
ACQUISITION, UTILISATION AND EFFECTIVENESS OF MALARIA PREVENTIVES AMONG PREGNANT WOMEN IN GOMBE METROPOLIS, GOMBE STATE- NIGERIA

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Abstract

Malaria remains one of the major health challenges to pregnant women despite the availability of various preventive measures. The study was conducted in Gombe metropolis between the months of August October 2014. The aim of the research was to investigate the situation of malaria preventive measures and to determine the effectiveness of the available preventive measures used among pregnant women. A total of 200 respondents attending five selected maternity clinics for antenatal were randomly selected, where 18(9.0%), 105(52.5%) and 77(38.5%) were in first, second and third trimesters respectively. 46 (23.6%), 83(41.5%), and 19(9.5%) had primary, secondary and tertiary level of education while 52(26.0%) were illiterate. The mean age of the study subjects ranges from 14-40 with the mean age of 23.70±6.66. A pre-tested questionnaire was used to elicit information on the socio-demographic characteristics, possession and utilizations of malaria preventive measures among pregnant women. Blood sample of each subject was collected using vein puncture technique and stained using giemsa stain. The prepared slides were observed under oil immersion using electric microscope at ×100 magnification. Out of 200(100%) study subjects, 162(81.5%) possessed different forms preventive measures where 84(51.9%), 77(47.8%) and 1(0.62%) possessed insecticide treated nets, insecticide and repellents respectively. 151(93.2%) used malaria preventive measures where 73(48.3%), 77(51.0%) and 01(0.7%) used insecticide treated nets, insecticide and repellents respectively. Possession of malaria preventive measure was significantly associated with utilization ($\chi^2 = 7.59$, $df=1$, $p<0.005$). A prevalence of 73(48.0%) and 39(79.59%) were recorded from subjects who used and those who did not use malaria preventive measures. Study subject who used repellents had the highest prevalence of 01(100%) while those who used insecticide treated nets recorded the least prevalence of 17(23.29%). Statistically, malaria prevalence is associated with the usage of malaria preventive measures ($\chi^2 = 16.78$, $df=1$, $p<0.005$) Further research for more effective malaria preventive measures should be conducted in order to drastically reduce the incidence of malaria among pregnant women.

Keywords: *Possession, Utilisation, Gombe and Pregnant women*

Background to the Study

Malaria is a life threatening parasitic disease and is considered as a complex and overwhelming public health problem. The disease is caused by four species of *Plasmodium* parasites (*P. vivax*, *P. malariae*, *P. falcifarum* and *P. ovale*), and is transmitted through the bite of infected female *Anopheles* mosquito during blood meal (Muhammad and Naphthali, 2014). About 40% of the global population lives in area where malaria transmission occurs. More than 300-500 million individuals throughout the World are infected with the disease, out of which 300 million cases (90%) occur in Africa and 1.5-2.7 million people die of it annually (Steketee *et al.*, 2001). Malaria remains one of the most important diseases of the tropics despite several years of concerted effort towards its control. Pregnant women are more susceptible together with little children (under the age of five), it is dangerous to both the mother and the foetus (Brabin, 1983). According to Nigeria's Federal Ministry of Health, malaria is associated with 11.0% of all maternal deaths and 70.5% of morbidity in pregnancy. It accounts for up to 15% maternal anemia, 5%-14% of Low Birth Weight (LBW), and 30% of preventable low birth weight. Other burdens associated with malaria during pregnancy include but not restricted to spontaneous abortion and miscarriage, stillbirth. Socio-economic status of the family is affected in terms of using scarce resources on preventable conditions (Federal Ministry of Health, 2004).

Malaria control remains a challenge in Africa where the disease is endemic in about 45 countries, including Nigeria, and about 588 million people are at risk (WHO, 2001). The protection of pregnant women living in malaria-endemic countries has been of particular interest to many National Malaria Control Programs because of their reduced immunity. Most cases of malaria in pregnancy in areas of stable malaria transmission are asymptomatic, this is attributed to anti-disease immunity acquired during previous exposures, which protects against clinical malaria (WHO, 2001). Unfortunately, this subclinical infection still poses great danger to both the mother and the fetus.

The principal impact of malaria infection is due to the presence of parasites in the placenta causing maternal anemia (potentially responsible for maternal death when severe) and low birth weight (Nosten *et al.*, 1999). The two most powerful and most broadly applied interventions for malaria vector control prevention are Insecticide treated mosquito net (ITN) and Indoor Residual Spraying (Roll Back Malaria, 2008). However, malaria vector control with ITNs, IRS or other interventions is only effective with sustained high coverage. Sleeping under ITN is one of the most effective ways to prevent malaria transmission, and previous studies have shown that regular use can reduce all-cause child mortality by around 20% in malaria endemic area (CDC, 2007).

Indoor Residual Spraying (IRS) with WHO-approved chemicals is another effective malaria prevention method in settings where it is epidemiologically and logistically appropriate (WHO, 2009). IRS involves applying a long lasting insecticide to the inside of houses and other structures to kill mosquitoes resting on interior walls. Evidence has shown that the combination of IRS and LLITNs is more effective than either intervention alone, together with the regular use of ITNs, intermittent preventive treatment during pregnancy (IPTp) is another vital tool in the prevention of malaria among pregnant women in endemic areas. IPTp refers to the administration of a full dose of an effective anti-malarial treatment at specified time during pregnancy with the objective of reducing the malaria burden in pregnant women (WHO, 2012). Despite various declarations by African governments in the 1990s and complementary effort promised in the main content of the Roll back Malaria Declaration in Abuja in 2000, malaria remains one of the major health challenges to pregnant women in most communities. For this, the aim of the research was to investigate the level of Possession, utilization and effectiveness of malaria preventive measures among pregnant women in Gombe metropolis.

Methodology

Study Area

The study was carried out in Gombe local government area of Gombe state, Nigeria. The Local Government area is located within the sub-sudan climatic zone between latitude 10°8' and 10°24' N, longitude 11°22' and 11°24' E; altitude 500 meters above sea level. Dry and wet seasons are two distinct seasons in the study area: the wet season, which begins between April-May and usually for 6 months and the dry season starts in November and ends around late March. Mean annual rainfall varies between 850 and 1100mm and mean maximum ambient temperature varies from 27-35°C, depending on the season. The average relative humidity during the wet season is about 72%, and during harmattan period is about 21%.

The Local government area has a total landmass area of 52km² with an estimated population of about 268,000 (NPC, 2006). Most of the populace in the L.G.A. are local farmers with few practicing commercial agriculture. There is one tertiary hospital and a state specialist with about twelve (12) maternity clinics rendering antenatal services to pregnant women in the local government.

Ethical Approval

Before commencement of the research, permission was sought from the head of department, Primary Health Care Centre Gombe L.G.A. in order to have access to the health facilities in the L.G.A. In addition, verbal consent of the subjects was sought before they were enrolled in the research.

Study Population

The study populations for the research were pregnant women attending antenatal clinic at five selected maternities in Gombe L.G.A. Simple random sampling technique was used for the selection of the study population at each maternity. A total number of 200 Questionnaires were administered and blood sample of each respondent was collected for malaria infection.

Method of Data Collection

Data on the possession and utilisation of malaria preventive measures together with socio-demographic information were collected by using questionnaire.

Blood Sample Collection

The blood samples were collected with the help of a medical personnel and the method employed was venepuncture techniques as described by Chessbrough (2004). Soft tubing tourniquet was fastened on to the upper arm of the subject to enable the index finger feel a suitable vein. The puncture site was then cleaned with methylated spirit (methanol) and venepuncture was made with the aid of a needle attached to a 5ml syringe. When 2mls had been collected, the tourniquet was removed and the needle removed immediately, after which the blood was transferred in to a labeled EDTA container and transferred to the Gombe State University laboratory for the test.

Malaria Parasite Test

Thick film was made as described by Kolhatkar and Ochei (2010), where a drop of blood was placed on a labeled, clean, grease free slide. A smear was made with the aid of cover slip making a thick film, it was then allowed to air dry and stained with giemsa stain solution, it was then allowed to stand for about 30 minutes, the slide was then washed with distilled water and allowed to air dry again. It was then viewed under oil immersion at x100 objectives lens.

Statistical Analysis

The data generated were analyzed using SPSS software Version 16.0 for descriptive statistic and association between the variables. All the tests were done at P= 0.05

Demographic characteristics

A total of 200 pregnant women attending five different maternities in Gombe metropolis for antenatal were used for the study. Where 80(40.0%) were from Gombe Town Maternity, 43(21.5%) from Pantami Primary Health Centre, 32(16.0%) from Nasarawo Maternity, 23(11.5%) from Tudun Wada Primary Health Centre and 22(11.0%) from Kumbiya- Kumbiya Maternity as shown in figure1. Majority of the study subjects 105(52.5%), were in second trimester while 77(38.5%) and 18(9.0%) were in third and second trimester respectively. With regard to their level of education, it was found that 83(41.5%) had secondary school level, 52(26%) were illiterate, 46(23%) and 19(9.5%) had primary and tertiary level respectively as shown in table Table 1. The age range of the respondents was 14-40 years and the mean age was 23.59 ± 6.85 .

Possession of malaria preventive measures

Table 2 shows that, of the 200 (100%) respondents who participated in the research 162 (81.6%) possessed different form of malaria preventive measures, where study subjects within the age range of 38-43 recorded the highest level of possession of 09(95.5%) and least level of possession of 45(71.4%) was from the age range 14-19. Possession Level of 09(90%), 67(83.8%) and 20(80.07%) were recorded from age range 38-43, 20-25 and 26-31 respectively as shown in table 2. Statistically, possession was associated with the age of the pregnant women ($\chi^2=2.55$, $P>0.05$). Possession in relation to trimester revealed that, study population in second trimester had the highest possession level of 90(55.5%) while those in first and third trimesters recorded 09(5.55%) and 63(38.85%) as shown in table 3. Chi-square test showed that possession of malaria preventive measures was not associated with trimester of the study subject ($\chi^2=15.39$, $P<0.05$). Based on the educational status, the result indicated that, highest possession of 73(45.8%) was from subject with secondary level of education and the least was from subject who had tertiary level of education with 17(10.49%). Study subjects who had primary level of education and illiterate recorded 37(22.5%) and 35(21.6%) respectively (Table4). Level of education was significantly associated with level of education of the study subjects ($\chi^2=1.2$, $P>0.05$).

Types of Preventive Measures Possessed by the Study Subject

162(81.5%) possessed different forms of malaria preventive measures where majority 84(51.9%) possessed Insecticide Treated Nets (ITNs), 77(47.8%) and 1(0.62%) possessed Insecticide and repellants respectively as shown in figure 2 below. Possession of ITNs in relation age revealed that highest possession 08(88.9%) was from age range 38-43 and age range 14-19 recorded the least with 16(35.6%). Age range 20-25, 26-31 and 32-37 had 39(58.2%), 10(50%) and 11(52.4%) respectively. 29(64.4%) of the study subjects within age range 14-19 possessed Insecticide. Age range 38-43 recorded the least with 1(11.9%). Insecticide possession of 10(50%), 10(47.6%) and 27(40.3%) were recorded from 26-31, 32-37 and 20-25 respectively. Possession of repellants was only recorded from study subjects within the age range 20-25 with 1(1.5%) as shown in table 2 below.

Possession of ITNs in relation to the trimester revealed that, highest possession of 38(60.3%) was from study subjects in third trimester, while those in first and second had 4(44.4%) and 42(46.7%) respectively while 5(55.6%), 48(53.3%) and 24(38.1%) of the study subjects in first, second and third trimester respectively possessed Insecticide. Repellants was possessed by only 1(1.6%) from the study subjects in third trimester as shown in table 3 below. In relation to educational status, possession of ITNs indicated that, study subjects with tertiary level of education had the highest percentage of ITNs possession with 13(76.5%) and the least was from study subjects with primary level of education who had 12(32.4%).

Study subjects with primary level of education and illiterate recorded 42(57.5%) and 17(48.6%) respectively. Insecticide was mostly possessed by the pregnant women who had primary education with 25(67.6%) and the least of 04(23.5%) was recorded from pregnant women with tertiary level of education. Pregnant women with secondary level of education and illiterate had 30(42.5%) and 18(51.4%) respectively. Repellants was only

possessed by 1(1.4%) from those had tertiary level of education as shown in table 4 above.

Utilization of Preventive Measures

The level of preventive measures utilization among pregnant women revealed that out of the 162(81.5%) who possessed malaria preventive measures 151(93.2%) used them, where 73(48.3%), 77(51.0%) and 01(0.7%) used Insecticide Treated Nets, Insecticide and Repellants respectively. Statistically, utilization of malaria preventive measures was significantly associated with possession ($\chi^2=16.78, P<0.005$), but was not associated with the age of study subjects ($\chi^2=10.82, P=0.05$). Pregnant women within the age range 26-31 and 32-37 had the highest percentage of utilization with 20(100%) and 21(100%) each and the least 37(82.2%) was from age range 14-19. 65(97.0%) and 08(88.9%) were recorded from the age range 20-25 38-43 respectively.

Utilization in relation to age group and type of preventive measures showed that highest utilisation of ITNs was from age range 38-43 with 07(87.5%) while age range 14-19 recorded the least with 08(21.6%). ITNs utilization level of 37(56.9%), 11(52.4%) and 10(50.0%) were recorded from pregnant women within the age range 20-25, 32-37 and 26-31 respectively. On the other hand highest and the least level of insecticide utilization were recorded from study subjects within the age range 14-19 and 38-43 respectively. 26-31, 32-37 and 20-25 recorded 10(50.0%), 10(47.6%) and 01(12.5%) respectively. Only 1(1.5%) from the age range 20-25 used repellants as shown in table 2 below. The level of utilization in relation to the trimester shows that, highest level of utilization of 09(100%) was recorded from study subject in first trimester, while those in second and third trimester recorded 82(91.1%) and 60(95.2%) respectively. Statistically, trimester of the pregnant women was not associated with utilization of malaria preventive measures ($\chi^2=0.63, P=0.05$).

Utilizations in relation to the trimester and form of preventive measure show that, more pregnant women 35(58.3%) in third trimester used ITNs than 4(44.4%) and 34(41.5%) recorded from those in first and second trimester respectively, while 48(58.5%), 5(55.6%) and 24(40.0%) from first, second and third trimester used Insecticide respectively. Repellants were used by only 1(1.7%) from pregnant women in third trimester as shown in table 3 below.

Malaria Preventive measures utilization in relation to the educational status of the study subjects show that all study subjects 73(100%) with secondary level of education that had malaria preventive measures used them. 34(91.9%), 15(88.2%) and 29(82.9%) were recorded from those who had primary, tertiary level of education and illiterate respectively. Chi-square test revealed that utilization was not associated with the level of education of the pregnant women ($\chi^2=12.20, P<0.05$).

Utilization in relation educational status and type of preventive measures showed that, highest level of INTs utilization 11(77.1%) was recorded from pregnant women with tertiary level of education and the least 9(26.5%) was from primary school leavers. Those with secondary level and illiterate had 42(57.5%) and 11(37.9%) respectively. Insecticide utilization of 25(73.5%), 30(41.1%) 4(26.7%) and 18(62.1%) were recorded from study subjects with primary, secondary, tertiary level of education and illiterate respectively, as shown in table 4 below.

Malaria Prevalence in Relation to Malaria Preventive Measures Utilization.

Out of the 200(100%) pregnant women used for the research, the result revealed an overall prevalence of 112(56.0%), where study subjects that used malaria preventive measures recorded the least prevalence of 73(48.02%) as compared to 39(79.59%) recorded from those that did not used any form of malaria preventive measures as shown in table 5.

Highest prevalence of 1(100%) was recorded from pregnant women that used repellent while the least prevalence of 17(23.29%) was recorded from those that used ITNs and 55(71.43%) was recorded from those that used insecticide as shown in table 6 below. Statistically, malaria prevalence is associated with the usage of malaria preventive measures ($\chi^2=16.78$, $df=1$, $p<0.005$).

Discussion

In this study, the result shows that 162 (81.0%) of the respondents possessed malaria preventive measures. This result is higher than 62.4% and 28.8% reported by Sibhatu *et al.* (2012) in Ethiopia and Augustine *et al.* (2012) among pregnant women in Nigeria respectively. ITNs were the most commonly possessed as recorded 85(51.85%). This result is higher than 44.2% recorded by Joel and Abimbola (2012) in Ibadan among pregnant women. This could be attributed to the fact that out of the entire available preventive measures its only ITNs that is currently distributed freely by the government and some non-governmental organization especially during antenatal visit or house-to-house distribution. However, this is lower than 69.4% reported by Muhammad and Naphthali (2014) from Gombe. This difference could be attributed to the fact that some of the pregnant women possessed other malaria preventive measures like insecticide and repellents. However, in terms of utilization ITNs is second to Insecticide with 48.2%. This is higher than 31.6% recorded by Joel and Abimbola (2012) in Ibadan.

Generally, the result demonstrated a very high level of malaria preventive measures utilization of 93.8% among pregnant women. This higher level of utilization could be translated in to the high level of awareness of the pregnant women on the benefit of using malaria preventive measures. Insecticide was recorded as the most commonly used preventive measures with 51.0%. This could be attributed to the fact that, most of the insecticides used were the cheapest of all the available preventive measures used, for this most of the pregnant women can afford to buy. Nevertheless, this result disagrees with findings of Gashawa and wakgari (2008) who reported ITNs as the most commonly used preventive measures in southern Ethiopia with 68.8%. Repellents had the least level of both possession and utilization of 0.62% and 0.7% respectively. This could be attributed to its non-availability and expensiveness coupled with fact that most of the pregnant women were not aware of the repellent as malaria preventive measures.

Malaria prevalence of 48.02% was recorded from study subjects that used malaria preventive and 79.59% was recorded study subjects that did not use any form of malaria preventives. This difference has clearly demonstrated the impact and effectiveness of the malaria Preventives used by the pregnant women. Pregnant women that used ITNs had the least prevalence of 23.29%. This success of Insecticide Treated Nets over other malaria preventives may be associated with chemicals contained in the Nets, which could repel the vector once it is exposed to the nets. A prevalence of 100% recorded from pregnant women that used repellent could be due to the reduction in efficacy of the repellent which could allow the mosquitoes to settle on the pregnant women and bite them.

Summary

The result revealed a level of 162 (81.0%) and 152 (94.0%) for possession and utilization of preventive measure respectively and possession is associated with utilization. The most commonly used and most effective preventive measures was Insecticide Treated Nets.

Conclusion

There was high level of possession and utilization of malaria preventive measures among pregnant women in Gombe local government area and ITN plays a vital role in reducing malaria among the study subjects.

Recommendation

Massive free ITN distribution especially among pregnant women should be strengthened in order to achieve 100% coverage and more awareness campaign programme should be organized so as to also achieve 100% utilisation as the ITNs has shown promise in this research.

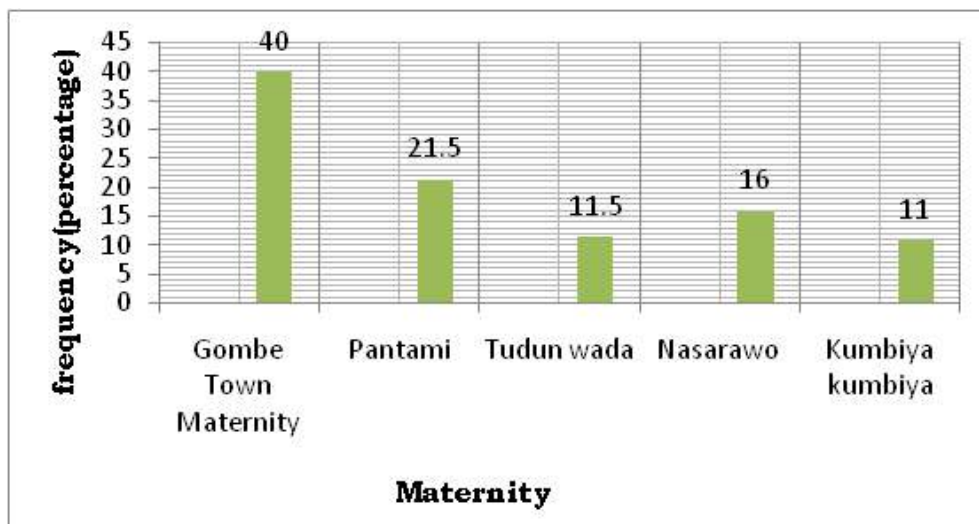


Figure 1: Distribution of study subjects in relation to maternity attended

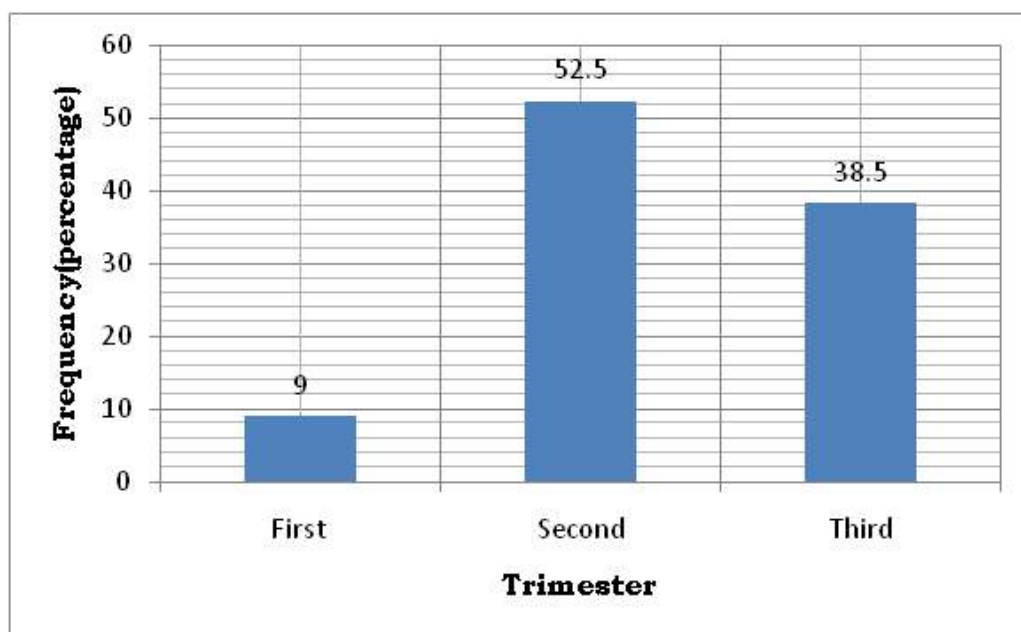


Figure 2: study subjects distribution based on trimester

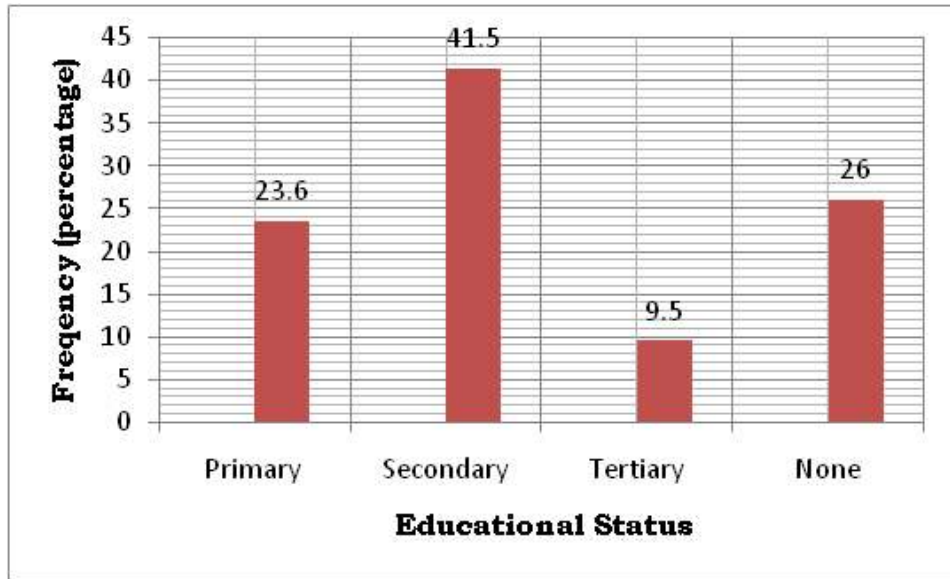


Figure 3: Distribution of study subjects in relation to their educational status

Table 1: Possession and utilisation of Malaria Preventive Measures In relation to age and form of the Preventive Measures

| Age range | NO.OF SUBJECTS | NO. POSSESSED | TYPE OF PREVENTIVE | | | NO.USED | TYPE OF USED | | |
|-----------|----------------|---------------|--------------------|-----------|-----------|------------|--------------|-----------|---------|
| | | | ITN | INSECT. | REPL | | ITN | INSECT. | REPL |
| 14-19 | 63(31.5%) | 45(71.4%) | 16(35.6%) | 29(64.4%) | 0(0.0%) | 37(82.2%) | 08(21.6%) | 29(78.4%) | 0(0.0%) |
| 20-25 | 80(40.0%) | 67(83.8%) | 39(58.2%) | 27(40.3%) | 1(1.5%) | 65(97.0%) | 37(56.9%) | 27(41.5%) | 1(1.5%) |
| 26-31 | 25(12.5%) | 20(80.0%) | 10(50.0%) | 10(50.0%) | 0(0.0%) | 20(100%) | 10(50.0%) | 10(50.0%) | 0(0.0%) |
| 32-37 | 22(11.0%) | 21(95.5%) | 11(52.4%) | 10(47.6%) | 0(0.0%) | 21(100%) | 11(52.4%) | 10(47.6%) | 0(0.0%) |
| 38-43 | 10(5.0%) | 09(90.0%) | 08(88.9%) | 1(11.9%) | 0(0.0%) | 08(88.9%) | 07(87.5%) | 01(12.5%) | 0(0.0%) |
| TOTAL | 200(100%) | 162(81.6%) | 84(51.9%) | 77(47.5%) | 01(0.62%) | 151(93.2%) | 73(48.3%) | 77(51.0%) | 1(0.7%) |

KEY: ITN= Insecticide Treated Net, INSECT= Insecticide , REPL= Repellants

Table 2: Possession and utilisation in relation to Educational Status of the Pregnant Women

| EDU.STATUS | NO.OF SUBJECTS | NO.POSSESSED | FORM OF PREVENTIVE MEASURES | | | NO.USED | FORM OF PREVENTIVE MEASURES USED | | |
|------------|----------------|--------------|-----------------------------|-----------|----------|------------|----------------------------------|-----------|---------|
| | | | ITN | INSECT. | REPL | | ITN | INSECT. | REPL |
| PRIMARY | 46(23.6%) | 37(22.5%) | 12(32.4%) | 25(67.6%) | 0(0.0%) | 34(91.9%) | 9(26.5%) | 25(73.5%) | 0(0.0%) |
| SECONDARY | 83(41.5%) | 73(45.8%) | 42(57.5%) | 30(42.5%) | 1(1.4%) | 73(100%) | 42(57.5%) | 30(41.5%) | 1(1.4%) |
| TERTIARY | 19(9.5%) | 17(10.49%) | 13(76.5%) | 04(23.5%) | 0(0.0%) | 15(88.2%) | 11(77.3%) | 4(26.7%) | 0(0.0%) |
| NONE | 52(26.0%) | 35(21.6%) | 17(48.6%) | 18(51.4%) | 0(0.0%) | 29(82.9%) | 11(37.9%) | 18(62.1%) | 0(0.0%) |
| TOTAL | 200(100%) | 162(81.6%) | 84(51.9%) | 77(47.5%) | 0(0.62%) | 151(93.2%) | 73(48.3%) | 77(51.0%) | 1(0.7%) |

KEY: ITN= Insecticide Treated Net, INSECT= Insecticide, REPL= Repellants

Table 3: Possession and utilisation in relation to the Trimester of the Pregnant Women and Form of Preventive Measures

| TRIMESTER | NO.OF SUBJECTS | NO.POSSESSED | TYPE OF PREVENTIVE MEASURES | | | NO.USED | TYPE OF PREVENTIVE MEASURE | | |
|-----------|----------------|--------------|-----------------------------|-----------|----------|------------|----------------------------|-----------|----------|
| | | | ITN | INSEC | REPL | | ITN | INSEC. | REPL |
| FIRST | 18(9.0%) | 09(5.55%) | 4(44.4%) | 5(55.6%) | 0(0.0%) | 9(100%) | 4(44.4%) | 5(55.6%) | 0(0.0%) |
| SECOND | 107(53.5%) | 90(55.5%) | 42(46.7%) | 48(53.3%) | 0(0.0%) | 82(91.1%) | 34(41.5%) | 48(58.5%) | 0(0.0%) |
| THIRD | 75(37.5%) | 63(38.85%) | 38(60.3%) | 24(38.1%) | 01(1.6%) | 60(95.2%) | 35(58.3%) | 24(40.0%) | 1(1.7%) |
| TOTAL | 200(100%) | 162(81.6%) | 84(51.9%) | 77(47.5%) | 01(0.6%) | 151(93.2%) | 73(48.3%) | 77(51.0%) | 01(0.7%) |

KEY: ITN= Insecticide Treated Net, INSECT= Insecticide, REPL= Repellants

Table 4: Malaria Prevalence in relation to Preventive Measure Utilisation

| UTILISATION | NO. OF SUBJECTS | NO. POSITIVE | PREVALENCE |
|-------------|-----------------|--------------|------------|
| USED | 151 | 73 | 48.02% |
| NOT USED | 49 | 39 | 79.59% |
| TOTAL | 200 | 112 | 56.0% |

Table 5: Malaria Prevalence in relation to the type Of Preventive Measures Used

| TYPE OF PREVENTIVE MEASURES | NO.OF EXAMINED | SAMPLE | NO.OF POSITIVE SAMPLE | PREVALENCE |
|-----------------------------|----------------|--------|-----------------------|------------|
| ITN | 73 | | 17 | 23.29% |
| INSEC | 77 | | 55 | 71.43% |
| REPL | 1 | | 1 | 100% |
| TOTAL | 151 | | 73 | 48.34% |

KEY: ITN= Insecticide Treated Net, INSEC.= Insecticide, REPL= Repellents

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