Original Research Article

Low Prevalence of Asymptomatic Malaria in Pregnancy among Subjects Attending Antenatal Clinic At A Tertiary Hospital in Bauchi, Nigeria

Abstract

Background; Background Asymptomatic malaria in pregnancy still posed clinical challenge and diagnostic problem. The preventive measures are often advocated during antenatal visits. This study assessed the prevalence of asymptomatic malaria in pregnancy among subjects attending ante-natal

Methodology; The cross-sectional study was conducted among volunteer asymptomatic pregnant women attending antenatal clinic of ATBUTH between July and September 2017. An interview structured questionnaire and consent form were administered, and malaria parasite antigen detected by rapid diagnostic kit.

Result; A total of 140 pregnant women at different gestational stages with mean age of 24.15+10.3years were studied. Majority were within age-group 27-32years, 39.3%(n=75), 79.5%(n=152) resides in urban area, 26.2%(n=50) involved in business, 77.4%(n=186)married, 69.6%(n=133) in monogamous relationship, 41.4%(n=79) had tertiary educational background and 70.2% had tap water as source of water. .Malaria prevalence detected was 2.1%, which varied with the sociodemographic variables and preventive measures studied.

Conclusion. The low malaria prevalence recorded in the present study could be attributed to the satisfactory ante-natal practice and malaria preventive measures. This finding could provide further awareness on the importance of ante-natal visits.

Keywords; Malaria infection, Pregnant women, Antenatal Practices Bauchi

Introduction

Malaria infection caused by protozoan parasite, *Plasmodium spp*. and transmitted by vector Anopheles mosquitoes remain a major public health problem, particularly in endemic region of sub-Saharan Africa and Asia, with attendant consequence of high morbidity and mortality[1] . The burden of malaria infection is much felt among pregnant women and children aged less than 5years,indicative of susceptibility of these population due to the level of immunity[2,3,4].

Over 90% of global population are at the risk of malaria, and 50% experience one malaria episode annually [5]. Thirty million pregnant women are at the risk of the infection, with 10,000 maternal mortalities and 20,000 neonatal deaths annually [5].

Nigeria accounts for 25% of malaria cases recorded in sub-Saharan Africa [6], while the predisposition of pregnant women to malaria and the attendant clinical outcome continued to attract public health attention. The malaria in pregnancy prevalence varies with geographical location, but dependent on age, parity, gestational age and diagnostic method employed [7]. In most cases malaria in pregnancy often presents as asymptomatic form, but progress to symptomatic depending on the intensity of infection resulting in serious clinical outcomes,- anaemia and low birth weight (LBW) capable of resulting into high morbidity and mortality [8-10]. Asymptomatic presentation is as a result of hormonal changes induced by pregnancy that causes the attraction of pregnant women to mosquitoes[11], sequestration of infected erythrocytes in the placenta[12] and expression of parasite antigen on infected erythrocyte which form the basis of falciparium malaria in pregnancy[13]

The increasing parasite resistance limit effective treatment and control of malaria, ,thus prompt diagnosis of malaria becomes imperative especially among people at high risk of the infection such as pregnant women. One of the WHO recommended measures to ensure good pregnancy outcomes is ante-natal practice towards malaria preventive approach where all pregnant women are required to visit ante-natal clinics periodically and be informed on the measures. During these visits, they undergo several physical and laboratory investigations including malaria test. Asymptomatic pregnant women with malaria parasitemia could be incidentally detected and promptly treated. In addition, intermittent Preventive Treatment (IP)T with Sulfadoxine-Pyrimethamine is administered at least twice to prevent malaria in pregnancy. .Light microscopy

remains a gold standard for malaria diagnosis, however, it is time-consuming and requires experienced microscopists [14]. Other techniques like Rapid Diagnostic Tests (RDT) are often unemployed. Different commercially manufactured RDT tests, detects either HRPS, aldolase or pLDH used for malaria antigen detection, in ANC and outpatient clinic because of easy to use approach. Both methods had shown certain degree of similarity specificity and sensitivity[15] depending on endemicity and transmibility of infection

A meta-analysis of malaria in pregnancy studies conducted in sub-Saharan Africa between 2000 and 2011,a mean malaria prevalence of 35.1% was reported in West and Central region[16]. Studies conducted in Nigeria had reported varied malaria prevalence 2.0% in Lagos[17], 11% in Sokoto[18],61.8% in Bauchi[19] and 99% in the Southeastern Nigeria[20]. As malaria prevalence among pregnant women varies with regions, assessment of the risk factors, and the level of compliance to the preventive measures is important. As the level could be used as template to evaluate the malaria prevalence and the risk factors among asymptomatic pregnant women, particularly the primigravidae towards lowering possible associated clinical outcome. Based on this observation, we assessed the malaria prevalence and antenatal practice in term of preventive measure among pregnant women attending antenatal clinic in Abubakar Tafawa Balewa University Teaching Hospital (ATBUTH), Bauchi.

Methodology

The descriptive cross-sectional study was carried among volunteer pregnant women attending antenatal clinic at ATBUTH Bauchi between July and September 2017. ATBUTH is a 750-bed capacity hospital that provides multispecialty in northeastern zone. Geographically, Bauchi state, Nigeria is located at latitude 10^{o} 17N and longitude 09^{o} 49I E with mean daily maximum temperature ranges from 27.0^{o}C to 29.0^{o}C between July and August and 37.6^{o}C in March and

April, mean daily minimum ranges from 22.0^{o}C in December and January to about 24.7^{o}C in April and May. The humidity ranges between 12% to 68%. The rainy season is between May to September, and dry season between October to April. The vegetation is within Sudan Savanna. The study protocol was approved by ATBUTH Institutional Review Board. Criteria for inclusion were asymptomatic pregnant women, with no obvious condition capable of elevating body temperature attending ante-natal clinics at ATBUTH during the study period. A structured questionnaire and consent form were administered to consented pregnant women. Information obtained with the study questionnaire includes sociodemographic variables, gestational age, and antenatal recommendation to pregnant women - ITN, prophylaxis and public health of the pregnant women.

Malaria diagnosis was conducted by RDT using CareStartTM according to manufacturer instruction. The preferred finger of the pregnant women was sterilized with 70% alcohol, allowed to dry and pricked with lancet. The first blood drop was wipe off, and subsequent blood dropped on the sample well of the RDT kit cassette, and 60µl of assay buffer placed into the 'A' well. The test result was read after 20 minutes. Positive result was indicated with two colour band (C and T), and negative result with only one line (C).

Data were analyzed using the SPSS version 20.1. Sociodemographic variables, and parasitological data were expressed in mean values and percentage, while the Chi square test was used to compare the variables. Statistical significance difference was inferred at $p<0.05$.

Result

A total of 140 pregnant women at different gestational stage, were enrolled in the study, with mean age of 24.15+10.2 years. Sociodemographic variables(table I) showed high number of the pregnant women were within the age-group of 23-33years(39.3%,n=75) followed by 21-26years(22.8% n=42) and least <20years(7.9%, n=15). Majority resides in urban setting, 79.5%(n=152), 22.2%(n=50) were involved in one business or other and 97%(n=186) were married , 69.6%(n=133) in monogamous relationship and 34%(n=85) of parity between 1-3.Educational background showed that 28.8%(n=55) had secondary and 41.4%(n=79) tertiary education respectively. Response to the study questionnaire on preventive measures, 56% had antimalaria prophylaxis at index pregnancy and affirmed sleeping under insecticide-treated net, 73.3% takes heamatenic 59% lives in environment with good drainage system and 70.2% with tap water.

Assessment of antenatal practice on malaria prevalence as presented in table 2, indicates statistical significance difference between the age-group and malaria prevalence, with the 3 cases recorded within age-group of 33-38years and >39years($p<0.03$). Likewise, 3 cases among those residing in urban area, and those with secondary and tertiary education background respectively. For the gestational age the 3 cases were recorded within 2 and 3 trimesters stages, while parity in nulliparous and multiparous women. On preventive measures, the 3 cases were recorded among pregnant sleeping under ITN and those using insecticide spray, while one each with those who had antimalaria treatment and heamatenic respectively, One case was recommended among those with good drainage system.

Discussion

In the study, the malaria prevalence of 1.2%(3/191), is low when compared to 61.1% recorded in same study area with a stable malaria transmission region[19]. But the prevalence is comparable to 2.0% reported in a similar study conducted in Lagos [17] and 2.3% in Chittagny, Banglesh[21],these studies employed both light microscopy and rapid diagnostic test. .Similar studies had reported relatively low malaria prevalence that were higher than the level in our study, 7.7% in Lagos[22], 11% in Sokoto[18] and 7.3% in PortHarcourt,[3]. In Colombia, VaÂsquez et al[15] reported malaria prevalence of 4.7%, using a highly sensitive RDT kit. While studies conducted in Nigeria with RDT only reported varied malaria prevalence, 13% in Dekina Nigeria[24], 36.8% in Southwest Nigeria [4] and 41% in Southeastern Nigeria[25]

Therefore, the low malaria prevalence in our study may be due to several factors, low malaria parasite density is known to affect the sensitivity of RDT[15], altered malaria parasite antigen and sequestration of parasite tends to reduce detectability by RDT kit[26], the presence of antimalaria antibodies[anti-HRP-2] elicited during exposure[27]. The contribution of antenatal practices as alluded to by the participant in the study questionnaire, 56% responded to be sleeping under insecticide treated net, 56% takes antimalaria prophylaxis at index pregnancy, 73% takes heamatenics and 59% lived in environment with good drainage system, may have contributed to lowering the risk of infection

Maternal age, parity and gestational stages are known risk factors of malaria in pregnancy and prevalence[4, 17, 18,19,2223]. In stable malaria transmission region as in the study area, high prevalence are often recorded with young age, second trimester and primigravidae and secondi

gravidae due to low pregnancy -specific immunity. Though the number of malaria cases detected was low nevertheless statistical significance association was observed between the age-group and malaria prevalence($p<0.05$), while the expected pattern was in contrast, as the 3 cases were recorded among pregnant women within second and third trimester and nulliparous and multiparous. While the low number of malaria cases may make it rather difficult to draw an inference between the risk factors and malaria prevalence. It is expected that previous exposure to malaria infection by multiparous women must have mounted pregnancy specific immunity capable of lowering the risk of infection. Therefore, this observed pattern raises possibility of obvious exposure of the subjects to mosquito bite either through environmental or occupational activities in the community.

The adherence and application of malaria infection preventive measures with the subjects depends primarily on adequate public health education, knowledge and awareness, which dependent on the level of formal education[28,29]. Several studies have collaborated this observation with high malaria infection prevalence among pregnant women with non-informal education compared to those with formal educational background[24,28]. In this study, the 3 malaria cases were recovered from pregnant women with secondary and tertiary educational background, similar to the finding of study conducted among pregnant women in Katsina, northwest Nigeria[29]. This raises the need for further advocacy on public health education awareness in the community. Appropriate usage and ownership of insecticide treated net, regular antimalaria prophylaxis and clean environment/non-stagnant water prevent breeding of mosquitoes and remains the WHO recommendations. Response from the participant(table I) showed that 56% sleep under ITN which is lower than 68% in similar study in Kano[30], but higher than 45% in a study that reported 41% malaria prevalence in southern Nigeria[25]. The

impact of ITN in lowering the risk of malaria depends on effective usage and ownership of the ITN[28]. While the ITN has impacted positively in lowering the risk of malaria infection, some limitations have been identified , such as sweating under the net, improper usage, quality of ITN and cost implication had limited proper usage. Similarly, intermittent preventive treatment with a dose of sulfadoxine-pyrimethamine and heamatinic at every scheduled antenatal care visit reduces the risk of infection. In this study, 56% and 73% affirmed taking antimlaria prophylaxis and heamatenics, while 59% had good drainage system and 70% had tap water as source of water .Based on the high preventive measures by the respondents and malaria prevalence. It can be assumed that the malaria cases recorded might be attributed to environmental and occupational activities that occurs outdoor exposing them to mosquito bite

The findings of the study portray malaria prevalence and associated risk factors among asymptomatic pregnant women attending antenatal clinic. Also, as a template for Midwives and attending Physician in early diagnosis and indicators in management. Despite, the positive perceptive of the study, there are limitation, The low malaria prevalence limit the assessment impact of antenatal practice on malaria infection. The sample size, number of malaria cases detected, and period of the study cannot serve as a good epidemiological representation of infection rate. In conclusion, the low malaria prevalence is of public health concern, as relates to the clinical outcome and diagnostic challenges. Therefore, further studies is needed to asses malaria prevalence and antenatal practice with a comprehensive epidemiological assessment.

Competing Interests

All authors declare that no competing interest exist

References

1- World Malaria Report 011.http://www.who.int/malaria/world_malaria_report_2011/9789241564403_eng.pdf

2- Desai M, ter Kuile FO, Nosten F, McCready R, Asamoa K, Brabin B, .Epidemiology and burden of malaria in pregnancy. Lancet Infect Dis.2007;7:93–104.

3-Ibeziako PA, Okerengwo AA, William AIO. Malaria immunity in Pregnant Nigerian Women and their babies. J Gynaecol Obstet. 1980;18:147–149.

4- Oyetunde T. Oyeyemi, Oluwarotimi J. Sode, Olalekan D. Adebayo, Grace O. Mensah-Agyei Reliability of rapid diagnostic tests in diagnosing pregnancy and infant-associated malaria in Nigeria. Journal of Infection and Public health, (2016) 9,471-477

5-WHO, World Malaria Report (Malaria in Pregnancy). WHO Global Malaria Programme, Geneva, Switzerland: World Health Organization, 2008.

6- Federal Ministry of Health (FMH), Malaria Desk Situation Analysis. FMH, Nigeria, 2005

7- Ebako Ndip Takem and Umberto D'Alessandro. Malaria in Pregnancy Mediterr J Hematol Infect Dis 2013; 5

8- Uko EK, Emeribe AO, Ejezie GC. Malaria infection of the placenta and Neonatal Low Birth Weight in Calabar. J Med Lab Sci. 1998;7:7–20

9- Kalilani L, Mofolo I, Chaponda M, Rogerson SJ, and Meshnick SR, The effect of timing and frequency of Plasmodium falciparum infection during pregnancy on the risk of low birth weight and maternal anemia. Trans R Soc Trop Med Hyg. 2010; 104(6): 416-

10- Huynh BT, Fievet N, Gbaguidi G, Dechavanne S, Borgella S, Guezo-Mevo B, Massougbodji A, Ndam NT, Deloron P, and Cot M, Influence of the timing of malaria infection during pregnancy on birth weight and on maternal anemia in Benin. Am J Trop Med Hyg. 2011; 85(2): 214-20

11- Lindsay S, Ansell J, Selman C, Cox V, Hamilton K, and Walraven G, Effect of pregnancy on exposure to malaria mosquitoes. Lancet. 2000; 355(9219): 1972

12- Cserti CM and Dzik WH, The ABO blood group system and Plasmodium falciparum malaria. Blood. 2007; 110(7): 2250-8.

13- Staalsoe T, Shulman CE, Bulmer JN, Kawuondo K, Marsh K, and Hviid L, Variant surface antigen-specific IgG and protection against clinical consequences of pregnancy-associated Plasmodium falciparum malaria. Lancet. 2004; 363(9405): 283-9.

14- World Health Organization. World Malaria Report 2017. Geneva; 2017

15- VaÂsquez AM, Medina AC, ToboÂn-Castaño A, Posada M, VeÂlez GJ, Campillo A, et al. (2018) Performance of a highly sensitive rapid diagnostic test (HS-RDT) for detecting malaria in peripheral and placental blood samples from pregnant women in Colombia. PLoS ONE 13(8): e0201769

16- Chico RM, Mayaud P, Ariti C, Mabey D, Ronsmans C, and Chandramohan D, Prevalence of malaria and sexually transmitted and reproductive tract infections in pregnancy in sub-Saharan Africa: a systematic review. JAMA. 2012; 307(19): 2079-86.

17 Aina Oluwagbemiga, Akinsanya Bamidele, Adewale Babatunde,Agomo Chimere, Sulyman Medinat1 and Rahman Olalekan2Prevalence of Malaria in Pregnant Women AttendingAntenatal Clinic in Primary Health Centres in Lagos,South West, Nigeria- Journal of Advances in Medicine and Medical Research 25(12): 1-9, 2018;

18- Buhari, H.A., Erhabor, O., Momodu, I. Plasmodium falciparum Malaria among Pregnant Women attending Ante-Natal Clinic in Sokoto, North Western, Nigeria Sokoto Journal of Medical Laboratory Science 2016; 1(1): 187 – 193

19- Samalia AB, Uchendu, S.C. and A. A. Yarma Prevalence of Plasimodium Falciparum Malaria in Pregnant women and non-pregnant women attending Specialist Hospital Bauchi, Bauchi State, Nigeria Palgo J.Med.Medical Sci. 2017, 4(1),139-144

20- Jayleen K. L. Gunn, John E. Ehiri, Elizabeth T. Jacobs, Kacey C. Ernst, Sydney Pettygrove,Lindsay N. Kohler, et al Population‑based prevalence of malaria among pregnant women in Enugu State, Nigeria: the Healthy Beginning Initiative Malar J (2015) 14:438.

21- Wasif AK, Sean R, Chai P, Jacob K, Sabeena A, Malathi R, Myaing MN.Asymptomatic plasmodium falciparum malaria in pregnant women in the Chittagong Hill District of Babgladesh.Plosone. 2013;11:45-50-

22- Agomo CO, Oyibo WA, Anorlu RI, Agomo PU. Prevalence of Malaria in Pregnant Women in Lagos South-west Nigeria. Kor J Parasitol. 2009;47:179–83.-

23- Clement Ameh Yaro, Florence Oyibo Iyaji1, Michael Obanogbon Tope. Rapid Diagnostic Test Kits Detection of Malaria Parasites among Pregnant Women Attending Antenatal in Selected Hospitals in Anyigba, Kogi State, Nigeria Advances in Bioscience and Biotechnology, 2017, 8, 249-258

24- Ibeneme Georgian, Ojone Matthew, and Nwode Isaiah Nte(2017)Prevalence and effect of malaria in pregnancy among antenatal women in Ebonyi State, Nigeria International Research Journal of Public and Environmental Health Vol.4 (8),pp. 177-183

25- Wellems, T.E., A. Walker-Jonah and L.J. Panton, 1991. Genetic mapping of the chloroquine-resistance locus on *Plasmodium falciparum* chromosome 7. Proc. Nat. Acad. Sci. USA., 88: 3382-3386

26- Biswas, S., D. Tomar and D.N. Rao, 2005. Investigation of the kinetics of histidine-rich protein 2 and of the antibody responses to this antigen, in a group of malaria patients from India. Ann. Trop. Med. Parasitol., 99: 553-562

27- Agomo CO, Oyibo WA. Factors associated with risk of malaria infectionamong pregnant women in Lagos Nigeria. Infect Dis Poverty. 2013;2:19

28- Report of the meeting on the development of guidelines for testing and evaluation of long-lasting insecticidal mosquito nets. WHO-Pesticide Evaluation Scheme (WHOPES), WHO/HQ, Geneva, 2005

29- Eberemu NC, Magaji H. The use of microscopy and rapid diagnostic test in diagnosing the prevalence of malaria among women attending antenatal clinic in Dutsin Ma, Katsina State Nigeria Nigerian Journal of Parasitology, 2017, 38; 92

30- Salwa Dawaki, Hesham M. Al-Mekhlafi , Init Ithoi, Jamaiah Ibrahim, Wahib M. Atroosh et al , Is Nigeria winning the battle against malaria? Prevalence, risk factors and KAP assessment among Hausa communities in Kano State . Malar J (2016) 15:351
-

Table 1; Demographic variables of Pregnant women studied

Variables	Frequency(%)
Age-group	
<20years	12(8.6)
21-26	32(22.9)
27-32	58(41.4)
33-38	35(25.0)
>39	3(2.1)
Residence	
Urban	129(92.1)
Semi urban	9(6.4)
Rural	2(1.4)
Occupation	
Student	29(20.7)
Civil servant	40(28.6)
Applicant	21(15.0)
Business	34(24.3)
Trader	16(11.4)
Marital status	
Married	135(96.4)
Non-married	5(3.6)
Type of relationship	
Polygamous	34(24.3)
Monogamous	106(75.7)

Educational background	
Islamic	8(5.7)
Primary	11(7.9)
Secondary	52(37.1)
Tertiary	69(49.3)
Gestational stage	
First	13(9.3)
Second	72(51.4)
Third	55(39.3)
Control	
Malaria Treatment at index Pregnancy	
Yes	64(45.7)
No	76(54)
Preventive measure	
Insecticide-treated net	80(57.1)
Mosquito coil	25(17.9)
Insecticide spray	35(25)
Heamatenic intake	
Yes	96(68.6)
No	44(31.4)
Drainage system	
Stagnant water	25(17.9)
Open space	40(28.6)
Drainage provided	75(53.6)
Parity	
0	37(26.4)
1-3	64(45.7)
>4	39(27.9)
Source of water	
Well water	36(25.7)
Tap water	104(74.3)

301

302 **Table 2;Malaria Prevalence versus demographic variables of pregnant women**

Variables	Frequency(%)	p-value
Age-group		
<20years		
21-26		
27-32		0.001
33-38	2(5.7)	
>39	1(33.3)	
Residence		

Urban	3(2.4)	.877
Semi urban		
Rural		
Occupation		
Student		
Civil servant	1(2.5)	
Applicant		.443
Business	2(5.9)	
Trader		
Housewife		
Type of relationship		
Polygamous	1(2.9)	.569
Monogamous	2(1.9)	
Educational background		
Islamic		
Primary		
Secondary	2(3.8)	.731
Tertiary	1(1.4)	
Gestational stage		
First		
Second	1(1.4)	.589
Third	2(3.6)	
Control		
Malaria Treatment at index Pregnancy		
Yes	1(1.6)	.582
No		
Preventive measure		
Insecticide-treated net	2(2.5)	.930
Mosquito coil		
Insecticide spray	1(2.9)	
Heamtenic intake		
Yes	1(1.0)	.226
No		
Drainage system		
Stagnant water	1(4.2)	
Open space	1(2.4)	.249
Drainage provided	1(1.3)	
Parity		
0	1(2.5)	
1-3		.379
>4	2(2.8)	
Source of water		
Well water	2(4.2)	.265

Tap water	1(1.1)	

303