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Knowledge, Awareness and Practices of Preventive Measures for Malaria among Pregnant Women in a Tertiary Health Institution

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Abstract: ***Background: Malaria accounts for nearly one million deaths every year in Africa alone. It is the most important of the parasitic diseases of human beings. Pregnant women are known generally to demonstrate an increased susceptibility to malaria infection. Malaria in pregnancy is a known cause of maternal and foetal morbidity and mortality. This study aimed to assess the level of knowledge and practices of malaria prevention among pregnant women attending the antenatal care clinic of Usmanu Danfodiyo University Teaching Hospital, Sokoto, North-west Nigeria. Methodology: The study was a cross-sectional study which adopted a descriptive design and systematic random sampling technique was used. Data collected were sampled using descriptive and inferential statistics. Results: The findings revealed that 85.51% of respondents had good knowledge of malaria prevention, and 73.82% practiced malaria preventive strategies. There was a significant relationship between good knowledge and the educational status of the pregnant woman and her husband, with p values of 0.001 and 0.001 respectively. Conclusion: It is recommended that midwives and doctors carry out comprehensive health talks during the antenatal clinic on malaria and its preventive measures in pregnancy. Intermittent preventive therapy and insecticide treated nets should also be given to pregnant women attending antenatal clinics.***

Keywords: Malaria; Intermittent preventive therapy; Insecticide treated nets, morbidity

1. Introduction

Malaria remains a major public health problem in Africa where 45 countries including Nigeria are mostly affected and about 588 million people at risk.[1] It is a mosquito-borne infectious disease affecting humans and other animals and it is caused by parasitic protozoans belonging to the plasmodium type.[2] It is a life threatening disease commonly transmitted by an infected female Anopheles mosquito.[2] The mosquito bites and introduces the parasites from its saliva into a person's blood.The parasites then travel to the liver where they mature, multiply and subsequently affect red blood cells.[2,3] Five species of plasmodium can infect and be spread by humans.They include *Plasmodium Falciparum*, *Plasmodium Vivax*, *Plasmodium ovale*, *Plasmodium malariae* and *Plasmodium Knowlesi*.[3] Most deaths and severe forms of malaria are caused by *Plasmodium falciparum*.[3]*Plasmodium vivax*, *Plasmodium ovale* and *Plasmodium malariae* generally cause mild forms of malaria.[3]*Plasmodium knowlesi* rarely causes disease in humans.[3] *Plasmodium falciparum* and *Plasmodium vivax* are the most common, and *Plasmodium falciparum* the most deadly.[3]

Each year approximately 300 million people in Africa, Asia, Oceania, Central and south America are affected by malaria.[4] Malaria accounts for nearly one million deaths every year in Africa alone.[4] It is the most important of the parasitic disease of human beings.[4] It is one of the biggest health problems in sub-Saharan Africa and its contribution to morbidity and mortality among people in Africa has been a subject of academic interest, political advocacy and speculation.[5] In sub-Saharan Africa alone, 400 million persons are at risk and nearly all the one million deaths per annum from malaria in the world occurs in this region.[5] In addition pregnant women are at immense risk of malaria due to natural immune depression in pregnancy.[5] In 2015, 91 countries had on-going malaria transmission.[3] Between 2010 and 2015, malaria incidence among populations at risk (the rate of new cases) fell by 21% globally.[3] In that same period malaria mortality rates among populations at risk fell by 29% globally among all age groups, and by 35% among children under 5.[3] These were largely due to malaria preventive and control measures.[3] Vector control is the main way to prevent and reduce malaria transmission.[3] If coverage of vector control interventions within a specific area is high enough, then a measure of protection will be conferred across the community.[3] WHO recommends protection for all people at risk of malaria with effective malaria vector control.[3] Two forms of vector control- insecticide treated mosquito nets and indoor residual spraying are effective in a wide range of circumstances.[3]

Malaria is preventable and curable.[3] Increased malaria prevention and control measures are dramatically reducing the malaria burden in many places.[3] Specific population risk groups include young children less than 5 years old, non-immune pregnant women as malaria causes high rates of miscarriage and can lead to maternal death.[3] Semi-immune pregnant women in areas of high transmission, HIV infected pregnant women, people with HIV AIDS, international travellers from non- endemic areas because of lack of immunity are also at risk.[3] Immunity to malaria is governed by a complex interplay of both cellular activity and humoral factors.[4] The stress of pregnancy tends to lower immunity acquired in the non-pregnant state.[4] The reason has not been well elucidated.[4] However it has been argued that when protein requirement is unusually high as in pregnancy, metabolic channels may be altered so that if the dietary intake is insufficient, protein is withdrawn from the immune system.[4] Another explanation is that the cell mediated immunity is depressed during pregnancy though specific malaria antibodies are not decreased.[4] Cortisol levels are increased during pregnancy and this may contribute to

decreased cell mediated immunity.[4] Susceptibility to other diseases normally controlled by cell mediated immunity, such as tuberculosis is also increased in pregnancy.[4] Lymphocyte from pregnant women when challenged with malaria antigens show a depressed proliferative response in comparison to lymphocytes from non- pregnant women.[4] As a result of this decline in immunity, pregnant women experience both increased parasitaemia and clinical disease.[4] This is more common in the last trimester than the first.[4]

Malaria can affect the pregnant woman and her foetus.[6] The effects on the mother include anaemia, hypoglycaemia, metabolic acidosis, jaundice, renal failure, pulmonary oedema, and respiratory distress, convulsion and coma.[6] Pregnancy complications are also increased. They include abortions, preterm labour, prematurity, IUGR, IUFD, foetal distress, small for gestational age, congenital malaria amongst others.[4,6]. The foetal effects are due to high feveror due to placental parasitization.[6] The intervillous spaces become blocked with macrophages and parasites and there is diminished placental blood flow[6]. This is mostly seen with P. falciparuminfectionand in the second half of pregnancy[6]. Congenital malaria is rare (< 5%) unless the placenta is damaged.[6]A recent study estimated that malaria contributes to 3-5% of maternal anaemia, 8-14% of low birth weight, and 3-8% of infant mortality.[1] Malaria often causes anaemia, increased uterine activity, abortions, preterm labour, foetal distress, death in utero, still birth and low birth weight.[4] The patients become more vulnerable to hypoglycaemia especially following treatment with certain anti-malarials.[4] A few may also develop pulmonary oedema in the pueperium.[4] A study reported that the practice of malaria preventive measures among pregnant women was not encouraging as their use of insecticides treated bed nets was unacceptably low and this contributed to high infection rates.[4,7]

Prevention of malaria in pregnancy is a major priority for the roll back malaria partnership.[4] In high transmission areas including Nigeria, the roll back malaria initiative recommends a 3 pronged approach for reducing the burden of malaria among pregnant women which are effective case management of malaria infection, use of insecticide treated nets (ITN) and intermittent preventive treatments in areas of stable transmission.[4,8] In line with this recommendation, approach to prevention of malaria in pregnancy changed since the early 2000 moving from weekly or bi-monthly chemoprophylaxis adopted in the year 2005 to four weekly chemoprophylaxis till delivery.[9] The prevalence of malaria in pregnancy continues to be high as portrayed by available statistics from health facilities in Nigeria as a whole.[7]

Based on these, it became necessary to ascertain the knowledge and practice of malaria prevention among pregnant women attending the antenatal care clinics in Usmanu Danfodiyo University Teaching Hospital, Sokoto. The study sought to address the following objectives: to assess the level of knowledge of pregnant women about malaria prevention, to assess the relationship between their educational status and the knowledge of malaria prevention, to assess the relationship between the women's occupation and their level of knowledge and to assess their practices of malaria prevention.

2. Materials and Methods

A cross-sectional descriptive study design was employed. An interviewer administered questionnaire was applied to 228 women attending the antenatal clinic in Usmanu Danfodiyo University Teaching Hospital, Sokoto. A systematic random sampling technique was used to recruit participants and the instrument for data collection was a structured and close-ended questionnaire. Ballot papers were compiled with yes and no options. Informed consent was obtained from women attending the antenatal clinic and the ballot papers given to willing participants to pick at random. The questionnaire was administered to the women that picked the papers with yes. Comparison between knowledge score level and other variables was analysed with independent Ttest.Other data were analysed using SPSS version 20 (SPSS Inc. Chicago, IL) to test the relationship between variables at a 0.05 level of significance.

3. Results

The study included 228 pregnant women attending the antenatal clinic.The participant's ages ranged between 17-42 years with a mean of 28.78 ± 5.70 years. Most, 198 (71.9%) had some form of formal education of which 124 women had tertiary education constituting 54.4%. Islam was the predominant religion (64.5%) and the Hausa tribe,59.6% was dominant. Majority,64.5%were multigravidae and most, 49.8% were not gainfully employed as they were full time housewives. Most husbands in the study were educated with 70.1% having tertiary education. The husbands with no formal education constituted 10.1% of the study group. (Table 1)

Table 1: Sociodemographic Characteristic Of Participants

Characteristics	*Frequency*	*Percentages (%)*
Age (years)		
< 20	12	5.2
20-24	39	17.1
25-29	73	32
30-35	59	25.8
35 and above	45	19.7
Total	228	100
Level of education		
No formal education	30	13.2
Primary education	18	7.9
Secondary education	56	24.6
Tertiary education	124	54.4
Total	228	100
Religion		
Islam	147	64.5
Christianity	69	30.2
Others	12	5.2
Total	228	100
Occupation of correspondents		
Unemployed/ Housewives	107	46.9
Student	27	11.8
Civil servants	65	28.5
Business	29	12.7
Total	228	100
Tribe		
Hausa	136	59.6
Yoruba	26	11.4
Igbo	49	21.5

Others	17	7.4
Total	228	100
Parity		
Primigravida	45	19.7
Multigravida	147	64.5
Grand multigravida	36	15.8
Total	228	100
Educational status of husband		
No formal education	23	10.1
Primary	11	4.8
Secondary	34	14.9
Tertiary	160	70.1
Total	228	100

Majority, 81.1% of the women had good knowledge of malaria and its prevention.Only 12.3% had some knowledge while 6.6% had poor knowledge.(Figure 1).

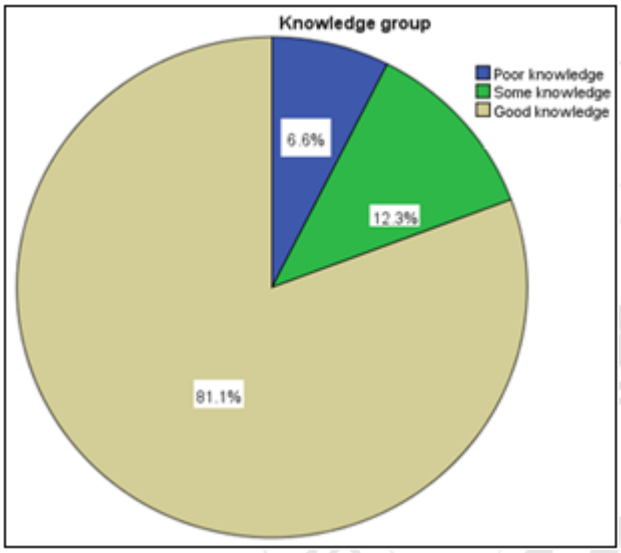

Figure 1: Knowledge of malaria prevention among participants

There was more knowledge of malaria prevention as the educational status of the participants increased with the least, 43.3%, seen among those with no formal education and the highest, 91.9% noted among those that had attained tertiary level of education.Thisdifference in knowledge was statistically significant with a p value of 0.0001.(Table 2)

Table 2: The relationship betweenEducational status andKnowledge of malaria prevention

Educational Status	Poor knowledge (%)	Some knowledge (%)	Good knowledge (%)	Total (%)	Test statistic
No formal Education	9 (30)	8 (26.7)	13 (43.3)	30 (100)	df = 51.227
Primary	2 (11.1)	5 (27.8)	11 (61.1)	18 (100)	p = 0-0001
Secondary	2 (3.5)	7 (12.5)	47 (83.9)	56 (100)	
Tertiary	2 (1.6)	8 (6.5)	114 (91.9)	124 (100)	
Total	15 (6.6)	28 (12.3)	185 (81.1)	228 (100)	

The husbands' educational status also had an impact on the woman's knowledge of malaria and its prevention. There was more knowledge among those women whose husbands had a higher level of education with 91.8% having good knowledge in those with tertiary level of education when compared to 43.4% among the women whose husbands had no formal education.This was statistically significant with a p value of 0.0001. (Table 3).

Table 3: Husbands educational status and knowledge of malaria

Educational Status	Poor knowledge (%)	Some knowledge (%)	Good knowledge (%)	Total (%)	Test statistic
No formal Education	6 (26.1)	7 (30.4)	10 (43.4)	23 (100)	df = 64.340
Primary	4 (36,4)	2 (18.2)	5 (45.5)	11 (100)	p = 0.0001
Secondary	2 (5.9)	9 (26.5)	23 (67.6)	34 (100)	
Tertiary	3 (1.9)	10 (6.3)	147 (91.8)	160 (100)	
Total	15 (6.6)	28 (12.3)	185 (81.1)	228 (100)	

The woman's occupation affectedher knowledge of malaria and its prevention. The civil servants, 90.8%, followed closely by the students, 81.5% had more knowledge than others. This was statistically significant a p value of 0.04. (Table 4).

Table 4: The relationship between the woman's occupation and level of knowledge of malaria prevention

Occupation	Poor knowledge (%)	Some knowledge (%)	Good knowledge (%)	Total (%)	Test statistic
Unemployed	0 (0)	1 (14.8)	6 (85.7)	7 (100)	df = 13.365
Student	1 (3.7)	4 (14.8)	22 (81.5)	27 (100)	p = 0.041
Civil servant	2 (3.1)	4 (6.2)	59 (90.8)	65 (100)	
Business	1 (3.5)	5 (17.2)	23 (79.3)	29 (100)	
House wife	11 (11)	14 (14)	75 (75)	100 (100)	
Total	**15 (6.5)**	**28 (12.3)**	**185 (81.1)**	**228 (100)**	

About 98.7%, 88.2% and 71.5% of thewomenpracticed cleaning their environments, used insecticides and had door nets to prevent malariarespectively, while only 8.8%used mosquito coils. Another21.9% applied mosquito repellent creams while 72.8% slept under mosquito nets. (Table 5).

Table 5: Practice of malaria prevention

Practice of Malaria Prevention	*Yes (%)*	*No (%)*	*Total*
Intermittent preventive therapy	185 (81.1)	43 (18.9)	228 (100)
Do you clean your environment?	225 (98.7)	3 (1.3)	228 (100)
Do you use mosquito bed nets?	166 (72.8)	62 (27.2)	228(100)
Do you use window nets?	199 (87.3)	29 (12.7)	228 (100)
Do you have door nets?	163 (71.5)	65 (28.5)	228 (100)
Do you use insecticides?	201 (88.2)	27 (11.8)	228 (100)
Do you use mosquito repellent creams?	15 (6.6)	213 (93.4)	228 (100)
Do you use mosquito coils?	10 (4.4)	218 (95.6)	228 (100)

The level of knowledge and the practice of the use of insecticide treated nets among the women showed 75.5%good knowledge,75% some knowledge and 33% poor knowledge.Astatistically significant relationship, between the level of knowledge of malaria prevention and the practice of the use of insecticide treated nets was seen among the women with a p value of 0.006. (Table 6)

Table 6: Level of knowledge and practice of the use of Mosquito Nets

Knowledge	Yes	No	Total	Test Statistics
Poor Knowledge (%)	5 (33)	10 (66.7)	15 (100)	df = 10.137
Some Knowledge (%)	21 (75)	7 (25)	28 (100)	p = 0.006
Good Knowledge (%)	140(75.7)	45 (24.3)	185 (100)	
Total (%)	166(72.8)	62 (27.2)	228 (100)	

4. Discussion

The results of the findings from this study showed that 81.1% of the women had good knowledge of malaria and its prevention strategies. This was similar to 83.9% of women having good knowledge of malaria in a study in Cross River State,[1] but more than 75.1%,71.5% and 53.2% in similar studies in Zamfara State, the Federal Capital Territory (FCT)and Abia State.[10 -12] Several other studies demonstrated adequate knowledge of malaria prevention measures among women attending antenatal care clinics.[13 – 15]Women's knowledge about malaria prevention strategies are important determinants of malaria prevention.[13] The increased awareness could be attributable to the various interventions focussed on malaria eradication by government and non-governmental organizations.[13] Health talks by health workers using simple local languages in educating women about malaria prevention during antenatal care on a regular basis also contributed to the high knowledge of malaria preventive strategies.[13] This is a regular practice at the antenatal care clinic of the Usmanu Danfodiyo University Teaching Hospital.

The mean age of 28.78± 5.70 yearsfound among the participants in this study is similar to findings in other studies.[12,16,17,18] Most of the participants in this study were literate with 82.1% having had secondary or tertiary education (24.6% and 57.5% respectively). This is similar to findings in the FCT Abuja,[12] Benin[19] and Ile-ife,[18] Nigeria.

This study showed a statistically significant relationship between the educational status of the women and their level of knowledge of malaria and its prevention strategies.(p value = 0.001).This finding is similar to the studies in FCT Abuja[12], and Aba, Nigeria.[11] A study from Northern Nigeria[20]also reported very low knowledge level of respondents on the mode of malaria transmission when compared to findings in previous studies across Africa andthis was attributable to the low level of education in that rural community.[20]

This study also showed a statistically significant relationship between the level of knowledge of malaria and its preventive strategies and husbands' level of education. This is similar to the findings in a Cameroonian study.[21] Another similar study from Equatorial Guinea reported that the level of education, rurality and socioeconomic status were the factors significantly related to the knowledge of malaria and its preventive strategies.[22]

A study by Ireneman et al found an association between malaria infection and occupation, indicating that malaria infection was related to the degree of exposure to infected mosquitoes.[5] However, there was no statistically significant relationship between knowledge and the occupation of the woman in this study.

Majority, 72.8% of the women used mosquito nets in their homes. This was higher than the 64.8%,64.5% and 52% reported from Bauchi,[13] Ghana[23] and Zamfara[10]respectively but lower than the 82.5%[24]from Yaoundé.The availability of insecticide treated nets at no cost at the antenatal care clinic may be responsible for its high use amongst the participants. The same may be said for the use of Sulphadoxine/ Pyrimethamine (S/P) combination for intermittent preventive therapy (IPT) for malaria which is administered at no cost to women attending the antenatal clinic. Majority, 81.1% of participants in this study practiced IPT usingS/P combination. This was more than the 62.8% in Rivers State, Nigeria in which most of the respondents (76.4%) had good knowledge of malaria but the knowledge of the correct use of S/P was low (32.6%).[25]

A significant proportion of participants in this study had window nets (87.3%), door nets (71.5%)and used insecticides (88.2%). Few of the participants used mosquito repellent creams (6.6%)and mosquito coils (4.4%). This finding was similar to that of Ezeigbo et al where 6.4% used mosquito repellent creams[26] and another study in Bayelsa where 83.3% used window and door nets, 66.7% used insecticides and 72.2% cleared bushes.[27]

5. Conclusion/ Recommendations

Majority of respondents had adequate malaria related knowledge and the consequences of malaria in pregnancy. They also had good knowledge on malaria preventive strategies. There was a significant relationship between the knowledge of malaria and the educational status of correspondents. This emphasizes how imperative female education is in ensuring adequate malaria prevention. The respondents employed several methods in prevention of malaria which ranged from IPT, the use of insecticides and insecticide treated nets amongst others.

Continuous advocacy by health care providers on malaria and its preventive measures in pregnancy through health talks including practical sessions with women attending the antenatal care clinic is recommended.Also employing directly observed treatment (DOT) forIPT for malaria using S/P, as practiced elsewhere,may improve malaria prevention in the study area.Furthermore, reducing the cost of antenatal care by making it free for women of low socioeconomic statusand providing medications for IPT (S/P), haematinics and insecticide treated mosquito nets free to women attending the antenatal care clinic may go a long way to reduce the burden of malaria and its sequalae in our subregion.

References

[1] Ojong IN, Iheanacho OI, Akpan MI, Nlumanze FF. Knowledge and practices of malaria prevention among pregnant women attending secondary health facility in Calabar, Cross river state, Nigeria. *Hamdard Medicus J.* 2013; 56(3): 70-7.

[2] Gladwin M, Trattler W, Scott-Mattan C (Eds). Protozoa. In: *Clinical microbiology made ridiculously simple* 6th edition. Miami Florida: Medmsaster Inc. 2010; 30: 343-50.
[3] Malaria. World Health Organization fact sheet. Accessed 31st of September 2017. Updated March 2014. Avaliableat https://www.who.int/mediacentre/factsheets/en/
[4] Opare-Addo HO, Odoi AT. Malaria in pregnancy. In: Kwawukume EY, Ekele BA, Danso KA, Emuveyan EE. (Eds) .*Comprehensive obstetrics in the tropics*, second edition. Accra Ghana: Assemblies of God literature centre ltd. 2015; 35: 321-31
[5] Ireneman NC, Dosunmu AO, Oyibo WA, Fagbenro-Beyioku AF. Knowledge, attitudes, perception of malaria and evaluation of malaria parasitaemia among pregnant women attending the antenatal care clinic in metropolitan Lagos Nigeria. *J Vector Borne Dis.* 2011; 48: 12-17.
[6] HiralalKonar (Ed). Medical and surgical illness complicating pregnancy. In: *Dutta textbook of obstetrics*. New Delhi: Jaypee brothers' medical publishers Ltd. 2013; 19: 271-8.
[7] Houmsou RS, Amuta EU, Sar TT. Malaria prevention during pregnancy; Awareness and factors contributing to disease occurrence among pregnant women on Gboko metropolis Benue state Nigeria. *Nig J. Med. Bio Med Sci*. 2010; 25(2): 144-46.
[8] World health organization. African summit on roll back malaria: The Abuja declaration on Roll Back Malaria in Africa by the African heads of state and Government. 25th April 2000, Abuja, Nigeria. Avaliable from: *http//www.rollbackmalaria.org/docs/abuja_declaration. Pdf.* Assessed on 10/01/2017.
[9] Chemoprevention in special risk groups. Guidelines for the treatment of malaria 3rd edition, WHO 2015. Pg. 99-105. Assessed on 20/06/2016. Available at http//www.who.int.
[10] Kallmu H, Hegar AR, Hayati KS, Ismaila UG. Association between knowledge, attitude and preventive practices on malaria among pregnant women with and without malaria attending the antenatal care in Zamfara state Nigeria. *Intl J. Pub Health Clin Sci.* 2015; 2(5): 68-78.
[11] Ejike UB, Ohaeri CC, Amaechi EC, Ejike EN, Oleka G, Irole-Eze O et al. Knowledge, attitude and preventive practices on malaria among pregnant women in Ago south Local government Abia state Nigeria. *Res Intl J*. 2016; 13(2): 2463-69.
[12] Akaba GO, Otubu JA, Agida ET, Onafowakan O. Knowledge and utilization of malaria preventive measures among pregnant woman at a tertiary hospital in Nigeria's federal capital territory (FCT). *Nig J Clin Pract*. 2013; 16: 201-6
[13] Andy E, Mangai MJ, Gotodok HK, Mbachioma J, Abubakar Z. Malaria prevention among pregnant women in Bauchi State, Nigeria. Knowledge and utilization of insecticide treated nets. *Open Sci J. Clin Med*. 2016; 4(1): 1-4.
[14] Ukibe SN, Ikeako LC, Mbanugo JI, Alphonosus OC, Ukibe NR. Knowledge, attitude and practices of pregnant women concerning the use of insecticide treated nets in Anambra state, south east Nigeria. *J. App Med Sci*. 2014; 3(1): 15-22.
[15] Ireneman NC, Dosunmu AO, Oyibo WA, Fagbenro-Beyioku AF. Knowledge, attitude, perception of malaria and valuation of malaria parasitaemia among pregnant women attending the antenatal care clinic in a metropolitan city Lagos Nigeria. *J Vector borne Dis*. 2011; 48: 12-7.
[16] Adegbola O. gestational age at antenatal booking in Lagos University Teaching hospital (LUTH). *Nig J Hosp Med*. 2009; 19:162-4.
[17] Yusuf OB, Dada-Adegbola HO, Ajayi IO, Falade CO. Malaria prevention practices among mothers delivering in an urban hospital in south western Nigeria. *J. Vector Borne Dis.* 2008; 45: 217-24.
[18] Adeyemi AB, Makinde ON, Adenifuja KO, Soyinka AS, Ayinde AK, Ola BA et al. determinants of antenatal booking time in south-western Nigerian setting. *West Afr J Med.* 2007; 26:293-7.
[19] Gharoro EP, Igbafe AA. Antenatal care: some characteristics of the booking visit in a major teaching hospital in the developing world. *Med Sci Monit*. 2000; 6: 519-22.
[20] Singh R, Musa J. Singh S. Ebere UV. Knowledge, attitude and practices on malaria prevention among rural communities in Aliero, Northern Nigeria. *J. Fam Med Prim care.* 2014; 3(1): 39-44.
[21] Kimbi HK, Nkesa SB, Ndamukong-Nyanga JL, Sumbele UN, Atashili J, Atanga MB. Knowledge and perceptions towards malaria prevention among vulnerable groups in the Buea health district Cameroon. *BMC Public Health*. 2014; 14: 883-5
[22] Romay-Barja M, Neoga P, Nseng G, Santana-Morches MA, Herrador Z, Bercosa P et al. Care givers malaria knowledge, beliefs, attitudes and related factors in Beta District, Equatorial guinea. *PLoS one.* 2016; 11(12): 1-5.
[23] Ayiisi EA. Knowledge and Utilization of intermittent preventive treatment for malaria control among pregnant women attending the antenatal care clinic in the Suyani west district of Ghana. *Sci J Pub health.* 2017; 5(3): 254-62.
[24] Bisony CE, Dangmo CM. Utilization of malaria preventive methods by pregnant women in Yaonde. *Pan Afri Med J*. 2013; 15: 89-90.
[25] Tobin-west IC, Asuquo EO. Utilization of intermittent preventive treatment of malaria by pregnant women in Rivers State, Nigeria. *Int J Prev Med*. 2013; 4(1): 63-71.
[26] Ezeigbo OR, Osuagwu MC, Ibebuleman ZO, Agomoh NG. Evaluation of the knowledge, attitude and practice of the use of insecticide treated nets (ITNS) in Aba, Nigeria. *BJMMR*. 2015; 5(1): 57-64.
[27] Onasoga OA, Adeleke AJ, Olubiyi SK, Eunice FR, Gambari AG. Methods employed in the prevention and treatment of malaria among pregnant women in a riverine community in Rivers state Nigeria. *NigHealth J*. 2016; 16(3): 1-13.