

## Risk Factors and Management Practices for Malaria among Pregnant Women in Owerri Metropolis-A Population-Based Study

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### ABSTRACT

Malaria risks and management practices among women receiving antenatal care in Owerri metropolis, Imo State was investigated. A total of 342 pregnant women that had lived in the study area for at least 1 year were recruited. Ethical clearance and informed consent were sought and obtained prior to the survey. At recruitment, each participating woman was administered a questionnaire to help capture information on risk factors, clinical status and symptoms, and their ethno-management practices. Results showed that the risk factors that predisposed pregnant women to *P. falciparum* infection implicated presence of sewage and overgrown bushes around residence, engaging in much farming and staying outdoors at night, when compared with abstainers that had less likelihood ( $p < 0.05$ ). Less than 35% of the women admitted they had episodes of fever, headache, cough/catarrah, anorexia and weakness, and mostly occurred during their first trimester. Malaria management among the women were the use of spray (37.4%), drug (27.5%) and treated net (19.3%) among others, with poor compliance and adherence. High preponderant of the women responded they had treatment satisfaction due to good health care delivery (38.0%) and drug effectiveness (33.3%) at moderate treatment cost. In conclusion, whereas environmental and behavioural factors do expose pregnant women alike to malaria infection, those in their first trimester are at more risk considering the higher rate of their clinical manifestations. Therefore, awareness campaigns by healthcare workers and/or trained volunteers should be carried out more intensely to address the poor compliance to malaria management procedures in the study area.

**Keywords:** Malaria; Pregnant women; Risk factors; Management practices; Owerri metropolis

### INTRODUCTION

Malaria is a life-threatening infectious disease which has had a profound effect on human lives for thousands of years [1-3]. Malaria is prevalent in tropical and subtropical regions because of rainfall, consistent high temperatures and high humidity, along with stagnant waters in which mosquito larvae readily mature, providing them with the environment they need for continuous breeding [4]. Malaria infection during pregnancy is a major public health problem in tropical and subtropical regions throughout the world [5]. 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 [6,7]. It has been reported that pregnant women

are trice more likely to suffer from severe disease as a result of malaria parasite infection compared with their non-pregnant counterparts [7]. Malaria during pregnancy leads to increased risks to the mother and foetus [8]. Maternal malaria increases the risk of spontaneous abortion, stillbirth, premature delivery, and rarely, congenital/placental malaria. It is also frequently associated with complications such as cerebral malaria, hypoglycaemia, and pulmonary oedema [9]. Ascertaining the factors that influence malaria spread as well as community acceptance of and adherence to malaria management is vital to improve effectiveness of interventions towards its elimination. This study determined some notable predisposing factors that influence malaria in pregnancy, and assessed the knowledge,

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attitudes and practices of residents of Owerri metropolis towards its management.

## MATERIALS AND METHODS

### Study area

This study was conducted in Owerri metropolis, Imo State, South-eastern Nigeria. It is located between longitude 7°02' E and latitude 5°29' N [10]. Owerri town has a population of 127, 213 and occupies an area of 58 km<sup>2</sup> and sits at the intersection of roads from Port Harcourt, Onitsha, Aba and Umuahia [11]. The dominant land use activities are buildings or built-up area for infrastructural development. The town experiences tropical climate seasons with two main regimes—a dry season (October to March) and a wet season (April to October). Rainfall figures for rainy season ranges from 2000 to 2200 mm per month while the driest months have less than 23 mm rainfall per month [12]. The mean daily maximum temperature is usually about 27°C throughout the year [13]. Owerri city is characterized by unsightly refuse dumps, over filled and blocked gutters and drainages. Stagnant water bodies, over grown bushes and fields even around homes and offices were easily noticeable in both urban and rural communities in the State [14]. These changes in the environment increased vector breeding sites and consequently increased transmission of the malaria parasites in the area.

### Study design and ethical consideration

The study adopted a hospital-based cross-sectional survey design. Ethical approval was obtained from Imo State Ministry of Health. Also, we solicited the participation of the different hospitals, and medical personnel, as well as the study subjects. The women were recruited without the prior knowledge of their clinical and family history. Inclusion criteria for participation were: pregnant women aged 18-45 years who had lived in the study area for at least one year and were attending antenatal clinic in any of the health facilities (International Christian Community Hospital, Umuihugba Umuodu Health Centre, Holy Family Hospital, Imo State General Hospital and Vaden Hospital), and absence of signs of severe and complicated malaria. Selection of eligible participants was carried out randomly from the list of all registered women for antenatal services in each of the health facilities. Prior to the survey, participants were briefed on the purpose of the study and their confidentiality was assured. Results from questionnaire were used to determine the risk factors for malaria and management practices of the residents in the study area.

### Study population and sample size

The sample population was pregnant women that were attending antenatal clinics in five different hospitals in Owerri metropolis. From the Monitoring and Evaluation Unit of the Health Department of Owerri Municipal Local Government Area, the population of registered pregnant women between January and July 2018 was 9,768. A sample size of 342 pregnant women between the ages of 18 and 45 years was randomly sampled from entire women attending the antenatal clinics in

the different hospitals. The size was deduced from the statistical formula [15,16].

### Administration of questionnaire

A total of 342 questionnaires were distributed, fully filled and returned. The questionnaires for the illiterate pregnant women were self-administered by oral interview [17]. Information on the study subjects infection status to malaria parasite, clinical symptoms (episodes of fever, headache, cough and catarrh, anorexia and weakness), risk factors (age category first heard of malaria, stagnant water and overgrown bushes around residence, engage in much farming, stay late night outdoor and management status), ethno-management practices (source and age first heard of malaria, use of insecticide spray, drug, insecticide treated nets) and economic impact (treatment satisfaction/dissatisfaction, treatment cost) of malaria during pregnancy were collected using a validated pre-tested questionnaire. The confidentiality of the participants' responses was assured. Structured questionnaire was chosen over the other types as it satisfied the research needs given that it is easy to fill out, take little time, keep the respondents focus on the subject of study, and is fairly easy to tabulate and analyse.

### Data analysis

The data collected from this study were entered into Microsoft Excel sheets and all statistical analyses carried out using Statistical Package for Social Science (SPSS Inc., Chicago, IL, USA) software version 20.0. Descriptive variables of clinical symptoms, ethno-management practices, as well as economic impact of malaria among pregnant women in the study area were summarized using simple frequencies and percentages. Binary logistic regression was carried out to estimate risk factors associated with malaria prevalence in the study area. Differences in values were statistically significant at  $p < 0.05$  (95% confidence interval).

## RESULTS

### Risk factors for malaria parasite infection among pregnant women in Owerri metropolis

Table 1 shows the risk factors associated with malaria parasite infection among pregnant women in Vaden Hospital in Owerri Metropolis. Out of 84 respondents, 32 had malaria parasite with 38.1% prevalence. The risk of exposure to malaria parasite infection among the pregnant women that attended the hospital showed significant ( $p < 0.05$ ) relation to the predisposing factors predicted to cause malaria like presence of stagnant water around residence, overgrown bushes, much farming and staying late nights outdoor. Other factors like age category first heard of malaria and management status were non-significant ( $p \geq 0.05$ ). The prediction from the result is that those that stayed where there is sewage exposure were 5 times more likely to have malaria than those without sewage exposure ( $p = 0.015$ , OR=5.000). Similarly, presence of overgrown bushes around residence due to absence of manual labour presents very high likelihood for malaria prevalence ( $p < 0.0001$ , OR=120.000). Those that engage in farming were more likely to have malaria

than those that do not farm either for income ( $p < 0.0001$ , OR=24.000) or as hobby ( $p < 0.0001$ , OR=33.600). Also, individuals that keep late nights or stay outdoor at nights were

more likely to present with the disease when compared with those that do not relax outdoor at nights ( $p = 0.006$ , OR=3.148).

**Table 1:** Risk factors associated with malaria parasite, *Plasmodium falciparum* infection among pregnant women in Vaden Hospital in Owerri Metropolis.

Variables	Exposure			df	Odds Ratio (95% CI)	p-value
	N	(+ve)	(-ve)			
<b>Age category first heard</b>						
Childhood	58	21	37		1.703 (0.067-5.153)	0.631
Teenage	22	10	12		2.500 (0.043-3.764)	0.423
Adulthood	4	1	3	2	1	
<b>Stagnant water around residence</b>						
Ditches	22	7	15		2.333 (0.101-1.816)	0.25
Sewage	44	22	22		5.000 (0.055-0.728)	0.015
None	18	3	15	2	1	
<b>Overgrown bushes around residence</b>						
Fallow ground	14	4	10		4.000 (0.057-1.087)	0.065
No manual labor	26	24	2		120.000 (0.002-0.036)	< 0.0001
None	44	4	40	2	1	
<b>Engage in much farming</b>						
For income	18	5	3		24.000 (0.013-0.131)	< 0.0001
As hobby	8	7	1		33.600 (0.005-0.163)	< 0.0001
None	58	10	48	2	1	
<b>Stay late night outdoor</b>						
For relaxation	38	20	18		3.148 (0.140-0.723)	0.006
None	46	12	34	1	1	
<b>Management status</b>						
Use insecticide spray	32	12	20		0.726 (0.596-3.182)	0.454
Used spray last night	10	1	9		0.135 (0.926-59.714)	0.059
Use drug	42	19	23	2	1	

Significant odds ratio at  $p < 0.05$

Table 2 shows the risk factors associated with malaria parasite infection among pregnant women in International Christian Community Hospital in Owerri Metropolis. From the 76

respondents interviewed, 24 had malaria parasite with 31.6% prevalence. The risk of exposure to malaria parasite infection among the pregnant women that attended the hospital showed

**Table 2:** Risk factors associated with malaria parasite, *Plasmodium falciparum* infection among pregnant women in International Christian Community Hospital in Owerri Metropolis.

Variables	Exposure			df	Odds Ratio (95% CI)	p-value
	N	(+ve)	(-ve)			
<b>Age category first heard</b>						
Childhood	40	10	30		0.524 (0.776-4.695)	0.159
Teenage	36	14	22	1	1	
<b>Stagnant water around residence</b>						
Ditches	28	10	18		3.056 (0.095-1.131)	0.078
Sewage	22	10	12		4.583 (0.062-0.770)	0.018
None	26	4	22	2	1	
<b>Overgrown bushes around residence</b>						
Fallow ground	8	3	5		2.200 (0.191-3.007)	0.693
No manual labour	6	1	3		0.733 (0.155-1.967)	0.78
None	64	20	44	2	1	
<b>Engage in much farming</b>						
For income	2	1	1		2.273 (0.038-5.071)	0.51
As hobby	2	1	1		2.273 (0.038-5.071)	0.51
None	72	22	50	2	1	
<b>Stay late night outdoor</b>						
For relaxation	18	8	10		2.171 (0.170-1.250)	0.128
As habit	6	2	4		1.357 (0.141-3.841)	0.717
None	52	14	38	2	1	
<b>Management status</b>						
Use insecticide spray	26	8	18		1.333 (0.203-2.770)	0.666
Used spray last night	14	2	12		0.500 (0.334-1.969)	0.448
Use insecticide net	12	6	6		3.000 (0.079-1.410)	0.136
Used net last night	8	4	4		3.000 (0.067-1.652)	0.178
Use drug	16	4	12	4	1	

Significant odds ratio at p<0.05

significant (p<0.05) relation to the predisposing factor of presence of stagnant water around residence. Other factors like age category first heard of malaria, overgrown bushes, much

farming, staying late night outdoor and malaria management status were insignificant (p ≥ 0.05), hence it did not add statistically to the prediction model. The prediction from the

result is that those with sewage exposure around residence presented more likelihood for malaria prevalence ( $p=0.018$ ,  $OR=4.583$ ) when compared with individuals that stay where there was no exposure to sewage.

Table 3 shows the risk factors associated with malaria parasite infection among pregnant women in General Hospital in Owerri Metropolis. Out of 74 respondents, 26 had malaria parasite with 35.1% prevalence. The risk of exposure to malaria parasite infection among the pregnant women that attended the hospital showed significant ( $p<0.05$ ) relation to the predisposing factors like presence of stagnant water around residence, overgrown bushes, much farming and staying late night outdoor. Other factors like age category first heard of malaria and malaria management status did not add significantly ( $p \geq 0.05$ ) to the

prediction. The prediction from the result is that those that have exposed sewage around them were more likely to have the disease outcome with 25 odds, than those without sewage exposure ( $p<0.0001$ ,  $OR=25.000$ ). Similarly, presence of overgrown bushes around residence predisposes for malaria prevalence as individuals with fallow ground ( $p<0.0001$ ,  $OR=12.500$ ) and/or without periodic manual labour ( $p=0.024$ ,  $OR=3.571$ ) were 12.5 and 3.571 times more likely to have malaria respectively. Engaging in much farming has higher odds of malaria prevalence, as those that farm as hobby were more likely to have malaria than abstainers ( $p=0.003$ ,  $OR=6.125$ ). Individuals that do stay late nights outdoor for relaxation were more likely to have malaria ( $p=0.014$ ,  $OR=3.393$ ) than their counterparts.

**Table 3:** Risk factors associated with malaria parasite, *Plasmodium falciparum* infection among pregnant women in General Hospital in Owerri Metropolis.

Variables	Exposure			df	Odds Ratio (95% CI)	p-value
	N	(+ve)	(-ve)			
<b>Age category first heard</b>						
Childhood	44	10	34		0.882 (0.123-10.421)	0.912
Teenage	26	15	11		4.091 (0.027-2.243)	0.213
Adulthood	4	1	3	2	1	
<b>Stagnant water around residence</b>						
Ditches	38	12	26		2.308 (0.130-1.445)	0.174
Sewage	12	10	2		25.000 (0.008-0.188)	< 0.0001
None	24	4	20	2	1	
<b>Overgrown bushes around residence</b>						
Fallow ground	14	10	4		12.500 (0.023-0.280)	< 0.0001
No manual labour	24	10	14		3.571 (0.093-0.847)	0.024
None	36	6	30	2	1	
<b>Engage in much farming</b>						
For income	6	3	3		2.625 (0.086-1.683)	0.203
As hobby	10	7	3		6.125 (0.048-0.550)	0.003
None	58	16	42	2	1	
<b>Stay late night outdoor</b>						
For relaxation	18	10	8	2	3.393 (0.111-0.781)	0.014

As habit	4	2	2		2.714 (0.061-2.208)	0.274
None	52	14	38		1	
<b>Management status</b>						
Use insecticide spray	11	4	7		0.929 (0.275-4.216)	0.915
Used spray last night	12	3	9		0.542 (0.430-7.923)	0.409
Use insecticide net	16	8	8		1.625 (0.193-1.965)	0.412
Used net last night	14	3	11		0.443 (0.533-9.555)	0.269
Use drug	21	8	13	4	1	
Significant odds ratio at p < 0.05						

Table 4 shows the risk factors associated with malaria parasite infection among pregnant women in Health Centre in Owerri Metropolis. From the 62 respondents interviewed, 18 had malaria parasite with 29.0% prevalence. The risk of exposure to malaria parasite infection among the pregnant women that attended the hospital showed significant (p<0.05) relation to the predisposing factors of like age category first heard of malaria and engaging in much farming. Other factors like presence of stagnant water around residence, staying late night outdoor and malaria management status did not add significantly (p ≥ 0.05) to the prediction. The predisposing factor of presence of

overgrown bushes around residence was constant, as none of the respondents had any around their place of residence. The prediction from the result is that those that first heard of malaria during their childhood period were 0.235 times less likely to present with the disease than those first heard it at teenage (p=0.007, OR=0.235). Also, engaging in farming either as source of income or as hobby predisposes individuals to malaria. Individuals take farming as source of income (p=0.003, OR=8.333) or as hobby (p<0.0001, OR=25.000) were more likely to have malaria than those that abstain from farming with high odds of 8.333 and 25 malaria outcome respectively.

**Table 4:** Risk factors associated with malaria parasite, *Plasmodium falciparum* infection among pregnant women in Health Centre in Owerri Metropolis.

Variables	Exposure			df	Odds Ratio (95% CI)	p-value
	N	(+ve)	(-ve)			
<b>Age category first heard</b>						
Childhood	42	8	34		0.235 (1.480-12.205)	0.007
Teenage	20	10	10	1	1	
<b>Stagnant water around residence</b>						
Ditches	10	5	3		6.111 (0.054-1.371)	0.115
Sewage	38	10	28		1.310 (0.192-3.039)	0.702
None	14	3	11	2	1	
<b>Engage in much farming</b>						
For income	8	5	3		8.333 (0.030-0.483)	0.003
As hobby	6	5	1		25.000 (0.007-0.240)	< 0.0001
None	48	8	40	2	1	

Stay late night outdoor						
For relaxation	20	7	13		1.615 (0.202-1.899)	0.402
As habit	10	3	7		1.286 (0.182-3.330)	0.735
None	32	8	24	2	1	
Management status						
Use insecticide spray	24	4	20		0.300 (0.723-15.374)	0.123
Used spray last night	4	1	3		0.500 (0.181-22.056)	0.571
Use insecticide net	6	3	3		1.500 (0.111-3.990)	0.657
Used net last night	18	6	12		0.750 (0.315-5.642)	0.696
Use drug	10	4	6	4	1	

Significant odds ratio at p<0.05

Table 5 shows the risk factors associated with malaria parasite infection among pregnant women in Holy Family Hospital in Owerri Metropolis. Out of 46 respondents, 14 had malaria parasite with 30.4% prevalence. The risk of exposure to malaria parasite infection among the pregnant women that attended the hospital showed significant (p<0.05) relation to the predisposing factor of staying late nights outdoor. Other factors like age category first heard of malaria, presence of stagnant water

around residence, overgrown bushes, much farming and malaria management status were insignificant (p ≥ 0.05). The prediction from the result is that those that do stay late nights outdoor presented more likelihood for malaria disease outcome. Individuals that relax outdoors at nights were 5.5 times more likely to have malaria than those that do not relax outdoor at late night (p=0.010, OR=5.500).

**Table 5:** Risk factors associated with malaria parasite, *Plasmodium falciparum* infection among pregnant women in Holy Family Hospital in Owerri Metropolis.

Variables	Exposure			df	Odds Ratio (95% CI)	p-value
	N	(+ve)	(-ve)			
Age category first heard						
Childhood	28	6	22		0.273 (0.287-46.842)	0.317
Teenage	16	7	9		0.778 (0.100-16.537)	0.847
Adulthood	2	1	1	2	1	
Stagnant water around residence						
Ditches	12	4	8		2.500 (0.065-2.469)	0.324
Sewage	22	8	14		2.857 (0.067-1.827)	0.213
None	12	2	10	2	1	
Overgrown bushes around residence						
Fallow ground	16	6	10		3.000 (0.060-1.854)	0.21
No manual labour	18	6	12	2	2.500 (0.073-2.204)	0.293

None	12	2	10	1	
<b>Engage in much farming</b>					
For income	10	5	5		3.571 (0.074-1.062) 0.061
As hobby	4	2	2		3.571 (0.043-1.821) 0.183
None	32	7	25	2	1
<b>Stay late night outdoor</b>					
For relaxation	18	9	9		5.500 (0.050-0.667) 0.01
As habit	2	1	1		5.500 (0.013-2.471) 0.2
None	26	4	22	2	1
<b>Management status</b>					
Use insecticide spray	10	3	7		1.286 (0.067-9.076) 0.841
Used spray last night	10	1	9		0.333 (0.162-55.721) 0.461
Use insecticide net	6	3	3		3.000 (0.027-4.186) 0.395
Used net last night	16	6	10		1.800 (0.055-5.570) 0.617
Use drug	4	1	3	4	1
Significant odds ratio at p<0.05					

**Clinical symptoms of malaria parasite infection among pregnant women in Owerri metropolis**

The clinical symptoms of malaria among the study subjects in Owerri Metropolis are presented in Table 6. The majority of the women (238, 68.4%) were asymptomatic for fever, headache (236, 69.0%), cough and catarrh (260, 76.0%), anorexia (238, 69.6%), weakness (228, 66.7%). Among the symptomatic women, majority had episodes of fever at their first trimester of pregnancy 64 (18.7%) (Vaden Hospital, 28.6%; ICCH, 15.8%; General Hospital, 16.2%; Health Centre, 12.9%; and Holy Family Hospital, 17.4%) at weekly intervals (62, 57.4%). The least fever episodes were observed in the third trimester 14 (4.1%) (Vaden Hospital, 2.4%; ICCH, 0.0%; General Hospital, 8.1%; Health Centre, 6.5%; and Holy Family Hospital, 4.3%). Similarly, episodes of headache were more frequent in the first

trimester 62 (18.1%) (Vaden Hospital, 26.2%; ICCH, 18.4%; General Hospital, 10.8%; Health Centre, 16.1%; and Holy Family Hospital, 17.4%) and at weekly intervals too (54, 50.9%), while the least was in third trimester (14, 4.1%). The symptoms of cough and catarrh among the pregnant women showed that their episodes were more during the first trimester of pregnancy (40, 11.7%) at monthly intervals (44, 53.7%) and least in third trimester (16, 4.7%). Furthermore, episodes of loss of appetite for food (i.e. anorexia) 78 (22.8%) and weakness (96, 28.1%) were more frequent among pregnant women in their first trimester and least in the third trimester stage, and often occur each week. Generally, less than 35% of the study subjects admitted having at one time or the other any of the malaria disease symptoms investigated in the study.

**Table 6: Clinical symptoms of malaria parasite infection among pregnant women in Owerri Metropolis.**

Symptoms	Rank	Hospital frequency (%)					Total
		Vaden (n=84)	ICCH (n=76)	General (n=74)	Health centre (n=62)	Holy family (n=46)	
Episodes of fever	None	32 (61.9)	58 (76.3)	48 (64.9)	44 (71.0)	32 (69.6)	234 (68.4)
	First Trimester	24 (28.6)	12 (15.8)	12 (16.2)	8 (12.9)	8 (17.4)	64 (18.7)



	Second Trimester	6 (7.1)	6 (7.9)	8 (10.8)	6 (9.7)	4 (8.7)	30 (8.8)
	Third Trimester	2 (2.4)	0 (0.0)	6 (8.1)	4 (6.5)	2 (4.3)	14 (4.1)
	Weekly	8 (9.5)	12 (15.8)	18 (24.3)	14 (22.6)	10 (21.7)	62 (57.4)
	Biweekly	12 (14.3)	4 (5.3)	2 (2.7)	0 (0.0)	0 (0.0)	18 (16.7)
<b>How often?</b>	Monthly	12 (14.3)	2 (2.6)	6 (8.1)	4 (6.5)	4 (8.7)	28 (25.9)
	None	56 (66.7)	52 (68.4)	52 (70.3)	44 (71.0)	32 (69.6)	236 (69.0)
	First Trimester	22 (26.2)	14 (18.4)	8 (10.8)	10 (16.1)	8 (17.4)	62 (18.1)
	Second Trimester	4 (4.8)	10 (13.2)	8 (10.8)	4 (6.5)	4 (8.7)	30 (8.8)
<b>Episodes of headache</b>	Third Trimester	2 (2.4)	0 (0.0)	6 (8.1)	4 (6.5)	2 (4.3)	14 (4.1)
	Weekly	4 (4.8)	18 (23.7)	16 (21.6)	12 (19.4)	4 (8.7)	54 (50.9)
	Biweekly	16 (19.0)	4 (5.3)	2 (2.7)	2 (3.2)	8 (17.4)	32 (30.2)
<b>How often?</b>	Monthly	8 (9.5)	2 (2.6)	4 (5.4)	4 (6.5)	2 (4.3)	20 (18.9)
	None	64 (76.2)	54 (71.1)	56 (75.7)	50 (80.6)	36 (78.3)	260 (76.0)
	First Trimester	10 (11.9)	10 (13.2)	10 (13.5)	4 (6.5)	6 (13.0)	40 (11.7)
	Second Trimester	8 (9.5)	6 (7.9)	2 (2.7)	8 (12.9)	2 (4.3)	26 (7.6)
<b>Episodes of cough and Catarrh</b>	Third Trimester	2 (2.4)	6 (7.9)	6 (8.1)	0 (0.0)	2 (4.3)	16 (4.7)
	Weekly	6 (7.1)	8 (10.5)	4 (5.4)	8 (12.9)	2 (4.3)	28 (34.1)
	Biweekly	2 (2.4)	2 (2.6)	4 (5.4)	0 (0.0)	2 (4.3)	10 (12.2)
<b>How often?</b>	Monthly	12 (14.3)	12 (15.8)	10 (13.5)	4 (6.5)	6 (13.0)	44 (53.7)
	None	62 (73.8)	52 (68.4)	48 (64.9)	44 (71.0)	32 (69.6)	238 (69.6)
	First Trimester	10 (11.9)	22 (28.9)	20 (27.0)	18 (29.0)	8 (17.4)	78 (22.8)
	Second Trimester	8 (9.5)	2 (2.6)	2 (2.7)	0 (0.0)	4 (8.7)	16 (4.7)
<b>Episodes of anorexia</b>	Third Trimester	4 (4.8)	0 (0.0)	4 (5.4)	0 (0.0)	2 (4.3)	10 (2.9)
	Weekly	6 (7.1)	12 (15.8)	20 (27.0)	14 (22.6)	8 (17.4)	60 (57.7)
	Biweekly	6 (7.1)	6 (7.9)	0 (0.0)	2 (3.2)	4 (8.7)	18 (17.3)
<b>How often?</b>	Monthly	10 (11.9)	6 (7.9)	6 (8.1)	2 (3.2)	2 (4.3)	26 (25.0)
	None	52 (61.9)	52 (68.4)	48 (64.9)	44 (71.0)	32 (69.6)	228 (66.7)
<b>Episodes of weakness</b>	First Trimester	28 (33.3)	22 (28.9)	20 (27.0)	14 (22.6)	12 (26.1)	96 (28.1)

	Second Trimester	2 (2.4)	2 (2.6)	2 (2.7)	2 (3.2)	2 (4.3)	10 (2.9)
	Third Trimester	2 (2.4)	0 (0.0)	4 (5.4)	2 (3.2)	0 (0.0)	8 (2.3)
	Weekly	22 (26.2)	18 (23.7)	20 (27.0)	10 (16.1)	8 (17.4)	78 (68.4)
	Biweekly	4 (4.8)	2 (2.6)	4 (5.4)	6 (9.7)	4 (8.7)	20 (17.5)
<b>How often?</b>	Monthly	6 (7.1)	4 (5.3)	2 (2.7)	2 (3.2)	2 (4.3)	16 (14.0)

ICCH: International Christian Community Hospital

**Ethno-management practices and attitude towards malaria among pregnant women in Owerri metropolis**

Table 7 shows the ethno-management practices on malaria among the pregnant women in Owerri Metropolis. It was observed from the result that high and overwhelming preponderant of the study subjects first heard about malaria from health workers in the hospital 144 (42.1%) (Vaden Hospital, 35.7%; International Christian Community Hospital, 47.4%; General Hospital, 40.5%, Health Centre, 41.9% and Holy Family Hospital, 47.8%) at childhood stage (212, 62.0%). Also, in all the hospitals examined, the study subjects used insecticide sprays, chemoprophylaxis and insecticide treated nets. Regrettably, the use of these management procedures as recorded among the pregnant women was poor (insecticide sprays: 128, 37.4%; drugs: 94, 27.5%; ITNs: 66, 19.3%).

Furthermore, the compliance and/or strict adherence to the use of insecticide sprays and treated nets each night was overwhelmingly below expectation (spray last night: 50, 14.6%; ITN last night: 80, 23.4%). Few participants admitted they used insecticide sprays plus treated nets (20, 5.8%) in the following hospitals (General Hospital, 8.1%; Health Centre, 9.7% and Holy Family Hospital, 17.4%). Those that use chemoprophylaxis plus treated net (drug+ITN), insecticide spray plus chemoprophylaxis (spray+drug) and insecticide spray plus chemoprophylaxis plus treated net (spray+drug+ITN) are recorded in General Hospital and Holy Family Hospital with 20, 8 and 6 women respectively. For other management practices among the women, the major ones include health education (90, 36.9%), good sanitation (80, 32.8%) and screening of doors and windows with nets (74, 30.3%).

**Table 7:** Awareness and management practices of malaria among pregnant women in Owerri Metropolis.

Variables	Rank	Hospital frequency (%)					Total
		Vaden (n=84)	ICCH (n=76)	General (n=74)	H/Centre (n=62)	H/Family (n=46)	
	Media broadcast	12 (14.3)	24 (31.6)	26 (35.1)	4 (6.5)	14 (30.4)	80 (23.4)
	Health campaigns	0 (0.0)	4 (5.3)	6 (8.1)	2 (3.2)	2 (4.3)	14 (4.1)
	Parents at home	40 (47.6)	8 (10.5)	10 (13.5)	30 (48.4)	4 (8.7)	92 (26.9)
<b>Source first heard of Malaria</b>	Workers hospitals at	30 (35.7)	36 (47.4)	30 (40.5)	26 (41.9)	22 (47.8)	144 (42.1)
	Education school in	2 (2.4)	4 (5.3)	2 (2.7)	0 (0.0)	4 (8.7)	12 (3.5)
	Childhood	58 (69.0)	40 (52.6)	44 (59.5)	42 (67.7)	28 (60.9)	212 (62.0)
<b>Age first heard of Malaria</b>	Teenage	22 (26.2)	36 (47.4)	26 (35.1)	20 (32.3)	16 (34.8)	120 (35.1)
	Adulthood	4 (4.8)	0 (0.0)	4 (5.4)	0 (0.0)	2 (4.3)	10 (2.9)
	No	42 (50.0)	36 (47.4)	56 (75.7)	40 (64.5)	40 (87.0)	214 (62.6)
<b>Use insecticide spray</b>	Yes	42 (50.0)	40 (52.6)	18 (24.3)	22 (35.5)	6 (13.0)	128 (37.4)

	No	74 (88.1)	62 (81.6)	62 (83.8)	58 (93.5)	36 (78.3)	292 (85.4)
<b>Used spray last night</b>	Yes	10 (11.9)	14 (18.4)	12 (16.2)	4 (6.5)	10 (21.7)	50 (14.6)
	No	42 (50.0)	60 (78.9)	62 (83.8)	46 (74.2)	38 (82.6)	248 (72.5)
<b>Use chemoprophylaxis (Drug)</b>	Yes	42 (50.0)	16 (21.1)	12 (16.2)	16 (25.8)	8 (17.4)	94 (27.5)
	No	84 (100.0)	56 (73.7)	54 (73.0)	44 (71.0)	38 (82.6)	276 (80.7)
<b>Use insecticide treated net (ITN)</b>	Yes	0 (0.0)	20 (26.3)	20 (27.0)	18 (29.0)	8 (17.4)	66 (19.3)
	No	84 (100.0)	64 (84.2)	60 (81.1)	24 (38.7)	30 (65.2)	262 (76.6)
<b>Used ITN last night</b>	Yes	0 (0.0)	12 (15.8)	14 (18.9)	38 (61.3)	16 (34.8)	80 (23.4)
	No	84 (100.0)	76 (100.0)	68 (91.9)	56 (90.3)	38 (82.6)	322 (94.2)
<b>Use spray+ITN</b>	Yes	0 (0.0)	0 (0.0)	6 (8.1)	6 (9.7)	8 (17.4)	20 (5.8)
	No	84 (100.0)	76 (100.0)	64 (86.5)	62 (100.0)	36 (78.3)	322 (94.2)
<b>Use drug+ITN</b>	Yes	0 (0.0)	0 (0.0)	10 (13.5)	0 (0.0)	10 (21.7)	20 (5.8)
	No	84 (100.0)	76 (100.0)	68 (91.9)	62 (100.0)	44 (95.7)	334 (97.7)
<b>Use spray+drug</b>	Yes	0 (0.0)	0 (0.0)	6 (8.1)	0 (0.0)	2 (4.3)	8 (2.3)
	No	84 (100.0)	76 (100.0)	72 (97.3)	62 (100.0)	42 (91.3)	336 (98.2)
<b>Use spray+drug+ITN</b>	Yes	0 (0.0)	0 (0.0)	2 (2.7)	0 (0.0)	4 (8.7)	6 (1.8)
	Health education	20 (23.8)	22 (28.9)	18 (24.3)	16 (25.8)	14 (30.4)	90 (36.9)
	Good sanitation	18 (21.4)	16 (21.1)	16 (21.6)	18 (29.0)	12 (26.1)	80 (32.8)
<b>Other major practices</b>	Netted doors/windows	20 (23.8)	16 (21.1)	16 (21.6)	12 (19.4)	10 (21.7)	74 (30.3)

ICCH: International Christian Community Hospital; H/Centre: Health Centre; H/Family: Holy Family Hospital

The economic impact of malaria treatment among pregnant women in Owerri Metropolis is presented in Table 8. It was observed from the result that for all the hospitals studied, there are higher proportions of the subjects that admitted they had satisfaction with previous treatments due to drug effectiveness 114 (33.3%) (Vaden Hospital, 40.5%; International Christian Community Hospital, 13.2%; General Hospital, 21.6%, Health Centre, 35.5% and Holy Family Hospital, 69.6%) and good health care delivery 130 (38.0%) (Vaden Hospital, 23.8%; International Christian Community Hospital, 57.9%; General Hospital, 45.9%, Health Centre, 32.3% and Holy Family Hospital, 26.1%) at the hospitals. Those that expressed dissatisfaction complained of poor health care delivery (28, 8.2%) at previous treatments received (Vaden Hospital, 14.3%; International Christian Community Hospital, 10.5%; General Hospital, 5.4%, Health Centre, 6.5% and Holy Family Hospital, 0.0%). According to the subjects' responses, greater preponderant of the women stated that the treatment cost for malaria was moderate 170 (49.7%) (Vaden Hospital, 57.1%;

International Christian Community Hospital, 50.0%; General Hospital, 48.6%, Health Centre, 29.0% and Holy Family Hospital, 21.7%) followed by those that admitted the treatment cost was low 106 (31.0%).

## DISCUSSION

### Associated risks for malaria prevalence among pregnant women in metropolis

On the overall, the major factors that predisposed the pregnant women to malaria outcome in relation to their residence were presence of stagnant water and overgrown bushes. Also, it was noted that engaging in much farming and staying late night outdoor for cool relaxation factored in significantly ( $p < 0.05$ ) to the prediction in all the sampled hospitals. The age category that the women first heard of malaria showed slight prediction, whereas those that heard about malaria in their childhood and teenage age were less likely to present with malaria, those that

**Table 8:** Economic impact of malaria treatment among pregnant women in Owerri Metropolis

Variables	Rank	Hospital frequency (%)					Total
		Vaden (n=84)	ICCH (n=76)	General (n=74)	H/Centre (n=62)	H/Family (n=46)	
	Drug effectiveness	34 (40.5)	10 (13.2)	16 (21.6)	22 (35.5)	32 (69.6)	114 (33.3)
	No side effects	8 (9.5)	12 (15.8)	16 (21.6)	12 (19.4)	2 (4.3)	50 (14.6)
	Good care delivery	20 (23.8)	44 (57.9)	34 (45.9)	20 (32.3)	12 (26.1)	130 (38.0)
	Drug ineffectiveness	10 (11.9)	0 (0.0)	2 (2.7)	2 (3.2)	0 (0.0)	14 (4.1)
	Side effects	0 (0.0)	2 (2.6)	2 (2.7)	2 (3.2)	0 (0.0)	6 (1.8)
<b>Treatment dissatisfaction/</b>	Poor care delivery	12 (14.3)	8 (10.5)	4 (5.4)	4 (6.5)	0 (0.0)	28 (8.2)
	Low	18 (21.4)	22 (28.9)	24 (32.4)	36 (58.1)	6 (13.0)	106 (31.0)
	Moderate	48 (57.1)	38 (50.0)	36 (48.6)	18 (29.0)	30 (65.2)	170 (49.7)
<b>Treatment cost</b>	High	18 (21.4)	16 (21.1)	14 (18.9)	8 (12.9)	10 (21.7)	66 (19.3)

ICCH: International Christian Community Hospital; H/Centre: Health Centre; H/Family: Holy Family Hospital

heard it at adulthood had higher odds of malaria parasites infection. This suggests the importance of awareness and knowledge of the disease in its prevention. Hence, the prediction from the present study is that malaria awareness at late ages and presence of poor environmental condition vis-à-vis ditches and sewages around residence are high risks associated with malaria prevalence and transmission in the study area. The study also noted that reduced risk to malaria parasite infection required strict adherence to the conventional preventive and management practices against malaria transmission like use of chemoprophylaxis, insecticide spray and bed nets; although, the present study found it to be statistically non-significant ( $p \geq 0.05$ ). Malaria awareness and knowledge at early ages would reduce the likelihood of its prevalence among any population.

On the risk assessment, information garnered from the respondents revealed that moderate number of pregnant women had knowledge of insecticide treated bed nets, as a method of preventing malaria parasite infection, although noted poor adherence to its usage. Sleeping under insecticide treated bed nets at night is very important to protect person from mosquito bites. The present result aligns with other studies that insecticide treated bed nets are effective in controlling malaria in pregnant women and that their use significantly reduces the prevalence and mean parasite load of malaria parasitaemia [18,19]. In addition, the finding on little or non-compliance to insecticide treated nets use by pregnant women had previously been documented [20,21]. There is therefore need for the

Government and other intervention agencies to extend and scale up malaria control intervention programs to pregnant women attending antenatal clinics with free distribution of insecticide treated bed nets, chemo-prophylactic drugs, and insecticide spray. This would help forestall placental malaria incidence which has been reported to be associated with increased Low Birth Weight (LBW) babies [22].

**Malaria assessment, management practices and economic impact among pregnant women in metropolis**

The symptoms of malaria among the pregnant women like episodes of fever, headache, cough and catarrh, anorexia and weakness were observed to be more during the first trimester of pregnancy or early gestational age. The frequencies for the episodes were noted to be weekly, except for cough and catarrh that occurred once a month. The majority of the pregnant women reported they first heard about malaria at childhood from workers at the hospital and least from health campaigns and educations in school. For the management, greater preponderant of the women used insecticide spray, followed by those that use chemoprophylaxis and then insecticide treated nets. Few of the women combine the use of either two or three practices in the study area. It is noteworthy that malaria in pregnancy is an avoidable cause of maternal and fatal mortality and morbidity. The estimate of malaria in pregnancy is of high

concern in reproductive health care management across the globe [23]. More so, in the developing countries, poverty, illiteracy, geographical diversity, socioeconomic disparities, and multiple pregnancies take their toll of mother's health.

The present study noted poor compliance to the management practices vis-à-vis inconsistency to the use of insecticide spray and treated bed nets. Other major practices for malaria management by the women include health education, good sanitation and netted doors and windows in decreasing order of preponderance. It was impressive to discover that knowledge about signs and symptoms of malaria is relatively high in this study with most respondents indicating awareness of major symptoms including fever, headache, cough and catarrh, anorexia, weakness. This is in line with the observations of other studies in endemic settings [24,25].

The women's attitude to treatment reveals that majority of the women have satisfaction with previous treatment received due to drug effectiveness and good health care delivery, while the minority that were dissatisfied complained of drug ineffectiveness and poor health care delivery. Similarly, majority of the women reported that the treatment cost is moderate and hence affordable. Timely intervention of early detection and adequate treatment are essential requirements and components for combating the incidence of deaths due to malaria in underdeveloped countries [26-28]. Furthermore, the treatment cost of malaria infection could determine treatment-seeking behaviour and compliance by the pregnant women. The present study did not corroborate previous works [17,29,30] that reported high cost of treatment which suggest an economic burden.

## CONCLUSION

Major associated risks for malaria in pregnancy were more of environmental factors, although behavioural factors also played out in the overall predisposition to malaria parasite infection. Pregnant women in their first trimester are at more risk considering the higher rate of their clinical manifestations, which if unchecked could lead to possible mortality of the mother and foetus. The health, reproductive and economic burden of malaria especially among pregnant women, underscores the importance of effective and timely interventions in area of prevention, treatment and control measures that would urgently stem the tide of its increased prevalence. Awareness campaigns by community healthcare workers and/or trained volunteers should be carried out more intensely to help address the poor compliance and adherence to conventional management procedures in Owerri metropolis. This will improve community knowledge on importance of malaria control and management, through regular visits to communities, so as to allow villagers to receive education, ask questions and have their concerns addressed.

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