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Knowledge Attitude Practice of Malaria Preventive Measures Amongst Attendees of ESUT Teaching Hospital, Parklane Enugu

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Abstract:-

- ***Aims:***

To determine the knowledge of malaria and its preventive measures among antenatal attendees of ESUT Teaching Hospital,to determine the preventive measures taken to prevent malaria,To determine the factors that influence their preventive practices towards malaria.

- ***Study Design:***

This is a descriptive cross-sectional study which was conducted using interviewer-administered questionnaire.

- ***Place and Duration of Study:***

The study area is antenatal ward situated in ESUT Teaching Hospital, which is located in Parklane GRA, Enugu, Nigeria, between June and July 2019.

- ***Methodology:***

We included willing antenatal attendees of ESUT Teaching Hospital from the age of 15 irrespective of their gestational age of pregnancy. A total of 360 pregnant women participated in the study.

- ***Results:***

Out of 355 questionnaires that were distributed only 323 were recovered, giving a response rate of 90.99%.The overall knowledge of the cause of malaria was relatively good, as 310 (96%) respondents believed that it was caused by mosquito bite, while only a few 38 (14.5%) did not know the cause.Also,more younger respondents 156 (90.7%) were knowledgeable about the use of Insecticides Treated Nets (ITNs) and Intermittent Preventive Therapy(IPT)in the prevention of malaria with p = 0.031 and p=0.001 respectively.

- ***Conclusion:***

We were able to deduct that majority of the pregnant women who participated in the study had a good knowledge of cause of malaria and it's effect on the unborn child,however the practice varies amongst individual and dependents on various factors including age,educational level,occupation and religious beliefs. Thus, we are recommending the government to make insecticide treated nets and insecticides readily accessible, in addition, health care providers should reinforce their health talks on the need to use insecticide treated nets while pregnant.

I. INTRODUCTION

- *Background Information*

Malaria is a potentially life-threatening disease caused by infection with Plasmodium parasite transmitted via the bite of an infected female Anopheles mosquito[1]. The four Plasmodium species known to cause malaria in humans are *Plasmodium falciparum*, *Plasmodium malariae*, *Plasmodium vivax* and *Plasmodium ovale*. Timely identification of the infecting specie is extremely important, as *P. falciparum* infection can be fatal. Malaria control strategies using anti-malaria drugs as one of the basic components has been hampered by the emergence and rapid spread of drug resistant malaria parasite[2].

The problem of the development of malaria resistance must be weighed against the essential goal of anti-malaria care; that is to reduce morbidity and mortality. Thus a balance must be reached that attempts to achieve both goals while not compromising either too much by doing so[3]. The most successful attempts so far have been in the administration of combination therapy. The best and most common type is Artemesinin-based combination therapies (ACTs)[3]. Artemesinin has a very different mode of action than conventional anti-malarials. This makes it particularly useful in the treatment of resistant infections, however in order to prevent the development of resistance to the drug, it is used in combination with another non-artemesinin based therapy[3]. It produces a very rapid reduction in the parasite biomass with an associated reduction in clinical symptoms and is known to cause a reduction in the transmission of gametocytes thus decreasing the potential for the spread of resistant alleles[3]. At present, there is no known resistance to artemesinin (though some resistant strains may be emerging)[3]. The different combinations include.

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- Artesunate and amodiaquine (coarsucam)
- Artesunate and mefloquine (artequin)
- Artemether and lumefantrine (coartem)
- Artesunate and sulfadoxine/pyrimethamine (ariplus or amalar plus)
- Dihydroartemisinin-piperaquine (artekin)
- Pyronaridine and artesunate (pyramax)

➢ *There are other Strategies to Control Malaria which Include –*

- *Source Reduction –*

It involves eliminating mosquito larval development sites by modifying and manipulating the environment. E.g. draining of dirty water, use of larvicides[2].

- *Spraying –*

Use of insecticides can be us ed to shorten the mosquito's life span[2].

- *Larviciding –*

Involves killing of mosquitoes in the larval stage. Chemical larvicides include petroleum oils, pesticides such as temephos and fenthion. Biological methods employ larvivorous fish, such as a *Gambusia* species or *Lebistes* species[2].

- *Contact Reduction –*

Protective clothing, insect repellents, insecticide-treated nets, can help reduce human-mosquito contact[2].

Currently, there are no vaccines for malaria. The effort to provide one has proved more difficult than anticipated[2].

Malaria poses a major threat to pregnant women as it is a major cause of anaemia. So the need for prevention among pregnant women cannot be over emphasized.

➢ *Problem Statement*

Malaria infection during pregnancy is a significant public health problem with substantial risks for the pregnant woman, her fetus, and the newborn child[4]. Malaria associated maternal illness and low birth weight is mostly as a result of *P. falciparum* infection and occurs predominantly in Africa[4].

In high-transmission areas, like in the tropical countries like Nigeria, Mozambique, Uganda, etc. where levels of acquired immunity tend to be high, *P. falciparum* infection is usually asymptomatic in pregnancy. Yet, parasites may be present in the placenta and contribute to maternal anaemia[4]. Both maternal anaemia and placental parasitaemia can lead to low birth weight, which is an important contributor to infant mortality[4].

In low-transmission areas, like western Europe and the United States where there is relatively little acquired immunity to malaria, malaria in pregnancy is associated with anaemia, an increased risk of severe malaria, and it may lead to spontaneous abortion, stillbirth, prematurity and low birth weight[4].

Lopez-Perez carried out a descriptive study through passive surveillance on 1328 pregnant women in low endemic areas of Colombia between 2011 and 2013 and reported[5]:

- Most were infected with *P. falciparum*
- In 44% of the women, the infection occurred during the first half of pregnancy.
- In 68%, there was mild to moderate anaemia.
- In 41%, there was mild thromboctopaenia.
- Four women had acute renal failure.

Beaudrap carried out a study among Ugandian pregnant women between October 2006 and May 2009 and reported that[6]:

The risk of peripheral malaria was higher in mothers who were younger, infected with HIV, had less education, lived in rural areas and those who didn't use insecticide treated net.

The risk of placental infection was associated with more frequent malaria infections and with infection during late pregnancy.

The risk of pre-term delivery and of miscarriage was increased in mothers infected with HIV, living in rural areas.

Okpere et al stated that malaria contributes to at least 10,000 maternal deaths and to at least 200,000 newborn deaths annually[7]. The research implicated reduced maternal immunity from increased steroid levels in pregnancy, increased attractiveness of pregnant women to mosquito bites and increased adherence of parasitized erythrocytes to Chondroitin sulphate A expressed in the placenta[7]. It was worse in the first and second pregnancies[7].

➢ *Justification and Relevance to Public Health*

The relevance of the study is to help review the knowledge, altitude and practice of malaria preventive measures among antenatal attendees in ESUT Teaching Hospital, Parklane Enugu. With the research, we will find out if pregnant women knew how harmful malaria could be to their pregnancy, and steps they take to prevent it. With the result we will get, it will give us an insight to how pregnant women react to malaria, and steps we will take to prevent harmful effect on pregnancy by malaria in the future. The research will help to educate the people on means of prevention and treatment of malaria and create awareness on early presentation to antenatal clinics.

Hopefully, the result and findings of this research will stimulate interest and increase the participation of pregnant women in improving on control and prevention of malaria.

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➢ *Research Questions*

- What is the knowledge of malaria among antenatal attendees of ESUT Teaching Hospital?
- What is their attitude towards it?
- What preventive measures do they take to prevent malaria?
- What factors influence their preventive practices towards malaria?

➢ *General and Specific Objectives*

- *General Objectives*

The overall objective of this study is to ascertain the Knowledge, Attitude and Practice of malaria preventive measures among antenatal attendees of ESUT Teaching Hospital, Parklane Enugu.

- *Specific Objectives*

✓ To determine the knowledge of malaria and its preventive measures among antenatal attendees of ESUT Teaching Hospital.
✓ To determine their attitude towards malaria.
✓ To determine the preventive measures taken to prevent malaria.
✓ To determine the factors that influence their preventive practices towards malaria.

II. METHODOLOGY

➢ *Study Area*

The study area is antenatal ward situated in ESUT Teaching Hospital, which is located in Parklane GRA, Enugu.

Enugu is the capital and largest city of Enugu State. Enugu State had a population of 3,267837 people at the census held in 2006 (estimated at over 3.8 million in 2012). It is in the South East geo-political zone of Nigeria. It is located at 6*30' north of equator, and 7*30' east of latitude. The state shares borders with Abia State and Imo State to the south, Ebonyi State to the east, Benue State to the northeast, Kogi State to the northwest and Anambra State to the west. The state is predominantly agricultural with yam, palm produce and rice being their main produce. The mean temperature in Enugu State in the hottest month of February is about 87.16*F (30.64*C), while the lowest temperatures occur in the month of November, reaching 60.54*F (15.86*C). The lowest rainfall of about 0.16 cubic centimetres is normal in February, while the highest is about 35.7 cubic centimetres in July.

Parklane is located along park avenue, GRA, Enugu. Nigeria. It is a specialist hospital which provides medical training services on pharmacists, laboratory technologists, physiotherapist, radiographers, research and specialist healthcare. Antenatal clinic holds from Monday – Friday. About 50 patients present each day.

➢ *Study design*

This is a descriptive cross-sectional study which was conducted using interviewer-administered questionnaire.

➢ *Study Population*

Antenatal attendees in ESUT Teaching Hospital were studied and their knowledge, attitude and practice of preventive measures against malaria were assessed.

➢ *Inclusion Criteria*

Willing antenatal attendees of ESUT Teaching Hospital from the age of 15 irrespective of their gestational age of pregnancy.

➢ *Exclusion Criteria*

- Mentally retarded pregnant women.
- Girls below 15 years.

➢ *Sample Size Determination*

The sample size determination was gotten using the formula stated below

$$\text{Sample size (N)} = \frac{Z^2\ PQ}{d^2}$$

Where N = sample size

Z = confidence interval, 95% = 1.96

P = Reference Prevalence

Q = 1 – P

d = Allowable error = 0.05

Using Reference Prevalence of 30% by Musibau malaria prevention practices among pregnant women resident in two Nigeria army barracks, Ibadan[14], sample size was calculated to be.

$$N = \frac{Z^2PQ}{d^2}$$

Z = 1.96

P = 30 = 0.3

Q = 1 – 0.3 = 0.7

d = 0.05

$$N = \frac{(1.96)^2 \times 0.3 \times 0.7}{(0.05)^2}$$

$$N = \frac{0.806736}{0.0025}$$

N = 323

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In order to reduce sampling error, the sample size was increased to 355 (bearing in mind that 100% recovery may not be achievable).

➢ *Sampling Technique*

A consecutively sampling technique was adopted to determine those on whom the questionnaire instruments was applied on.

➢ *Study Instrument*

A semi-structured questionnaire was used to collect information from the respondents. The questionnaire was constructed by the researchers, and consisted of

- *Section A (Personal Data)*

A total of eight questions were asked in this section. It helped the researchers determine those factors that influenced the participants' actions.

- *Section B (knowledge)*

A total of eight questions were also asked in this section. It enabled the researchers assess the knowledge of the participants about malaria and its preventive measures.

- *Section C (Altitude)*

Eight questions were asked in this section to assess their attitude towards malaria and its preventive measures.

- *Section D (Prevention)*

Ten questions were asked in this section. It enabled the researchers know whether the participants practiced what they knew.

➢ *Data Collection Method*

Data was collected through semi-structured questionnaires which was interviewer-administered by members of the team. The study was explained to the antenatal attendees and informed consent obtained. The respondents were not any given prior information to prevent biased responses. They were assured that it was only for study purposes. The questionnaires were administered to the antenatal attendees while they were seated in the antenatal ward waiting to be seen by a doctor. In areas where they encountered difficulty, the researchers helped out. Appropriate measures were taken to ensure that no antenatal attendee filled the form more than once.

➢ *Data Management*

- *Measurement of Variables*

The outcome measures of this study was looking at the percentage of antenatal attendees with adequate knowledge, altitude and preventive measures for malaria. For section B (knowledge), every correct question was scored 1, while every incorrect question was scored 0. Scores greater than or equal to 50% were considered adequate, while scores less than 50% were considered poor.

For section C (attitude), a Likert scale was used. For every positive statement, strongly agree was scored 5, agree 4, indifferent 3, disagree 2, strongly disagree 1. For every negative statement, strongly agree was scored 1, agree 2, indifferent 3, disagree 4, strongly disagree 5. A grand mean equal to or greater than 3 was considered good while less than 3 was considered poor.

For section D (practice), positive response was scored 1, while negative response 0. Scores greater than or equal to 50% was considered good, while scores less than 50% was considered poor.

➢ *Statistical Analysis*

The completed questionnaire was sorted, arranged, coded and analysed using SPSS computing programme. In analysing the data, the following statistical principles was used

- Tallying of responses to each variable in the questionnaire
- Frequency distribution tables for data
- Calculation of percentages
- The open-ended and closed-ended questions were calculated and analysed

➢ *Ethical Considerations*

Permission to conduct this study was obtained from the Ethical Review committee of Enugu State University Teaching Hospital, Parklane Enugu. An introductory letter from the researchers was given to the head of research and ethical committee of the institution and explanation of the purpose of the study was given. Also, the respondents were informed of the scope of the study and they were assured of the confidentiality of their data.

➢ *Limitations*

We encountered challenges in getting the approval from the hospital management but with persistent trials, we were able to obtain their consent.

The hospital staffs sometimes were not willing to let us conduct the research, but with determination we were able to overcome.

III. RESULTS

➢ *Introduction*

The knowledge, attitude and practice of malaria preventive measures among pregnant women attending antenatal clinic in ESUT Teaching Hospital, Parklane were assessed. Out of 355 questionnaires that were distributed only 323 were recovered, giving a response rate of 90.99%. The respondents were seated in the antenatal clinic, and the questionnaires shared to them. They filled it at their own convenience.

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➢ *The Following are the Results.*

Table 1a: Sociodemographic Characteristics of the Respondents

Variable	Frequency (n = 323)	Percent
Age group (years):		
< 20	3	0.9
20 – 29	169	52.4
30 – 39	117	36.3
≥ 40	5	1.5
No response	29	8.9
Mean age ± standard deviation	29.2 ± 4.6	
Marital status:		
Married	291	90.1
Single	19	5.9
Divorced	7	2.2
Widowed	4	1.2
Separated	2	0.6
Religion:		
Christianity	309	95.5
Islam	5	1.5
Traditional African Religion	4	1.2
Others	4	1.2
No response	2	0.6

From the table, out of the 323 respondents, the majority 169 (52.4%) were aged between 20 and 29 years. Most 291 (90.1%) were married and a good number of them 309 (95.5%) were Christians.

Table 1b: Socio-Demographic Characteristics of the Respondents (Continued)

Variable	Frequency (n = 323)	Percent
Tribe		
Igbo	281	87.0
Yoruba	21	6.5
Hausa	8	2.5
Others	9	2.8
No response	4	1.2
Level of Education		
No education	5	1.5
Primary education	7	2.2
Secondary education	62	19.2
Tertiary education	245	75.9
No response	4	1.2
Occupation		
Civil Servants	90	27.9
Teachers	74	22.9
Farmers	14	4.3
Medical laboratory Scientists	13	4.0
Doctors	11	3.4
Nurses	11	3.4
Midwife	1	0.3
Pharmacist	1	0.3
Others	102	31.6
No response	6	1.9
Number of pregnancies		
1	136	42.1
2 – 4	155	48
≥ 5	22	6.8
No response	10	3.1
Mean ± standard deviation	2.2 ± 1.4	

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Which month of your pregnancy did you attend ANC		
First trimester	199	61.6
Second trimester	94	29.1
Third trimester	3	0.9
No response	27	8.4
Mean ± standard deviation	3.1 ± 1.3	

From the table, a good number of them 281 (87%) were Igbos, had tertiary education 245 (75.9%) and were between their second and fourth pregnancies 155 (48%). Majority 199 (61.6%) booked for antenatal in the first month.

Table 2 Knowledge of Malaria and its Preventive Measures

Knowledge	**Frequency (n = 323)**	**Percent**
Awareness of malaria	321	99.4
Cause of malaria:		
Mosquito bite	310	96.0
Dirty environment	187	57.9
Standing water	117	36.2
Housefly bite	31	9.6
Dog bite	1	3
I don't know	6	1.9
Prevention of malaria		
Insecticide treated net	290	89.8
Antimalarial drugs	215	66.6
Environmental cleanliness	215	66.6
Use of insecticide	165	51.1
Drinking of herbal medicine	12	3.7
Rubbing of Vaseline	9	2.8
Others	3	``0.9
Awareness of Insecticide treated net	311	96.3
Awareness of IPTp	182	56.3
Awareness of insecticides	302	93.5

From the table above, the overall knowledge of the cause of malaria was relatively good, as 310 (96%) respondents believed that it was caused by mosquito bite, while only a few 38 (14.5%) did not know the cause. Majority also knew the ways to prevent malaria. Most were aware of ITN and insecticides 311 (96.3%) and 302 (93.5%) respectively, but the awareness of Intermittent preventive therapy for malaria was a little above average as only 182 (56.3) knew about it.

Table 3 Consequences of Malaria to the Pregnant Woman and her Unborn Child

Knowledge	**Frequency (n = 323)**	**Percent**
To the pregnant woman		
Weakness of the body	197	61.0
Anaemia	144	44.6
Premature delivery	105	32.5
Abortion	84	26.0
Obesity3	12	3.7
Healthy pregnancy	8	2.5
Diabetes mellitus	1	3
Others	6	1.9
To the unborn child		
Jaundice	149	46.1
Premature baby	133	41.2
Anaemia	120	37.2
Still birth	87	26.9
Obese baby	7	2.2
Healthy baby	5	1.5
Others	15	4.6

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From the table, the general knowledge of the consequences of malaria to the mother and unborn child was relatively poor. Majority 197 (61%) believed it caused body weakness to the mother and 149 (46.1%) jaundice to the unborn child.

Table 4 Attitude to Malaria

Attitude	Frequency (n = 323)	Percent
Pregnant women are worried about malaria		
Strongly agree	156	48.2
Agree	133	41.2
Indifferent	10	3.1
Disagree	8	2.5
Strongly disagree	6	1.9
No response	10	`3.1
Mean ± standard deviation	4.3 ± 0.1	
Malaria is a serious disease for the pregnant woman and the young child		
Strongly agree	193	59.8
Agree	115	35.6
Indifferent	9	2.8
Disagree	2	0.6
Strongly disagree	1	0.3
No response	3	0.9
Mean ± standard deviation	4.5 ± 6.5	

The table shows that most pregnant women 289 (89.4%) are worried about getting malaria during pregnancy and a good number of them 308 (95.4%) believed that malaria can cause serious harm to the mother and child.

From the mean, taking values below 3 as poor attitudes and values equal to or greater than 3 as good attitudes, the respondents had good attitudes because they scored 4.3 and 4.5 respectively.

Table 5 Attitude to Insecticide Treated Net

Attitude	Frequency (n = 323)	Percent
Sleeping without ITN exposes one to mosquito bites		
Strongly agree	183	56.7
Agree	107	33.1
Indifferent	16	5.0
Disagree	10	3.1
Strongly disagree	5	1.5
No response	2	0.6
Mean ± standard deviation	4.4 ± 0.3	
Sleeping in ITN prevents malaria		
Strongly agree	163	50.5
Agree	130	40.2
Indifferent	12	3.7
Disagree	8	2.5
Strongly disagree	1	0.3
No response	9	2.8
Mean ± standard deviation	4.3 ± 0.3	

From the table, majority 290 (89.8%) believed that sleeping without ITN exposes one to mosquito bites, thereby preventing malaria.

They had good attitudes towards ITN because they had a mean scores of 4.4 and 4.3 in both questions asked.

Table 6 Attitude to Intermittent Preventive Treatment for Malaria

Attitude	Frequency (n = 323)	Percent
Two doses of IPTp for malaria after the first trimester of pregnancy is not dangerous to the baby		
Strongly agree	98	30.3
Agree	104	32.2
Indifferent	72	22.3
Disagree	17	5.3

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Strongly disagree	2	0.6
No response	30	9.3
Mean ± standard deviation	3.7 ± 0.3	
The use of IPTp in pregnancy prevents complications of malaria in pregnancy		
Strongly agree	112	34.6
Agree	110	34.1
Indifferent	59	18.3
Disagree	8	2.5
Strongly disagree	3	0.9
No response	31	9.6
Mean ± standard deviation	3.8 ± 0.1	

From the table, most respondents 202 (62.5%) believe that IPTp is not dangerous to the unborn child and 222 (68.7%) of them believed that it prevents complications of malaria during pregnancy.

The mean values 3.7 and 3.8 indicates good attitudes towards IPTp.

Table 7 Attitude to Insecticides in Pregnancy

Attitude	**Frequency (n = 323)**	**Percent**
The use of insecticides will prevent mosquito bite		
Strongly agree	143	44.3
Agree	150	46.4
Indifferent	17	5.3
Disagree	4	1.2
Strongly disagree	2	0.6
No response	7	2.2
Mean ± standard deviation	4.3 ± 0.1	
The use of insecticides will prevent the occurrence of malaria during pregnancy		
Strongly agree	119	36.8
Agree	132	40.9
Indifferent	38	11.8
Disagree	19	5.9
Strongly disagree	5	1.5
No response	10	3.1
Mean ± standard deviation	4.0 ± 0.2	

From the table, a good number of respondents 293 (90.7%) indicated that insecticides prevent mosquito bite and 251 (77.7%) of them also indicated it prevents malaria during pregnancy.

The mean values are good as they scored 4.3 and 4.0.

Table 8a Practice of Malaria Preventive Measures – Insecticide Treated Net

Practice	**Frequency (n = 323)**	**Percent**
Ownership of ITN	225	69.7
Number of ITN owned		
0 – 1	101	31.2
2 – 4	114	35.4
≥ 5	1	0.3
No response	107	33.1
Mean ± standard deviation	1.7 ± 0.9	
Usage of ITN	196	60.7
Frequency of usage of ITN		
Regularly	83	25.7
Sometimes	53	16.4
Always	43	13.3
Rarely	14	4.3
Never	5	1.5
No response	125	38.8
Reasons for not using ITN		

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I dislike it	11	3.4
It is torn	9	2.8
I'm too tired to use it	6	1.9
I forget	5	1.5
No mosquito	5	1.5
Others	6	1.9
No response	281	87.0
Reasons for not owning ITN		
No mosquito net in my area	26	8.0
I don't like it	19	5.9
It was damaged	18	5.6
Cost (very expensive)	14	4.3
Others	26	8.0
No response	220	68.2

From the above table, most owned ITN 225 (69.7%). From those that had it, majority 196 (60.7%) used it and owned between two and four. For those who had but did not use it 42 (13%), a good number of them 11 (3.4%) indicated the reason for not using it was because they disliked it. Some 26 (8%) didn't have ITN because they believed that there were no mosquito nets in their area.

Table 8b Practice of Malaria Preventive Measures – IPTp and Insecticide

Practice	**Frequency (n = 323)**	**Percent**
Taking of IPTp during pregnancy	184	57
Doses of IPTp taken during pregnancy		
1	17	5.3
2	102	31.6
3	43	13.3
4	3	0.9
I don't know	24	7.4
No response	134	41.5
Spraying of insecticides during pregnancy	230	71.2

Used it and owned between two and four. For those who had but did not use it 42 (13%), a good number of them 11 (3.4%) indicated the reason for not using it was because they disliked it. Some 26 (8%) didn't have ITN because they believed that there were no mosquito nets in their area.

Table 8c Practice of malaria preventive measures – IPTp and Insecticide

Practice	**Frequency (n = 323)**	**Percent**
Taking of IPTp during pregnancy	184	57
Doses of IPTp taken during pregnancy		
1	17	5.3
2	102	31.6
3	43	13.3
4	3	0.9
I don't know	24	7.4
No response	134	41.5
Spraying of insecticides during pregnancy	230	71.2
Frequency of usage of insecticides		
Sometimes	115	35.7
Regularly	55	17
Always	36	11.1
Rarely	24	7.4
Others	3	0.9
No response	90	27.9

From the table, fairly above average 184 (57%) had taken IPTp during pregnancy, about two doses and most 230 (71.2%) sprayed insecticides when pregnant.

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Table 9 Knowledge of ITN to Prevent Malaria in Relation to the Socio-Demographic Characteristics

Variables	Knowledge of ITN		Total	X^2	p-value
	Yes Freq. (%)	No Freq. (%)	Freq. (%)		
Age group (years)					
< 30	156 (90.7)	16 (9.3)	172 (100.0)	0.335	0.563
≥ 30	134 (88.7)	17 (11.3)	151 (100.0)		
Marital status					
Married	262 (90)	29 (10)	291 (100.0)	0.202	0.653
Others	28 (87.5)	4 (12.5)	32 (100.0)		
Religion					
Christianity	279 (90.6)	29 (9.4)	308 (100.0)	4.641	0.031*
Others	11 (73.3)	4 (26.7)	15 (100.0)		
Tribe					
Igbo	255 (90.7)	26 (9.3)	281 (100.0)	2.190	0.139
Others	35 (83.3)	7 (16.7)	42 (100.0)		
Level of Education					
Tertiary	224 (91.4)	21 (8.6)	245 (100.0)	2.994	0.084
Others	66 (84.6)	12 (15.4)	78 (100.0)		
Occupation					
Health workers	35 (94.6)	2 (5.4)	37 (100.0)	1.405	0.843
Teacher	67 (90.5)	7 (9.5)	74 (100.0)		
Civil servants	80 (88.9)	10 (11.1)	90 (100.0)		
Farmer	12 (85.7)	2 (14.3)	14 (100.0)		
Others	96 (88.9)	12 (11.1)	108 (100.0)		

*Statistically Significant

More younger respondents 156 (90.7%), married women 262 (90.0%), Christians 279 (90.6%), Igbos 255 (90.7%), those with tertiary education 224 (91.4%) and health workers 35 (94.6%) were knowledgeable about the use of ITNs in the prevention of malaria. However, only religion had a significant association (p = 0.031) with the knowledge about ITN and prevention of malaria.

Table 10 Knowledge of Insecticides to Prevent Malaria in Relation to the Socio-Demographic Characteristics

Variables	Knowledge of Insecticides		Total	X^2	p-value
	Yes Freq. (%)	No Freq. (%)	Freq. (%)		
Age group (years)					
< 30	90 (52.3)	82 (47.7)	172 (100.0)	0.227	0.634
≥ 30	75 (49.7)	76 (50.3)	151 (100.0)		
Marital status					
Married	149 (51.2)	142 (48.8)	291 (100.0)	0.017	0.897
Others	16 (50.0)	16 (50.0)	32 (100.0)		
Religion					
Christianity	161 (52.3)	147 (47.7)	308 (100.0)	3.753	0.053
Others	4 (26.7)	11 (73.3)	15 (100.0)		
Tribe					
Igbo	144 (51.2)	137 (48.8)	281 (100.0)	0.023	0.880
Others	21 (50.0)	21 (50)	42(100)		
Level of Education					
Tertiary	143 (58.4)	102 (41.6)	245 (100.0)	21.540	0.000*
Others	22 (28.4)	56 (71.8)	78 (100)		
Occupation					
Health workers	26 (70.3)	11 (28.7)	37 (100)	8.378	0.079
Teacher	33 (44.6)	41 (55.4)	74 (100)		
Civil servants	48 (53.3)	42 (46.7)	90 (100)		
Farmer	5 (35.7)	9 (64.3)	13 (100)		
Others	53 (49.1)	55 (50.9)	108 (100)		

*Statistically Significant

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More younger respondents 90 (52.3%), married women 149 (51.2%), Christians 161 (52.3%), Igbos 144 (51.2%), those with tertiary education 143 (58.4%) and health workers 26 (70.3%) were knowledgeable about the use of insecticides in the prevention of malaria. However, only level of education had a significant association (p = 0.000) with the knowledge about insecticides and prevention of malaria.

Table 11 Ownership of ITN in Relation to the Socio-Demographic Characteristics

Variables	Owning insecticide treated net		Total	X^2	p-value
	Yes Freq. (%)	No Freq. (%)	Freq. (%)		
Age group (years)					
< 30	117 (68)	55 (32)	172 (100.0)	0.466	0.495
≥ 30	108 (71.5)	43 (28.5)	151 (100.0)		
Marital status					
Married	203 (69.8)	88 (30.2)	291 (100.0)	0.014	0.906
Others	22 (68.7)	10 (31.3)	32 (100.0)		
Religion					
Christianity	217 (70.5)	91 (29.5)	308 (100.0)	1.984	0.159
Others	8 (53.3)	7 (46.7)	15 (100)		
Tribe					
Igbo	196 (69.8)	85 (30.2)	281 (100.0)	0.009	0.926
Others	29 (69)	13 (31)	42 (100.0)		
Level of Education					
Tertiary	175 (71.4)	70 (28.6)	245 (100.0)	1.502	0.220
Others	50 (64.1)	28 (35.9)	78 (100.0)		
Occupation					
Health workers	23 (62.2)	14 (37.8)	37 (100.0)	4.617	0.329
Teacher	56 (75.7)	18 (24.3)	74 (100.0)		
Civil servants	67 (74.4)	23 (25.6)	90 (100.0)		
Farmer	9 (64.3)	5 (35.7)	14 (100.0)		
Others	70 (64.8)	38 (35.2)	108 (100.0)		

More older respondents 108 (71.5%), married women 203 (69.8%), Christians 217 (70.5%), Igbos 196 (69.8%), those with tertiary education 175 (71.4%) and teachers 56 (75.7%) had ITNs as a measure to prevent malaria.

Table 12 Use of IPTp during Pregnancy in Relation to the Socio-Demographic Characteristics

Variables	IPT during pregnancy		Total	X^2	p-value
	Yes Freq. (%)	No Freq. (%)	Freq. (%)		
Age group (years)					
< 30	84 (50.6)	82 (49.4)	166 (100.0)	11.913	0.001*
≥ 30	100 (69.9)	43 (30.1)	143 (100.0)		
Marital status					
Married	169 (61)	108 (39)	277 (100.0)	2.380	0.123
Others	15 (46.9)	17 (53.1)	32 (100.0)		
Religion					
Christianity	177 (60)	118 (40)	295 (100.0)	0.555	0.456
Others	7 (50)	7 (50)	14 (100.0)		
Tribe					
Igbo	159 (59.3)	109 (40.7)	268 (100.0)	0.040	0.841
Others	25 (61)	16 (39)	41 (100.0)		
Level of Education					
Tertiary	144 (62.1)	88 (37.9)	232 (100.0)	2.458	0.117
Others	40 (51.9)	37 (48.1)	77 (100.0)		
Occupation					
Health workers	24 (64.9)	13 (35.1)	37 (100.0)	14.580	0.006*
Teacher	42 (61.8)	26 (38.2)	68 (100.0)		
Civil servants	62 (70.5)	26 (29.5)	88 (100.0)		
Farmer	10 (71.4)	4 (28.6)	14 (100.0)		
Others	46 (45.1)	56 (54.9)	102 (100.0)		

*Statistically Significant

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More older respondents 100 (69.9%), married women 169 (61%), Christians 177 (60%), Igbos 159 (59.3%), those with tertiary education 144 (62.1%) and farmers 10 (71.4%) used IPTp to prevent malaria. However, age group (p = 0.001) and occupation (p = 0.006) had a significant association with the use of IPTp to prevent malaria.

IV. DISCUSSION

More than a decade ago, the heads of states from across Africa signed a declaration in Abuja, Nigeria, to halve the malaria mortality for Africa by 2010[15]. The knowledge and use of malaria preventive measures among pregnant women at antenatal care booking clinic are very important factors, which are pivotal to the realisation of the targets of the Roll Back Malaria program[15].

The main aim of this study was to determine the knowledge, attitude and practice of malaria preventive measures among pregnant women attending antenatal clinic in ESUT Teaching Hospital, Parklane Enugu. Data was collected using interviewer-administered questionnaire.

A total of 360 pregnant women participated, but only 323 questionnaires was recovered giving a response rate of 89.7%. Among the respondents, 169 (52.4%) aged between 20 -29 years, and 117 (36.3%) between 30 - 39 years as shown in Table 1a. The mean age of 29.2 ± 4.6 years found among the participants is similar to findings in other studies[14,15]. Most 291 (90.1%) were married. This is a little bit higher than the findings in the study carried out by Ambrose in Weil Bugando University College of Medicine Mwanza Tanzania, where 258 (70.5%) were married[13]. The majority of the respondents 309 (95.5%) were Christians. This is similar to the study done by Adogu were 96% of the participa nts were Christians[16]. A good number of them 281 (87%) were Igbo. This is probably due to the fact that the study was conducted in Enugu State, a southeastern state in Nigeria where majority of the people are Christians and Igbos. Most of the respondents in this study were literate with 307 (95.1%) of them having had secondary 62 (19.2%) or tertiary education 245 (75.9%). This is similar to the findings gotten by Akaba in Abuja[15]. However, the literacy level of the women in this study is much higher than the findings gotten in the study carried out by Ambrose where only 39 (10.7%) and 4 (1.1%) had secondary and tertiary education respectively[13]. The high literacy level seen in this study may be related to the location of the study area Parklane, GRA Enugu. It is an urban area where educated people reside. The high literacy rate had a significant correlation with the knowledge and attitude of malaria and its preventive measures. Most of the respondents were Civil Servants 90 (27.9%), Teachers 74 (22.9%) and the others as presented in Table 1b. They mostly were between their second and fourth pregnancies 155 (48%) while a good number of them 136 (42.1%) were in their first pregnancies also. This is a bit similar to the findings gotten in the study carried out by Akaba where 144 (35.7%) were in their first pregnancy and 244 (60.5%) were in their second, third or fourth pregnancies[15]. This may have also played a vital role in the findings gotten in this study, as the more you get pregnant, the more knowledge you gain from each. Majority 199 (61.6%) booked for antenatal clinic in the first trimester of pregnancy. This is significantly different to the findings gotten by Akaba, where most women 220 (54.5%) booked for antenatal in the second trimester[15]. Early booking helps women get the maximum benefits of antenatal care, including improving their knowledge on malaria and its preventive measures as well as the utilization of these measures in pregnancy and after child birth.

The awareness of malaria was very high, as 321 respondents (99.4%) were aware of it. The result is different to the study carried out by Akaba in Abuja in 2010 to determine the knowledge and utilization of malaria preventive measures where a score of 71.5% was gotten[15]. This probably might be due to Abuja, being a cleaner state than Enugu, there are less predisposing factors to getting malaria. Also, being that the study was carried out in 2010, and this one in 2019, people have gotten more knowledgeable. The excellent awareness of malaria in this study show that malaria is a common infection in Enugu state, Nigeria. The knowledge on the causes of malaria was relatively good as 310 (96%) believed it was caused by mosquito bite, 187 (57.9%) believed a dirty environment can be a factor to getting malaria and 117 (36.2%) indicated that standing water can contribute also. This result is significantly better than the one gotten from the study carried out by Ambrose in Weill-Bugando University College of Health Sciences, Mwanza, Tanzania where 80.2% of the respondents believed it was caused by mosquito bite and only 0.9% and 1.8% believed a dirty environment and standing water could be a contributor factor to getting malaria respectively[13]. Despite the good knowledge on the cause of malaria, a few number of respondents believed that housefly (9.6%) and dog bite (3%) could also be a means to getting malaria. These wrong beliefs no doubt will have negative implications on malaria control programs as energy and resources would be channeled wrongly towards control and prevention of malaria by these individuals. They may also be unwilling to embrace malaria preventive practices. The awareness of the use of ITN as a measure in the prevention of malaria in this study was 88.9%. This is similar to the result (93.7) gotten in the study carried out by Musibau in Nigeria army Barrack, Ibadan[14]. But significantly different to the one done by Sabin in Ranchi District Hospital, Konbir Mission Hospital and Gumia District Hospital, India where 12 % was gotten[12]. This probably might be due to the use of other preventive measures like mosquito coils. The high awareness in this study might also be due to the fact that most of the women were in their second, third and fourth pregnancies. They probably had learnt in their first pregnancy that ITN as a measure to prevent malaria is beneficial. In this study, 182 (56.3%) respondents knew about the drugs used to prevent malaria in pregnancy which was similar to the study done by Sabin where 50% was gotten[12]. Intermittent preventive therapy for malaria has been shown to prevent low fetal birth weight and improve good fetal outcome. So emphasis should be laid on its importance in pregnancy, and pregnant women should not wait until they are sick before they take the drugs. From the study, married women took IPTp more

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than unmarried women. In the study carried out by Choonara, it was stated that married women are more likely to receive IPTp than never married ones[17]. This may be due to financial constraint, as married women can always fall back to their husbands for financial support, From the study the knowledge of insecticides as a measure to prevent malaria was very high as 302 (93.5%) respondents knew about it. This is likely due to the low cost of insecticides and high rate of advertisement of insecticides by the media as a measure to prevent mosquito bite.

The study findings showed 69.7% of the respondents owned ITN and 60.68% used it. This is different to the study carried out by Akaba in Abuja where 42.6% owned ITN and 24.6% used it during pregnancy[15]. This might be due to lower risk for transmission of malaria in Abuja as it is a cleaner city than Enugu. Although, ITN provides a simple but effective means of malaria prevention, barriers to its use still exists. These include discomfort especially due to heat and reduced ventilation, size not fitting to their beds and conviction of non-effectiveness of ITN[17]. In a study carried out by Manu, some of the respondents complained that the chemicals in the nets had an unpleasant smell that made 15% of them vomit or experience difficulty in breathing[23]. Logistical constraint also played a role as 20% of the respondents mentioned that they did not use their nets because it was difficult to hang them[23]. The art of hanging ITNs is a cumbersome task and 9% of them found it a challenging process due to the architecture of their rooms and beds[23].

In the study conducted, 184 (57%) respondents had taken IPTp during pregnancy, 24 (7.4%) did not know how many doses to be taken in pregnancy. 102 (31.6%) indicated that two doses should be taken during pregnancy, 43 (13.3%) said three doses should be taken, 17 (5.3%) said only one dose should be taken and 3 (0.9%) believed that four doses should be taken. In the study carried out by Musibau among pregnant women resident in two Nigeria barracks, Ibadan, about 31.8% had taken IPTp before, 65.8% did not know the number of doses that should be taken in each pregnancy and 17.5% of them said that two doses should be taken in each pregnancy while 8.3% respondents said that three doses should be taken while only 8.3% said only one dose should be taken[14]. The result gotten in this study was not so high, probably due to the fact that 42.1% of the respondents were in their first pregnancy. They may not have had any exposure to IPTp and how it is being taken.

As shown in table 9, the knowledge of ITNs as a measure to prevent malaria was very high between those below 30years and those above it. Also table 11 showed there was no significant difference between them in its usage. This might be due to the fact that malaria is a common disease in the study area. There is probably increase awareness on its preventive measures. Marital status in this study didn't play any significant role as there wasn't much difference between the married and unmarried in the knowledge and usage of ITN as a preventive measure for malaria.

Table 9 showed that health workers had the highest knowledge in the use of ITNs to prevent malaria, but table 11 showed they had the least score in the usage of ITNs to prevent malaria. It is surprising because it would have been expected that they should be the ones practising it more. Some factors might have come into play. Health workers, most knowing how to treat malaria, they might not find it necessary as to going an extra mile to using ITNs to prevent malaria when they can just treat it with drugs when they have malaria. But others, due to not having enough knowledge on the drugs and how it should be taken, they consider it cheaper to prevent it than cure it.

Table 10 showed significant difference in the knowledge of the use of insecticides to prevent malaria during pregnancy as those with tertiary education were more knowledgeable than those without. This is a bit similar to the study done by Adogu where those who had tertiary and secondary education had more knowledge than those with primary education and less[16]. This shows the need to create more awareness in the use of insecticides to prevent malaria. There is also need to increase awareness for those who attained tertiary education as only 58.4% had the knowledge which is fairly above average.

Table 12 showed women above 30 years of age using IPTp to prevent malaria more than those below 30 years. This might be due to, being older, they probably have had more pregnancies, and therefore more knowledge of the benefits of IPTp. Also, due to IPTp being a routine drug given to pregnant women who attend antenatal clinic in most hospitals in Enugu, ESUT Teaching Hospital being one of them, it could be that most of the respondents below 30years, were in their first pregnancy. They might not have heard much exposure to IPTp unlike those above 30years.

V. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

From our study we deduced that the knowledge of malaria and its preventive measures among antenatal attendees of ESUT Teaching Hospital was good. Though a lot of work still needs to be done in the aspect of using intermittent preventive therapy for malaria as a means to prevent malaria, as not much of the respondents knew about it.

The attitude towards malaria among the respondents was good. Majority of them were worried of getting malaria while pregnant due to how it could harm them and their unborn child. They also had good attitudes to ITN, IPTp and insecticides as a means to prevent malaria.

They had good practice in the use of ITN and insecticides to prevent malaria while pregnant. The use of IPTp was good among those who knew about it.

We also deduced that older women, married women, Christians and those who had tertiary level of education used the preventive measures more.

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The result gotten from the study can be said to be a positive one, as high scores were gotten.

B. Recommendations

Based on the findings of the study on the knowledge, attitude and practice of preventive measures of malaria among antenatal attendees in Enugu State University Teaching Hospital, the following recommendations are made.

The government should make insecticide treated nets and insecticides readily accessible.

The nurses should reinforce their health talks on the need to use insecticide treated nets while pregnant.

➢ *Authors' Contributions*

This work was carried out in collaboration among all authors.All data was collected and analyzed by all the authors. Authors CPO and UNI drafted the manuscript. Author UNI was responsible for-language and technical editing. All authors reviewed and approved the manuscript.

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APPENDIX 1

A. Questionniare

Topic: Knowledge Attitude and Practice of Malaria Preventive Measures Among Antenatal Antendees in ESUT Teaching Hospital Parklane

We are fifth year medical students of Enugu state university of science and technology carrying out a research on the above topic. We would appreciate you answering the following questions to help us carry out the study properly. You are assured that any information given here will be treated with utmost confidentiality.

➢ *Section A: Personal Data*

- Tick √ for the Correct Option.

Age: ……

Marital Status

1) Single ☐ 2) Married ☐ 3) Divorced ☐

4) Widowed ☐ 5) Separated ☐

3. Religion

1) Christianity ☐ 2) Islam ☐ 3) Buddhism ☐

4) Traditional African Religion ☐ 5) Others (specify) ……

4. Tribe

1) Igbo ☐ 2) Hausa ☐ 3) Yoruba ☐ 4) Others (specify) ……..

5. Level of Education

1) No education ☐

2) Primary education ☐

3) Secondary education ☐

4) Tertiary education ☐

6. Occupation

1) Doctor ☐ 2) Nurse ☐ 3) Medical Laboratory Scientist ☐

4) Midwife ☐ 5) Pharmacist ☐ 6) Teacher ☐

7) farmer ☐ 8) Civil Servants ☐ 9) Others (specify) ……

7. Number of pregnancies: ……

8. Which month of your pregnancy did you first attend antenatal clinic? ……

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➢ *Section B: Knowledge of Malaria Preventive Measures*

- *Are you aware of Malaria?*

Are you aware of malaria?

1) Yes ☐ 2) No ☐

Cause(s) of malaria (multiple answer is permitted)

1) Mosquito bite ☐ 2) Dirty environment ☐ 3) Standing water ☐

4) Housefly bite ☐ 5) Dog bite ☐ 6) I don't know ☐

11. What are the ways to prevent malaria? (multiple answer is permitted)

1) Insecticide treated net ☐ 2) Environmental cleanliness ☐

3) Antimalarial drugs ☐ 4) Rubbing of Vaseline ☐

5) Use of insecticide ☐ 6) Drinking herbal medicine ☐

7) Others (specify) ……

12. What are the consequences of malaria to pregnant women? (multiple answer is permitted)

1) Anaemia ☐ 2) Abortion ☐ 3) healthy pregnancy ☐

4) Premature delivery ☐ 5) Obesity ☐ 6) weakness of the body ☐

7) Diabetes mellitus ☐ 8) Others (specify)……

13. What are the consequences of malaria to the unborn child? (multiple answer is permitted)

1) Premature baby ☐ 2) Anaemia ☐ 3) Jaundice ☐ 4) Still birth ☐

5) healthy baby ☐ 6) Obese baby ☐ 7) Others ……

14. Do you know about Insecticide treated net?

1) Yes ☐ 2) No ☐

15. Do you know about Intermittent preventive therapy (IPTp)?

1) Yes ☐ 2) No ☐

16. Do you know about insecticides?

1) Yes ☐ 2) No

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➢ *Section C: Attitude about Malaria Preventive Measures*

- *For each Row Tick √ for the Option that Best Explains how you Feel.*

	Strongly Agree	**Agree**	**Indifferent**	**Disagree**	**Strongly Disagree**
Pregnant women should be worried about getting malaria					
Malaria is a serious disease for the pregnant woman and the young child					
Sleeping without insecticide-treated nets exposes one to mosquito bites					
Sleeping in insecticide-treated net prevents malaria					
Two doses of Intermittent preventive treatment (IPTp) for malaria after the first trimester of pregnancy is not dangerous to the baby					
The use of Intermittent preventive therapy in pregnancy prevents complications of malaria in pregnancy					
The use of insecticides will prevent mosquito bite					
The use of insecticides will prevent the occurrence of malaria during pregnancy					

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➢ *Section D: Practice of Malaria Preventive Measures*

- *Tick √ for the Correct Option*

Do you own an insecticide-treated net?

1) Yes ☐ 2) No ☐

If yes, answer questions 18 and 19

If no, answer question 22

How many insecticide-treated nets do you have ……..

Do you use them

1) Yes ☐ 2) No ☐

If yes, answer question 20

If no, answer question 21

How often do you use them?

Rarely ☐ 2) Sometimes ☐ 3) Regularly ☐

4) Always ☐ 5) Never ☐

21. Why don't you use the mosquito net?

1) it is torn ☐ 2) I'm too tired to use it ☐ 3) I forget ☐

4) I dislike it ☐ 5) No mosquito ☐ 6) Others (specify)……..

22. What are the reasons for not owing a mosquito net?

1) Cost (very expensive) ☐ 2) I don't like it ☐ 3)No mosquito net in my are ☐

4) It was damaged ☐ 5)Others ……

Have you ever taken intermittent preventive therapy during pregnancy?

1) Yes ☐ 2) No ☐

If yes, answer question 24

How many doses do you take?

1) 1 ☐ 2) 2 ☐ 3) 3 ☐ 4) 4 ☐

5) I don't know ☐

25. Do you spray insecticides to prevent malaria bite whenever you are pregnant

1) Yes ☐ 2) No ☐

26. How often do you spray it

1) Rarely ☐ 2) Sometimes ☐ 3) Regularly ☐

4) Always ☐ 5) Others (specify)……..