
A study on awareness and Usage of Malaria Intervention Measures among pregnant women in Imo State Nigeria

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Abstract: *The study was carried out to evaluate the level of awareness and subsequent usage of malaria intervention among pregnant women in Imo State Nigeria. The sample population was determined randomly from six (6) Local Government Areas to cover the Three (3) Geopolitical Zones of the Study Area. The subjects were people residing in the twelve local government areas under study. Random sampling technique was used to select 160 respondents (80 from each of the healthcare centers or hospitals) from each Local Government Area. The study included a total of 960 participants. The study was a cross sectional survey for the assessment of the impact of intermittent preventive therapy and insecticide treated nets. Data obtained from the study was analyzed using the statistical package for Social sciences (SPSS). The results obtained showed that 429(44.68%) use IPTp only, 287(29.89%) use ITNs only while 244(25.41%) combine both. From the result, the compliance rate and malaria status of ITN, IPT and ITN+IPT usage revealed malaria infection rate of 51.25% versus 41.25% versus 15.31% in relation to age, 55.31% versus 37.81% versus 14.69% in relation to educational level, 48.44% versus 42.29% versus 17.19% in relation to occupation, 51.25% versus 41.25% versus 15.31% gravidity and (42.50% versus 45.94% versus 19.38%) trimester. This study has been able to establish the fact that some pregnant women do not protect themselves from malaria parasite infection with protective measures such as ITNs and IPTp, in spite of the popularity given to the use of these protective measures, particularly the ITNs which in most centres are distributed free of charge to these pregnant women. This underscores the need creates awareness on the use IPTp among pregnant women.*

Keywords: Awareness, Malaria, Intervention Measures, pregnant women, Imo State

INTRODUCTION

Malaria is an important health problem and continues to be a serious public health problem globally, especially in sub-Saharan Africa. In 2022, there were estimated 249 million malaria cases globally, exceeding the pre-pandemic level of 233 million in 2019 by 16 million cases (Achan, et al., 2011). This could be due to climatic factors, poor environmental sanitation and cultural habits in this region, which provide conducive atmosphere that allows mosquito breeding and transmission of the parasite throughout the year (WHO, (Achidi, et al., 2005). Malaria is a major cause of morbidity and mortality worldwide. Globally, it is estimated that some 2.37 billion people live at risk of *Plasmodium falciparum* infection, the most virulent of the human malaria parasites (Adedokun et al., 2017). Malaria is caused by five different species of *Plasmodium* parasite and transmitted by female *Anopheles* mosquito (White, 2008). In Nigeria, *Plasmodium falciparum* is the most dominant malaria parasite (>95.0%), with *P. ovale* and *P. malariae* being responsible for less than 5% of malaria infection. Pregnant women, children and immune-compromised individuals have the highest morbidity and mortality (Adedotun et al., 2010). In Nigeria, according to the National Malaria Strategic plan (2014-2020), malaria is responsible for 60% of outpatient visits to health facilities, 30% of childhood death, 25% of death in children below one year of age, and 11% of maternal death (Aduloju, et al., 2013). The economic impact of the disease in Nigeria households is evident from huge financial resources that are involved in control and treatment, absenteeism at work and disability adjusted life years (DALY's). This therefore causes a significant drawback to socioeconomic growth (Afolabi, et al., 2009).

In most malaria endemic countries in Africa, 40% of pregnant women sleep under ITNs. As a result of these interventions provided, malaria transmission has fallen in some parts of Africa, leading to localized reductions in the malaria burden (Ahmad and Farhad , 2005). However, the incidence remains high in many other areas.

Intermittent preventive treatment (IPT) against malaria is a malaria control strategy aimed at reducing the burden of malaria in certain high-risk groups, namely pregnant women and children. *P. falciparum* malaria causes 250 million clinical episodes and 850,000 deaths every year. The overwhelming majority of which occur in sub-Saharan Africa (Aikins, et al., 2013).

MATERIALS AND METHODS

Study Area

The study was conducted in six Local Government Areas (Owerri Municipal, Mbaitoli, Orsu, Njaba, Isiala-Mbano and Onuimo) of Imo State randomly selected between July and October, 2021. Imo State is bordered by the states of [Anambra](#) to the North, [Abia](#) to the East, and [Rivers](#) to the south and west.

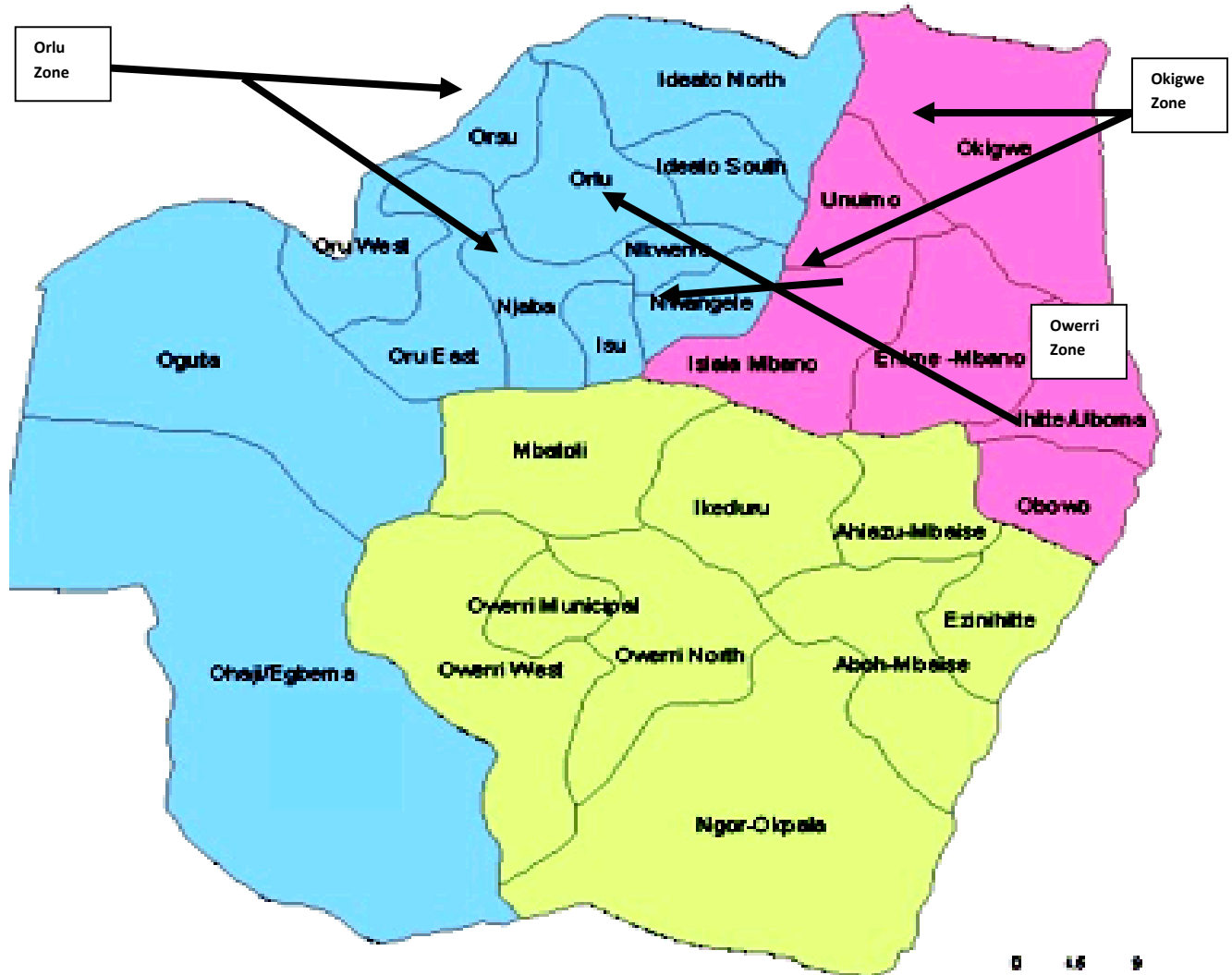


Fig. 1: Map of Imo State showing the local government areas under study (arrow indicated)

In this study, there is need for the ready availability of adequate chemotherapeutic agents for early treatment of malaria and easy accessibility of health care facilities in the areas to avert complications

Ethical Consideration

Ethical approval for the study was gotten from the Post Graduate Board of the Department of Zoology, Imo State University Owerri ethical committee. Written/oral Consent was sought and obtained from the health officers in the different health facilities and as well as the study

participants. Prior to commencement of study, the researcher also obtain ethical clearance from the state ministry of health and the local government health authorities under study.

Preliminary visit to Hospitals

This aspect of study was done immediately after the consent was obtained from the randomly selected twelve (12) hospitals from the six (6) Local Government Areas under study. The researcher and her team visited the heads of the selected hospitals. The aim was to create a forum for interaction, familiarization with them, explain the study objectives and obtain their consent. After this, the research team had an interactive session with the pregnant women where they were acquainted with the purpose of the study and its benefits to them.

The heads of the hospitals and some nurses were educated intensely to assist the researcher's team in further explaining to the pregnant women the purpose of the study, specimen collection and administration of the intervention measures (IPTp and ITNs).

Questionnaire distribution and administration

Well-structured questionnaire were issued to the study population to obtain demographic data, choice of malaria control strategy and personal health information. After proper explanation of the study objectives and consent sought from subjects, the questionnaires were administered alongside with instruction on how to fill it properly. Completed questionnaires were submitted to the field assistant on the spot. A total of 960 consenting participants were selected for the study.

Purchase and Distribution of ITNs and IPTs

Insecticide Treated Nets (ITNS – brand: Perma net; Size: 4x4; Colour: white and pink) were purchased from the popular Onitsha main market and were distributed to the consenting pregnant women who indicated willingness to participate and have fully completed and submitted the issued questionnaires. Also, the Intermittent Preventive Therapy (IPTs – brand: Swidar; 500/25mg; NAFDAC Reg. No: A4-6639; Dosage: Single dose of 3 tablets) were purchased Grams Pharmaceutical Company, MCC Road Owerri and distributed to the pregnant women after proper explanation of the dosage and the mode of administration. They were urged to take the study seriously, hence should make proper use of the items.

Study participants from the three (3) groups (Owerri, Orlu and Okigwe Zones) were given 320 pieces of ITNs as intervention measures while Owerri Zone received 100 cards of IPTp-SP, Orlu Zone were given 180 cards of IPTp-SP and Okigwe Zone 200 cards of IPTp-SP as intervention measures.

Study/Sample Population

The sample population was determined randomly from six (6) Local Government Areas (Owerri Municipal, Mbaitoli, Isiala Mbano, Onuimo, Orsu and Njaba) to cover the Three (3) Geopolitical Zones of the Study Area. This method was drawn from (Alaai, et al., 2009). The choice of these Local Government Areas was to ensure good geographical spread. The subjects were selected on

the basis of obtaining an informed consent. The study population cut across pregnant women of all age groups between 15years and above and their societal class, immune-compromised.

Selection of hospitals and Study Subjects

The subjects were people residing in the twelve local government areas under study. Random sampling technique was used to select 160 respondents (80 from each of the healthcare centers or hospitals) from each Local Government Area. The study includes a total of 960 participants. The hospitals/clinics under study are as follows:

1. Owerri Zone include;

- a. Holy Family Hospital and Maternity Ikenegbu and
- b. St. Davids Hospital Mbari
- c. Rimah Hospital and Maternity Umudagu Mbieri
- d. Nwaorubi General Hospital

2. Orlu Zone include;

- a. Ignatus and Veronica Hospital located at Amanogu Ihetenansa, Orsu L.G.A.
- b. Amaruru Community Health Centre located at Orsu L.G.A.
- c. Umuaka community hospital
- d. Ogechi hospital Obeakpu Autonomous Community, Umuaka

3. Okigwe Zone include;

- a. Hope Alive hospital and Maternity, Amaraku
- b. T Emmanuel hospital and Maternity, Amaraku
- c. Okwelle Health Centre
- d. Umunna Health Centre

Inclusion and Exclusion Criteria

Inclusion Criteria

- i. Consenting pregnant women between 15years and above attending antenatal at the time of this study
- ii. Pregnant women sleeping under insecticide treated bed nets and utilizing intermittent preventive therapy as a malaria control measure.
- iii. Pregnant women using both the above named malaria control strategies for over a period of one year.

Exclusion Criteria

- i. Non-consenting pregnant women
- ii. Pregnant women who are not using either insecticide treated net or intermittent preventive therapy as a malaria control strategy.
- iii. Pregnant women utilizing the two malaria control measures less than the stipulated time interval.

Study Design

The study was a cross sectional survey for the assessment of the impact of intermittent preventive therapy and insecticide treated nets and their association in malaria control and elimination among pregnant women. Three medical personnel (Nurse, Medical Laboratory Scientist and another health worker) were recruited prior to the study in October, 2021. To ensure quality data control, one day training was organized for them on the study; how to administer and fill questionnaires, collection, handling and storage of samples. All the enrolled population 960 was used for the survey method. After processing of the samples, they were categorized into a test group made of infected pregnant women and control group of pregnant women not infected with malaria [12]. The study subjects were divided into four(4) separate groups;

Group1: Subjects sleeping under insecticide treated nets for over one year.

Group2: Subjects practicing intermittent preventive therapy as malaria control measure for over one year.

Group3: Subjects using both insecticide treated nets and intermittent preventive therapy as malaria control measures for a period of one year.

Group4: Subjects who are not using insecticide treated net or intermittent preventive therapy as malaria control or elimination measures. This group served as the control group.

Data Analysis

Data obtained from the study was analyzed using the statistical package for Social sciences (SPSS) software (version 20.0, SPSSInc, Chicago, IL, USA). Continuous variables will be presented as mean±standard deviation. Categorical variables will be presented as actual numbers and percentages in table forms or figures. P-values <0.05 will be considered significant for all tests.

RESULTS

The demographic characteristics of pregnant women under study are shown in Table 1. A total number of 960 pregnant women were recruited for the study. Age group 21-30years 553(57.6%) recorded the highest participation followed by 31-40years with 259(26.9%), 15-20years had 79(8.2%) participation, >40years had the least participation 69(7.2%). In their educational levels, 622(64.8%) of the pregnant women had tertiary education, followed by those with secondary education 319(33.2%) while those with primary education 19(1.95%) recorded the least. Most of the women were married 672(70%), while others were either single 240(25.0%) or divorced 48(5.0%).

It was observed that most of these pregnant women 510(53.1%) were students/ unemployed, 206(21.5%) were civil servants, 147(15.3%) were house wives/farmers while 97(10.1%) were traders. Also, the gravidity of these pregnant women revealed, that 527(54.9%) were multiplegravid, 311(32.4%) were secundigravid and 122(12.7%) were primigravid. On the number of antenatal visit, 533(55.5%) of the subjects had 3 or more antenatal visit, 356(37.1%) had visited twice, while 156(16.3%) had visited once. Among the pregnant women, 630(65.6%) have had 1-

2 children, 260(27.1%) had 2-4 children while 70(7.3%) had 5 children or more. Record also showed that 546(56.9%) were in their 3rd trimester, 356(37.1%) in their 2nd trimester while only 58(6.0%) were in their 1st trimester.

Table 1: Demographic Characteristics of the Pregnant Women under Study

Variables	Frequency	Percentage
Age in years		
15-20	79	8.2
21-30	553	57.6
31-40	259	26.9
>40	69	7.2
Educational Level		
Primary	19	1.9
Secondary	319	33.2
Tertiary	622	64.8
Marital Status		
Single	240	25.0
Married	672	70.0
Divorce	48	5.0
Occupation		
Students/unemployed	510	53.1
Trader	97	10.1
Civil Servant	206	21.5
House wife/farmer	147	15.3
Gravidity		
Primigravid	122	12.7
Secundigravid	311	32.4
Multiplegravid	527	54.9
Number of Antenatal Visit		
1 st Visit	156	16.3
2 nd Visit	271	28.2
3 rd or more visit	533	55.5
Number of children had presently		
1-2	630	65.6
3-4	260	27.1
5 and above	70	7.3
Trimester		
1 st Trimester	58	6.0
2 nd Trimester	356	37.1
3 rd Trimester	546	56.9

Table 2: Assessment of awareness and Usage of Intervention Measures by Hospitals in the Study Areas

Hospitals	Frequency	IPTp (%)	ITNs (%)	Both (%)
Owerri Zone				
Holy Family and Maternity, Ikenegbu	80	23(28.75)	40(50.00)	17(21.25)
St. David's Hospital, Mbari	80	25(31.25)	40(50.00)	15(18.75)
Rimah hospital and Maternity, Umudagu Mbieri	80	30(37.50)	35(43.75)	15(18.75)
Nwaorubi general hospital	80	35(43.75)	20(25.00)	25(31.25)
Total	320	113(31.38)	135(37.50)	72(20.00)
Orlu Zone				
Amaruru Community Health Center, Orsu	80	40(50.00)	20(25.00)	20(25.00)
Ignatius and Veronica hospital and maternity, Ihitenansa Orsu	80	35(43.75)	20(25.00)	25(31.25)
Ogechi Hospital and Maternity, Obeakpu Njaba	80	45(56.25)	20(25.00)	15(18.75)
Umuaka community hospital Njaba	80	40(50.00)	18(22.50)	22(27.50)
Total	320	160(44.44)	78(21.66)	82(25.63)
Okigwe Zone				
Hope Alive hospital and maternity, Amaraku	80	35(43.75)	25(31.25)	20(25.00)
T. Emmanuel hospital and maternity Amaraku	80	40(50.00)	15(18.75)	25(31.25)
Umuna Health Center, Okigwe	80	41(51.25)	14(17.50)	25(31.25)
Okwelle general Hospital	80	40(50.00)	20(25.00)	20(25.00)
Total	320	156(43.33)	64(17.77)	90(25.00)
Grand Total	960	429(44.69)	277(28.85)	244(25.41)

Assessment of awareness and usage of intervention measures in relation to age groups, educational levels, occupation, gravidity and trimesters among the subjects were shown in Table 2. The table shows that 429(44.68%) use IPTp only, 287(29.89%) use ITNs only while 244(25.41%) combine both. In their age relation, age groups 15-30years had the highest percentage 31.64% of ITN usage, 21-30years recorded highest 50.63% of IPTp usage while >40years recorded highest 59.42% combination. The use of the different intervention methods in relation to age was statistically significant ($P < 0.05$; $X^2 = 73.7413$, $P = < 0.0001$).

It was also observed that subjects with primary education had the highest percentage 42.10% of ITN usage while IPTp usage was found to be highest among secondary 40.75% and tertiary 46.94%. The use of different intervention method was not dependent on the level of education of the respondents ($P < 0.05$; $X^2 = 4.7433$, $P = < 0.314$).

In relation to their occupation, the result shows that ITN and IPTp usages 40.13% vs 55.78% were found to be highest among house wives/farmers, and 39.32% vs 49.02% among civil servants, while combined were found to be highest between students/unemployed and traders (35.88% vs 31.95%) respectively. The occupation based used of the different intervention methods was significantly different ($P < 0.05$; $X^2 = 91.78$, $P = < 0.0001$).

In their gravidity, ITN usage and combined were found highest among multiplegravid (31.87% vs 31.87%); IPTp usage was found highest among primigravid (55.73%). More so, ITN and Combined were found to be highest among 3rd Trimester (31.86% vs 28.75%) while IPTp usage was highest among 2nd Trimester (51.96%). There was a significant difference ($P < 0.05$) in the frequency of usage of IPTp, ITNs or both in pregnant women from all the age brackets when compared with one another. There was a significant difference ($P < 0.05$) in pregnant women in the primary school using IPTp and ITNs when compared with those that use both. There was a significant difference ($P < 0.05$) in pregnant women at tertiary education level using IPTp, ITNs or both when compared with one another. There was a significant difference ($P < 0.05$) in usage of IPTp, ITNs or both by pregnant women from the respective occupations when compared with one another. Similarly, there was a significant difference ($P < 0.05$) in usage of IPTp, ITNs or both by pregnant women at the respective gravidity levels when compared with one another. Also, there was a significant difference ($P < 0.05$) in usage of IPTp, ITNs or both by pregnant women at the three trimester levels when compared with one another

Table 2: Assessment of awareness and Usage of intervention measures in relation to Demographic Characteristics

Variables	Frequency N = 960	IPTp Usage (%)	ITN Usage (%)	Combined (%)
Age in years				
15-20	79	35(44.30)	25(31.64)	19(24.05)
21-30	553	280(50.63)	175(31.64)	98(17.72)
31-40	259	94(36.29)	79(30.50)	86(33.20)
>40	69	20(28.98)	8(11.59)	41(59.42)
Educational Level				
Primary	19	7(36.84)	8(42.10)	4(21.05)
Secondary	319	130(40.75)	100(31.34)	89(27.98)
Tertiary	622	292(46.94)	179(28.77)	151(24.27)
Occupation				
Students/unemployed	510	209(40.98)	118(23.13)	183(35.88)
Trader	97	37(38.14)	29(29.89)	31(31.95)
Civil Servant	206	101(49.02)	81(39.32)	24(11.65)
House wife/farmer	147	82(55.78)	59(40.13)	6(4.08)
Gravidity				
Primigravid	122	68(55.73)	32(26.22)	24(19.67)
Secundigravid	311	168(54.01)	89(28.61)	54(17.36)

Multiplegravid	527	193(36.62)	168(31.87)	168(31.87)
Trimester				
1 st Trimester	58	29(50.00)	13(22.41)	16(27.58)
2 nd Trimester	356	185(51.96)	100(28.08)	71(19.94)
3 rd Trimester	546	215(39.37)	174(31.86)	157(28.75)

Table 3 shows the summary of compliance rate and malaria status. From the result, the compliance rate and malaria status of ITN, IPT and ITN+IPT usage revealed malaria infection rate of 51.25% versus 41.25% versus 15.31% in relation to age, 55.31% versus 37.81% versus 14.69% in relation to educational level, 48.44% versus 42.29% versus 17.19% in relation to occupation, 51.25% versus 41.25% versus 15.31% gravidity and (42.50% versus 45.94% versus 19.38%) trimester.

Summary of Compliance rate and malaria status

Variables	ITN		IPT		Combined	
	No. Exam	No. (%) infected	No. Exam	No. (%) infected	No. Exam	No. (%) infected
Age (years)	320	164(51.25)	320	132(41.25)	320	49(15.31)
Educational Level	320	177(55.31)	320	121(37.81)	320	47(14.69)
Occupation	320	155(48.44)	320	135(42.29)	320	55(17.19)
Gravidity	320	164(51.25)	320	132(41.25)	320	49(15.31)
Trimester	320	136(42.50)	320	147(45.94)	320	62(19.38)

DISCUSSION

The study was conducted to appraise the awareness and usage of malaria intervention Measures among pregnant women in Imo State Nigeria. Expectedly, the prevalence of malaria varied significantly ($P < 0.05$) among pregnant women from the different age bracket, educational levels, type of occupation and gravidity, however, there was no significant difference ($P < 0.05$) in the prevalence of malaria among pregnant in their first, second and third trimesters. Result on the lower prevalence of malaria among pregnant women using ITN (33.79%) from those using IPT (46.38%) in this study was in agreement with the study by [12] on the Impact of Insecticide Treated Nets and Intermittent Preventive Treatment in Reducing Malaria Morbidity among Pregnant Women in Gombe, Nigeria. Their findings showed a significant difference among pregnant women utilizing ITN from those who do not as it was recorded that pregnant women using ITN recorded lower malaria prevalence (74.4%) as against those that do not use ITN (83.6%).

It is expected that ITN usage will significantly affect malaria infection; hence it is not surprising that in this study net usage by pregnant women greatly influence malaria infection. This finding corroborate with that of a study in Cote d' Ivoire where no difference was found between user and

non-user group of mosquito net with regard to parasitaemia (Onwujekwe et al., 2013). Similarly, the finding was in disagreement with the results of a study carried out in East Africa where net usage did not appear to reduce malaria prevalence (Friedman *et al.*, 2003). Furthermore, this finding contrast sharply with that of Tanzania (Sazawal, et al., 2006) where effective utilization of ITN was accompanied by 100% reduction in malaria cases, but in accordance with studies in Gambia where ITN utilization was common among houses with low malaria incidence of less than 40% (Schlitzer 2008) and Rwanda where increase in ITN distribution brought down malaria sharply in the affected community (Takem, et al., 2009). Effective prevention against malaria reduces intensity of malaria infection (Waters & Edstein, 2012). In all, there was no difference in the rate of compliance to IPTp and ITN by the pregnant women.

This study has been able to establish the fact that some pregnant women do not protect themselves from malaria parasite infection with protective measures such as ITNs and IPTp, in spite of the popularity given to the use of these protective measures, particularly the ITNs which in most centres are distributed free of charge to these pregnant women.

Despite the widespread acceptance of the use of these intervention measures, particularly the ITNs, which in most centers are provided free of charge to these pregnant women, this study has been able to demonstrate that some pregnant women do not protect themselves from malaria parasite infection with protective measures such as ITNs and IPTp.

Recommendation

The use of insecticide treated nets as well as other protective measures by pregnant women should be significantly encouraged and intermittent preventive therapy in pregnancy (IPTp) during antenatal care should be strictly adhered to, in order to reduce the incidence of this dangerous disease. The current mobilization process should be sustained and adequate finances provided for empowerment.

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