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Prevalence of Malaria Infection across Trimesters of Pregnancy and Number of Births in Pregnant Women in South-South Nigeria

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ABSTRACT

This study investigated the Prevalence of Malaria Infection across Trimesters and Number of Births in Pregnant Women in South-South, Nigeria. The study aimed to determine the prevalence of malaria parasitemia across trimesters and number of pregnancies. A descriptive design study with 100 pregnant women participants Sample size was calculated using the Fischer's formula. The demographic data: age, trimester of the pregnancy and the number of pregnancies were collected with laboratory request form for microscopy of the participants' blood sample. Venous blood samples were collected into EDTA sample bottles and taken to a central laboratory for blood microscopy test to determine the presence of malaria parasite. Descriptive and inferential statistics, supported with SPSS Version 22 were done. Findings revealed that the presence of malaria parasitaemia was more common in the second trimester 28(45.9%), and in multigravida 43(70.5 %.). The study concluded that there is no significant relationship between trimester of pregnancy and number of pregnancies with malaria infection among pregnant women (P = 0.05). Based on the study findings, it was recommended that more studies should be carried out in HIV positive pregnant (since their immunity is lower). It was also recommended that some studies on malaria parasitaemia in pregnant women should be carried out during wet season June to July when the rainfall is highest in the same study area to determine if the prevalence could be attributed to the excess rainfall and wet weather condition in the region.

Keywords

Prevalence, Malaria, Pregnant women, Trimester, Gravid arum.

Introduction

Malaria is a disease caused by the transmission of plasmodium parasite by the female Anopheles mosquito and is characterized by intense signs and symptoms especially fever and chills. Its incubation period is 7–30 days. Symptoms commence within the average of 7–15 days after bite from an infected female Anopheles mosquito [1]. Of the known numerous species of plasmodium, only five affect humans and cause malaria namely; the Plasmodium falciparum, Plasmodium vivax, Plasmodium oval, Plasmodium malaria and Plasmodium Knowles. There are two (2) main species of Plasmodium parasites which are the most virulent of the five (5) known plasmodium parasite species that cause malaria in humans, namely–*Plasmodium falciparum* and P*lasmodium vivax* [2]. As noted by Ballantine [1], the parasites Plasmodium falciparum causes malignant tertian fever which recurs every 48 hours. About 25 to 30 percent infections are resulted from the species. This type of malaria is self-hunted, lasts about one year if untreated, and has high mortality. The falciparum type accounts for 80% of malaria in men and it is the most dangerous and devastating. Plasmodium vivax causes benign tertian fever which recurs every 48 hours. About 65 to 70% of malaria infections are caused by these species. The fever usually lasts for 3 years if untreated. P. vivax is rare in indigenous people of West Africa in contrast to their counterparts in central and eastern parts of the continent. On the other hand, Plasmodium malaria causes Quatian type of fever which recurs every 72 hours. It lasts for many years if untreated while Plasmodium oval is rarely found in man mainly confined

to tropical Africa and Plasmodium causes complicated malaria abruptly from the uncomplicated malaria. It is found in most parts of South Eastern Asia.

Malaria transmission varies from place to place owing to certain factors such as weather conditions including temperature and rainfall, physical features of the location and level of immunity of inhabitants. The plasmodium parasite cannot mature in its vector–mosquito where the temperature is below 15°C. Such temperature can be found in temperate regions and mountain tops, and some parts of Africa. Also, transmission is highest in the rainy season in most malaria endemic regions because of the increased breeding, bites and the abundance of vegetation where the vectors can rest. Physical features of the land also improve the transmission of malaria because they increase the ability of the soil to allow surface water logging, which encourages mosquito breeding since the vector lays its eggs on water. Sloppy or hilly places allow water to drain off easily and are, therefore not conductive for mosquito breeding; and based on the level of immunity of inhabitants, according to Roerson and others [3], malaria is an important cause of morbidity but not everyone infected with malaria becomes seriously ill or dies. Repeated exposure to the parasite leads to the acquisition of specific immunity, which restricts serious problems to young children and causing mild illness in older persons. They also opined that resistance could be innate or acquired. Hence, those at increased risk of contracting and suffering from malaria are; pregnant women, children (especially those below the age of five years), those with sickle cell anemia (HbSS), individuals who have had their spleens removed, persons suffering from other ailments including stress, persons of all ages from places where malaria is not endemic who visit malaria endemic countries. The burden of malaria remains unexpectedly high especially in the Sub-Saharan Region of Africa with the highest prevalence in twenty (20) countries despite the strategies launched and put in place by the leaders in the most affected Sub-Saharan African countries through the approach referred to as the "High burden to high impact" (HBHI). The most affected countries are Mozambique with 4% mortality rate, Niger with same mortality rate as Mozambique, Tanzania with 5%, Democratic Republic of Congo with 11%, and the highest mortality rate of about 24% in Nigeria. A high suspicion of malaria can be made by travel history to a malaria endemic area (for people in areas where malaria is not endemic who visited malaria endemic areas), signs and symptoms and investigations. A definitive diagnosis of malaria may now be made by using the microscopic smear.

Malaria is treatable, but humans can be re-infected. Hence, measures to prevent mosquito bites is advisable through: environmental modifications and manipulation through clearing of bushes, disposal of wastes, prevention of water floods and stagnant waters which are mosquito habitats; preventing mosquito bites through use of mosquito repellants, insecticide-treated mosquito nets, wearing protective clothing and decontamination of household with anti-mosquito fumigants; chemo-prophylaxis, early diagnosis and treatment of acute cases of malaria in pregnancy using safe and approved medications; and health education to improve awareness of the need for personal and environmental protection and hygiene to prevent malaria.

The virulence of malaria in pregnancy depends on the pregnant woman's ability to resist malaria infection by the action of specific antibodies [4]. This means that, a pregnant woman is more likely to suffer from malaria infection and its complications in the mother and baby in utero. Such complications include; severe anemia, increased rate of spontaneous abortion, preterm delivery, low-birth-weight neonates, neonatal and maternal death. It is therefore crucial to understand the trend of malaria infection in pregnancy in endemic areas, the study area being inclusive and to map out effective strategy to curb its transmission. With reference to some studies carried in Nigeria on the prevalence of malaria in pregnancy, higher percentages were reported more in the South Region of Nigeria compared to the South-Western and Northern region of Nigeria in recent times. Prevalence of malaria in pregnancy has been reported by studies; In Porthar court 72.% [5], Benin City 78.9% [6], Kano state 39.2% [7], Ile-Ife 13.1% [8]. Most of the studies were conducted in public medical facilities where the women were already receiving antenatal care, routine screening and prophylaxis against malaria in pregnancy. In-addition, there seem to be less empirical report on parasitaemia infestation among women receiving antenatal care from private healthcare facilities and there is no certainty as to whether the women receive routine screening and prophylaxis for malaria parasitaemia infestation or not.

Materials and Methods

This study adopted the descriptive design. It was conducted in four selected private facilities in Nigeria. The study population included all pregnant women who accessed care in the private healthcare facilities from March 2020 to April 2020. The total population from the facilities was 800 pregnant women in attendance within the period. Pregnant women on antimalarial medication were excluded from the study. Sample size was calculated using the Fischer's formula and a total of 103 sample size drawn using simple random sampling method, and 100 pregnant women were studied.

Ethical clearance and access were sought and obtained from the facilities' management. Participants were also assured of utmost confidentiality. Standard precautions and Privacy was ensured while collecting samples at the phlebotomy unit. Participants' trimester of pregnancy and number of pregnancies were obtained from the laboratory request form. Sample bottles were identified with coded number.

The study involved the collection of the socio-demographic data (age, trimester and number of pregnancies) as well as blood sample of the participants. The binocular light microscope was used to view participants' blood smear to identify the presence of malaria parasite – Plasmodium. Results were analyzed using descriptive and inferential statistics. Analysis was supported with Statistical Package for Social Sciences (SPSS) software version 22. Data on research questions was analyzed using descriptive

statistics of frequency count and percentages. The association between prevalence and socio-demographic characteristics of the study participants was determined using inferential statistics of Chi-square.

Table 1: Distribution of Malaria Parasitaemia across Trimesters (n=100).

		Malaria parasites result		Total
		Present	Not present	
Trimester	First	n= 21 34.4%	n = 10 25.6%	n = 31 31.0%
	Second	n = 28 45.9%	n = 15 38.5%	n = 43 43.0%
	Third	n = 12 19.7%	n = 14 35.9%	n = 26 26.0%
Total		**n = 61**	**n = 39**	**n = 100 100.0%**

Table 2: Distribution of Malaria Parasitaemia by Gravid arum (n=100).

		Malaria parasite result		Total
		Present	Not Present	
Gravid arum	Primigravidae (1)	n = 14 23.0%	n = 6 15.4%	n = 20 20.0%
	Multigravidae (2-4)	n = 43 70.5%	n = 30 76.9%	n = 73 73.0%
	Grand multigravidae (5 & above)	n = 4 6.6%	n = 3 7.7%	n = 7 7.0%
Total		**n = 61**	**n = 39**	**n = 100**

Table 3: Chi-square test on the Relationship between Malaria Parasitaemia and Trimester (n=100).

X^2 Cal	X^2 tab	Df	P value	Inference	Decision
3.307	5.99	2	0.05	X^2 Cal< X^2 tab	Ho Accepted

Table 4: Chi-square test on the Relationship between Malaria Parasitaemia and Gravid arum (n=100).

X^2 Cal	X^2 tab	Df	P value	Inference	Decision
0.860	5.99	2	0.05	X^2 Cal< X^2 tab	Ho Accepted

Discussions

Prevalence of Malaria Parasitaemia across Trimester of Pregnancy and Gravid arum

With regards to the trimester of pregnancy, it was observed that 21 (34.4%) of the women who were in the first trimester had malaria parasite detected in their blood. For those in the second trimester, 28 (45.9%) tested positive while only 12 (19.7%) of those in the third trimester tested positive. It therefore means that pregnant women in the second trimester had the highest prevalence of malaria parasitaemia. Although the total number of pregnant women in the second trimester in the study were not proportionally equal, however the ratio of those with positive parasites and negative parasites results were significant (first trimester 2.1:1, second trimester 9.3:5 and third 6:7). This finding could be attributed to the delay in treatment of pregnant women with intermittent preventive treatment (IPTp) of malaria in pregnancy with sulfadoxine-pyrimethamine (SP) as recommended by WHO, 2012 to commence the prophylactic treatment as early as possible in the second trimester and that each pregnant woman should receive three doses of the regimen at least one month apart and can be administered safely up until delivery.

However, the test on the relationship between malaria parasitaemia and trimester of pregnancy using the Pearson Chi Square test, results revealed that the Calculated Chi square, X^2 value is 3.307, degree of freedom (df) = 2 and level of significance p = 0.05. Therefore, there is no significant relationship between the prevalence of malaria parasitaemia. In contrast, [9] reported higher prevalence of parasteamia (56.6%) in first trimester among pregnant women in a study at Abia state Nigeria, and 70.1% in Congo [10], while Frank and others [11] reported high prevalence (79.2%) in third trimester in Idea to South Local Government Area, Imo State. The disparities in the findings may be a reflection of the period of presentation at the facility. Some women delay registration at the antennal clinic until almost or in the second trimester due to financial, personal or religious reasons. It is also possible, that some participants already had malaria parasitaemia but remained asymptomatic, hence were not tested and treated in the previous trimester. They therefore carried the parasite into the following trimester. It could also be related to the idea of postponement of malaria treatment, especially in the first trimester of pregnancy for fear of the outcome of the therapy.

For the Prevalence of Malaria Parasitaemia and Number of Pregnancies, the result noted, highest (70.5%) prevalence of malaria parasitaemia in pregnant women with previous pregnancies of two to four. (multipgravid).

However, the test on the relationship between malaria parasitaemia and number of pregnancies using the Pearson Chi Square test, results revealed that the Calculated Chi square, X^2 value as 0.860, degree of freedom (df) = 2 and level of significance, p = 0.05 suggest no significant relationship in the occurrence of malaria parasitaemia and gravid arum. This translates that the susceptibility and prevalence of malaria parasitaemia does not increase as the number of pregnancies increases, the number of pregnancies a woman has does not prevent her from contracting malaria infection. The results indicate that the prevalence of malaria parasitaemia in the pregnant women was inversely associated with the number of pregnancies, which literally means that as the number of pregnancies increases, the lower the prevalence of malaria parasitaemia in the pregnant women. Findings from the afore-mentioned studies could be attributed to the boosting of immunity to malaria infection with subsequent pregnancies.

Despite the fact that the increased number of pregnancies helps to confer immunity to malaria in subsequent pregnancies as asserted by [3] in their review on "Malaria in pregnancy,. They noted that malaria parasites especially *P. falciparum* accumulate at the placenta during pregnancy and could protect the women in subsequent pregnancies from the complications of malaria. In addition to the idea of [3], the WHO [2] stated that the intensity of malaria transmission can determine presentation, complications and outcome of malaria in pregnancy. Therefore, as revealed in this study, a pregnant woman is still susceptible to contract malaria infection whether she has been pregnant before or not but possibly, the more the pregnancies a woman encounters, the less likely she might suffer from the complications of malaria parasitaemia.

Conclusion

Malaria in pregnancy remains a major challenge globally, more so in this region of the country where the prevalence remains above 60%. It affects all pregnant women of all ages, trimesters, gravid arum, parity, occupation and race but in varying proportions dependent on certain factors such as environmental factors, knowledge and attitude of pregnant women and their significant others to malaria prevention and treatment etc. The likelihood that a pregnant woman will contract and suffer the adverse effects malaria is high. It is therefore imminent to expedite efforts to curb this menace. The immunity of a pregnant woman is already interfered by pregnancy hormones, how much more if the woman has significant positive malaria parasites. It is recommended that more studies should be carried out in pregnant women. It is also recommended that some studies on malaria parasitaemia in pregnant women should be carried out wet season when the rainfall is highest, especially in the South region of Nigeria; see if the prevalence is mainly due to the excess rainfall and wet weather condition in this region.

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