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PREVALENCE OF *Plasmodium falciparum* MALARIA IN PREGNANT AND NON – PREGNANT WOMEN ATTENDING SPECIALIST HOSPITAL BAUCHI, BAUCHI STATE, NIGERIA.

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Malaria infection especially with *Plasmodium falciparum* causes high mortality and high morbidity rates among children and pregnant women in the tropics. A hospital based cross-sectional survey was conducted to determine the prevalence of malaria parasite infection among pregnant and non-pregnant women who attended the antenatal clinic between the months of June – December, 2015 at the Specialist hospital Bauchi, Bauchi State, Nigeria. The study was conducted from June – December,2015. A total of 140 comprising of 90 pregnant and 50 non-pregnant women within the age-range of 15-45 years were studied and demographic data on age and pregnancy status collected. Individual blood samples from the women were examined for malaria parasites infection using thick and thin film smears techniques. The hospital based prevalence of malaria was 61.1% in pregnant and 36.0% in non –pregnant and were statistically significant ($p<0.05$).The infection cuts across the age group studied, irrespective of pregnancy; ages 41-45 years were most affected (100.0%). In the infected pregnant women, the first trimester was the most affected with prevalence of 70.4%. Highest prevalence of 72.7% was also recorded among women in their first pregnancy; similarly highest prevalence was seen in pregnant and non-pregnant women residing in the slum 61.9% and 62.5% respectively. According to professional status the highest prevalence rate was recorded among public servant 79.1% while in non-pregnant women students had the highest prevalence rate of 50%. This study showed that malaria was still prevalent and posed a major threat to human well-being. There is need to intensify and strengthen malaria control/elimination efforts through public enlightenment, health education on the dangers of the disease, emphasizing the usefulness of malaria preventive/prophylactic control measures. In addition, government should seriously address the poverty level which may go a long way in curtailing the disease.

Keyword: Prevalence, Malaria, Pregnancy, Women, *Plasmodium,* Non – pregnant

INTRODUCTION

Malaria infection during pregnancy is a major public health problem in tropical and subtropical regions throughout the world (WHO, 2010). The burden of malaria infection during pregnancy is caused mainly by *Plasmodium falciparum*, the most common malaria species in Africa (WHO, 2010). Each year at least 3 million pregnancies occur among women in malarious areas of Africa, most of who reside in areas of relatively stable malaria transmission (Brabin, 2000). The symptoms and complications of malaria during pregnancy differ with the intensity of malaria transmission and thus with the level of immunity the pregnant woman has acquired (Perlmann and Troye-Blomberg,2000). Pregnant women and the unborn children are particularly vulnerable to malaria, which is a major cause of prenatal mortality, low birth weight, and maternal anaemia (Greenwood *etal*., 2007).

Despite evidence of the cost effectiveness of improving treatment access and compliance (Goodman *et al.,* 1999), most victims of malaria still die because of a lack of health care close to their homes or because their condition is not diagnosed by health workers (WHO, 2000; Armstrong-Schellenberg*et al*., 1994). Early diagnosis and prompt effective treatment of malaria illness has been a cornerstone of malaria control (Vander *et al.,* 2005). Diagnosis based on symptoms alone has inherent difficulties (Vander *et al*., 2005), although volunteer health workers in rural areas have practised it with some success (Pagnoni, 1997; Okanurak and Ruebush, 1996). The reduction of morbidity and the interruption of parasite transmission by means of community-based antimalarial treatment require an accurate, rapid and practical method of diagnosis. The delivery of treatment in rural areas in Nigeria is complicated by the centralized nature of microscopy services (Alaba and Alaba, 2008). Over the past few years, developments in rapid field diagnostic techniques based on the demonstration of parasite antigens have opened new possibilities for improved rural malaria

diagnosis that is independent of centralized diagnostic services (Bojang, 1999; Onwere *et al*., 2008). There have been a considerable number of reports about knowledge, attitudes, and practices relating to malaria and its control from different parts of Africa. These reports concluded that misconceptions concerning malaria still exist and that practices for the control of malaria have been unsatisfactory (Deressa*et al.,* 2008). However, epidemiological patterns of malaria are widely different from one place to another (Himeiden *et al*., 2005).

MATERIALS AND METHODS

Permission Obtainment

A preliminary visit to the hospitals was made so as to seek permission from the hospitals' authorities. During the visits, the management, health workers in charge of antenatal services and laboratory scientists were informed on the nature and objectives of the study. They later organized and informed both pregnant and non-pregnant women about the study. The consent of management, non-pregnantand pregnant women were sought and obtained before the commencement of the study.

Study Area

Bauchi State has an estimated population of approximately 4,653,066 million people according to National Population Census (NPC, 2006). The State occupies a total land area of 49,119 km² representing about 5.3% of Nigeria's total land mass and is located between latitudes 9° 3′ and 12° 3′ north and longitudes 8° 50′ and 11° easts. Bauchi state is one of the states in the northern part of Nigeria that span two distinctive vegetation zones, namely, the Sudan savannah and the Sahel savannah. The Sudan savannah type of vegetation covers the southern part of the state while the Sahel savannah, also known as semi-desert vegetation, becomes manifest from the middle of the state as one moves from the state's south to its north.The vegetation types as described above are conditioned by the climatic factors, which in turn determine the amount of rainfall received in the area.

Rainfall in Bauchi state ranges between 1300mm per annum in the south and only 700mm per annum in the extreme north. Consequently, rains start earlier in the southern part of the state where rain is heaviest and last longer. In contrast, the northern part of the state receives the rains late, usually around June or July, and records the highest amount of 700 mm per annum. Temperature is high throughout the year with day time range of 23^0C - 35^0C. Malaria is endemic in these areas and occurs throughout the year with peaks during the rainy season.

Fig 1: Map of Nigeria

Sample Collection

A total of 140 blood samples were collected for this study for a period of six months. Out of these number (140 blood samples), 90 were from pregnant visiting antenatal clinic while 50 were non-pregnant women from out – patient department.Prior to collection of samples, an ethical approval was obtained from the management and a biodata of each subject was collected including malaria history, gravidity and trimester period after responding to a structure questionnaire. They were all out patient residing permanently in their respective homes within Bauchi.The study is a hospital based cross-sectional survey conducted in specialist Hospital, Bauchi State. The women were of varying age ranging from 15-45years and also of different status.

Microscopic examination

About 2 ml venous blood sample was collected from each pregnant and non- pregnant women attending antenatal clinic and out-patient department respectively. Blood samples collected were preserved with Ethylenediaminetetraacetic acid (EDTA) before being transported to the laboratory of Microbiology of the Abubakar Tafawa Balewa University, Bauchi, for examination. Both thick and thin blood films as described by Cheesbrough (1998).

Thick Film

To prepare the thick film, 2 drops of blood sample was placed on a slide using a small rubber pipette and then was gently mixed for 20 seconds using the corner of a second slide to defibrinate the blood and to obtain a round smear. The slide was immersed in the staining trough, containing already diluted Giemsa solution, and contact was maintained for 30-40 minutes, and then allowed to dry (Cheesbrough (1998).

Thin Film

For the thin film, a drop of blood sample on a clean slide using a rubber pipette. The edge of a second slide was then laid on the drop of blood that would spread on the entire line of contact between the two slides. The second slide, steadily held to form a 45° angle with the original slide was then moved to the opposite end of the slide to which the drop was originally located.

The thin film was fixed using Methanol (methyl alcohol) by maintaining contact with methanol for 10 seconds. The slide was immersed in the staining trough containing already diluted Giemsa solution, and contact was maintained for 30 minutes, and then allowed to dry. Stained slides were examined under the light microscope using × 100 lenses (immersion oil). The thick films were to identify the parasite densities while thin films were used to identify the parasite species as described by Cheesbrough (1998).

Identification of Malaria Parasites

Ring forms: Young trophozoites are concave disks which appear ring-shaped in stained preparations because the ring of cytoplasm stains but not the central food vacuole. The ring of the cytoplasm contains organelles. The nucleus is clearly visible as a single or sometimes a double chromatin dot.

Data Analysis

The data generated on prevalence was analysed using statistical programme for service solution (SPSS) 17.0 Window versions. The statistical significance of variables was estimated using Chi-square test. Pearson correlation analysis was used to establish possible correlation of prevalence with parity, age, trimester. P-values of equal to or less than 0.05 was taken as measures of significance.

RESULT

Prevalence of malaria infection among pregnant and non-pregnant women

A total of 140 pregnant and non-pregnant women were sampled. Out of 90 pregnant women examined for malaria parasite in specialist hospital Bauchi, 55 were infected(61.1%),while out of the 50 non-pregnant women examined, 18 (36.0%)were infected and the total percentage for both pregnant and non-pregnant women infected was (52.1%).

Table 1: Prevalence of malaria infection among pregnant and non-pregnant women

SAMPLE	NO. EXAMINED	NO. INFECTED	%
PREGNANT	90	55	61.1
NON PREGNANT	50	18	36.0
TOTAL	140	73	52.1

Prevalence of malaria infection according to gestation

Highest prevalence of 70.4%(19 out of 27) was observed in women in their first trimester of pregnancy followed by 66.6%(4 out of 6) in the second trimester, with the least been in the thirdtrimester 56.1% (32 out of 57).

Table 2: prevalence malaria of infection according to gestation

GESTATION PERIOD	NO. EXAMINED	NO. INFECTED	%
First trimester	27	19	70.4
Second trimester	6	4	66.6
Third trimester	57	32	56.1

Prevalence of malaria infection according to parity

The primgravidae(72.7%)first pregnancy had the highest infection rate, followed the secungravidae (50.0%), and then the multigravid women had the least infection (39.1%).

Table 3: Prevalence of infection according to parity

PARITY	NO. EXAMINED	NO. INFECTED	%
Primgravidae	55	40	72.7
Secungravidae	12	6	50.0
Multigravid	23	9	39.1
Total	90	55	61.1

Prevalence of malaria infection according to age

The age of prevalence (table 4) followed a concave pattern, being more prevalence in older females 41-45 years (100%) and age groups of 26-36(73.7 %), 31-35 (69.2%), 21- 25(66.7%) and 36-40 (66.6%) . Young females'(15-20) 34.8% in the non- pregnant women those of age group 15-20 were more infected (80%).

Table 4: prevalence of malaria parasite in pregnant and non- pregnant women according to age.

Age	Pregnant			Non pregnant		
	NO. EXAMINED	NO. INFECTED	%	NO. EXAMINED	NO. INFECTED	%
15-20	23	8	34.8	5	4	80.0
21-25	27	18	66.7	9	2	22.2
26-30	19	14	73.7	10	2	20.0
31-35	13	9	69.2	8	3	37.5
36-40	6	4	66.6	11	3	34.4
41-45	2	2	100.0	7	4	42.9
Total	90	55	61.1	50	18	36.0

Prevalence of malaria parasite infection according to residential areas

Table 5 show the distribution of malaria parasite according to residential areas of the patients. The pregnant women reside in the slum have the highest prevalence rate of (61.9%), followed by pregnant women residing in the village with the prevalence rate of (61.5%), the least prevalence recorded (57.1%) among pregnant residing in the town. In the pregnant women those that reside in slum were more infected (62.5%).

Table 5: Prevalence of malaria infection according to residential areas

Residence	Pregnant			Non pregnant		
	No. Examined	No. Infected	%	No. Examined	No. Infected	%
Slum	63	39	61.9	16	10	62.5
Village	13	8	61.5	20	7	35.0
Town	14	8	57.1	14	1	7.14
Total	90	55	61.1	50	18	36.0

Prevalence of malaria infection according to professional status

The distribution of the parasite according to professional status of the patients shows thatthe highest prevalence rate was recorded in Public servant, Petty Traders and subsistence farmers while the least was observed among students as follows:(79.1%),(62.5), (55.5) and (37.5) respectively.

Table 6: Prevalence of malaria infection according to professional status

Professionals	Pregnant			Non-pregnant		
	No. Examined	No. Infected	(%)	No. Examined	No. Infected	(%)
Students	16	6	37.5	8	4	50.0
Subsistence farmers	15	10	55.5	13	3	25.0
Petty trader	32	20	62.5	20	8	40.0
Public servant	24	19	79.1	9	3	33.3
Total	90	55	61.1	50	18	36.0

DISCUSSION

Malaria remains a major disease in tropical countries. Malaria as the most prevalent infectious disease has serious consequences in pregnant women, their foetus, and infants. Pregnancy appears to interfere with the immune process in malaria, a disease which itself alters immune reactivity. In highly endemic area where semi-immune adults usually have substantially acquired resistance of local strains of *Plasmodium* the prevalence is higher and its severity is greater in pregnant women than in non-pregnant women (Sule-odu, 2000). This is also true in our study in which prevalence of malaria in pregnant women was (61.1%)and in non-pregnant was (36%)

The attitude of the women not starting ante-natal care early in pregnancy may also have contributed to this prevalence. Someof the women attending ante-natal care are either toward the end of their first trimester or mid second trimester. Also some avoided anti-malaria chemoprophylaxis for the fear that the foetus may be affected.The prevalence obtained within the first and second trimesters agreed with those of Menendez (2000), Minakwa *et al.* 2002, who observed the peak prevalence in weeks 10-20 of pregnancy. This may be attributedto the expression of adherent proteins on the surface of the infected red blood cells (IRBCs), enabling the IRBCs to adhere to micro vascular capillaries of vital organs causing severe pathological conditions (Menendez, 2000; Minakwa *et al.,* 2002). Agbor - Enoh*et al*., (2003) had suggested that high prevalence was due to the rapid expansion of the placenta corresponding to the concomitant expression of significant levels of extra cellular CSPGs providing binding sites for IRBCs. This coupled with the absence of chondroitin -4 – sulfate ((C4s) – IRBC) adhension – inhibitory antibodies prior to 12 – 20 weeks of gestation enhanced the prevalence.

Also parity played a role in the prevalence rates. Primgravidae and secungravidae accounted for (72.7% and 50%) of the infection against 39.1% in multigravidae women.The prevalence rate was higher among pringravidae pregnant women then the multigravidae. This agrees with the work of Stekette, *et al*., (2001) which suggested that multigravidae pregnant women acquire immunity from previous infections and may have also experienced physiological change caused by pregnancy (Onwere *et al*., 2008). Cell-mediated immune responses to malaria antigens are more markedly suppressed first pregnancy than in subsequent ones (Brabin, 1996). High plasma corticosteroid levels may have an immunosuppressive effect on cell mediated responses. In first and second pregnancies women are especially vulnerable (Mcgregor, 1984), identified the factors responsible for susceptibility of primgravidae to malaria as inhibition of type 1 cytokine responses.

Pregnant women in their first trimester had the highest prevalence than those in second and third trimesters. This correlated with the work done(Minakwa *et al.,* 2002) in western Kenya that prevalence was highest at 13-16 weeks of gestation (1 trimester), and found similar number of recoveries in both groups during the 2 and 3 trimesters. The loss of immunityin early pregnancy was equivalent to an 11 –fold decrease in the rate of recovery from infection. The recovery seen in the late pregnancy suggests that women mount a satisfactory immune response to malaria infection, re-acquiring their pre-pregnancy immune status at about the time of delivery (Minakwa *et al.,* 2002).The observation could also be as a result of constant intermittent preventive treatment (IPT) given to these women during antenatal care visit which usually commence during second trimester.

This study showed that malaria was still prevalent and posed a major threat to human well-being. There is need to intensify and strengthen malaria control/elimination efforts through public enlightenment, health education on the dangers of the disease, emphasizing the usefulness of malaria preventive/prophylactic control measures.

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