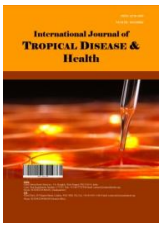

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Knowledge of Malaria and Utilization of Its Preventive Measures among Pregnant Women Attending Antenatal Care at a Tertiary Hospital in Port-Harcourt, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author PAA designed the study, performed the statistical analyses, and wrote the first draft of the manuscript. Author CO and BN assisted in data collection, managed the analyses of the study and literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: Prevention of malaria is a major priority for the roll back malaria partnership which recommends three-pronged approach for reducing the burden of malaria among pregnant women. The WHO framework for malaria prevention during pregnancy in areas of stable malaria transmission recommends IPT, use of ITN, and case management of malaria illness.
Objective: This study sought to determine the knowledge of malaria and its preventive measures among pregnant women, assess their utilization of malaria preventive measures and attitude to treatment. To ascertain whether there exists any relationship between their knowledge and practice of prevention.
Methodology: An institutional based, cross-sectional study was carried out. 385 consenting participants, between 18-48 years, were interviewed using a structured questionnaire. Information

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on socio-demographic characteristics, knowledge of malaria and its preventive measures, use of IPT and ownership/use of ITN, and attitude to treatment were recorded. Data were entered into Excel spreadsheet and analyzed with SPSS version 20. Associations between different variables were determined using Fisher's exact test or Chi-square test, as appropriate, and logistic regression used to test statistical significance at P<0.05.

Results: Of the 385 women, 307 (79.7%) had excellent (18.7%) and good (61%) knowledge, while 78 (20.3%) had average (16.6%) and poor (3.6%) knowledge. There was no difference in association of Knowledge with age, marital status, education, occupation, and parity. Of the 385 women, 61.3% were using IPT for chemoprophylaxis, 66.2% were using insecticide spray or repellants and 71.4% owned mosquito net; of these, 84% owned insecticide treated nets, but only 65.8% were using it in this current pregnancy. Reasons for not using nets ranged from unavailable 49.0%, discomfort due to heat 32.9%, fear of suffocation 6.9%, Spouse's disapproval 3.9% and 1.0% ineffective. There was statistically significant difference between knowledge and use of IPT, ITN and insecticide sprays.

Conclusion: There was adequate knowledge of malaria in pregnancy and its preventive measures, but utilization of these measures needs improvement. Efforts should be made to address barriers to utilization.

Keywords: Malaria in pregnancy; preventive measures; knowledge and utilization; Port-Harcourt.

1. INTRODUCTION

Malaria infection during pregnancy is a major public health problem in tropical and subtropical regions throughout the world [1]. Pregnant women in sub-Saharan Africa are more likely than non-pregnant women to become infected with *Plasmodium falciparum* malaria and have a higher density of parasitemia [2,3]. In Nigeria, malaria during pregnancy is responsible for 11% of maternal mortality [4]. Malaria in pregnancy has been associated with a range of deleterious effects in women and their offspring. The resultant impairment of fetal nutrition contributes to low birth weight (LBW), which is a leading cause of poor infant survival and development in Africa [3,5,6].

The World Health Organization's (WHO) strategic framework for malaria prevention and control during pregnancy in areas of stable malaria transmission recommends intermittent preventive treatment (IPT), use of insecticide-treated nets (ITN) and case management of malaria illness [7,8]. IPT using Sulphadoxime-Pyrimethamine (SP) was a key component of the focused antenatal care package for over a decade, reducing the burden of LBW attributable to malaria in sub-Saharan Africa [9]. In most African countries, including Nigeria, SP is recommended during the second and third trimesters of pregnancy for IPT in areas of high malaria transmission [9,10].

Studies conducted in Lagos, Ekiti and Ogun States in southwest Nigeria revealed that the use of IPT was still suboptimal [11,12,13]. A study reported that the practice of malaria prevention measures among pregnant women was below expectation, as their use of ITN was unacceptably low and this contributes to high infection rates [14].

Prevention of malaria in pregnancy is a major priority for the roll back malaria partnership which recommends these three-pronged approaches for reducing the burden of malaria among pregnant women. Despite improved antenatal care services and the health education provided during these services, the prevalence of malaria in pregnancy continues to be high. It becomes necessary to ascertain the knowledge and utilization of malaria prevention among pregnant women attending the antenatal clinics.

This study therefore sought to determine the knowledge of malaria and its preventive measures among pregnant women booked for antenatal care at the Rivers State University Teaching Hospital (RSUTH). To assess their utilization of malaria preventive measures and attitude to early treatment, as well as ascertain whether there exist any relationship between their knowledge and practice of malaria prevention. The findings of this study will identify areas of lapses in the knowledge and practice of malaria prevention measures. This will aid in improving the content of antenatal education sessions and will help in the realization of coverage targets of the Roll Back Malaria Programme.

2. METHODOLOGY

2.1 Study Site/Area

This study was conducted at the antenatal clinic of RSUTH located in Port Harcourt city, an urban area in Nigeria, a tertiary hospital owned and funded by the Government of Rivers State of Nigeria. Patients are expected to pay directly for services they receive (except few that participate in the National Health Insurance Scheme). The hospital provides emergency obstetric services to women referred from other centers, as well as providing antenatal care and delivery services for low and high-risk pregnant women registered with the hospital. There are Five teams headed by consultants that run antenatal care services Mondays through Fridays. There is an average annual ANC attendance of over 12,000.

2.2 Study Design and Population

An institutional based, cross-sectional study was carried out between 24TH April to 21ST August 2020. Consenting participants were interviewed using a structured questionnaire that required about ten minutes to complete. The study population was all pregnant women between the ages of 18-48 years booked for antenatal care at the antenatal clinic of the RSUTH. All consecutive women between 18 and 48 years who gave informed written consent were included, non-consenting women were excluded.

2.3 Sample Size Determination

The required sample size was determined by using sample size for single population proportion formula [15] with the national prevalence of malaria in pregnancy by the federal ministry of health of 48% [16].

$$n = (Z\alpha/2)^2 \times p(1-p) / d^2$$

Where, Z = critical value for normal distribution at 95% confidence level which equals to 1.96 (z value at α =0.05, two tailed).
p = Proportion 48%. d = margin of error = 5% in case of our study = 0.05. n = sample size
$n = 1.96^2 \times 0.48 \times (1-0.48) / (0.05)^2$
$n = 3.84 \times 0.48 \times 0.52 / 0.0025 = 383.4. \approx$ **385**.

2.4 Sampling Technique / Procedures

All consecutive consenting pregnant women booked for ANC on each clinic day were recruited for the study until the required sample size was attained. An average of 30-50 women, registered for antenatal care, are seen daily in our Centre. However, due to the Covid 19 pandemic, attendance dropped. The recruitment lasted for About 4 months, between 24TH April and 21ST August.

2.5 Data Collection Instrument / Methods

Data was collected by structured questionnaire administered to the study participants to collect information on socio-demographic characteristics, their knowledge about malaria and its preventive measures, including use of IPT and ownership/use of insecticide-treated nets. *Knowledge of malaria was defined as the ability of a person to have correct understanding of malaria in terms of causative agent, mode of transmission, signs & symptoms, and prevention. Utilization of malaria preventive measures are the routine activities and actions of individuals towards preventing malaria and includes Chemoprophylaxis, use of insecticide treated nets, using insecticide spray/repellents, control & clearing of mosquito breeding places and health seeking behavior.*

Knowledge about malaria and its preventive measures was calculated by dividing the number of correct answers by the total number of options and multiplying by 100 to convert the score to percentage (% knowledge score = total correct responses / total available options x 100). The percentage knowledge scores were rated as follows: Excellent-knowledge = ≥80%, Good-knowledge = 60-79%, Average-knowledge = 40-59 and Poor-knowledge = <40%

The questionnaire was administered by one trained resident doctor running routine antenatal care for each clinic day, Monday through Friday. Prior to data collection, the data collectors were trained for one day. Close supervision and daily check-up of the data was carried out by one author daily, to improve quality of data.

2.6 Data Analysis

Coded data were entered into Excel spreadsheet and exported to SPSS version 20 for statistical analysis. Descriptive statistics such as Mean, and frequencies were used to present the results in tables and figures. Cross-tabulation was used to determine associations between different variables using Fisher's exact test or Chi-square test, as appropriate, and significant findings on

bivariate analysis put to logistic regression to test statistical significance at P<0.05.

3. RESULTS

A total of the 385 participants were interviewed. Their mean age ± SD was 31.36±4.87years; median age was 31years with range of 18 – 43years. Their median Parity was 1 with range of Para 0 – 6. Majority of the women were married 95.6%, had tertiary education 56.6% and 22.3% of them were unemployed and without any source of personal income (see Table 1). Regarding their knowledge of malaria in pregnancy and its preventive measures, of the 385 women 307 (79.7%) had excellent (18.7%) and good (61%) knowledge, while 78 (20.3%) had average (16.6%) and poor (3.6%) knowledge.

A comparison of their socio-demographic characteristics and their knowledge of malaria in pregnancy and its preventive measures revealed no significant association with age (P=0.531), marital status (P=0.172), educational level (P=0.088), occupational status (P=0.265) and parity (P=0.953) as elucidated in Table 2.

Common malaria preventive measures as practiced by the pregnant women is as enumerated in Table 3. Of the 385 women interviewed, 236 (61.3%) were using IPT for chemoprophylaxis, 255 (66.2%) were using insecticide spray or repellants and 275 (71.4%) owned mosquito net. Of those that owned mosquito nets, a good majority 231 (84%) owned insecticide treated nets, but only 181 (65.8%) were using the nets in this current pregnancy. Almost half of these women (49.8%) have never washed or changed their nets, with the thinking that it is meant to be used until damaged. Table 3B relates to a bivariate analysis of sociodemographic characteristics and good or poor practice of malaria prevention measures, with a significant association with parity (P=0.041). Regarding reasons given by those not using mosquito nets, majority were not using it because of unavailability, reasons given by the

Table 1. Socio-demographic characteristics of pregnant women attending ANC at RSUTH

Variables (N = 385)	Frequency	Percentage
Age in years		
<20 years	3	0.8
20 – 29 years	129	33.5
30 – 39 years	237	61.6
≥40 years	16	4.2
Mean ± SD = 31.36±4.87years; Median = 31years; Range = 18 – 43years		
Marital status		
Single	14	3.6
Married	368	95.6
Separated/Divorced	1	0.3
Widowed	2	0.5
Educational level		
None	2	0.5
Primary	4	1.0
Secondary	101	26.2
Post-secondary	60	15.6
Tertiary	218	56.6
Occupation		
Housewife/Unemployed	86	22.3
Public servant	106	27.5
Health worker	7	1.8
SME	96	24.9
Petty trader	90	23.4
Parity		
Para 0	139	36.1
Para 1	115	29.9
Para ≥2	131	34.0
Median = Para 1; Range = Para 0 – 6		

Table 2. Socio-demographic characteristics versus knowledge on malaria and its prevention measures among pregnant women attending ANC at RSUTH

Variables (N = 385)	Knowledge on malaria & its prevention measures		Total n
	Excellent/Good n (%)	Average/Poor n (%)	
Age in years			
<20 years	2 (66.7)	1 (33.3)	3
20 – 29 years	100 (77.5)	29 (22.5)	129
30 – 39 years	193 (81.4)	44 (18.6)	237
≥40 years	12 (75.0)	4 (25.0)	16
	Fisher's exact test = 2.024; p-value = 0.531		
Marital status			
Single	8 (57.1)	6 (42.9)	14
Married	296 (80.4)	72 (19.6)	368
Separated/Divorced	1 (100.0)	0 (0.0)	1
Widowed	2 (100.0)	0 (0.0)	2
	Fisher's exact test = 4.832; p-value = 0.172		
Educational level			
None	0 (0.0)	2 (100.0)	2
Primary	3 (75.0)	1 (25.0)	4
Secondary	77 (76.2)	24 (23.8)	101
Post-secondary	50 (83.3)	10 (16.7)	60
Tertiary	177 (81.2)	41 (18.8)	218
	Fisher's exact test = 7.519; p-value = 0.088		
Occupation			
Housewife/Unemployed	65 (75.6)	21 (24.4)	86
Public servant	91 (85.8)	15 (14.2)	106
Health worker	6 (85.7)	1 (14.3)	7
SME	78 (81.2)	18 (18.8)	96
Petty trader	67 (74.4)	23 (25.6)	90
	Chi Square = 5.222; p-value = 0.265		
Parity			
Para 0	112 (80.6)	27 (19.4)	139
Para 1	91 (79.1)	24 (20.9)	115
Para ≥2	104 (79.4)	27 (20.6)	131
	Chi Square = 0.096; p-value = 0.953		

SME = Small and Medium Entrepreneur

94 women who owned mosquito nets but were not using it ranged from discomfort due to heat 80 (32.9%), fear of suffocation 14 (6.9%), Spouse's disapproval 8 (3.9%) and 2 women (1.0%) claimed the net does not prevent mosquitoes from biting.

Table 4 relates to the health seeking behaviour and attitude to treatment of malaria of the women. Of the 385 participants, 212 (55.1%) agreed they have been ill with malaria in the current pregnancy, of these 209 (98.6%) said they visited the hospital for treatment, only 3 (1.4%) retorted to self-medication. There were 246 women who had been pregnant previously and a majority 231 (93.9%) took antimalaria prophylaxis in their previous pregnancy, only 15 (6.1%) never had any. Of the 231 that had chemoprophylaxis, 181 (78.4%) took SP (Fansidar). When asked where they will seek for treatment when ill with malaria, 316 (82.1%) said they will visit a medical Centre, 54 (14.0%) opted for drugstore, 14 (3.6%) opted for self-medication and one person (0.3%) opted for traditional healer. When asked how soon after noticing symptoms of malaria would they seek for treatment, only about half of the women, 197 (51.2%) said they will seek treatment within 24 hours, the rest opted for 2 or more days and when asked what they will be doing while waiting, 106 (56.4%) said they will take analgesics while waiting, 78 (41.5%) said they will just observe/do nothing, one person (0.5%) opted for prayers. Table 4B relates to a bivariate

analysis of sociodemographic characteristics and good or poor attitude to treatment of malaria with a significant association with parity (P=0.041) and marital status (P=0.014).

Table 5 shows the comparison of their knowledge of malaria and its preventive measures, and their practice of the preventive measures. There was a statistically significant relationship between knowledge and use of IPT as a preventive measure (P=0.0001), use of ITN as a preventive measure (P=0.010) and use of insecticide sprays/repellants as preventive measure (P=0.0001). However, the relationship between knowledge and ownership of mosquito nets (P=0.521), type of mosquito net owned (P=0.273), use of nets in current pregnancy (P=0.865) and how often they change the nets (P=0.065), were not statistically significant.

Table 6 shows the comparison of their knowledge of malaria and its preventive measures, and their attitude to treatment of malaria. The only significant association was with where to seek for treatment when sick with malaria (P=0.0001). The comparison between their knowledge and whether they've had malaria in the current pregnancy (P=0.076), what was done when they were sick (P=1.000), whether they took antimalarials in their previous pregnancy (P=0.205) and how soon they will seek treatment when sick (P=0.213) were all not statistically significant. Table 7 relates to multiple logistic regression analysis for significant findings on bivariate analysis. Knowledge of malaria and its preventive measures was significantly associated with use of IPT (P=0.0001), use of ITN (P=0.012) and use of insecticide sprays (P=0.0001) but not significant for where to seek help when sick with malaria (P=0.106).

4. DISCUSSION

The knowledge and use of malaria prevention measures is an important factor to the realization of the targets of the Roll Back Malaria programme. Most of the participants in this study were literate as 98.4% of them have completed Secondary education and above, with 56.6% of them haven acquired a tertiary education. This was the exact finding of an earlier study in our Centre of women booking for ANC by Awoyesuku et al [17] and is like findings of studies carried out in similar metropolitan cities of Abuja [18] and Benin [19] in Nigeria.

Table 3. Common malaria prevention practices among pregnant women attending ANC at RSUTH

Variables (N = 385)	Frequency	Percentage
Use of drugs (IPT) as prevention measure		
Yes	236	61.3
No	149	38.7
Used nets as prevention previously		
Yes	290	75.3
No	95	24.7
Used of insecticide spray as prevention measure		
Yes	255	66.2
No	130	33.8
Own mosquito nets presently		
Yes	275	71.4
No	110	28.6
Type of mosquito nets owned and being used (N = 275)		
Insecticide treated net	231	84.0
Ordinary nets	44	16.0
How often change mosquito net (N = 275)		
Every 6 months	99	36.0
Above 6 months to yearly	39	14.2
Until net is damaged	137	49.8
Using mosquito net in current pregnancy		
Yes	181	65.8
No	94	34.2

Table 3B. Sociodemographic characteristics versus practice of malaria prevention measures among pregnant women attending ANC at RSUTH

Variables (N = 385)	Practice of malaria prevention measures		Total n (%)
	Good n (%)	Poor n (%)	
Age in years			
<20 years	2 (66.7)	1 (33.3)	3
20 – 29 years	92 (71.3)	37 (28.7)	129
30 – 39 years	167 (70.5)	70 (29.5)	237
≥40 years	11 (68.8)	5 (31.2)	16
	Fisher's exact test = 0.410; p-value = 0.982		
Marital status			
Single	6 (42.9)	8 (57.1)	14
Married	263 (71.5)	105 (28.5)	368
Separated/Divorced	1 (100.0)	0 (0.0)	1
Widowed	2 (100.0)	0 (0.0)	2
	Fisher's exact test = 4.832; p-value = 0.172		
Educational level			
None	0 (0.0)	2 (100.0)	2
Primary	3 (75.0)	1 (25.0)	4
Secondary	66 (65.3)	35 (34.7)	101
Post-secondary	44 (73.3)	16 (26.7)	60
Tertiary	159 (72.9)	59 (27.1)	218
	Fisher's exact test = 6.155; p-value = 0.152		
Occupation			
Housewife/Unemployed	52 (60.5)	34 (39.5)	86
Public servant	84 (79.2)	22 (20.8)	106
Health worker	6 (85.7)	1 (14.3)	7
SME	69 (71.9)	27 (28.1)	96
Petty trader	61 (67.8)	29 (32.2)	90
	Chi Square = 9.272; p-value = 0.055		
Parity			
Para 0	88 (63.3)	51 (36.47)	139
Para 1	83 (72.2)	32 (27.8)	115
Para ≥2	101 (77.1)	30 (22.9)	131
	*Chi Square = 6.368; p-value = 0.041**		

**Statistically significant (p<0.05)*

These are higher than the generality of the population in Nigeria as the 2008 Nigeria Demographic Health Survey report only 45% of women attended secondary and tertiary institutions [20]. In this study 79.7% of the participants had excellent/good knowledge of malaria and its preventive measures, as is like findings by the above sited studies. There was a statistically significant relationship between knowledge and use of IPT as a preventive measure, use of ITN as a preventive measure and use of insecticide sprays/repellants as preventive measure. The high literacy rate may explain the high knowledge of malaria and use of its preventive measures in the study participants. A comparison of this knowledge and the ages of participants, their parity, occupation, and educational status, however, was not significant. Some studies [18,21,22] have found a significant association particularly with education and the difference may be attributed to the spread of educational level among the study populations.

One of the WHO strategic framework for malaria prevention and control during pregnancy recommends use of IPT, which involves receiving at least two doses of SP during routine ANC visits, during second and third trimesters of pregnancy, regardless of whether the woman is infected or not. In this study 61% of the participants were using IPT in the current pregnancy; of those who had been previously pregnant 93.9% used IPT of which 78.4% used SP. This is close to the expected WHO target of reaching at least 80% of pregnant women with IPT by end of 2010 [23]. This finding is higher

than the findings of similar Nigerian studies in Abuja [18], Ibadan [24] and Calabar [25]. The differences in the findings may be attributed to the fact that these are much older studies and that the knowledge and use of IPT has improved over the years.

The Nigerian National Strategic Plan 2009-2013 of the National Malaria Control Programme targets that at least 80% of pregnant women sleep under ITN by 2010 and coverage sustained until 2013 [26]. The finding of this study, of 71.4% ownership of bed nets, is still far from achieving that target, years after. This study also revealed that only 65.8% of the women were actually using the ITN in the current pregnancy. Similar studies have shown a high level of ownership of nets but low level of utilization [18,27]. Like these studies, barriers to its use found in this study were un-comfortability due to heat, fear of suffocation due to reduced ventilation, non-acceptability by husband and conviction of non-effectiveness of ITN. A lot of women need to be encouraged and there is need for involvement of men towards ensuring increased utilization of ITN in their homes.

Another key intervention of the National malaria Control Programme is prompt treatment of clinical malaria episodes with drugs. This, however, cannot be achieved if the health seeking behaviour of the population is poor. This study found that of the women who have had an episode of malaria in the current pregnancy, 98.6% visited a medical center and got treated. Generally, only 82.1% said they will go to a medical center, others preferred drug store, self-medication, and traditional healers. What was most worrying is the finding that only 51.2% of the women were going to seek treatment within 24 hours, others preferred to wait at least 48 hours or more before seeking treatment and while waiting only 56.4% will take analgesics, the rest preferred to do nothing or observe. Despite the good knowledge exhibited by the participants, this health seeking behaviour

Table 4. Attitude to treatment of malaria among pregnant women attending ANC at RSUTH

Variables (N = 385)	Frequency	Percentage
Been sick with malaria in current pregnancy		
Yes	212	55.1
No	173	44.9
What was done when sick with malaria (N = 212)		
Visited the hospital for prescription drugs	209	98.6
Self-medicated	3	1.4
Took antimalarials in past pregnancy (N = 246)		
Yes	231	93.9
No	15	6.1
Antimalarials taken at past pregnancy (N = 231)		
Fansidar	181	78.4
Coartem	30	13.0
Paludrine	12	5.2
Daraprim	8	3.5
Where to seek treatment for malaria		
Medical Center	316	82.1
Drugstore	54	14.0
Self-medicate	14	3.6
Traditional healer	1	0.3
How soon after suspecting malaria do you seek treatment		
Within 24 hours (1day)	197	51.2
After 24 hours (2 – 3 days)	188	48.8
Initial response when not treating malaria within 24 hours (1 day)		
Observe/No response at all	78	41.5
Take analgesic	106	56.4
Pray	1	0.5

Table 4B. Sociodemographic characteristics versus attitude to treatment of malaria among pregnant women attending ANC at RSUTH

Variables (N = 385)	Attitude to treatment of malaria		Total n (%)
	Good n (%)	Poor n (%)	
Age in years			
<20 years	3 (100.0)	0 (0.0)	3
20 – 29 years	67 (51.9)	62 (48.1)	129
30 – 39 years	113 (47.7)	124 (52.3)	237
≥40 years	7 (43.8)	9 (56.2)	16
	Fisher's exact test = 6.517; p-value = 0.319		
Marital status			
Single	11 (78.6)	3 (21.4)	14
Married	176 (47.8)	192 (52.2)	368
Separated/Divorced	1 (100.0)	0 (0.0)	1
Widowed	2 (100.0)	0 (0.0)	2
	*Fisher's exact test = 7.716; p-value = 0.014**		
Educational level			
None	1 (50.0)	1 (50.0)	2
Primary	1 (25.0)	3 (75.0)	4
Secondary	43 (42.6)	58 (57.4)	101
Post-secondary	33 (55.0)	27 (45.0)	60
Tertiary	112 (51.4)	106 (48.6)	218
	Fisher's exact test = 4.096; p-value = 0.383		
Occupation			
Housewife/Unemployed	44 (51.2)	42 (48.8)	86
Public servant	53 (50.0)	53 (50.0)	106
Health worker	4 (57.1)	3 (42.9)	7
SME	50 (52.1)	46 (47.9)	96
Petty trader	39 (43.3)	51 (56.7)	90
	Chi Square = 1.891; p-value = 0.756		
Parity			
Para 0	73 (52.5)	66 (47.5)	139
Para 1	59 (51.3)	56	115
Para ≥2	101 (77.1)	30 (22.9)	131
	*Chi Square = 6.368; p-value = 0.041**		

**Statistically significant (p<0.05)*

Table 5. Comparison between knowledge of malaria/its prevention measures and practice of the prevention measures among pregnant women attending ANC at RSUTH

Malaria prevention practices	Knowledge on malaria &its prevention measures		Total n (%)
	Excellent/Good n (%)	Average/Poor n (%)	
Use of drugs (IPT) as prevention measure			
Yes	210 (89.0)	26 (11.0)	236 (100.0)
No	97 (65.1)	52 (34.9)	149 (100.0)
	*Chi Square = 32.246; p-value = 0.0001**		
Use of insecticide treated nets as prevention measure			
Yes	240 (82.8)	50 (17.2)	290 (100.0)
No	67 (70.5)	28 (29.5)	95 (100.0)
	*Chi Square = 6.628; p-value = 0.010**		

Malaria prevention practices	Knowledge on malaria &its prevention measures		Total n (%)
	Excellent/Good n (%)	Average/Poor n (%)	
Use of insecticide spray as prevention measure			
Yes	224 (87.8)	31 (12.2)	255 (100.0)
No	83 (63.8)	47 (36.2)	130 (100.0)
	*Chi Square = 30.692; p-value = 0.0001**		
Ownership of mosquito nets			
Yes	217 (78.9)	58 (21.1)	275 (100.0)
No	90 (81.8)	20 (18.2)	110 (100.0)
	Chi Square = 0.412; p-value = 0.521		
Type of mosquito nets owned and being used (N = 275)			
Insecticide treated net	185 (80.1)	46 (19.9)	231 (100.0)
Ordinary nets	32 (72.7)	12 (27.3)	44 (100.0)
	Chi Square = 1.203; p-value = 0.273		
How often do you change net (N = 275)			
Every 6 months	81 (81.8)	18 (18.2)	99 (100.0)
Above 6 months to yearly	35 (89.7)	4 (10.3)	39 (100.0)
Until net is damaged	101 (73.7)	36 (26.3)	137 (100.0)
	Chi Square = 5.469; p-value = 0.065		
Using mosquito net in current pregnancy			
Yes	145 (80.1)	36 (19.9)	181 (100.0)
No	162 (79.4)	42 (20.6)	204 (100.0)
	Chi Square = 0.029; p-value = 0.865		

**Statistically significant (p<0.05)*

Table 6. Comparison between knowledge of malaria/its prevention measures and attitude to treatment of malaria among pregnant women attending ANC at RSUTH

Attitude to treatment of malaria (N = 385)	Knowledge on malaria &its prevention measures		Total n (%)
	Excellent/Good n (%)	Average/Poor n (%)	
Been sick with malaria in current pregnancy			
Yes	176 (83.0)	36 (17.0)	212 (100.0)
No	131 (75.7)	42 (24.3)	173 (100.0)
	Chi Square = 3.139; p-value = 0.076		
What was done when sick with malaria (N = 212)			
Visited the hospital for prescription drugs	172 (82.8)	36 (17.2)	209 (100.0)
Self-medicated	3 (100.0)	0 (0.0)	3 (100.0)
	Fisher's exact p-value = 1.000		
Took antimalarials in previous pregnancy (N = 246)			
Yes	185 (80.1)	46 (19.9)	231 (100.0)
No	10 (66.7)	5 (33.3)	15 (100.0)
	Fisher's exact p-value = 0.205		
Where to seek treatment when sick with malaria			
Medical Center	264 (83.5)	52 (16.5)	316 (100.0)
Drugstore	35 (64.8)	19 (35.2)	54 (100.0)
Self-medicate	8 (57.1)	6 (42.9)	14 (100.0)
Traditional healer	0 (0.0)	1 (100.0)	1 (100.0)
	Fisher's exact test = 16.932; p-value = 0.0001*		

How soon from suspecting malaria to seeking treatment			
Within 24 hours (1day)	162 (82.2)	35 (17.8)	197 (100.0)
After 48 to 72 hours (2 – 3 days)	145 (77.1)	43 (22.9)	188 (100.0)
Chi Square = 1.552; p-value = 0.213			

**Statistically significant (p<0.05)*

Table 7. Multiple logistic regression showing factors associated with knowledge of malaria & its prevention measures among pregnant women attending ANC at RSUTH

Factors	Coefficient(B)	Odds ratio (OR)	95% CI	*p value*
Use of drugs (IPT) as prevention measure				
Yes	1.422	4.145	2.36 – 7.27	0.0001*
No [R]		1		
Use of insecticide treated nets as prevention measure				
Yes	0.765	2.149	1.19 – 3.90	0.012*
No [R]		1		
Use of insecticide spray as prevention measure				
Yes	1.513	4.540	2.58 – 7.99	0.0001*
No [R]		1		
Sought treatment at the right place				
Yes	-0.983	2.672	0.81 – 8.81	0.106
No [R]		1		

**Statistically significant (p<0.05)*

cannot reduce the maternal and infant morbidity and mortality from malaria. A change in this behaviour can only occur from proper education at ANC visits and discouraging adverts by analgesic drug manufacturers, that ask people to take their drugs and see doctor after two days if not feeling better.

5. CONCLUSION

This study found that there was adequate knowledge of malaria and its preventive measures among the study population, but utilization of these measures and the health seeking behaviour of the women needs improvement. Efforts should be made to address barriers to utilization, as well as a change in the health seeking behaviour by proper education at ANC visits and discouraging adverts by analgesic drug manufacturers that ask people to see their doctor, after two days of taking their drugs, if not feeling better.

6. LIMITATION

This was an institution based cross sectional survey and the findings need to be interpreted as such. Large community-based studies are needed to ascertain and generalize the findings.

CONSENT AND ETHICAL APPROVAL

Prior to data collection, the proposal was submitted to the RSUTH Research and Ethics Committee, as the study involved use of human subjects and patients of the hospital. Ethical clearance letter was obtained (RSUTH/REC/2020001). Individual written informed consent was also collected from each participant.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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