PREVALENCE OF MALARIA: KNOWLEDGE, ATTITUDE AND CULTURAL PRACTICES OF PREGNANT WOMEN IN KATSINA METROPOLIS, NIGERIA

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Abstract

A study on Malaria in Pregnancy was carried out in Katsina Metropolis. A total of four hundred and eight (408) pregnant women were interviewed and administered questionnaires. Blood samples from each of the interviewed subjects were collected to make thin and thick smears. A total of 149 samples of the blood were found to be infected with *Plasmodium* corresponding to prevalence 36.5%. Only one type of specie, *Plasmodium falciparum* was encountered during the study. Distribution of infection in the trimester was highest in the 1st trimester (43.5%) and among those with non-formal education (75.0%), but age group of 19 years has 45.7% and health workers with 100%. A high percentage of the respondents (93.4%) attributed malaria infection to mosquito bites. Knowledge on mode of transmission of malaria varies considerably among age groups, different educational level and social status. A low percentage (3.7%) of the subject respondents was asymptomatic while a higher percentage (75.2%) showed fever as a major symptom of malaria. This varies gradually among different age, gravids and trimester groups. About 2.0% mostly full house wives (3.1%) do not take any preventive measure of malaria, while a high percentage of 79.2% mostly teachers with 100% sleep under mosquito net as their preventive measure ($P > 0.05$). Among the respondents (20.8%) who did not sleep under mosquito nets, 8.6% of them have insufficient/no mosquito net, 2.4% restrict the infection to weather fluctuation and 0.5% attributed malaria to rainy season.

Keywords: Prevalence, malaria, *Plasmodium*, cultural practices and pregnant women

Introduction

Malaria of the genus *Plasmodium*, is the most common Protozoan parasitic disease in the tropical and subtropical regions of the world (Davidson, 2000). It was once thought that the disease came from fetid marshes and hence the name malaria (Olumese *et al*., 1999). It has also been found out in 1880 by Charles Laveron a French Army surgeon that the disease is caused by four (4) different species; *P*. *falciparum*, *P*. *ovale*, *P*. *vivax*, and *P*. *malariae* (Nonstrand, 1978), of these four different species pathogenic to man, *P*. *falciparurm* infection is the commonest and the most deadly (Miller and Marley, 1999). Severe *P*. *falciparum* infection is the commonest cause of death among children in endemic areas and it often complicates itself into cerebral malaria (Angyo *et al*., 1996). Malaria is endemic in about 103 countries with more than half the world population at risk, (Smyth, 1996).

In all the endemic areas, the frequency of malaria is higher in pregnant women than the same women before pregnancy (Ebrahim, 1996). Malaria in pregnancy is a major public health problem with serious consequences to the women and the foetus. It causes severe maternal anemia, spontaneous abortion, stillbirth, premature delivery (gestation of less than 37 weeks), intrauterine growth retardation and low birth weight increasing rise of infant death, (Isma'il *et al*., 2000; Verboeff *et al*., 2001). Low birth weight is a well documented risk factor; along with poor neuro-sensory, cognitive and behavioral performance and achievement (Mc-Cormick *et al*., 1992). The interaction between HIV and malaria during pregnancy are complex studies. In Kenya and Malawi it was shown that the prevalence and density of malaria parasites are also found in HIV positive victims (Parise *et al*., 1998). The risk of infants dying during the post neonatal period has also been identified to rise higher in children born with HIV positive mothers and with placental malaria than in those born to HIV positive mothers without placental malaria (Bloland *et al*., 1995 and Nosten *et al*., 2007).

Malaria is an internationally devastating disease and the burden of this disease fall heaviest among children below the age of 5 years in Sub-Saharan Africa and 30% of annual mortality in population attributed to Malaria (AHRQ, 2004).

Malaria increases susceptibility to other infections and retard growth and development in children. It is associated with considerable economic burden including direct loss to government productive work or education. Malaria killed Northern Nigerian children every 30 seconds, hence, pregnant

women and their unborn children are also vulnerable to malaria which serves as major cause of maternal anemia and parental death (Davidson, 2000).

There are lot of activities and momentum to combat malaria in Katsina State and Nigeria at large, but deadly gaps still exist. More need to be done to prevent pregnant women and their children from being infected and ensure access to qualitative malaria treatment. We need to empower families and communities to participate and improve their knowledge and practices on how to recognize and treat malaria through nongovernmental organizations like UNICEF and WHO (Lokomba, 2012).

The present study was carried out to determine the prevalence of the common *Plasmodium* parasites and assess the attitudes and practices of pregnant women on the infections caused by the parasite.

Materials methods

Description of the study area

Katsina State, covering an area 23,938 sq. km., is located between latitudes 11Â°08'N and 13Â°22'N and longitudes 6Â°52'E and 9Â°20'E. The State is bounded by Niger Republic to the North, by Jigawa and Kano States to the East, by Kaduna State to the South and by Zamfara State to the West. As of 2007, Katsina's estimated population was 459,022 with total annual rainfall ranging from 600 to 700mm and 1000mm to over 800 in the eastern part of the State's Metropolis.

The city is the centre of an agricultural region producing groundnuts, cotton, hides, millet and guinea corn, and also has mills for producing peanut oil and steel (Wikipedia, 2004).

Some of the major rivers which originate in or transverse the state contain water in their channels only during the rainy season and have little or no water in the dry season.

A cool dry (harmattan) season from December to February; a hot dry season from March to May; a warm wet season from June to September and a less marked season after rains during the months of October to November, characterized by decreasing rainfall and a gradual lowering of temperature. The southern half of the state belongs to the Northern Guinea Savannah Zone, while the north belongs to the Sudan Savannah Zone (Wikipedia, 2010).

Sample collection

Samples collection was carried out between the months of May to October, 2011. Blood collection and analysis was made using a technique of disinfection as described by Cheesbrough (1998). Blood was collected from four hundred and eight (408) pregnant women at the Antenatal clinics in the districts and General Hospital in Katsina. The lobe of the finger was first

disinfected with alcohol, blood lancet were used to prink the finger which were then squeeze to drop small quantity of blood of about 15x15mm at the right and another drop at the centre of the slide. The right drop was spread immediately using the edge of a slide to make the thin smear, while the central drop was spread to make the thick smear which was covered about 15x15mm at the left side of the slide.

Administering questionnaires

In all the four hundred and eight (408), sixty eight (68) questionnaires were administered to each group of the respondents (pregnant women) from whom the samples were collected. The questionnaires contain data about: age group, educational level, and occupation, modes of transmission and control measures of the mosquitoes/malaria. The slides were then labeled in accordance with the number of questionnaires.

Fixing and staining

The blood film collected was allowed to air-dry with the slide in the horizontal position. Absolute methanol was used to fix the thin blood film and allow fixing for 1 to 2 minutes. All the thick and thin blood films were stained using Giemsa 3% stain for 40 minutes. The stain was then washed using tap water and the slides were placed in draining rack and allowed air-dry. The blood films were placed in a box and carried to the Biology laboratory of Isa Kaita College of Education Dutsin-Ma for microscopic examination using 40 x and 100 x oil immersion objective. The results and the species of the malarial parasites were reported on the top of the questionnaires.

Statistical analysis

Data collected were analyzed using descriptive statistics and Chi square (X^2) test. However, tables were drawn to show the differences and similarities between parameters.

Results

It was established in this research that, out of four hundred and eight (408) blood samples collected and examined under the microscope in the laboratory, a total of one hundred and forty nine (149) were found to be infected with *Plasmodium falciparum* representing an incidence of 36.5%. It is only this type species which was encountered during the study, (table 1).

Specific incidence base on gravid status indicate that the primigravids (45.2%) have a higher incidence than the multigravids (34.6%) with $p > 0.05$ (table 2).

The trimester distribution of the infection indicates that women in their first (1st) trimester have the highest prevalence (43.5%), followed by those who are in the third (3rd) trimester (38.3%) and the second (2nd) trimester (32.5%), $p > 0.05$ (table 3).

Base on educational level the incidence was found to be higher in pregnant women with non-formal education (75.0%) and varies from pregnant women who attended post secondary school (45.5%), secondary school (44.8%) illiterates (43.2%), Primary School (38.4%) to those who attend Qur'anic schools (33.1%) where $p > 0.05$ (table 4).

The incidence of infection was age dependent showing a highest prevalence at the 10 to 19 years age group (45.7%) and 40 to 50 age group (37.5%) while 20 to 29 age group (34.2%) and 30 to 39 age group (34.1%) in years having the least incidence with slight variation, $p > 0.05$ (table5).

Base on social status (occupation) the infection reveals an increased incidence rate from craft women (34%), full house wives (34.4%), traders (39.1%), physical working class (39.5%), teachers (42.9%) and students (60%) to a peak amongst health workers with 100%, ($p > 0.05$) as in table 6.

Table 1: Prevalence and frequency of malaria parasite with respect to species

Parasite Spcies	Frequency	Prevalence (%)
P. ovale	149	36.5
P. vivax	0	0
P. malariae	0	0
P. falciparum	0	0
Total	149	36.5

X^2 test ($p < 0.005$)

Table 2: Prevalence of malaria parasite based on gravid status

Gravid Status	No. Examined	No. Positive	Prevalence (%)
Primigravid	73	33	45.2
Multigravid	335	116	34.6
Total	408	149	36.5

X^2 test ($p < 0.005$)

Tabe 3: Prevalence of malaria parasite by duration of the pregnancy

Duration of pregnancy	No. Examined	No. Positive	Prevalence (%)
1st Trimester	46	20	43.5
2nd Trimester	166	54	32.5
3rd Trimester	196	75	38.3
Total	408	149	36.5

X^2 test ($p < 0.005$)

Table 4: Prevalence of malaria parasite by educational level

Education level	No. Examined	No. Positive	Prevalence (%)
Illiterate	37	16	43.2
Primary school	73	28	38.4
Secondary school	29	13	44.8
Post secondary school	11	05	45.5
Qur'anic school	254	84	33.1

Non-formal education	04	03	75.0
Total	408	149	36.5
	X^2 test	($p < 0.005$)	

Table 5: Prevalence malaria parasite by age group

Age group	No. examined	No. positive	Prevalence (%)
10 to 19	79	36	45.7
20 to 29	222	76	34.2
30 to 39	91	31	34.1
40 to 50	16	06	37.5
Total	408	149	36.5
	X^2 test	($p < 0.005$)	

Table 6: Prevalence of malaria parasite by Social status (occupation)

No. examined	No. positive	Prevalence (%)	
Physical working class	38	15	39.5
Craft women	50	17	34
Full house wife	224	77	34.4
Trader	82	32	39.1
Health worker	02	02	100
Teacher	07	03	42.9
Student	05	03	60.0
Total	408	149	36.5
	X^2 test	($p < 0.005$)	

A high percentage of respondents 93.4% attributed malaria infection to mosquito bites. This knowledge is higher among the health workers, teachers, students (100%) and decreases from Craft women (98.0%), Traders (95.1%), and full house wives (91.9%) to physical working class (89.5%) as seen in appendix I. This knowledge also varies according to the educational level from the interviewed subjects without formal/with non-formal education (100%), those who attended post secondary school (100%), primary school (93.3%). Qur'anic School (91.7%) and Illiterates (91.9%) as indicated in appendix II.

The aged group knowledge of malaria transmission showed that 83.5% of those between 10 to 19 years of age attributed malaria to mosquito bites. The awareness increase to 94.6%, among women aged 20 to 29 and 97.8% to those aged 30 to 39 and 100% among those aged 40 to 50 as shown in appendix III.

Other modes of malaria transmission notified by the respondents include mother to child (3.9%), sexual intercourse (1.2%), and intake of contaminated food (1.7%), contact with house fly (0.5%), house fly bite (0.5%), higher temperature (0.2%), exposure to sun (0.2%), smelling of bad water (0.2%), and contact with blood (0.2%), and those respondents that do not know (Lay men) how malaria is transmitted with 3.7% as indicated in appendix III.

A low percentage of 3.7% of the pregnant women are asymptomatic while a relatively higher percentage (75.2%) show fever as a major symptom of malaria. This varies gradually from the age group 10 to 19 years (55.7%) to age group 40 to 50 years (87.5%) as shown in appendix IV. Hence, from the pregnant women who are in their first trimester (65.2%) to those who are in the third trimester 77.1% (appendix V), while approximately the same percentage of primigravids (75.3%) and multigravids (75.2%) have shown fever as a common symptom (appendix VI).

About 2.0% of the studied population mostly house wives (3.1%) do not take any preventive measures against malaria infection, while a higher percentage of the respondents (79.2%) sleep under mosquito net to prevent malaria. This varies gradually from Teachers (100%), Traders (85.4%), Students (80.0%), Full house wives (76.8%), Physical working class (63.1%) and Health workers (50.0%). However, other preventive measures used by the pregnant women include hygiene (52.5%), use of drugs/mass chemotheraphy (60.0%), use of insecticides (29.2%), drainage of water (31.1%), devegetation (1.5%), burning of herbs/shrubs and grasses (2.2%), seeking protection from God (3.7%), shooting mosquitoes normally (2.5%), pouring oil on stagnant water (0.5%), covering of pots (0.5%), covering oneself during sleep (0.7%) and closing bed room (1.0%) as shown in appendix VII.

Out of 20.8% of the respondents who did not sleep under mosquito net 8.6% asserted that it is because they lack mosquito nets, 1.0% have no reason, 3.2% stated that it is because there are no more mosquitoes, 2.4% opined that the weather is hot, 0.7% sleep outside bed rooms, 0.2% because they sleep inside the room, 0.7% judged enough the alternative measures they use. Similarly, 0.2% because of travelling, 1.5% incapable due to laziness, 0.2% use to forget and 0.5% stated till raining season while 1.0% are of the view that they do not know the importance of the net (appendix VIII).

Discussion

It has been reported from this research, that the high prevalence of malaria among women in the study area may be attributed to the high level of illiteracy, traditional beliefs, lack of personal engagement of the population to fight malaria, the failure of government policy, the climate which influence the development of the mosquito as well as the endemicity of the area, the human behavior and the presence of *Anopheles gambiae* and *A. funestus* which are strongly anthropophagical and consequently are said by CDC (2008) to be the most efficient malaria vector in the world. All these factors promote the spread of the parasite infection.

Moreover, the presence of *Plasmodium falciparum* in the metropolis of Katsina being sub-saharan to some extent is vulnerable among the study populations; because CDC (2004) reported that most *Plasmodium falciparum* infection occur in sub Saharan Africa and the *P. falciparum* has been shown to be more common in pregnant than non pregnant women.

The higher prevalence of malaria infection established in the study area is in line with the work of Ebrahim (1996) who stated that in all malaria endemic areas the frequency of malaria is higher in the pregnant women than the same women before pregnancy , non pregnant women and men.

The higher prevalence rate of the infection among the primigravids compared with multigravids in the study area may be attributed to the fact that women at their first pregnancy (primigravids) are highly stressed compared to those with higher gravids who have experienced the physiological changes caused by the pregnancy. This condition lower the condition of the primigravids immunity which is proportionate to the stress and may also contribute to one self.

The pregnant women who are in the first trimester showed a higher prevalence than those who are in their second and third trimester. This controversy is due to the fact that, pregnant women who attended the antenatal care center of the study area start receiving intermittent preventive treatment (IPT) at their second and third trimester which reduces the prevalence of the parasite. This disagrees with the statement made by Desai *at al.* (2007) who says that the second trimester carries the highest risk of infection.

The absence of any significant difference between the prevalence of the infection among the educated and illiterate women suggests that the prevalence of the malaria parasite in the area is not affected by education. This is because, those who attended primary, secondary or post secondary schools are not health educated. Meaning that, the syllabus that was used in the schools did not contain areas on health management.

It was revealed in the research, that occupation might influence the prevalence of infection in the study area based on the results obtained which have shown that the health workers recorded the peak of the infection followed by the students. The reason might be due to the fact that the former are more exposed to mosquitoes because, they spend most of their night time to read in an open or closed space without protective measures just as the health workers.

This correlates with the work of Aiyelabegan (2002) on the prevalence of malaria parasites in pregnant women in Sokoto metropolis who discovered that students have the highest rate of infection.

The higher prevalence of infection seen in women aged 10-19 compared to other age groups could be due to the fact that youngest pregnant

women have experienced less contact with mosquitoes than the other aged groups and therefore their immunity is not well developed/active as others.

The results revealed that the knowledge on malaria transmission is very poor and reflect ideas rooted in the custom and tradition of the people who believed that sexual intercourse, ingestion of contaminated food, contact with house fly or its bite, high temperature exposure to sun and smelling of bad water predispose someone to malaria infection. This supports the work of Malar (2005) who conducted a research on epidemiological and biological features of malaria among children in Niamey, Niger Republic and noticed that traditional believes are still deeply rooted in families and they interfere with the care seeking pattern. Only few women knew that malaria can be transmitted from mother to fetus, while some asserted that they do not know any mode of malaria transmission. Older pregnant women 40 to 50 years, those with post secondary education, health workers and students recorded more correct knowledge on malaria transmission. From this, it could be deduced that, the level of education and the life time experience is very important in understanding the modes of malaria transmission. Oparacha (2007) pointed out that the mother's perception and management of childhood malaria in Umuahia South Local Government Area, Abia State Nigeria, that the older mothers with tertiary education and health workers recorded more correct knowledge on the etiology of malaria.

The socio-cultural and behavioral practices to prevent malaria indicate that most of the pregnant women prefer to sleep under mosquito net to prevent malaria. This shows that pregnant women of this area are aware of the efficiency in using mosquito net to control malaria in pregnancy which will contribute to roll back malaria and to reduce the maternal and neonatal death. This disagrees with the findings of Idowu and Mafiana (2007) on malaria in pregnancy in Abeokuta, Nigeria who reported that only 0.2% of the Abeokuta's women used Insecticide Treated Nets. It was also reported that a high parentage of the respondents use Intermittent Preventive Treatment (IPT). This might be due to the fact that the pregnant women who attended public antenatal care centers in their second and third trimester were been given free drugs. WHO (2003) in their report recommended that all pregnant women should receive at least two (2) doses of IPT during routinely antenatal clinic visits. More so, the result revealed that some of the respondents do not take any preventive measures. This shows that up to now some pregnant women of the area are not worried about infants/fetus health status. This may have great impact on the morbidity and mortality. Out of the pregnant women who do not use mosquito net, some asserted that it is because they do not have the nets. This shows that poverty may have played some role in the choice of malaria preventive measures. Other stated reasons by the respondents on not sleeping under mosquito net include: sleeping

outside and hot weather. This agrees with the CDC report (2004) which highlighted that the climate may determine human behaviors that may increase contact with *Anopheles* mosquitoes. Hot weather may also encourage people to sleep outdoors or discourage them from using mosquito nets. The results indicated that some of the interviewed subjects do not sleep under mosquito nets because, according to them there are no more mosquito. But traditional folk believe that malaria is "a raining season disease'' that still exists in the area. This study also document on the most common symptoms and signs found among the population studied. Therefore most of the pregnant women experienced fever during malaria illness. This correlates with the view of Hagmann *et al*. (2007), who stated that congenital malaria tends to present and rise with fever and Erik (1999) said that malaria is very important cause of fever.

However, a low percentage of the subjects are asymptomatic. This disagrees with the work of Nonsten *et al*. (2007) who reported that majority of women with malaria during pregnancy remained asymptomatic. Other symptoms and signs shown by the pregnant women in this research include headache, tiredness, joint pain, pimples/rashes on the mouth, lean bodies, diarrhea and loss of appetite. This approves the report of Erik (1999) who reported that the signs and symptoms of malaria are non specific and mimic those many other infections.

Conclusion

The research undertaken indicates that there is a high prevalence of *Plasmodium* and *falciparum* is the only species in which malarial parasites are found. Recognition of malaria-like illness was also based on peoples beliefs and the behavioral practices and their attitudes may become key determinants to successfully rollback malaria throughout the study area, Nigeria and Africa at large.

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Table of appendices

Appendix I: Knowledge on the modes of malaria transmission by women occupation

Occupation	Mosquito Bite	Sexual Intercourse	Ingestion of contaminated food	Mother to child	Don't know	Contact with house fly	House fly bite	High temperature	Exposure to sun	Smelling of bad water	Contact with blood
Physical working class	34 (89.5)	02 (5.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	01 (0.6)	01 (0.6)	0 (0.0)	01 (0.6)	0 (0.0)
Craft women	49 (98.0)	0 (0.0)	01 (2.0)	03 (6.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Full house wife	206 (91.9)	02 (0.9)	06 (2.7)	04 (1.8)	12 (5.4)	02 (0.9)	01 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Trader	78 (95.1)	01 (1.2)	0 (0.0)	07 (8.5)	03 (3.7)	0 (0.0)	0 (0.0)	0 (0.0)	01 (1.2)	0 (0.0)	01 (1.2)
Health worker	02 (100.0)	0 (0.0)	0 (0.0)	01 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Teacher	07 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Student	05 (100.0)	0 (0.0)	0 (0.0)	01 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	381 (93.4)	05 (1.2)	07 (1.7)	16 (3.9)	15 (3.7)	02 (0.5)	02 (0.5)	01 (0.2)	01 (0.2)	01 (0.2)	01 (0.2)

Appendix II: Knowledge on the modes of malaria transmission by educational level

Educational level	Mosquito Bite	Sexual Intercourse	Ingestion of contaminated food	Mother to child	Don't know	Contact with house fly	House fly bite	High temperature	Exposure to sun	Smelling of bad water	Contact with blood
Illiterate	34 (91.9)	0 (0.0)	0 (0.0)	0 (0.0)	01 (2.7)	02 (5.4)	0 (0.0)	01 (2.7)	0 (0.0)	0 (0.0)	0 (0.0)
Primary School	71 (93.3)	0 (0.0)	02 (2.7)	04 (5.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Secondary School	28 (96.6)	0 (0.0)	0 (0.0)	02 (6.9)	01 (3.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Post Secondary School	11 (100.0)	0 (0.0)	0 (0.0)	01 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Qur'anic School	233 (91.7)	05 (2.0)	05 (2.0)	09 (3.5)	09 (3.5)	0 (0.0)	02 (0.8)	0 (0.0)	01 (0.4)	01 (0.4)	01 (0.4)
Non formal Education	04 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	381 (93.4)	05 (1.2)	07 (1.7)	16 (3.9)	15 (3.7)	02 (0.5)	02 (0.5)	01 (0.2)	01 (0.2)	01 (0.2)	01 (0.2)

Appendix III: Knowledge on the modes of malaria transmission by age group

Age group	Mosquito Bite	Sexual Intercourse	Ingestion of contaminated food	Mother to child	Don't know	Contact with house fly	House fly bite	High temperature	Exposure to sun	Smelling of bad water	Contact with blood
10-19	66 (83.5)	01 (1.3)	03 (3.8)	01 (1.3)	04 (5.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
20-29	210 (94.6)	04 (1.8)	03 (1.4)	09 (4.1)	10 (4.5)	01 (0.5)	01 (0.5)	01 (0.5)	01 (0.5)	0 (0.0)	01 (0.5)
30-39	89 (97.8)	0 (0.0)	01 (1.1)	05 (5.5)	01 (1.1)	01 (1.1)	01 (1.1)	0 (0.0)	0 (0.0)	01 (1.1)	0 (0.0)
40-50	16 (100.0)	0 (0.0)	0 (0.0)	01 (6.25)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	381 (93.4)	05 (1.2)	07 (1.7)	16 (3.9)	15 (3.7)	02 (0.5)	02 (0.5)	01 (0.2)	01 (0.2)	01 (0.2)	01 (0.2)

Appendix IV: Common malaria symptoms and signs among the respondents by age groups

Age group	Fever	Headache	Tiredness	Joint pain	Pimple on the mouth	Vomiting	Chill	Stomach	Dizziness	Muscle pain	Loss of appetite	Thinness	Diarrhoea	Asymptomatic
10-19	44 (55.7)	19 (24.1)	25 (31.6)	04 (5.1)	01 (1.3)	01 (1.3)	03 (3.8)	01 (1.3)	01 (1.3)	02 (2.5)	02 (2.5)	02 (2.5)	01 (1.3)	07 (8.8)
20-29	174 (78.4)	77 (34.7)	85 (38.3)	30 (13.5)	05 (2.3)	24 (10.8)	32 (14.4)	03 (1.4)	08 (3.6)	20 (9.0)	05 (2.3)	04 (1.8)	01 (0.5)	05 (2.3)
30-39	75 (82.4)	36 (39.6)	34 (37.4)	07 (7.7)	02 (2.2)	08 (8.8)	22 (24.2)	01 (1.1)	02 (2.2)	04 (4.4)	01 (1.1)	01 (1.1)	01 (1.1)	03 (3.3)
40-50	14 (87.5)	07 (43.8)	06 (37.5)	01 (6.25)	0 (0.0)	04 (25.0)	05 (31.3)	0 (0.0)	0 (0.0)	0 (0.0)	01 (6.25)	0 (0.0)	0 (0.0)	0 (0.0)
Total	307 (75.2)	139 (34.1)	150 (36.7)	42 (10.3)	08 (1.9)	37 (9.1)	62 (15.2)	05 (1.2)	11 (2.7)	26 (6.4)	09 (2.2)	07 (1.7)	03 (0.7)	15 (3.7)

Appendix V: Common malaria symptoms and signs among respondents by duration of pregnancy

Duration of pregnancy	Fever	Headache	Tiredness	Joint pain	Pimple on the mouth	Vomiting	Chill	Stomach	Dizziness	Muscle pain	Loss of appetite	Thinness	Diarrhea	Asymptomatic
1st trimester	30 (65.2)	19 (41.3)	14 (30.4)	12 (26.1)	01 (2.2)	03 (6.5)	05 (10.9)	0 (0.0)	01 (2.2)	03 (6.5)	0 (0.0)	0 (0.0)	0 (0.0)	04 (8.7)
2nd trimester	126 (75.9)	57 (34.3)	58 (34.9)	12 (7.2)	03 (1.8)	18 (10.8)	27 (16.3)	04 (2.4)	08 (4.8)	06 (3.6)	06 (3.6)	05 (3.0)	0 (0.0)	08 (4.8)
3rd trimester	151 (77.1)	63 (32.1)	78 (39.8)	18 (9.2)	04 (2.1)	16 (8.2)	30 (15.3)	01 (0.5)	02 (1.0)	17 (8.7)	03 (1.5)	02 (1.0)	03 (1.5)	03 (1.5)
Total	307 (75.2)	139 (34.1)	150 (36.7)	42 (10.3)	08 (1.9)	37 (9.1)	62 (15.2)	05 (1.2)	11 (2.7)	26 (6.4)	09 (2.2)	07 (1.7)	03 (0.7)	15 (3.7)

Appendix VI: Common malaria symptoms and signs among the respondents by gravid status

Gravid status	Fever	Headache	Tiredness	Joint pain	Pimple on the mouth	Vomiting	Chill	Stomach	Dizziness	Muscle pain	Loss of appetite	Thinness	Diarrhea	Asymptomatic
Primigravid	55 (75.3)	28 (38.4)	24 (32.9)	07 (9.6)	01 (1.4)	09 (12.3)	02 (2.7)	02 (2.7)	01 (1.4)	07 (9.6)	02 (2.7)	02 (2.7)	01 (1.4)	05 (6.8)
Multigravid	252 (75.2)	111 (33.1)	126 (37.6)	35 (10.4)	07 (2.1)	28 (8.4)	60 (17.9)	03 (0.9)	10 (2.9)	19 (5.7)	07 (2.1)	05 (1.5)	02 (0.6)	10 (2.9)
Total	307 (75.2)	139 (34.1)	150 (36.7)	42 (10.3)	08 (1.9)	37 (9.1)	62 (15.2)	05 (1.2)	11 (2.7)	26 (6.4)	09 (2.2)	07 (1.7)	03 (0.7)	15 (3.7)

Appendix VII Respondents socio-cultural and behavioral preventive practices in malaria by occupation

Occupation	Sleeping under net	Hygiene	Pour oil on stagnant water	Shoot mosquito manually	Drugs	Protection from God	Cover pots	Use of insecticides	Draining of water	Devegetation	Burning herbs	Close room with fan	Do not take any measure
Physical working class	24 (63.1)	13 (34.2)	0 (0.0)	03 (7.9)	18 (47.4)	04 (10.5)	0 (0.0)	10 (26.3)	06 (15.8)	01 (2.6)	01 (2.6)	01 (2.6)	01 (2.6)
Craft women	45 (90.0)	36 (72.0)	02 (4.0)	03 (6.0)	34 (68.0)	01 (2.0)	01 (2.0)	17 (34.0)	19 (38.0)	01 (2.0)	01 (2.0)	01 (2.0)	0 (0.0)
Full house wife	172 (76.8)	111 (49.6)	0 (0.0)	02 (0.9)	128 (57.1)	06 (2.7)	0 (0.0)	61 (27.2)	68 (30.4)	03 (1.3)	05 (2.2)	02 (0.9)	07 (3.1)
Trader	70 (85.4)	49 (59.8)	0 (0.0)	01 (1.2)	53 (64.6)	04 (4.9)	01 (1.2)	21 (25.6)	30 (36.6)	0 (0.0)	02 (2.4)	0 (0.0)	0 (0.0)
Health worker	01 (50.0)	01 (50.0)	0 (0.0)	0 (0.0)	02 (100.0)	0 (0.0)	0 (0.0)	02 (100.0)	01 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Student	04 (80.0)	0 (0.0)	0 (0.0)	0 (0.0)	04 (80.0)	0 (0.0)	0 (0.0)	03 (60.0)	01 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Teacher	07 (100.0)	04 (57.1)	0 (0.0)	01 (14.3)	06 (85.7)	0 (0.0)	0 (0.0)	05 (71.4)	02 (28.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	323 (79.2)	214 (52.5)	02 (0.5)	10 (2.5)	245 (60.0)	15 (3.7)	02 (0.5)	119 (29.2)	127 (31.1)	06 (1.5)	09 (2.2)	04 (1.0)	08 (2.0)

Appendix VIII: Attitude of the respondents with to refusal use of mosquito net by occupation

Occupation	Don't have mosquito net	No reason	No more mosquito	Hot weather	Sleep outside	Don't know the importance	Laziness	Till rainy season	Forgetfulness	Stifling	Alternative measures are enough	Travelling	Sleep in the room
Physical working class	6	0	3	2	1	0	1	1	0	0	0	0	0
Craft women	1	0	0	1	0	0	1	0	0	0	0	1	0
Full house wife	24	3	8	4	2	3	4	1	0	0	2	0	0
Trader	4	1	2	2	0	1	0	0	1	0	1	0	1
Health worker	0	0	0	1	0	0	0	0	0	0	0	0	0
Teacher	0	0	0	0	0	0	0	0	0	0	0	0	0
Student	0	0	0	0	0	0	0	0	0	1	0	0	0
Total	35 (8.6)	04 (1.0)	13 (3.2)	10 (2.4)	03 (0.7)	04 (1.0)	06 (1.5)	02 (0.5)	01 (0.2)	01 (0.2)	03 (0.7)	01 (0.2)	01 (0.2)