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Socio-Demographic Characteristics and Malaria Prevalence among HIV Positive Pregnant Women attending Aminu Kano Teaching Hospital, Kano-Nigeria

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Abstract
The effect of Human immunodeficiency virus (HIV) infection in relation to effectiveness of malaria control in pregnancy remains a big challenge despite the high prevalence of both infections in sub-Saharan Africa. A study to determine the prevalence of malaria parasite and other contributing factors among pregnant women living with HIV attending Aminu Kano Teaching Hospital (AKTH), Kano was conducted between July and December, 2016. Four hundred blood samples (200 HIV- positive and 200 HIV- negative as control) were subjected to microscopic malarial screening using Giemsa staining techniques. Questionnaire was used to capture demographic, socio-economic status, and other related information from the study population. Of the 400 samples screened, 141(56.18%)HIV-positive and 110(43.82%) HIV- negative had malaria infections respectively. Prevalence of malaria based on gravidity among HIV positive pregnant was 27.49% and 28.68% while HIV negative subjects had a prevalence of 27.09% and 16.73% among primigravidae and multigravidae respectively. Clients that attended secondary school had the highest prevalence among both HIV- positive and HIV- negative subjects (36.65% and 26.69%) respectively. Habits of the subjects towards prevention of malaria showed that a combination of long-lasting insecticide treated nets (LLTI's) and intermittent preventive treatments (IPT's) were more effective than the use of insecticide alone. However, despite the effectiveness of IPT's in the prevention and control of malaria among pregnant women, it was shown to be less effective among HIV- positive subjects as compared to HIV- negative subjects. That could probably be due to their low immune status. The study therefore recommends routine screening of malaria during antenatal care visits for effective management as well as increased IPT dose among HIV- positive pregnant mothers.

Keywords: HIV, Malaria, multigravidae, Prevalence, primigravidae, Trimester

INTRODUCTION
Malaria is an acute infectious disease characterized by fever and related symptoms which is caused by one or more of the five existing species (*Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malariae* and *Plasmodium knowlesi)* of the genus Plasmodium that belongs to the phylum protozoa and class Sporozoa (citation needed) It is transmitted to humans by the bite of infected female anopheles mosquito (Cox-Singh and Singh, 2008).The disease varies widely in epidemiology and clinical manifestation in different parts of the world. This variability is due to factors such as the distribution and efficiency of mosquito

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vectors, the species of malaria parasite that occur in a given area, the climate and other environmental conditions, the behavior and level of acquired immunity of the exposed human populations and their susceptibility to commonly used or available anti malaria drugs (Rogerson *et al.,* 2010).

Malaria is more pronounced in developing countries and in populations living under the most difficult and impoverished conditions (Bourdy *et al.,* 2008). The disease causes damage by weakening the health and general welfare of families (Sachs and Malaney, 2002). Worldwide, 1.2 billion people are at risk of malaria infection, resulting in 207 million cases and 627,000 deaths reported every year (O'Meara, 2010). In sub-Saharan Africa, majority of these deaths occur in young children under five years of age and pregnant women(UNAIDS, 2007) with resultant effects on maternal health and birth outcomes (Kabore, 2001). Areas of the world with high rates of malaria also carry a heavy burden of HIV. There are 33 million people living with HIV worldwide, with 22.5 million in sub-Saharan Africa alone (Naniche *et al.,* 2012). It is estimated that 2.1 million deaths in 2007 were due to HIV, of which 1.6 million occurred in sub-Saharan Africa, making HIV/AIDS the number one cause of mortality in that region (UNAID, 2007).

Human immunodeficiency virus (HIV) positive persons are at increased risk of clinical malaria compared with HIV negative persons and have a poorer response to anti malaria drugs (Rogerson *et al.,* 2010).In high endemic areas, acquired immunity is high, mortality is less common, asymptomatic and incidental parasitemia are not uncommon. Higher parasitemia, particularly in II and III trimester; anemia and altered placental integrity result in less nutritional support leading to abortion, stillbirth, premature birth and low birth weight, and excess infant mortality/morbidity. These problems are more common in first and second pregnancies as the parasitemia level decreases with increasing number of pregnancy (citation). HIV infection extends this to all pregnancies and makes it worse (Thigpen *et al.,* 2011). The strategies for management of malaria in pregnant population in areas of high transmission are formidable tasks include intermittent treatment and use of insecticide treated bed nets. Mosquitoes, vectors of *P. falciparum* are highly adaptable to environmental conditions and have shown resistance to insecticides. The parasite is also highly adaptable, hides in humans and mosquitoes and has developed resistance to drugs (Richard *et al.,* 2009). This research was therefore aimed at determining the prevalence of malaria and level of infection in relation to socio-economic status, demographic parameters and habits of the study population among pregnant mothers living with HIV attending Aminu Kano Teaching Hospital, North-western Nigeria.

MATERIALS AND METHODS

Study Area

The study was carried out at the antenatal clinic and Sadiq Suleiiman Wali (S.S. Wali) ART center in Aminu Kano Teaching Hospital (AKTH).It is one of the state of the art antiretroviral treatment center in the state. Kano State is located in North-Western Nigeriaon Latitudes 11.9634° N, 8.5504° E.

Ethical Clearance

Ethical clearance was granted by the Aminu Kano Teaching Hospital Research Ethics Review Committee (AKTH/MAC/SUB/12A/P-3/VI/1488).

Questionnaire Administration and Informed Consent

Structured questionnaire was used to obtain socio-demographic information such as gravid status, parity, educational level, trimester and other relevant information as well as information about habit of pregnant mothers against prevention of malaria which include previous antimalarial used and use of insecticide.

Sample Size

The sample size was determined using the formula $n = \frac{Z^2Pq}{d^2}$ developed by Gberikon *et* al.(2019). The scientifically calculated sample size was 380based on a local prevalence report by Gajida *et al.*(2010),as such 400 was used for the study.

Sample Collection

About 5ml of bloodwas aseptically collected from each subject, of whom 200 were confirmed HIV- positive using serial algorithm national guideline for the detection of HIV antibodies and 200 HIV- negative as control.

Microscopic Analysis

Samples were tested for the presence of malaria parasite using microscopic examination whereby thick and thin film were made on two separate glass slides, air dried, thin film was fixed using methanol and blood thick and thin films were explored and stained using Giemsa-staining technique. Films were examined microscopically using×100 oil immersion objectives for the presence of malaria parasite. Parasitaemia was determined by counting the asexual parasites against 200 white blood cells (WBCs) assuming a count of 8,000 leukocytes per microlitre of blood (IMMC, 2011).

Statistical Analysis

Data generated from the questionnaire and microscopic examinations were analyzed using OpenEpi statistical software version 2.3. Chi square was used to estimate *p*-value with 95% confidence interval.

RESULTS

Table 1: Trimester and Gravidity Status in Relation to Malaria Positive Cases among HIV positive and HIV Negative Pregnant Women.

	HIV Negative		HIV Positive		
Variables	**No Examined**	**No Positive (%)**	**No Examined**	**No Positive (%)**	**P-value**
Trimester					0.1112
1st	24	15(5.98)	62	34(13.55)	
2nd	104	63(25.10)	85	69(27.49)	
3rd	72	32(12.75)	53	38(15.14)	
Total	200	110(43.82)	200	141(56.18)	
Gravid					
Primigravidae	100	68(27.09)	100	69(27.49)	0.04197
Multigravidae	100	42(16.73)	100	72(28.68)	
Total	200	110(43.82)	200	141(56.18)	

Table 2: Socio-demographic Factors Based on Malaria Positive Cases Among HIV positive and HIV Negative Pregnant Mothers.

	HIV Negative		HIV Positive		
Variable	**No Examined**	**No Positive (%)**	**No Examined**	**No Positive (%)**	**P-value**
Edu Level					0.05464
Primary	14	6(2.39)	20	17(6.77)	
Secondary	110	67(26.69)	113	92(36.65)	
Tertiary	76	37(14.74)	67	32(12.75)	
Marital Status					
Married	197	107(42.63)	187	129(51.39)	0.05473
Single	3	3(1.20)	5	5(1.99)	
Divorced	0	-	8	7(2.79)	
O Status					
B- Women	56	25(9.96)	61	46(18.33)	0.1082
Civil servant	99	47(18.73)	81	44(17.53)	
House wife	45	34(13.55)	58	51(20.31)	
Income					
A (<50)	95	77(30.68)	115	102(40.64)	0.912
B (50-100)	94	25(9.96)	59	29(11.55)	
C (>100)	31	8(3.19)	36	10(3.98)	

Key: Edu level= Educational level, O Status= Occupational status, x= Significant difference ($p< 0.05$), A = Less than fifty thousand, B = Fifty to hundred thousand, C = More than hundred thousand, B- Women = Business women.

Table 3: Preventive Practice of the Subject and its Association with Malaria Positive Cases Among HIV positive and HIV Negative Pregnant Mothers.

		HIV Negative		HIV Positive	
Variable	**No. Examined**	**No. +ve(%)**	**No. Examined**	**No +ve (%)**	**P-value**
IPT's					
Yes	119	45(17.93)	79	45(17.93)	0.1405
No	81	65(25.90)	121	96(38.25)	
LLTI's					
Yes	103	23(9.16)	103	52(20.72)	0.006095
No	97	87(34.66)	97	89(35.46)	
Insecticides					
es	142	93(37.05)	130	100(39.84)	0.01107
No	58	17(6.77)	70	41(16.33)	

Keys:IPT's = Intermittent Protective Treatment's, LLTI's = Long Lasting Treated Insecticide nets.

DISCUSSION

World Health Organization (WHO) Malaria Fact Sheet (2012) describes malaria as a treatable and preventable mosquito- borne febrile illness, whose main victims are pregnant mothers and children under five years of age in Africa. However, the emergence of HIV in malaria positive pregnant mothers creates a potentially new situation with regard to malaria control in pregnancy. Our results show that 141 of the 200 HIV- positive and 110 of the 200 HIV-negative were positive for malaria. High prevalence rates obtained could be due to the fact

that the currently available funding for malaria prevention and control is far below the resources required to reach global malaria targets. An estimated US$ 5.1 billion is needed every year between 2011 and 2020 to achieve universal access to malaria interventions as stated by WHO, (2012).

The prevalence of malaria among the HIV positive was seen across all gestational ages. Results obtained showed that multigravidae have higher malaria infection (28.68%)than the primigravidae (27.49%)among HIV positive pregnant mothers. Similar observation had also been made by Roger *et al.*(2015) who reported higher prevalence of malaria of (74.7%) in multigravidae compare to (72.7%) among the primigravidae. The difference in the prevalence might be due to the fact that HIV increases the risk of malaria in adults. Our result is in conformity with the report of Bicego *et al.* (2002) who that, multigravidae in holoendemic areas for malaria develop parity-specific immunity following recovery from first pregnancy parasitaemia however, and HIV infection impairs immunity and lead to an increase in susceptibility to malaria in the higher parity groups.Peak parasite prevalence occurred earlier in gestation in HIVpositiveprimigravidae (1st trimester). This shows that HIV infection is associated with significant increase in malaria prevalence among pregnant women of different gestational ages, while the severity of the infection was more pronounced among the second trimester in the multigravidae HIV positive subjects.

Literacy level might have played a vital role in providing knowledge on preventive measures against malarial infection. Highest prevalence rate was observed among subjects with secondary education in both the HIV positive and HIV negative groups (26.6 and 36.65)respectively. The result has shown that lack of formal education is independently associated with severe malaria infection (P >0.05).This could be due to the fact that people with primary education may likely comply with malaria preventive strategies as compared to their counterparts with secondary and tertiary level of education

Regarding the marital status of the subjects, highest infection rate was observed among the house wives (20.31%)among HIV positive and 13.55% among HIV negative. The result obtained also showed that (40.64%) and (30.68%) of those having a monthly income of <50,000 had the highest level of parasitemia among the HIV positive and HIV negative subjects respectively, This could be due to the fact that malaria is a disease of poverty affecting individual of low socio-economic status, who cannot afford appropriate treatment. These finding is in conformity with the report of WHO (2012) Malaria Report, which stated that, malaria remains inextricably linked with poverty. The highest malaria mortality rates are being seen in countries that have the highest rates of extreme poverty.

Prevention and control of malaria have been aimed at reducing contact between host (man) and vector (female anopheles mosquito) by the use of indoor residual spraying, use of insecticides, chemoprophylaxis among pregnant mothers and sleeping under long lasting treated net and also by reducing the level of parasitaemia in the blood stream of the infected individual through therapeutic means. With regard to protection against malaria infection based on the habit of the population, those that reported used of IPT's dose and higher bet net use were in general protected against parasitemia than those reported the use of insecticide. Our results shows that, (17.93%) and (17.93%) of those reported the used of IPT's have parasitemia with less parasite density among the HIV positive and HIV negative subjects respectively. This finding conceded with research conducted by Nduka *et al.* (2011) were they observed 32.7% compliance and significantly lower infection rate of (39%) against (61%) in those not on IPTp. While (20.72%) and (9.16%) of those reported the used of LLTI's are

parasitemia with high significant differences among the HIV positive and HIV negative subjects.

This is also similar to the work of Nwosu *et al.* (2011) were they observed (26.7%) LLIN compliance and (36.9%) infection rate among LLIN users which was lower than that of non-users and also the prevalence among. A high percentage of malaria positive were observed among those using insecticide, (39.84%) and (37.05%) among the HIV positive and HIV negative pregnant mothers. The presence of malaria parasite among subjects receiving antimalarial and among those that reported the used of insecticide for prevention of malaria could be due to lack of effort to prevent the emergence and spread of parasite resistance to anti-malarial medicines and mosquito resistance to insecticide which are constrained by inadequate funding as reported by WHO(2012). The result showed a high significant difference among the study subject.

CONCLUSION AND RECOMMENDATIONS

The finding of this study showed that malaria infection was relatively high among HIV-positive pregnant mothers (56.18%) compared to the HIV- negative subjects (43.82%). This is a reflection of low effectiveness of IPT's, illiteracy, less use of LLTI's as well as low level of income. Based on the results obtained, the following are recommended:

1. Routine doses of IPT's should be administered at least one month apart in both primigravidae and multigravidae taken as directly observed therapy (DOT) in antenatal clinic. This is because restricting antimalarial treatment in pregnancy to primigravidae has been suggested to be inappropriate in HIV - positive individual.
2. There is also the need to provide all pregnant women with long lasting insecticide treated nets (LLTI's) so as to serve as a barrier method for preventing mosquito bites during night time.
3. Enlighten pregnant women on the dangers of becoming infected with malaria as well as preventive measures such as use of LLTI's and taking of IPT's should be strictly maintained.
4. Further research is required to investigate the implications of these findings for treatment of malaria among pregnant women living with HIV to determine whether a reduced response to antimalarial treatment among HIV positive pregnant women increases the malaria case fatality rate, and the potential implications for control of malaria transmission.

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