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Incidence of malaria parasites among pregnant women attending ante-natal clinic at Umaru Sanda Ndayako General Hospital, Bida.

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Abstract
This study was carried out to investigate the status of malaria parasites among randomly selected one hundred pregnant women attending ante-natal clinic at Umaru Sanda Ndayako General Hospital, Bida, Niger State. Blood samples were obtained using syringe and needle, and tested for malaria parasite in thin film and rapid diagnostic test (RDT). Structured questionnaire was administered to the pregnant women to determine the information on their socio- economic status that might be responsible for the occurrence of malaria in their locality. The highest rate of malaria parasite was found to be sixty (70.6%) in *Plasmodium falciparum*, while the least occurrence of 25(29.4%) was recorded for *Plasmodium vivax*. Other species of *Plasmodium* were not identified in this research study. Among all the variables examined in the course of administration of questionnaire, the use of Long lasting insecticides treated net (LLITN) was found very effective when properly used in the prevention of malaria during pregnancy. The result of chi-square test of association revealed that there is an association between all the risk factors considered and the occurrence of malaria parasite in pregnant women as indicated by the P value ($P< 0.05$). The P value for each risk factor considered is: Parity ($P<0.05$); Gestation Age ($P<0.05$); Use of Intermittent pesticides treatment IPT ($P<0.05$); Use of Long Lasting Insecticides Treated Net LLITN ($P<0.05$); and Area of domicile of all the subjects ($P<0.05$). There is the need to educate pregnant women on the risk associated with the occurrence of malaria parasite during pregnancy, especially primigravids and secondigravids during antenatal visits on the risks of their susceptibility and that of her growing fetus during pregnancy. LLITN and other malaria prophylactic drugs should be made available to pregnant women, both the rural and urban dwellers.

Key words: Blood sample, domicile, prophylactic, rapid diagnostic test, women

Introduction

Malaria is a mosquito borne infectious disease of human and other animals caused by protists (a type of microorganism of the genus *Plasmodium* (Nayyar*et al.*, 2012).It begins with a bite from an infected female mosquito (Anopheles mosquito), which introduces the protists via its saliva into the circulatory system, and ultimately to the liver where they mature and reproduces (Nadjm and Behrens, 2012). The disease causes

symptoms that typically include fever and headache, which in severe cases can progress to coma or death (Bartoloni and Zamarchi, 2012). Malaria is widespread in tropical and subtropical regions in a broad band around the equator, including much of sub-Saharan Africa, Asia, and the American (Beare*et al.*, 2006). Five species of *plasmodium* can infect and be transmitted to humans. The vast majority of deaths are caused by *Plasmodium falciparum,* while *P. vivas, P. ovale*, and *P. malariae* caused a generally milder form of malaria that is rarely fatal (Ferrif, 2009).

Plasmodium falciparum is found mainly in the hotter and more humid regions of the world. It is the main species found in tropical and subtropical Africa and part of Central America and South America, and Bangladesh. It also occurs in the parts of India, the Middle East, and East Mediterranean. *P. vivax* are capable of developing in mosquitoes atlower temperatures than *P.falciparum,* and therefore has a wider distribution in temperate and subtropical areas (Cheesbrough, 2000). *P. malariae,* it is found in the tropical and subtropical regions(Cheesbrough, 2000). *P. ovale* has a low prevalence. It is found in West Africa where it accounts for up to 10% of malaria infection, and has also been reported from other parts of Africa, and from Indonesia, china, and part of the Far East, South East, Asia, and South America (Cheesbrough, 2000).

Pregnancy associated malaria (PAM) is a presentation of the common illness that is particularly life threatening to both mother and developing fetus. Pregnancy associated malaria (PAM) is caused primarily by infection with *P. falciparum*, the most dangerous of the four species of malaria causing parasites that infect humans (Doolan *et al.*, 2009). During her first pregnancy, a woman faces a much higher risk of contracting malaria and it is of associated complications. Prevention and treatment of malaria are essential components of pre-natal care in areas where the parasite is endemic, while the average adult citizen of an endemic region possesses some immunity to the parasite (Duffy and Fried, 2005). Pregnancy causes complications that leave the woman and fetus extremely vulnerable (Perlmann and Troy-Blomberg, 2000).The parasite interferes with transmission of vital substances through the fetal placenta, often resulting in stillbirth, spontaneous abortion, or dangerously low birth weight (Meghna *et al.*, 2011). The tragedy of malaria in developing countries receives abundant attention from the international health community, but until recently, PAM and its unique complication were not adequately addressed (W.H.O., 2010).

Women experiencing pregnancy associated malaria (PAM) may exhibit normal symptoms of malaria, but may also be asymptomatic or present with more mild symptoms, including a lack of the characteristic fever. This may prevent a woman from seeking treatment despite the danger to herself and to her unborn child (Perlmann and Troy-Blomberg, 2000).

The disease results from the aggregation of erythrocytes infected by *Plasmodium falciparum*, which have been shown to adhere to chondroitin surface on placental proteoglycans causing them to accumulate in the intervillous species of the placenta, blocking the crucial flow of nutrients from mother to embryo. Malaria parasites are transmitted by the bite of an infected female *Anopheles* mosquito. Sporozoites contained in the saliva of the mosquito are inoculated into the blood of a human host when the mosquito takes a blood meal. Infection can also occur by transfusion of infected donor blood, by injection through the use of needles and syringes contaminated with infected blood, and very occasionally, congenitally, usually when a mother is non-immune (Lucas *et al*., 2003).

Materials and Methods

Collection of blood sample

The study was conducted among pregnant women attending ante-natal clinic at Umaru Sanda Ndayako General Hospital Bida, Niger State. One hundred (100) Blood samples were collected from these out-patients. Tourniquet was tied onto the hand of the patients and cotton wool was dipped into the methylated spirit and then used to disinfect the skin of the patients. The syringe was then inserted into the hand of the pregnant women to draw 2mls of blood sample from the ante-natal patients, which was transferred into an EDTA container.

Detection of Malaria Parasites

Malaria parasite detection was carried out in the laboratory using microscopy and rapid diagnostic test:

i) Microscopy

Blood samples were also obtained for thin blood smear for malaria parasite using Giemsa staining technique. Two (2) mls of blood sample were collected from the out-patients into an E.D.T.A container which was used for the preparation of thin blood film. Using a completely clean grease-free microscope slide, a drop of blood sample was made unto the slide and then spread the blood on the microscope slide to make a thin blood film using a smooth edged slide spreader. A black lead pencil was used to label the slide with the date and the patient's name and number.

Thin blood film was flooded with Giemsa stain for two minutes and then diluted with tap water for five minutes before washing away the staining reagent and the water on the slide. The slides were later viewed under the microscope for the presence of malaria parasites (Cheesbrough, 2000).

ii) Rapid Diagnosis Test (RDT)

A drop of Blood sample was made on the test strip and five drops of Buffer solution was added at the other end of the strip and was allowed to stand for fifteen minutes to see if there is an appearance of both test and control line which indicates positive test (Presence of malaria parasite) or if only the test line appears which is an indication of Negative result (Absence of malaria parasite).

Statistical Analysis

Data was collected using a pretest, semi-constructed interviewer administered questionnaire. Chi-square test of association was used to see if there is an association between the socio-economic and demographic factors considered and the occurrence of malaria parasite among pregnant women.

Results

Table 1 shows the Percentage occurrence of *Plasmodium* parasites among the pregnant women. The highest rate of occurrence was recorded for *Plasmodium falciparum* 60(70.6%), while the least occurrence of 25(29.4%) was recorded for *P. vivax.* Other species of *Plasmodium* were not identified in this research study.

Chi square test of association between parity (no of children including latest pregnancy) and presence of malaria in pregnant women indicated that parity is statistically significant($P<0.05$), i. e. there is significant difference in the distribution of parity among the pregnant women as shown in Table 2.

Chi square test of association between gestation age (pregnancy stage) and presence of malaria in pregnant women indicated that gestation age is statistically significant ($P<0.05$), i. e. there is significant difference in the distribution of gestation age among the pregnant women as shown in Table 3.

Chi square test of association between the use of intermittent pesticide control (IPT) and presence of malaria in pregnant women indicated that IPT is statistically significant ($P<0.05$), i. e. there is significant difference in the distribution of IPT among the pregnant women as shown in Table 4.

Chi square test of association between the use of Long lasting insecticide treated net (LLITN) and presence of malaria in pregnant women indicated that LLITN is statistically significant ($P<0.05$), i. e. there is significant difference in the distribution of LLITN usage among the pregnant women as shown in Table 5.

Chi square test of association between the area of domicile of the patients and the presence of malaria in pregnant women indicated that the area of domicile is statistically significant ($P<0.05$), i. e. there is significant difference in the distribution of the area domicile among the pregnant women as shown in Table 6.

Table 1: Percentage occurrence of *Plasmodium* parasites among pregnant women attending ante-natal clinic at Umaru Sanda Ndayako General Hospital Bida.

S/No	Species	No	%
1.	*Plasmodium falciparum*	60.0	70.6
2.	*Plasmodium vivax*	25.0	29.4
3	*Plasmodium malariae*	0.0	0.0
4	*Plasmodium ovale*	0.0	0.0
	TOTAL	**85.0**	**100**

Table 2: Occurrence of malaria parasite by parity among pregnant women attending ante-natal clinic at Umaru Sanda Ndayako General Hospital, Bida.

Parity	Frequency	Percent
One Child	28	28
Two Children	30	30
Three Children	12	12
Four Children	10	10
Five and above Children	20	20
TOTAL	**100**	**100**

$X^2 = 16.400$ df= 4; P<0.05

Table 3: Occurrence of malaria parasite by Gestation Age among pregnant women attending ante-natal clinic at Umaru Sanda Ndayako General Hospital, Bida.

Gestation age	Frequency	Percent
First Month	1	1
Second Month	2	2
Third Month	5	5
Forth Month	20	20
Fifth Month	17	17
Sixth Month	11	11
Seventh Month	17	17
Eighth Month	13	13
Ninth Month	14	14
Total	**100**	**100**

$X^2 = 34.460$; df= 8; P<0.0

Table 4: Occurrence of malaria parasite by Use of IPT among pregnant women attending ante-natal clinic at Umaru Sanda Ndayako General Hospital, Bida.

Use of IPT	Frequency	Percent
No	56	56
Yes	44	44
Total	**100**	**100**

$X^2 = 1.440$; df= 1; P<0.05

Table 5: Occurrence of malaria parasite by Use of LLITN among pregnant women attending ante-natal clinic at Umaru Sanda Ndayako General Hospital, Bida.

USE OF LLITN	FREQUENCY	PERCENT
No	51	51
Yes	49	49
TOTAL	**100**	**100**

$X^2 = 1,440$; df= 1; P<0.05

Table 6: Occurrence of malaria parasite by Area of domicile among pregnant women attending ante-natal clinic at Umaru Sanda Ndayako General Hospital, Bida.

Area of Domicile	Frequency	Percent
Rural	25	25
Urban	75	75
Total	**100**	**100**

$X^2 = 25,000$; df= 1; P<0.05

Discussion

All the 100 pregnant women that participated in this research work were approached at the time of their ante-natal visit ate-natal unit of the hospital. Sixty 60(70.6%) subjects were positive for *Plasmodium falciparum*. Malaria caused by *Plasmodium falciparum* is also called malignant or *falciparum* malaria.It is the most dangerous form of malaria with the highest rate of complications and mortality. As of 2006, there were an estimated 247 million human malaria infections (98%) in Africa, 70% being 5years and younger (WHO, 2008). It is most prevalent in sub-Sahara than many other regions of the world. In most Africa countries, over 75% of cases were due to *Plasmodium falciparum*. Where as in most other countries with malaria transmission, other less virulent *Plasmodial* species predominate. Almost every malaria death is caused by *Plasmodium falciparum* (WHO, 2008). Twenty five (25) (29.4%) were positive for *Plasmodium vivax.* The above finding is similar to what was obtained by (Lucas *et al.*, 2003). A higher proportion of pimigravid (26%),secondigravid (31%) than multigravid (29%) pregnant women have malaria parasitemia similar to what was obtained earlier by Kuile (2003).

It was observed that pregnant women with two children has the highest percentage of participation in this research (30%), followed by those with one child (28%) and this is followed by the percentage of those with five and above children (20%), then the least percentage was observed from those with four children (10%). During this research work, it was observed that pregnant women with one child recorded the highest parasite concentration followed by pregnant women with two children and the concentration of malaria parasite decline as the parity of the pregnant women increases. This might be due to the fact that pregnant women with first pregnancy has not been exposed to condition of being pregnant, making them more susceptible to malaria parasite during this period and those with two and above has been exposed to pregnancy, which makes them less susceptible to malaria because they might have developed partial immunity to malaria during the previous pregnancy. From this fact, it can be concluded that malaria parasite concentration decreases as the number of pregnancy increases and this finding is in agreement with what was obtained earlier by Kuile (2003).

Age of the subjects ranged from 15 to 35 years with a S.D of 0.2 (n = 100). The subjects were found to have malarial parasitemia. The study shows that the gestation age of pregnant women in this study ranges from one to nine months and there is higher proportion of malaria parasite

infection in the pregnant women with Gestation Age from one to six months (1st and 2nd trimesters) compared to seven to nine months (3rd trimesters) respectively in this study area. During the period of this research work, it was observed that first trimester pregnant women had the lowest number of antenatal clinic attendee (8%), followed by third trimester (43%), and second trimester recorded the highest number of antenatal clinic attendee (49%) at this primary health care facility during this research. the highest malaria burden was recorded between primigravid and secondigravid pregnant women than multigravid, this might be as a result of previous exposure of multigravid to pregnancy, resulting into the development of partial immunity to malaria parasite which primigravid pregnant women does not have, resulting into higher susceptibility of primigravid to malaria parasite. This finding agrees with what was obtained earlier on by (Achidi *et al.*, 2005) where high concentration of malaria parasite were recorded among primigravids and secondigravids pregnant women respectively.

Forty four (44) pregnant women out of hundred make use of intermittent preventive treatment (IPT) for the prevention of malaria parasite and fifty six of the subjects does not use intermittent preventive treatment and those that does not use IPT recorded high parasite concentration than those that uses it. If IPT is provided to pregnant women and used effectively, can serve as a preventive measure of malaria parasite, anemia, still birth, low birth weight during pregnancy. This should be provided mostly for primigravid, secondigravid, pregnant women because; malaria parasite is more common in their blood similar to the finding Kabore (2001).

This study revealed that 49 subjects sleep under long lasting insecticide mosquito treated net, and 51 does not use LLITN, and the study shown that some pregnant women sleep under mosquito net and they still have malaria parasite in their blood because, they are not using the net regularly. All the hundred pregnant women that were involved in this study, only fifteen of them have no malaria parasite in their blood. Those subjects that does not have malaria parasite in their blood sleep under mosquito net always and by this, the vector of malaria which is mosquito will not have contact with human skin, and if contact of mosquito to human is prevented, there is no going to be transmission of *Plasmodium* to human and this would result into eradication of malaria as observed in some parts of the world. If long lasting insecticide treated net (LLITN) is used always, and effectively, there is high probability of eradicating malaria parasite in Sub-Sahara. This research study also shown that *plasmodium falciparum* infection is more common in this primary health facility with standard deviation of 2.69 and *P. vivax* infection with standard deviation of 1.16 which is similar to what was obtained by W.H.O (2012) where they revealed *Plasmodium falciparum, and Plasmodium vivax* respectively and *Plasmodium falciparum* has the highest percentage of occurrence. Ninety percent (90%) of all malaria cases are in Sub-Sahara Africa. World-wide a children dies of malaria every 30 seconds. Although if caught early, the mosquito borne disease is curable (W.H.O, 2012). Other studies has also shown that the use of insecticide treated Net (ITN) influence the outcome of malaria burden, those who did not sleep in ITN recorded the highest parasite burden 814 (78.6%), while 21.4% of pregnant women slept in ITNs (Mclean, 2002).

Seventy five (75) (75%) of the subjects involved in this research are urban dwellers and 25(25%) of the subjects are rural dwellers. At the time of this research, it was revealed that pregnant women from rural settings recorded the highest parasite density. This might be as a result of them not using LLITN, keeping stagnant water which is required by mosquito growth, and other malaria preventive measures regularly and by so doing the vector of malaria parasite gain contact with their skin, obtain blood and introduces *Plasmodium* into their blood. Pregnant women are particularly vulnerable to malaria because pregnancy reduces immunity to malaria; increases susceptibility to malaria infection, the risk of illness, severe anemia, acute pulmonary edema, renal failure and increases the risk of death. Several studies in endemic areas suggested that pregnant women have higher frequency of malaria, and are more likely to

develop severe malaria when compared to their non-pregnant counterpart. Environmental factors such as types of housing affect exposure to malaria parasite. Studies across the globe shown that more pregnant women in the Sub-Sahara Africa live in rural area 476 (46%), while the lowest malaria burden was found in those living in Urban Area 197 (19%) (Egwunyenga *et al.*, 2001). Similarly, it was found out by previous researchers that the highest malaria burden was recorded in those living in mud houses 522 (50.40%), while those living in houses with concrete wall had 513 (49.6%) (Omolade, 2003). High parasite burden was recorded in those who used well water 510 (49.3%) and 115 (15.1%) for those who used spring water (Kuile, 2003). In the endemic area of Africa Counties, children under the age of five and pregnant women bear the brunt of the burden of malaria disease, this is because they have lower immunity to the disease compared to other people in the same environmental location.

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