their children before laboratory diagnosis. The results also indicate that forty of the respondents representing (25%) said they do administered drugs only when prescribed by a medical doctor, while a majority of the respondents 120 representing (75%) said they do administered drugs without medical prescription. Another factor revealed that thirty of the respondents representing (18.8%), they give antibiotics to their children when they fall sick, while majority of the respondents representing 130 (81.3%) they do not give antibiotics to their children even when they fall sick.

The above specifies clinical factors that might be responsible for malaria infection in Maiduguri in the study area at the University of Maiduguri teaching Hospital (UMTH),at the emergency pediatric unit (E.P.U), fever 113 of the respondents representing (70.6 %) said their children always had fever when they were infected with a malaria parasite, 25(15.6%) of the respondents said their children had fever sometime, while 22(13.8%) of the respondents said their children do not show any sign when they were infected with malaria. The results also indicate that 80 representing (50%) half of the respondents said their children always had headache when they were infected with malaria parasite, 28 representing (17.5%) of the respondents said their children had a headache sometime, only 52(32.5%) of the respondents said their children do not had a headache even when they were infected with malaria parasite. Seventy-one representing (44.4%) of the respondents said their children always had General body pain when they had malaria infection, while 28 representing (17.5%) said their children do sometimes had general body pain,61 (38.1%), of the respondents said their children do not had general body pain when they were infected with malaria parasite.

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However, the observed relationship between age and parasite density in this study. Similarly, this study and several other studies, have observed no significant effect of gender on the prevalence and density of malaria parasitaemia in the under-five children. Malaria is frequently referred to as a disease of the poor or a disease of Poverty. Seventy-one (44.4%) have the ability of anti-malaria drugs in their houses while the majority of them eighty-nine (55.6%) do not have the availability of the anti – malaria drugs. The majority 141 representing (88.1%) of the respondent agreed on poverty progress malaria infection while 19(11.9%) do not agreed on poverty progress malaria infections. A large percentage 110 (68.8%) of the respondent experiences that lack of awareness contribute malaria infection while 50 (31.3%) do not agreed. Another large percentage 110 (68.8%) of the respondent aware campaign on malaria, while 50 (31.3%) of respondents do not aware on the malaria campaign still on the table 7 parental occupations of the patients in the study area where thirteen (8.1%) of their parents are farmers and thirty-four (21.3%) were skilled laborer also sixty-six (41.3%) their parent are business man and woman while forty-seven (29.4%) their parents are civil servant. In this study, however, socioeconomic status did not have a significant effect on the prevalence but density has significant effects of malaria parasitaemia. It maybe that there is insufficient variation in socio-economic status among the study population, since they all live within the same community (Maiduguri) to allow for significant differences to be detected. This may suggest that the overall socioeconomic status of a community may be a more important determinant than individual status similar to findings in other studies. However, other studies have found low socioeconomic status to be associated with higher malaria prevalence. This variation of the effect of socioeconomic status on malaria prevalence could be due to variable method of socioeconomic status classification; while Yusuf *et al.,* (2005) used wealth index to measure socioeconomic status, this study used status in parental occupation to determine the socioeconomic status of each child. However, the evidence with regard to vulnerability to the consequences of malaria by groups of lower socioeconomic status is more consistent. This may reflect lower access to effective means of treatment once infected. Contrary to a well established positive impact of ITNs on the prevalence of malaria, ownership of ITNs had major effect on the frequency of malaria infection in this study. A similar findings have been reported by other workers.

Outcome of this study may be attributed to numerous factors; such as, ownership of ITNs is not synonymous with usage, and even when used, lack of care of the nets might have contributed to this observations. In addition, the present study did not evaluate usage of and care for ITNs The results indicate that a majority of the respondents one hundred and forty-four representing (90%) of the respondents said they do used insecticide treated net for preventing and control of the mosquitoes, while only 16 (10%) of them are not using insecticide treated net. Furthermore, those who did not own ITNs were not good controls because many (21%) and (49.4%) of them practiced other forms of vector control measures such as usage of insect repellent (mosquito coils) and insecticide which are known effective control measures. A temperature at presentation neither had major effect on the occurrence of malaria infection and parasite density in this study. This finding may be due to the paroxysmal nature of malarial fever and thus history of fever may be as important as fever at presentation in the clinical diagnosis of malaria. However, while this finding is similar to the finding in studies with regards to frequency of malaria infection, others have found temperature at presentation to be associated with high malaria prevalence. This study went further to demonstrate direct relationship between temperature at presentation and parasite density. Hence, the observed difference could be attributed to the high parasite density documented in this study.

Conclusion

Occurrence of malaria infection was high in the population studied in spite of various control measures. Malaria infection among this age group is characterized by high density parasitaemia which increases with age and hence the need to interpret result with caution. The age, gender, socio-economic status, temperature at presentation as well as ownership of ITNs had major effect on the prevalence of Malaria. However, there is need to fortify and scale up various malaria control programs while safeguarding proper implementations of programs and activities following effective monitoring and evaluation. Limitation the study was carried out in a tertiary health facility which is a referral center and thus could have underestimated the burden of malaria in general population. outcome of field survey shows that the preventive methods identified for fighting malaria infections among 0-5 years children were using tropical repellent, wearing attires that cover most of the body, by a pyrethrum containing flying insect spray in living and sleeping areas during evening and night time, prompt and accurate diagnosis, use of insecticides treated nets and installing screens on all windows and doors. In the absence of actual vaccine for malaria prevention and growth of unacceptable stages of resistance to one drug after another by the malaria parasite, coupled with the development of resistance to insecticides by mosquitoes that transmit the disease; prevention of Mosquito bites following the use of insecticide treated nets remains a very important approach for malaria control (Lengeler and Snow, 2000; TerKuile *et al.*, 2003).

On the economic toll of both preventive and curative measures of malaria on families in the study area, giving health insurance to children, distribution of free mosquito net, reducing environmental pollutants, complete monitoring of open water sources was reported in International Journal of General Studies (IJGS), Vol. 2, No. 2, July-September 2022. Other parameters such as availability of anti-malarial drugs, measurement of outcomes and impact, an awareness campaign on vulnerability of children to malaria infection, effective case management, operational research regarding malaria and resultant key interventions, were identified.

Recommendations

Based on the findings from the present study, the following recommendations were made:

i. The government should release funds for malaria research and control activities. The increasing severity of the threat of malaria to country residents, especially the study area among the subjects, and the diminishing ability to counter it, should be addressed by a broader and better integrated approach to malaria research and control.

ii. Malaria control with short-term interventions can be put in place to produce only short-term results. The greatest momentum for the development of new tools exists in vaccine and drug development, and it is essential that this momentum be maintained.

iii. The fact that children have low immunity and are at the risk of being infected with malaria, Proper examination should be given especially to those within the age range of 0-5 years. They should be provided with antimalarial vaccine if available and given necessary prevention strategies.

iv. Awareness campaign and seminars should be organized to orientate the community on the vulnerability of children 0-5 years should be adopted to prevent malaria infection among children 0-5 years in Maiduguri. The economic toll of preventive and curative measures on families should be considered to reduce the economic cost on the family.

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APPENDIX i

RESEARCH QUESTIONNAIRE

Name:……. Age…….……

Resident……..… Gender……..……..

Father occupation:……... Temperature……

Mother occupation:……..

What are the sign & symptoms of malaria infection?

Statement

1. When your child is sick to what extent to the following happen to him/her?

	always	response sometime	not available
a). A fever			
b). Headache	[ ]	[ ]	[ ]
c). A General body pain	[ ]	[ ]	[ ]
d). Refusal of food	[ ]	[ ]	[ ]
e). Diarrhoea	[ ]	[ ]	[ ]
f). Vomiting	[ ]	[ ]	[ ]
g). Abdominal pain	[ ]	[ ]	[ ]

How do you treat malaria infection? /Treatment of malaria infection

2. Do you normally give drug to your child before bringing him /her for laboratory diagnosis? Yes [ ] or No [ ]

3. Do the drugs taken prescribed by a doctor? Yes [ ] or No [ ]

4. Do the drugs taken antibiotics? Yes [ ] or No [ ]

Method use to prevent malaria /Prevention and control of malaria infection.

5. Do you use mosquito coil in controlling mosquitoes? Yes [ ] or No [ ]

6. Do you drain water from house hold in order to prevent Mosquitoes spread? Yes [ ] or No [ ]

7. Do you use insecticide treated bed net ITNs as a means of controlling mosquitoes? Yes [ ] or No [ ]

8. Do you use residual insecticides or topical insect repellent for vectors control?

Yes [ ] or No [ ]

9. Do you wear clothes that covers most of the body? Yes [ ] or No [ ]

How economic toll of both preventive and curative measures of malaria on families can be enhanced.

10. Do you reduce environmental pollutants? Yes [ ] or No [ ]

11. Do you monitor open water sources in household? Yes [ ] or No [ ]

12. Do you have available anti-malaria drugs? Yes [ ] or No [ ]

13. Does poverty encourage the spread of malaria? Yes [ ] or No [ ]

14. Does lack of awareness contribute malaria infection? Yes [ ] or No [ ]

15. Do you aware campaign on malaria? Yes [ ] or No [ ]

LABORATORY RESULT

THICK FILM……..

THIN FILM…….

P.DENSITY……..

APPENDIX ii

UNIVERSITY OF MAIDUGURI TEACHING HOSPITAL

Chairman Board of Management
Hadi Ukashatu Gumel, B.Sc, FCNA, MNIM

Director of Administration
Ahmed Alhaji Lawan BA. (Ed), MPA, M.Sc, MNIM, FCICA

Chief Medical Director
Prof. A. Ahidjo, FWACS, FMCR

Chairman Medical Advisory Committee
Prof. M. B. Sandabe, FWACS

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ADM/TH/497/VOL. 1 — 23rd October, 2023

HAJJA KARU AHMAD ABUBAKAR
Department of Microbiology,
University of Maiduguri,
Borno State. Nigeria.

RE: REQUEST FOR ETHICAL CLEARANCE/APPROVAL
TITLE: "PREVALENCE AND PATTERN OF MALARIA PARASIT AEMIA AMONG UNDER FIVE YEARS FEBRILE CHILDREN ATTENDING EMERGENCY PAEDIATRIC UNIT (E.P.U) AT UNIVERSITY OF MAIDUGURI TEACHING HOSPITAL (UMTH), MAIDUGURI, BORNO STATE". NIGERIA.

Date of receipt of valid application: 22nd August, 2023.

Date of meeting when final determination on Ethical approval was made: 23rd October, 2023.

1. This is to inform you that the submitted proposal has been reviewed and given full approval by the Hospital`s Ethics Committee. The approval number is OHRP-IRB-FWA 00013572 UMTH/REC/23/1255
2. This approval dates from 23rd October, 2023.to 23rd October, 2024.

If there is delay in starting the research, please inform the Hospital's Ethics Committee.

Thank you.

UNIVERSITY OF … TEACHING HOSPITAL … 23 OCT 2023 SIGN.

PROF. FARUK BUBA MRCP (UK) FWACP
Chairman, (R & E) UMTH.

All Correspondence to the Chief Medical Director