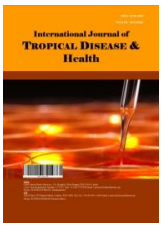

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Pregnancy Malaria: Predisposing Factors, Burden and Management in Agrarian Settlements Southeast Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author EIN provided all the materials used for this study. Authors EIN, OCE, PANA, GCN, CAI, KCE and CCE designed this research, the instrument for data collection, administered and collected back the instrument. Authors EIN and GCN analyzed the data collected statistically. Author EIN drafted the manuscript while all authors corrected, proofread and approved the manuscript for publication. All authors read and approved the final manuscript.

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ABSTRACT

Aim: To evaluate predisposing factors, burden and management of malaria amongst pregnant women in some agrarian settlements southeast Nigeria.
Study Design: Cross-sectional survey conducted in 4 randomly selected agrarian communities was conducted.

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Place and Duration of Study: Isi-Uzo Local Government Area (Eha-Amufu, Ikem, Mbu, Neke and Umualor). The study lasted six months.
Methodology: A total of 385 respondents participated. A cross-sectional survey was conducted in 4 randomly selected agrarian communities was conducted. Data were collected using a structured questionnaire.
Results: Obstetric and socio-demographic characteristics of the participants showed that majority were age-bracket 25-34 (42.6%), 1st trimester (56.4%) and multigravidae (52.8%), primary education group (32.2%), secondary education group (55.6%), farmers (73.1%) and Christians (93.5%). All the respondents (100%) agreed to the presence of overgrown bushes in their environs, many farming activities which is the main source of income and staying out late at night for relaxation. A high percentage of the women experienced fever (57.9), headache (61.6), cough & catarrh (54.5) and anorexia (53.8) monthly reflecting high malaria frequency in the locale. 20.3% had experienced stillbirth, 82.6% neonatal death and 65.5% infant mortality once, twice or more. And according to (58.7%) and (38.7%) of respondents, malaria moderately and highly affects their productivity during pregnancy respectively. Respondents that seek health/treatment in hospitals (50.9) differ insignificantly from those that seek health through traditional remedies (49.1). Cost of treatment was reported to be high and moderate by 31.9% and 65.5% respondents respectively. Poor health care delivery was implicated as major dissatisfaction with treatment by 76.4% of respondents.
Conclusion: Malaria is a major health problem encountered by pregnant women in agrarian locales. Hence, girls should be exposed to malaria awareness programs an earlier stage of life.

Keywords: Pregnancy malaria; predisposing factors; burden; management; agrarian settlement.

1. INTRODUCTION

Pregnant women and their foetuses are the most susceptible to malaria scourge. Pregnancy reduces a woman's immunity to malaria, making her more susceptible to infection and at greater risk of illness, severe anaemia and death. Malaria in pregnancy is among the major causes of mortality and morbidity in Sub-Saharan Africa. Maternal malaria also interferes with the growth of the foetus, increasing the risk of premature delivery and low birth weight - major contributors to neonatal and infant mortality. It also causes maternal anaemia, intrauterine growth retardation and death [1,2].

Malaria infection in pregnancy compromises the mother's health and can lead to her death. In 2018, an estimated 11 million pregnant women living in 38 countries with the moderate-to-high transmission in sub-Saharan Africa were infected with malaria (29% of all pregnancies). Similarly, an estimated 872 000 children in 38 African countries were born with a low birth weight due to malaria in pregnancy.

Poor housing quality (with regards to walls, roofs, doors, and window materials) [3], the nearness of communities to bushes, forest and water sources [4] have been reported as main factors that predispose people to malaria especially in rural settlements. The factors mentioned above clearly describe the nature, structure and organization of agrarian settlements in Nigeria and other Sub-Saharan African nations. These same factors sever as environmental markers for accessing mosquitoes and malaria-endemic regions [5].

Research has reported that some agrarian populace (southeast Nigeria) suffer high malaria predisposition, high burden of malaria and poor health care delivery [5], but there is a dearth of literature on malaria predisposing factors, burden and management among pregnant women. Therefore, the present research was designed to evaluate malaria predisposing factors, burden and management among pregnant women in some agrarian settlements, south-east Nigeria.

2. MATERIALS AND METHODS

2.1 Study Area

Isi-Uzo Local Government Area in Enugu State, South-East, Nigeria was the area where this study was conducted. Isi-Uzo is an integral part of Enugu East Senatorial Zone with an area of 877 km², a population of 148,415 (2006 census) with an estimated population of 217, 952 and 10, 579 for pregnant women in 2019. The postal code of the area is 412 while its Global Positioning System is 6°43'50.38" N 7°41'34.58"

E (Climate-data.org). It shares boundaries north with Udenu Local Government Area, northeast with Benue State, east with Ebonyi State, south with Enugu East Local Government Area and west with Nsukka Local Government Area. The dry season stretches from November to April while the rainy season begins from May and ends in October. It is an agrarian settlement (http://www.tageo.com/index-e-ni-v-00-d-m2792190.htm; climate-data.org; [6].

2.2 Study Design

The study adopted a hospital-based cross-sectional survey design. The participants were recruited without prior knowledge of their clinical and family history. Inclusion criteria for participation were all residents who had lived in the study area for at least one year; attending health centres in the five communities in Isi-Uzo Local Government Area: Eha-Amufu, Ikem, Mbu, Neke and Umualor. Selection of eligible participants was carried out randomly in each of the health facilities. Data on malaria predisposing factors, demographic information, burden indices and management practices were collected using a structured questionnaire [5].

2.3 Study Population and Sample Size

The sample population for all pregnant women was 10, 579 in 2019. From the study population, a sample size of 385 was randomly selected. The size was deduced from the sample size estimation [7] using the formula: n = N1+ N e2 (Where n = sample size, N = population size, e = level of precision, 0.05). The number of residents recruited from each community depended on the percentage ratios available from the National Population Commission. The following number of residents were recruited from the five communities; Eha-Amufu (139), Ikem (73), Mbu (69), Neke (62) and Umualor (42).

2.4 Statistical Analysis

The data were analyzed using Statistical Package for Social Sciences (SPSS) 20.0. Data on socio-demography, predisposing factors, and burden and management practices were analyzed using the Chi-square ($\chi 2$) test and simple percentages as appropriate. Probability values of P = .05 were regarded as significant.

3. RESULTS

The obstetric and socio-demographic characteristics of the pregnant women in the study area are presented in Table 1. The result shows that the pregnant women of age bracket 25 – 34 years (164, 42.6%), followed by ages 35 – 44 years (128, 33.2%). Concerning trimester and parity, those at the first trimester of pregnancy (217, 56.4%) and multigravidae (203, 52.8%) had higher preponderance than their counterparts. Most of the pregnant women had secondary level education (214, 55.6%), followed by primary level qualification (124, 32.2%). Farming is the most common occupation (281, 73.1%) among pregnant women in the study area and they are mostly Christians (360, 93.5%).

Table 2 shows malaria awareness and predisposing factors for malaria among pregnant women in the study area. On the overall, 47.8% (184) of the pregnant women responded they first heard of malaria through the media broadcast. This was followed by those that heard it from health workers at hospitals (96, 25.0%). The least in preponderance for source first heard of malaria is health campaigns (1, 0.2%). The age category that many of the pregnant women first heard of malaria was at adulthood 341 (88.6%). The major factors that predispose the study women to malaria prevalence are the presence of overgrown bushes around residence due to absence of manual labour (385, 100.0%), much farming as a source of income (385, 100.0%) and staying late-night outdoor for cool relaxation (385, 100.0%).

The burden of malaria prevalence among the pregnant women in the study area is presented in Table 3. From the result, it was observed that episodes of fever (223, 57.9%), headache (237, 61.6%), cough and catarrh (210, 54.6%) and anorexia (207, 53.8%) were most frequent at monthly intervals. A Much lower preponderance of the pregnant women had stillbirth; where many of the respondents responded that the condition occurred once (58, 15.0%). The burden of postnatal death and mortality recorded a greater number of pregnant women with at least one occurrence as follows (175, 45.5% and 144, 37.4%) respectively. This is followed by those with twice occurrence of postnatal death (90, 23.4%). Also, a greater number of pregnant women said the rate of malaria burden on their productivity is moderate (226, 58.7%).

Table 1. Obstetric and socio-demographic characteristics of the pregnant women in the study opposite area

Characteristics	Rank	Communities frequency (%)					
		Eha-Amufu (n=139)	Ikem (n=73)	Mbu (n=69)	Neke (n=62)	Umualor (n=42)	Total (n=385)
Age	15 – 24	31 (22.3)	16 (21.9)	17 (24.6)	8 (12.9)	10 (23.8)	82 (21.3)
	25 – 34	55 (39.6)	29 (39.7)	27 (39.1)	29 (46.5)	24 (57.1)	164 (42.6)
	35 – 44	49 (35.3)	25 (34.2)	24 (34.8)	23 (37.1)	7 (16.7)	128 (33.2)
	45 – 54	4 (2.9)	3 (4.1)	1 (1.4)	2 (3.2)	1 (2.4)	11 (2.9)
Trimester	First	66 (47.5)	42 (57.5)	39 (56.5)	43 (69.4)	27 (64.3)	217 (56.4)
	Second	47 (33.8)	28 (38.4)	21 (30.4)	17 (27.4)	13 (31.0)	126 (32.7)
	Third	26 (18.7)	3 (4.1)	9 (13.0)	2 (3.2)	2 (4.8)	42 (10.9)
Parity	Primigravidae	20 (14.4)	14 (19.2)	12 (17.4)	15 (24.2)	7 (16.7)	68 (17.6)
	Secundigravidae	38 (27.3)	22 (30.1)	23 (33.3)	21 (33.9)	10 (23.8)	114 (29.6)
	Multigravidae	81 (58.3)	37 (50.7)	34 (49.3)	26 (41.9)	25 (59.5)	203 (52.8)
Education	Primary	46 (33.1)	35 (47.9)	18 (26.1)	11 (17.7)	14 (33.3)	124 (32.2)
	Secondary	64 (46.0)	31 (42.5)	46 (66.7)	48 (77.4)	25 (59.5)	214 (55.6)
	Tertiary	20 (14.4)	5 (6.8)	4 (5.8)	3 (4.8)	3 (7.1)	35 (9.1)
	Post-tertiary	9 (6.5)	2 (2.7)	1 (1.4)	0 (0.0)	0 (0.0)	12 (3.1)
Occupation	House chores	1 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.2)
	Salary-Employed	12 (8.6)	16 (21.9)	9 (13.0)	11 (17.7)	3 (7.1)	51 (13.2)
	Self-Employed	13 (9.4)	10 (13.7)	9 (13.0)	9 (14.5)	5 (11.9)	46 (11.9)
	Farming	111 (79.9)	46 (63.0)	49 (71.0)	42 (67.7)	33 (78.6)	281 (73.1)
	Student	2 (1.4)	1 (1.4)	2 (2.9)	0 (0.0)	1 (2.4)	6 (1.6)
Religion	Christianity	134 (96.4)	71 (97.3)	65 (94.2)	54 (87.1)	36 (85.7)	360 (93.5)
	Traditionalist	5 (3.0)	2 (2.7)	4 (5.8)	8 (12.9)	6 (14.3)	25 (6.5)

Table 2. Malaria awareness and its predisposing factors among pregnant women in the study area

Variables	Rank	Communities frequency (%)					
		Eha-Amufu (n=139)	Ikem (n=73)	Mbu (n=69)	Neke (n=62)	Umualor (n=42)	Total (n=385)
Source first heard	Media broadcast	70 (50.4)	42 (57.5)	28 (40.6)	25 (40.3)	19 (45.2)	184 (47.8)
	Health campaigns	0 (0.0)	1 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.2)
	Guardian at home	25 (18.0)	5 (6.8)	13 (18.8)	6 (9.7)	5 (11.9)	54 (14.0)
	Workers at hospital	36 (25.9)	18 (24.7)	19 (27.5)	15 (24.2)	8 (19.0)	96 (25.0)
	Education at school	8 (5.8)	7 (9.6)	9 (13.0)	16 (25.8)	10 (23.8)	50 (13.0)
Age category	Teenage	11 (7.9)	7 (9.6)	6 (8.7)	11 (17.7)	9 (21.4)	44 (11.4)
	Adulthood	128 (92.1)	66 (90.4)	63 (91.3)	51 (82.3)	33 (78.6)	341 (88.6)
Overgrown bushes	No manual labour	139 (100.0)	73 (100.0)	69 (100.0)	62 (100.0)	42 (100.0)	385 (100.0)
Much farming	Means of income	139 (100.0)	73 (100.0)	69 (100.0)	62 (100.0)	42 (100.0)	385 (100.0)
Stay late outside	Cool relaxation	139 (100.0)	73 (100.0)	69 (100.0)	62 (100.0)	42 (100.0)	385 (100.0)

Table 3. Burden of malaria among pregnant women in the study area

Variables	Rank	Communities frequency (%)					
		Eha-Amufu (n=139)	Ikem (n=73)	Mbu (n=69)	Neke (n=62)	Umualor (n=42)	Total (n=385)
Fever	Biweekly	36 (25.9)	22 (30.1)	12 (17.4)	6 (9.7)	6 (14.3)	82 (21.3)
	Monthly	84 (60.4)	37 (50.7)	39 (56.5)	35 (56.5)	28 (66.7)	223 (57.9)
	Quarterly	19 (13.7)	14 (19.2)	18 (26.1)	21 (33.9)	8 (19.0)	80 (20.8)
Headache	Biweekly	38 (27.3)	21 (28.8)	14 (20.3)	5 (8.1)	5 (11.9)	83 (20.8)
	Monthly	89 (64.0)	40 (54.8)	40 (58.0)	38 (61.3)	30 (71.4)	237 (61.6)
	Quarterly	12 (8.6)	12 (16.4)	15 (21.7)	19 (30.6)	7 (16.7)	65 (16.9)
Cough & Catarrh	Biweekly	19 (13.7)	14 (19.2)	18 (26.1)	21 (33.9)	8 (19.0)	80 (20.8)
	Monthly	80 (57.6)	34 (46.6)	37 (53.6)	33 (53.2)	26 (61.9)	210 (54.6)
	Quarterly	40 (28.8)	25 (34.2)	14 (20.3)	8 (12.9)	8 (19.0)	95 (24.6)
Anorexia	Biweekly	6 (4.3)	5 (6.8)	3 (4.3)	3 (4.8)	2 (4.8)	19 (4.8)
	Monthly	84 (60.4)	40 (54.8)	29 (42.0)	34 (54.8)	20 (47.6)	207 (53.8)
	Quarterly	49 (35.3)	28 (38.4)	37 (53.6)	25 (40.3)	20 (47.6)	159 (41.3)
Still birth	None	119 (85.6)	57 (78.1)	53 (76.8)	48 (77.4)	30 (71.4)	307 (79.8)
	Once	16 (11.5)	12 (16.4)	14 (20.3)	9 (14.5)	7 (16.7)	58 (15.0)
	Twice	2 (1.4)	2 (2.7)	1 (1.4)	2 (3.2)	1 (2.4)	8 (2.1)
	Thrice	1 (0.7)	1 (1.4)	0 (0.0)	2 (3.2)	0 (0.0)	4 (1.0)
	Above	1 (0.7)	1 (1.4)	1 (1.4)	1 (1.6)	4 (9.5)	8 (2.1)
Neo/postnatal death	None	22 (15.8)	12 (16.4)	13 (18.8)	12 (19.4)	8 (19.0)	67 (17.4)
	Once	56 (40.3)	35 (47.9)	30 (43.5)	31 (50.0)	23 (54.8)	175 (45.5)
	Twice	40 (28.8)	15 (20.5)	17 (24.6)	12 (19.4)	6 (14.3)	90 (23.4)
	Thrice	11 (7.9)	6 (8.2)	5 (7.2)	4 (6.5)	3 (7.1)	29 (7.5)
	Above	10 (7.2)	5 (6.8)	4 (5.8)	3 (4.8)	2 (4.8)	24 (6.2)
Mortality	None	40 (28.8)	25 (34.2)	26 (37.7)	23 (37.1)	19 (45.2)	133 (34.5)
	Once	49 (35.3)	25 (34.2)	30 (43.5)	22 (35.5)	18 (42.9)	144 (37.4)
	Twice	28 (20.1)	18 (24.7)	10 (14.5)	7 (11.3)	2 (4.8)	65 (16.9)
	Thrice	7 (5.0)	3 (4.1)	2 (2.9)	7 (11.3)	1 (2.4)	20 (5.2)
	Above	15 (10.8)	2 (2.7)	1 (1.4)	3 (4.8)	2 (4.8)	23 (6.0)
Affect productivity	Low	4 (2.9)	2 (2.7)	2 (2.9)	2 (3.2)	0 (0.0)	10 (2.6)
	Moderate	86 (61.9)	43 (58.9)	40 (58.0)	35 (56.5)	22 (52.4)	226 (58.7)
	High	49 (35.3)	28 (38.4)	27 (39.1)	25 (40.3)	20 (47.6)	149 (38.7)

Table 4 shows the management practices of malaria among pregnant women in the studied communities. It was observed from the result that the drug of choice for treatment and control of malaria for most of the pregnant women in the study area is hospital drugs (196, 50.9%). The result showed that a little below an equal number of the sampled pregnant women use traditional drugs (189, 49.1%). All pregnant women claimed they use the combination of insecticide spray and nets and drug (385, 100.0%). For the other management practices, the pregnant women responded on the following in decreasing order of frequency (local herbs: 183, 47.5%; clothing: 98, 25.5%; sanitation: 55, 14.3% and netted doors/windows: 49, 12.7%).

The economic impact of malaria on the studied pregnant women in the sampled communities is presented in Table 5. On the overall, the result shows that pregnant women from the sampled communities are not satisfied with the treatment received. They implicated poor health care delivery (294, 76.4%) as the major reason for the dissatisfaction. This is followed by the ineffectiveness of the drugs received (76, 19.7%). On the cost of treatment, the greater preponderance of the pregnant women responded it was moderate (252, 65.5%).

Table 6 reveals the prevalence of malaria burden among pregnant women in the study area. From the result, the fever and headache episodes did not vary significantly ($p \geq 0.05$) among the participants. However, the fever (223, 57.9%), headache (237, 61.6%) and cough/catarrh (210, 54.5%) episodes were more at the monthly interval and among Eha-Amufu pregnant women with 37.7%, 37.6% and 38.1% prevalence respectively. All the differences were regarded as significant ($p < 0.05$). The differences in anorexia ($p = 0.406$), stillbirth ($p = 0.153$), postnatal death ($p = 0.967$) and affect productivity ($p = 0.923$) burden were non-significant ($p \geq 0.05$). The result showed that the mortality burden was more prevalent in Eha-Amufu (49, 34.0%) and significantly ($p < 0.05$) so than the other communities.

Table 4. Management of malaria among pregnant women in the study area

Variables	Rank	Communities frequency (%)					
		Eha-Amufu (n=139)	Ikem (n=73)	Mbu (n=69)	Neke (n=62)	Umualor (n=42)	Total (n=385)
Drug of choice	Hospital	71 (51.1)	42 (57.5)	39 (56.5)	33 (53.2)	11 (26.2)	196 (50.9)
	Traditional	68 (48.9)	31 (42.5)	30 (43.5)	29 (46.8)	31 (73.8)	189 (49.1)
Spray + drug + net	Yes	139 (100.0)	73 (100.0)	69 (100.0)	62 (100.0)	42 (100.0)	385 (100.0)
Other management	Local herbs	59 (42.4)	27 (37.0)	31 (44.9)	34 (54.8)	32 (76.2)	183 (47.5)
	Sanitation	20 (14.4)	11 (15.1)	18 (26.1)	5 (8.1)	1 (2.4)	55 (14.3)
	Clothing	40 (28.8)	22 (30.1)	12 (17.4)	17 (27.4)	7 (16.7)	98 (25.5)
	Net door/window	20 (14.4)	13 (17.8)	8 (11.6)	6 (9.7)	2 (4.8)	49 (12.7)

Table 5. Economic impact of malaria among pregnant women in the study area

Variables	Rank	Communities Frequency (%)					
		Eha-Amufu (n=139)	Ikem	Mbu (n=69)	Neke (n=62)	Umualor (n=42)	Total (n=385)
Non-satisfaction with treatment	Ineffective drugs	22 (15.8)	13 (17.8)	17 (24.6)	15 (24.2)	9 (21.4)	76 (19.7)
	Side effects	5 (3.6)	2 (2.7)	1 (1.4)	4 (6.5)	3 (7.1)	15 (3.9)
	Poor health care	112 (80.6)	58 (79.5)	51 (73.9)	43 (69.4)	30 (71.4)	294 (76.4)
Cost of treatment	Low	2 (1.4)	1 (1.4)	3 (4.3)	4 (6.5)	0 (0.0)	10 (2.6)
	Moderate	101 (72.7)	48 (65.8)	39 (56.5)	37 (59.7)	27 (64.3)	252 (65.5)
	High	36 (25.9)	24 (32.9)	27 (39.1)	21 (33.9)	15 (35.7)	123 (31.9)

Table 6. Prevalence of malaria burden among pregnant women in the study area

Variables	Rank	Communities frequency (%)					
		Eha-Amufu (n=139)	Ikem (n=73)	Mbu (n=69)	Neke (n=62)	Umualor (n=42)	Total (n=385)
Fever	Biweekly	36 (43.9)	22 (26.8)	12 (14.6)	6 (7.3)	6 (7.3)	82 (21.3)
	Monthly	84 (37.7)	37 (16.6)	39 (17.5)	35 (15.7)	28 (12.6)	223 (57.9)
	Quarterly	19 (23.8)	14 (17.5)	18 (22.5)	21 (26.2)	8 (10.0)	80 (20.8)
					$\chi^2 = 20.449$ df = 8 p = 0.009		
Headache	Biweekly	38 (48.8)	21 (25.3)	14 (16.9)	5 (6.0)	5 (6.0)	83 (21.6)
	Monthly	89 (37.6)	40 (16.9)	40 (16.9)	38 (16.0)	30 (12.7)	237 (61.6)
	Quarterly	12 (3.1)	12 (3.1)	15 (3.9)	19 (4.9)	7 (1.8)	65 (16.9)
					$\chi^2 = 26.039$ df = 8 p = 0.001		
Cough & Catarrh	Biweekly	19 (23.8)	14 (17.5)	18 (22.5)	21 (26.2)	8 (10.0)	80 (20.8)
	Monthly	80 (38.1)	34 (16.2)	37 (17.6)	33 (15.7)	26 (12.4)	210 (54.5)
	Quarterly	40 (42.1)	25 (26.3)	14 (14.7)	8 (8.4)	8 (8.4)	95 (24.7)
					$\chi^2 = 19.327$ df = 8 p = 0.013		
Anorexia	Biweekly	6 (31.6)	5 (26.3)	3 (15.8)	3 (15.8)	2 (10.5)	19 (4.9)
	Monthly	84 (40.8)	40 (19.3)	29 (14.0)	34 (16.4)	20 (9.7)	207 (53.8)
	Quarterly	49 (30.8)	28 (17.6)	37 (23.3)	25 (15.7)	20 (12.6)	159 (41.3)
					$\chi^2 = 8.283$ df = 8 p = 0.406		
Still birth	None	119 (38.8)	57 (18.6)	53 (17.3)	48 (15.6)	30 (9.8)	307 (79.7)
	Once	16 (27.6)	12 (20.7)	14 (24.1)	9 (15.5)	7 (12.1)	58 (15.1)
	Twice	2 (25.0)	2 (25.0)	1 (12.5)	2 (25.0)	1 (12.5)	8 (2.1)
	Thrice	1 (25.0)	1 (25.0)	0 (0.0)	2 (50.0)	0 (0.0)	4 (1.0)
	Above	1 (12.5)	1 (12.5)	1 (12.5)	1 (12.5)	4 (50.0)	8 (2.1)
					$\chi^2 = 21.700$ df = 16 p = 0.153		
Neo/postnatal death	None	22 (32.8)	12 (17.9)	13 (19.4)	12 (17.9)	8 (11.9)	67 (17.4)
	Once	56 (32.0)	35 (20.0)	30 (17.1)	31 (17.7)	23 (13.1)	175 (45.5)
	Twice	40 (44.4)	15 (16.7)	17 (18.9)	12 (13.3)	6 (6.7)	90 (23.4)
	Thrice	11 (37.9)	6 (20.7)	5 (17.2)	4 (13.8)	3 (10.3)	29 (7.5)
	Above	10 (41.7)	5 (20.8)	4 (16.7)	3 (12.5)	2 (8.3)	24 (6.2)
					$\chi^2 = 7.318$ df = 16 p = 0.967		

Variables	Rank	Communities frequency (%)					
		Eha-Amufu (n=139)	**Ikem (n=73)**	**Mbu (n=69)**	**Neke (n=62)**	**Umualor (n=42)**	**Total (n=385)**
Mortality	None	40 (30.1)	25 (18.8)	26 (19.5)	23 (17.3)	19 (14.3)	133 (34.5)
	Once	49 (34.0)	25 (17.4)	30 (20.8)	22 (15.3)	18 (12.5)	144 (37.4)
	Twice	28 (43.1)	18 (27.7)	10 (15.4)	7 (10.8)	2 (3.1)	65 (16.9)
	Thrice	7 (35.0)	3 (15.0)	2 (10.0)	7 (35.0)	1 (5.0)	20 (5.2)
	Above	15 (65.2)	2 (8.7)	1 (4.3)	3 (13.0)	2 (8.7)	23 (6.0)
					$\chi^2 = 28.239$ df = 16 p = 0.030		
Affect productivity	Low	4 (40.0)	2 (20.0)	2 (20.0)	2 (20.0)	0 (0.0)	10 (2.6)
	Moderate	86 (38.1)	43 (19.0)	40 (17.7)	35 (15.5)	22 (9.7)	226 (58.7)
	High	49 (32.9)	28 (18.8)	27 (18.1)	25 (16.8)	20 (13.4)	149 (38.7)
					$\chi^2 = 3.179$ df = 8 p = 0.923		

4. DISCUSSION

Pregnancy increases the risk of malaria transmission [8]. Its implications include greater risk of illness, maternal anaemia and death as well as premature delivery, neonatal and infant mortality [2].

A study conducted in selected agrarian communities in southeast Nigeria on malaria predisposing factors, burden and management among revealed that majority of the respondents reported that these factors were high implying possible high malaria prevalence in their locale [5].

In relation to the obstetric characteristics of age, trimester and parity respectively; most respondents were within age-bracket 25-34 (42.6%), 1st trimester (56.4%) and multigravidae (52.8%) respectively. Hence, it can be deduced from this study that younger maternal age could be a predisposing factor to malaria because age-associated immunity increases with age and exposure as evident in prior researches [9,10]. This inquiry contrasts with some reports in similar studies [11,12] that generally reported higher malaria prevalence in 2nd trimester pregnancies. Some of these authors argued that the progressive collapse of weak reserves of iron and folic acid [10] as well as immunosuppression and depression of lymphocyte activity leads to higher susceptibility to malaria by women during their 2nd trimester of pregnancy [12]. However, given that the health-seeking tendencies of women commonly increases when they become pregnant in order to protect themselves and their unborn offspring, it's probable that most of them might have resorted to antimalarial prophylactics and other immune boosters in 1st trimester that proved more efficacious with successive usage progressively inhibiting higher prevalence in 2nd trimester. This study also reflects high malaria predisposition and possible prevalence as well to multigravidae contradicting previous assertions that paucigravidae (primigravidae and secungraviadae) are more susceptible to malaria because consecutive pregnancies is believed to expose women more to a variety of malaria parasites strains conferring them with parity-specific immunity over time [11]. Nonetheless, it is consistent with reports from earlier researchers who did not establish a significant association between malaria and parity [12]. Sometimes indiscriminate and successive births might put unnecessary pressure on the mother making her prone to malaria and other infectious diseases.

In relation to demographic characteristics of education, occupation and religion; a significantly high number of respondents ($p<0.05$) were observed among those with lesser academic qualification: primary education (32.2%) and secondary education (55.6%) than in those with higher academic qualifications: tertiary (9.1%) and post-tertiary (3.1%). Also, farmers (73.1%) and Christians (93.5%) constituted the majority of the respondents as found in work by previous researchers [13]. This infers that higher education improves knowledge and practices towards malaria increasing the likelihood of appropriate malaria prevention and treatment strategies [13] consequently reducing prevalence. Furthermore, farming activities exposes women to bushes, streams, springs, lakes, rivers, farmlands (especially water-logged rice farms), and other mosquito-breeding sites in the environment. Also, the rigorous stress of farming and conveying products to the marketplace might cause fatigue resulting in a deep sleep which favours uninterrupted blood-sucking tendencies of mosquitoes [14].

Significantly higher ($p<0.05$) among respondents reported they first heard of malaria through media broadcast (47.8%) and during adulthood (88.6%). Probably, exposure to malaria awareness processes through guardians and other more person-to-person close-contact approaches from an earlier stage of life might help reduce prevalence. The presence of overgrown bushes, farming as the main source of income and habit of staying outside late at night for cool relaxation observed in the study are strong predisposing factors that favour mosquito breeding and malaria transmission [5,8].

Most respondents reported occurrence of malaria-associated symptoms such as fever, headache, cough and catarrh except anorexia on a monthly basis reflecting a high frequency of malaria in the locale. Result also showed that 20.3% experienced stillbirth, 82.6% neonatal death and 65.5% infant mortality once, twice or more. And according to (58.7%) and (38.7%) of respondents, malaria moderately and highly affects their productivity during pregnancy respectively, while 2.6% reported low effect on productivity.

There is no statistical difference ($p>0.05$) between respondents that manage malaria condition by seeking health/treatment through the hospital (50.9) and those that use traditional remedy (49.1). Respondents agree to the use of

insecticide spray, antimalarial drug and insecticide-treated nets as well as other preventive measures such as sanitation, protective clothing, netted doors and windows. A possible explanation for high malaria prevalence nonetheless in the pregnant women might be due to abundant breeding sites, ignorance, poverty, unsanitary conditions, poor behavioural attitudes, inadequately planned socio-cultural projects rife in the rural areas and poor health care delivery [5,13]. Hence, some of the women who claimed to sleep under insecticide net at night might not be properly clothed during farm work or evening relaxation and vice versa, and some might not be putting other preventive measures at their disposal to judicious use. Also, according to [15] transient depression of cell-mediated immunity in pregnancy that allows foetal allograft retention but also interferes with resistance to various infectious diseases such as malaria could be a contributing factor.

In relation to economic impact, 65.5% and 31.9% of respondents claimed that cost of treatment was moderate and high respectively, while 2.6% testified the cost is low. Poor health care delivery was implicated as major dissatisfaction with treatment by 76.4% of respondents. This is in line with [5] who attributed high malaria prevalence in some agrarian populace to poor health care delivery. Perhaps if the health care services are improved more women might seek health/treatment inefficient government clinics/hospitals and these might abate prevalence.

5. CONCLUSION

Malaria during pregnancy is a major public health problem in most agrarian communities. Young mothers, farmers and those with lesser academic education are at greatest risk. Other predisposing factors include the presence of overgrown bushes that serve as mosquito breeding sites, farming as the main source of income and habit of staying out late at night. High incidence of malaria in the locale is reflected in the malaria-associated symptoms such as fever, headache, cough, catarrh, and anorexia experienced by expectant mothers on a monthly basis. Tragically, most expectant mothers first become aware of malaria through media broadcast and at a much later stage in life. Stillbirth, neonatal death, infant mortality and fluctuating productivity recorded in the study are indicators of malaria-associated burden. Poor health care delivery in the locale might exacerbate malaria condition in this vulnerable group of women.

6. RECOMMENDATIONS

Malaria awareness programmes should be launched in these locales to emphasize on the importance of early antenatal, intermittent preventive treatment, use of long-lasting insecticides bed nets, environmental sanitation, prompt diagnosis and treatment of malaria during pregnancy. The taarget audience should also include young girls and people who get exposed should be encouraged to educate others. The primary health care (PHC) system in such locales should be improved by government and other health stakeholders as an efficient PHC is a requisite for a healthy communal life.

CONSENT

The participants were briefed (in either English or Igbo language) on the purpose of the study and their confidentiality will be assured. Thereafter, they were given three days to reach their decision.

ETHICAL APPROVAL

Ethical clearance was obtained from Enugu State Ministry of Health (No. MH/MSD/REC18/045) to enable prompt consent and participation of the different hospital heads and medical personnel, as well as the study subjects.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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