



Malaria in Pregnancy Amidst Possession of Insecticide Treated Bed Nets (ITNs) in Orlu L.G.A. of Imo State, Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Malaria is one of the most dreadful diseases in pregnancy due because it affects not only the pregnant mother, but also the foetus especially in the Tropical African countries. Most endemic nations have embarked on free or affordable distribution of insecticide treated bed net as an alternative to drug interventions, yet many people, especially children and pregnant women stand the risk of malaria attack annually. Hence the study on the malaria status and possession of insecticide treated bed net (ITN) among pregnant women in Orlu LGA in 2019. A total of 600 pregnant women were encountered in health care service centers in the area, out of which 514 gave their consent and participated in the study. Blood samples were collected using finger pricking method, stains made directly on slides allowed to dry and then taken to diagnostic laboratory for parasitological analysis. The slides were stained with Giemsa stain and examined using X100 oil immersion objective lens. Biodata and other relevant information on the use/ non use of ITN were obtained using well-structured questionnaire and focus group discussions. The results obtained revealed that out of 514 participants examined, 318(61.9%) had malaria parasites while 196(38.1%) had no malaria. Gravid related prevalence showed primed of having the highest prevalence of

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69.1%, while the least infected were those of thirdgravidae, (44.3%). Trimester related prevalence also had the first trimester group of having the highest prevalence of 71.5%, while the least was observed among the second trimesters, 55.5%. Of 217 (42.2%) who use ITN,129 (59.4%) were infected while 63.6% of those who do not use had a malaria infection as well. Generally, this study revealed that it is not only the distribution or possession of ITN that reduces or prevents malaria infection, but the zeal and enabling environment to use the nets appropriately. A lot more is needed to really prevent malaria infection among the most vulnerable and indeed the entire populace through improved education strategy. Better enlightenment of the public as well as availability of coping strategies to really ameliorate the effect of extra heat and rashes from the bed nets are paramount.

Keywords: Pregnant women; insecticides; bed nets; gravidity; trimester; ameliorate.

1. INTRODUCTION

Malaria is really on the increase and a great burden infection in the endemic tropic and sub-tropical African nations especially Nigeria. It is one of the major causes of morbidity and mortality in malaria endemic parts of the world [1]. Being a mosquito borne vector infectious disease, it readily affects human [2]. More than 3.2 billion people all over the world are at risk of the infection while morbidity stands at between 148-304 million cases with nearly 235-639 deaths globally, of which 92% are in WHO African regions [1]. Over 609 million people experience malaria attack in WHO countries members at least twice a year with no less than 80% at risk in Nigeria. It is one of the causes of respiratory distress syndrome that occurs in about 5-25% adults of which 29% are pregnant women, [3]. Thus malaria stands as the most frequently diagnosed disease in the out-patient hospitals in endemic area of Africa [4].

According to Skekelee,[5], about 25-30 million women become pregnant annually with prime gravid being the most vulnerable group to malaria infection. Globally, malaria parasitemia among pregnant women is highly associated with complications that are life threatening to both mother and the foetus, [6] (Isah *et al* 2011) [7]. Takem and Alessandro [8] reported that pregnant women who are infected with malaria often have more severe symptoms with higher rates of miscarriages, intrauterine death, premature delivery, low birth weight and neonatal death than the uninfected. Malaria transmission is also affected by immunity acquired as a result of previous attacks or exposure over the years. However, it does not provide complete protection, but aid in reducing the risk of disease severity. Hence young children and pregnant women are most affected by malaria due to reduced immunity [2].

High malaria burden is found in the tropics especially in African countries due to clearly identified human and environmental risk factors that exist even from the households levels as a result of poor personal and environmental sanitations, ignorant and non-availability of essential amenities [9]. According to Enayati *et al.*[10], mosquito breeding and transmission can be controlled through the use of interventions such as indoor residual spraying with insecticide and insecticide treated bed net which are highly effective in vector control.

WHO [2] made it clear that in the absence of vaccine with great increase of resistant malaria species, the best option for control of malaria is the use of insecticide treated bed net. This alternative option is known to reduce to both child and maternal death to about 25%. Ruth (2019) reported that factors such as closeness to breeding site, overcrowding and poor drains contribute a lot to the multiplication and spread of malaria infections. Use of insecticide treated bed net is one of the most cost effective interventions against malaria and campaign like strategies as means of rapidly increasing use of long lasting insecticide bed coverage has been embarked on by a number of countries [11,12].

Hill and Hoyt-van Eijk [13] reported an increase in the use of ITN from 33%-43% among pregnant women, they however, expressed that many who owe these nets do not use them due to poor knowledge and perception on the importance of the nets. Baume and Franca [14] in a work conducted in Ghana, reported that about 40% who possess ITNs do not use them. Ricolta *et al.* [15] observed that access to ITNs does not always suggest usage. This could be as a result of many challenges such as socio cultural, personal non conviction and other logistical reasons that may surround the owner.

As malaria among the vulnerable groups, especially the pregnant women continues to be on the increase despite the distribution and possession of insecticide treated bed net in the State, the researcher therefore, set out to assess the prevalence of malaria among pregnant women amidst possession of insecticide treated bed nets in the study area.

2. MATERIALS AND METHODS

2.1 The Study Area

Orlu is one of the 27 LGAs in Imo State, the eastern heartland which is one of the five states that made up the Southern part of Nigeria created in 1976 with three geopolitical zones; Orlu, Okigwe and Owerri. It lies within latitude $5^{\circ}10'$ and $5^{\circ}67'$ N and longitude $6^{\circ}35'$ and $7^{\circ}28'$ E. It is bounded by Abia State in the East, on the South by Rivers and South West by Rivers and Delta States and on the North and North West by Anambra State. Topographically, it has high and low landscapes having two distinct seasons; the rainy wet season and dry seasons. Education is the biggest industry in the state which is justified by the presence of many educational institutions in the state with the highest number of candidate registration in all the national and international examinations annually. Majorly Christian states with few other religions which is very much instrumental to monogamous marriages and moderate number of children. Occupationally, the people are mainly civil servants, businessmen and women, farmers and artisan.

Although the Eastern Heartland of the South East, with all the natural gift of nature the State still has very poor environmental conditions as a result of ignorance, poor personal and environmental hygiene emanating from poor governance and inadequate provision of essential amenities by the government. A factor highly instrumental in the high malaria breeding, transmission and poor attitude towards the use of insecticide treated bed net.

2.2 Study Population

This includes all pregnant women attending health services in the study area who possess ITN and has not been treated of malaria within one month at the time of the examination. A total of 514 out of 600 women encountered participated in the study.

2.3 Sample Collection and Analysis

A total of 600 pregnant women with varying gravid and trimesters was randomly selected

from health care service centers. Of this number, 514 gave their consent and were screened for malaria parasites. Finger pricked blood samples were collected from the participants, thick and thin smears were immediately made on slides, allowed to dry before packaging for onward transportation to a diagnostic laboratory for analysis. The slides were stained using Giemsa stains and examined using X100 microscope [16]. Bio-data and other relevant information on the use/ non use of ITN were obtained using well-structured questionnaire and focus group discussions.

2.4 Data Analysis

The data collected were analysed using descriptive statistics (percentages, chi-square and Z-test) for proportion of infected population.

3. RESULTS

The study of malaria prevalence among pregnant women amidst possession of ITN was conducted in Orlu LGA of Imo state, in 2019 and presented thus:

Table 2 expresses the result in relation to gravid levels of the study group, the primers had the highest prevalence of (69.1%) while the least infected group was those in gravid three (44.3%). This infection is significantly dependent on the gravid levels of the pregnant women ($p < 0.05$).

Table 3, revealed that infection was highest among the first trimesters (71.5%) while the least was among the second trimesters, (55.5%). Statistically infection was dependent on the trimesters, ($p < 0.05$).

Table 4 Showed that (59.4%) of those who used ITN were infected while (63.6%) of those who do not use ITN were also infected. Infection is therefore independent of the use and non-use of ITN ($P < 0.05$).

Table 5 revealed that infection is highly dependent on the use of ITN by gravid levels, ($p < 0.05$).

Table 5, Revealed that 69.7% of those in gravid 1 who did not use were infected while the least infected group were those in gravid 3. Infection is independent on the non-use of ITN by gravid levels, ($p < 0.05$).

Table 7, Reveals that infection is significantly independent on trimesters among those that use ITN, ($P < 0.05$).

Table 8 shows that infectin is dependent on trimester among those that did not use ITN,($P>0.05$).

Table 9,the result of the reasons for none use of the ITN revealed that (66.0%) experience extra heat generation resulting from the ITN, 32.2% had skin rashes result of contact while 10.8% had no reasons for not using the ITN.

4. DISCUSSION

There is a much increased susceptibility to malaria and other infections during pregnancy due to the suppression of the immune system by the parasite in other to ensure establishment and non -rejection of the foetus [17]. Thus a

prevalence of 61.9% was recorded among the study group. This result is truly disturbing because it came at the time of mass distribution and possession of ITN by almost every pregnant woman in the study area. IT is contrary to many other works done by researchers in thecountry and elsewhere [18, 2].This high proportion of pregnant women infected by malaria parasite did not in any way justify the great effort made by the government and NGOs in making ITN available to almost everyone. However, considering the disposition of the study group in the study area with very poor provision of social amenities such as electricity, one will not expect anything less since pregnancy demands some physical comfort to combat the natural discomforts that go with it. Hence the result obtained.

Table 1. The proportion of pregnant women infected by malaria

No. Examined	No. Infected (%)	No. Uninfected (%)	Z _{cal} -
514	318 (61.9)	196 (38.1)	28.97

Table 2. Prevalence in relation to the number of pregnancies (Gravid)

Gravid	No. Examined	No. Infected (%)	No. Uninfected (%)	P-0.0005
Prima Gravid	269	186 (69.1)	83 (30.9)	X ² 17.91
Second Gravid	142	79 (55.6)	63(44.4)	
Third Gravid	70	31 (44.3)	39(55.7)	
Multi Gravid	33	27 (66.7)	11(33.3)	
Total	514	318	196	

Table 3. Trimester related prevalence

Trimester	No. Examined	No. Infected (%)	No. Uninfected (%)	P-.0052
1 st Trimester	158	113 (71.5)	45(28.5)	X ² =10.50
2 nd Trimester	247	137 (55.5)	110(44.5)	
3 rd Trimester	109	68 (62.4)	41(37.6)	
Total	514	318	196	

Table 4. Prevalence of malaria in relation to the use and non-use of ITNs

No. examined	Use		Non-use			PROPORTION Z _{cal}
	No. infected (%)	No. uninfected (%)	No. examined	No. infected (%)	No. uninfected (%)	
217(42.2)	129 (59.4)	88(40.6)	297(57.9)	189(63.6)	108(36.4)	37.80

Table 5. Gravid prevalence in relation to the use of ITNs

Gravid	No. examined	No. infected (%)	No. Uninfected (%)	
1	147	101(68.7)	46(31.3)	X ² 18.29 P-0.0003
2	54	19(35.2)	35(64.8)	
3	12	7 (58.5)	5(41.7)	
4	4	2(50)	2(50)	
total	217		88129	

Table 6. Gravid related prevalence in relation to the non use of ITNS

Gravid	Non-use			$\chi^2=15.41$ P=0.0150
	No. examined	No. Infected (%)	No. uninfected (%)	
1	122	85 (69.7)	37 (30.3)	
2	88	60 (68.2)	28 (31.8)	
3	58	24 (41.4)	34 (58.6)	
4	29	20 (69.0)	9 (31.0)	
Total	297	189	108	

Table 7. Trimester prevalence in relation to the use of ITN

Trimester	No, Examined	No. Infected (%)	No. Uninfected (%)	$\chi^2=2.82$	P=0.24441
1	59	40(69.8)	19(32.2)		
2	121	70(42.1)	51(42.1)		
3	37	19(51.4)	18(48.1)		
Total	217	129	88		

Table 8. Trimester prevalence in relation to non use of ITNs

Trimester	Non-use			$\chi^2 =10.95$ P=0.0042
	No. examined	No. infected (%)	No. uninfected (%)	
1	99	73 (73.7)	26 (26.3)	
2	126	67 (53.2)	59 (46.8)	
3	72	49 (68.1)	23 (31.9)	
Total	297	189	108	

Table 9. Reasons for non-use of the ITN

Those that did not use ITN	Due to extra heat generation (%)	Due to skin rash (%)	No Reason (%)
297	196(66.0)	69(32.2)	32(10.8)

Trimester and gravidity related prevalence also revealed that infection is highly dependent, (P<0.005). This result is in line with Menedez [19] and Stephen *et al.* [20] who expressed that in early pregnancy, the body is somehow prone to many infections as a result of the change in the level of cellular immunity and pregnancy hormones. It could also be as a result of some human factors for most people at early trimesters and gravid could be as confused or ignorant as not to care or adapt to appropriate measures against endemic infections like malaria.

Consequently, this study revealed that majority of the women who had ITN did not sleep under the nets, hence the high prevalence. It was recorded that only (42%) of the study group used their net and among these groups, (59.4%) were infected. It then became obvious that the ITNs usage may have been abused due to some human and mostly social and environmental factors. Hence the result agrees with works of Baume and

Franca [15], Okwelogu *et al.* (2012) and Ivan *et al.* [21] who also observed that only few women sleep under their nets.

Various reasons such as extra hot heat generation, skin rashes and other discomforts were given for none use of the ITNs by the study group [13,21]. These responses to none use of ITN could be justified since there is evidence of very poor supply of electricity all over the country but worst heat in Imo State. Even when one has a generator set, it is usually not used throughout the night and must be switched off before one can truly go to bed. Hence, it seems almost impossible for pregnant women to sleep under the ITN when there is inadequate supply of electricity coupled with numerous mosquito breeding sites.

On the other hand, due to some ignorance and poverty, many women preferred to and were seen protecting their plants and domestic animals from pests with the nets, [21] and field

observations). This singular act calls for urgent attention by both government and the health authorities to really bring home the importance of the use of the ITNs by the pregnant women and others in the society [22-26].

5. CONCLUSION

Malaria is a life threatening endemic disease and cause of many maternal and child mortality in African countries. Moreover, pregnancy disposes women to great many infections due to lowered immunity and the presence of pregnancy hormones. Hence, high rate of malaria infection among pregnant women.

Generally, this study revealed that it is not only the distribution or possession of ITN that reduce or prevent malaria infection, but the Zealand enabling environment to use it appropriately.

Hence, a lot of more effort is needed to really prevent malaria infection among the most vulnerable and indeed the entire populace through improved education strategy.

Better enlightenment of the public by the governments and NGOs as well as availability of coping strategies to ameliorate the effect of extra heat from the bed nets is needed.

Consequently, Government at all levels and residents should as a matter of urgency carry out massive educational campaigns on the proper use of ITN and adequate clean-up of the environments to help achieve health for all through infection reduction.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical clearance was obtained from the Imo State University ethical clearance committee and other appropriate authorities, including household heads and the participants before the commencement of the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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