Research article

Prevalence of Malaria and Associated Risk Factors in Pregnant Women in Mbaitoli Local Government Area, South-east Nigeria

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ABSTRACT

Malaria infection during pregnancy is a significant public health problem with substantial risks for the pregnant woman, her fetus and the newborn child. This study was conducted to determine the prevalence of malaria parasite infection and associated risk factors among pregnant women in Mbaitoli Local Government Area of Imo State. A total of 300 pregnant women were sampled for malaria parasites infection using thick and thin film smears. Venous blood samples of 1ml were collected from pregnant women attending antenatal clinic in Primary Health Care Centres and hospitals using needles and syringes to determine the presence of malaria parasite. Questionnaires were also filled. Data was analysed using simple percentages, Odd ratios and Chi-square analytical statistical tools. An overall prevalence of 63.7% was recorded in the study, while the proportions of women infected were highest within the 26-30 years age cohort (73.5%) . The burden of malaria infection among pregnant women in Mbaitoli Local Government Area is significant across the various examined depended variables which implies that malaria remains one of the highest prevalent diseases facing pregnant women. Age, Educational status, Occupational status, presence of stagnant water around the surrounding residence, overgrown weeds/bushes around the residence, non-use of mosquito insecticide nets, staying late-night , not attending antenatal care and health education sessions are significantly associated with malaria infection in the area. Effort should be geared towards improving their environmental conditions and educational backgrounds. Insecticide treated mosquito nets should be provided.

Keywords: *Malaria, Risk factors , Pregnant, Bood, Woman, Mbaitoli*

INTRODUCTION

Malaria is a life-threatening disease caused by malaria parasites that are transmitted to people through the bites of infected female Anopheles mosquitoes (WHO, 2016). And in malaria endemic areas, pregnant women are the highest risk group for malaria infection and to develop a severe form of the disease that results in mortality. Thus, increasing the use of antimalaria interventions that target pregnant women which can address the social, cultural, and economic factors that heighten susceptibility, has the potential to control the disease in most of the susceptible and underserved groups (Yartey,2016). About 200 million cases, nearly half million death and 300-500 million people are being infected each year (WHO, 2017). Malaria is the most common primary health problem in tropical and developing countries of Sub-Saharan Africa and Southeast Asia. During pregnancy, the immune system is suppressed as such pregnant women are more predisposed to malaria infection (Lindsay *et al*.,2000). More so, the burden of this disease falls heaviest among children below the age of five in sub-saharan Africa and 30% of the

annual mortality in the populations are attributed to malaria (WHO, 2013) . In 2015 there were 212 million cases of malaria and 429,000 deaths and between 2010 and 2015, malaria prevalence among populations at risk fell by 21% globally (WHO, 2016); during the same period, malaria mortality rates among populations at risk decreased by 29%. An estimated 6.8 million malaria deaths have been averted globally since 2001 (Murphy and Breman, 2001), moreover, the WHO African Region continues to carry a disproportionate high share of the global malaria burden (Steketee *et al*., 2001). And in 2015, the region was home to 90% of malaria cases and 92% of malaria deaths (WHO, 2016). Each year, 25-30 million women become pregnant in malaria endemic area of Africa, and similar numbers are exposed to malaria in Asia, Oceania, and South America (Steketee *et al*., 2001).

Meta-analysis of malaria in pregnancy studies conducted in Eastern and Southern Africa between 1990 and 2011 showed that 32.0% of pregnant women attending antenatal care facilities had peripheral parasitaemia, and when the time

period was restricted to studies conducted between 2000 and 2011, parasitaemia was 29.5% (Chico *et al*., 2012). In Western Ethiopia, Grima *et al*., 2020 found a prevalence of 10.2% of malaria infection among pregnant women in Sherkole district, Benishanful Gumuz regional state. In Nigeria malaria is highly endemic being one of the countries in the tropical and sub-tropical zones, thus increasing the susceptibility of pregnant women in the country, thereby raising the rate of infections since transmission is stable and occurs throughout the year(Onyenekwe *et al*., 2002). Associated burden of malaria during pregnancy includes spontaneous abortion and miscarriage, still birth, unstable socio-economic status. Its major impact on pregnant women is severe anemia, maternal deaths and low birth weight. According to Federal Ministry of Health (FMOH), malaria is associated with 11.0% of all maternal deaths and 70.5% of morbidity in pregnancy in Nigeria (Abdulazezeez *et al*.,2020).

Furthermore, National Malaria Elimination Programme (NEMP, 2015) stated that Nigeria accounts for 25% of the global burden of malaria and has the highest number of cases of any country, highlitghting the need to focus on treatment as well as prevention. Nationwide, malaria prevalence varies widely, ranging from 14% in the South East Zone to 37% in the North West Zone (NEMP,2015) and varies across its range of distribution, known to be influenced by weather, which affects the ability of the main carrier of malaria parasites, Anopheles mosquitoes to survive or otherwise (Mwangagia *et al*., 2007), and in tropical areas including Nigeria which have the best combination of adequate rainfall, temperature and humidity thus allowing for fauna breeding and survival of Anopheles mosquitoes (Okwa *et al*., 2009). Moreso, malaria transmission in Nigeria takes place all year round in the South but is seasonal in the far Northern regions (WHO, 2010), where the infection occurs between April and October.

In Pregnancy, Malaria infection is a significant public health problem with substantial risks for the pregnant woman, her fetus and the newborn child. Moreover, malaria-associated maternal illnesses and low birth weights are mostly the result of Plasmodium falciparum infection and occurs predominantly in Africa. Each year, 50 million women living in malaria-endemic areas become pregnant; one-half of these women live in Africa, and it is estimated that 10,000 women and 200,000 infants die as a result of malaria infection during pregnancy. Severe maternal anaemia, prematurity and low birth weight contribute to more than half of these deaths (WHO, 2017). Thus, malaria infection in pregnancy continues to be a major health issue in endemic countries with clinical consequences such as the death of both mother and child. In Nigeria, statistics show that as many as 300,000 lives especially those of children and pregnant women are lost annually to malaria(Raimi and Kanu,2010). A number of studies have been carried out on the prevalence of malaria parasite infection amongst pregnant women in Nigeria by different scholars and researchers for instances, 45.4% in Zaria, Kaduna (Igiri *et al*., 2018), 61.8% in Bauchi (Samalia *et al*., 2017), 43.1% in Rivers (Wogu *et al*., 2018), 11% in Sokoto (Buhari *et al*., 2016), 2.1% in Bauchi (Kadas *et al*., 2019), and 2.0% in Lagos (Oluwagbemiga *et al*., 2018). Nevertheless, the report on this situation is scarce in Mbaitoli LGA thereby creating a very huge gap, as a result this study is

timely in order to provide baseline data and prevalence level in the area.

Malaria infection has quite serious impact on the most vulnerable people in society which include pregnant women, young girls and children less than 5 years, internally displaced persons and the homeless among others. Additionally, pregnant women have two to three times higher risk of suffering from malaria and this increases their risks of miscarriages, still birth, premature births, low birth weight and anaemia in pregnancy. All these complications may even lead to death (WHO, 2010). The protection of pregnant women living in malaria-endemic countries has been of particular interest to many National Malaria Control Programmes because of their reduced immunity (WHO,2017). The recent world malaria report (WHO, 2010), which indicated that Nigeria accounts for a quarter of all malaria cases in the 45 malaria-endemic countries in Africa, clearly showed the challenge of malaria in Nigeria. The principal impact of malaria infection is due to the presence of parasites in the placenta causing maternal anaemia (potentially responsible for maternal death when severe) and low birth weight. Despite considerable efforts to control malaria, it is still the most prevalent and devastating disease in tropical Africa with pregnant women and children below five years the highest risk groups (Andy *et al*., 2018). The symptoms and complications of malaria during pregnancy have economic implications. Despite lack of evidence on the economic burden of malaria in pregnancy, it is likely that a substantial cost is imposed on the health services, household economy and the economy of the larger society(Ayanlade *et al*., 2010). A data from Imo State indicate that total loss due to malaria in pregnancy within a six month period was estimated at 5.8 million naira, suggesting that the burden of malaria in pregnant women is high (Ohalete *et al*.,2011)

With the interest of Nigerian government in controlling malaria through the various malaria control strategies, which were reflected in the theme for the 2016 world malaria day "End malaria for good , and with the slogan, it is Possible" as well as that of 2019 which is "Zero Malaria starts with me" with the slogan "will empower individuals across the world to make a personal commitment to saving million more lives, help communities and economies to thrive by ending malaria" , it is now apt and necessary to embark on this study in Mbaitoli LGA" of Imo State, in order to provide part of the much needed baseline data to effectively plan and control malaria infection in the area, among the populations at risk.

MATERIALS AND METHODS

Study Area: Mbaitoli Local Government Area was created out of what used to be called Mbaitoli/Ikeduru Local Government under the leadership of General Ibrahim B Babangida on May 11, 1989. It has nine autonomous communities, which include : Mbieri, Orodo, Ogwa, Umunoha, Ubomiri, Ifakala; Afara; Ogbaku; and Eziama-Obiato. Mbaitoli as a local government area in Imo State, Nigeria has its headquarter at Nwaoriubi or (Nworieubi) which serves as its administrative headquarter, situated along Owerri-Orlu Federal road. It has an area of 204 Km^2 and shares common boundaries with Oru, Njaba, Isu LGA in the

North, while, its Southern boundary is with Owerri North and Owerri West LGAs. Its Western neighbours is Oguta and on the eastern side are Isiala Mbano and Ikeduru LGAs.

The people are predominantly farmers, peace loving and always well dressed expressing the confidence they have in themselves. They are mostly educated, industrialist and Civil Servants.

Apart from Natural resources like big forest at Idem/Oburo Ogwa, there is also a wonderful lake called Ugwu Okwu – Oba Bridge at Umahii Mbieri and the Iyi Egbeada River at Egbeda with with white sand and fish. The inhabitants of the area are predominantly farmers who produce a variety of food and cash crops such as Yam, Cocoyams, Cassava, Maize, Vegetable and Palm produce. Rearing of animals and poultry are also common in the area.

Study Population: This study was carried out among pregnant women attending antenatal clincs in primary healthcare centres and General Hospitals (Maternity and Child health Umuokwara Primary Health Center, General Hospital Alaenyi Ogwa, General Hospital Mbieri, Primary Health Center Obi-Orodo, Primary Health Center Nwaoriubi, Eziama Obiato Dispensary) of Mbaitoli LGA.

Research Design: This is a cross-sectional descriptive study of the prevalence of malaria parasite infection and associated risk factors among pregnant women in Mbaitoli LGA, Imo State.

Sample Size Determination
A suitable sample size of pregnant women in Abaji area council was selected within the target population. Thus sample size was derived as follows:

A prevalence rate of 26.6%(Kimberly *et al*., 2019) was chosen according to *Naing et al.,* 2006 , margin of a sampling errror or precision tolerated was set at 5%, at 95% confidence interval using the formula: $n = N^2 P(1-P)/d^2$
where n=sampla size, N= 1.96 (Statistical constant), P = 26.6% (Population based) d= 5% (marginal error or precision).
$n = (1.96)^2 x 0.266 (1-0.266)/(0.05)^2$
$= 3.8416 x 0.266 x 0.734/0.0025$
$= 300.01976 = 300$

Sampling Technique: The blood samples from the pregnant women attending antenatal clinic in primary healthcare centres and general hospitals were randomly collected for laboratory tests to determine the presence of malaria parasites as evidence of infection .

Sample Collection, Processing and Analysis: A venous blood sample of 1ml was collected from the pregnant women using needle and syringe. Standard and careful laboratory procedures were adopted in collecting blood samples from the pregnant women. Thick and thin blood films of the blood samples were made on clean dry grease free slides, labelled and allowed to dry. The thin films were fixed in 70% alcohol to avoid lysis, allowed to dry and then stained with Leishmam stain for 10 minutes, while the thick films were stained with diluted Giemsa stain for 25-30 minutes and allowed to dry. The films were examined under the light binocular microscope using x100 objective lens, with a drop of oil immersion (

Ochei and Kolhatkar, 2008; WHO,2000). The presence of malaria parasite in either of the films was regarded as positive, either with one plus (+), two pluses (++) or three pluses (+++).

Data Analysis: Data obtained were analysed using simple percentages , Odds Ratio and Chi-square analytical methods.

Ethical Consideration: Permission to carry out the study was obtained from the Committee in charge of health in the Local Government Area and informed consent was obtained from the pregnant women after explaining what they would gain by participating.

RESULTS

Prevalence: Table 1 shows the overall prevalence (63.7%) of malaria infection among the pregnant women in Mbaitoli Local Government Area.

Table.1
Prevalence of malaria parasite infection among the pregnant women

No. Examined	No. Positive (%)	No. Negative (%)
300	191(63.7)	109(36.3)

$\chi^2 = 75.93$

Age distribution: Table 2 showed that, pregnant women aged 26-30 years had the highest infection rate of 73.5% followed by 21-25 with 63.4% and others , 18-20, 31-35 and 36-40 years with 61.9%, 54.5% and 50.0% respectively.

Table 2 :
The age distribution and prevalence of malaria parasite infection among pregnant women in Mbaitoli Local Government Area.

Age group	No examined	No positive (%)	No negative (%)
18-20	21	13 (61.9)	8 (38.1)
21-25	101	64(63.4)	37(36.6)
26-30	98	72(73.5)	26(26.5)
31-35	44	24(54.5)	20(45.5)
36-40	36	18 (50.0)	18(50.0)
Total	300	191(63.7)	109(36.3)

$X^2 = 74.53$

Predisposing/Risk Factors of Malaria Infection: Table 3 shows the multivariate analysis of risk factors associated with malaria infection among pregnant women in Mbaitoli LGA in Imo state. Age, Educational status, Occupational status, presence of stagnant water around the surrounding residence, overgrown weeds/bushes around the residence, non-use of mosquito insecticide nets, staying late-night , not attending antenatal care and health education sessions are significantly associated with malaria infection in the area.

Table.3:
Multivariate Analysis of Predisposing/Risk Factors of Malaria Infection Among the Pregnant Women in Mbaitoli LGA

Variables	No. Screened	No Positive (%)	OR	X^2	P-value
Age-group					
18-20	21	13(61.9)	1.89	74.07	0.023
21-25	101	64(63.4)	2.10	67.31	0.004
26-30	98	72(73.5)	3.12	80.02	0.001
31-35	44	24(54.5)	1.70	75.04	0.025
36-40	36	18(50.0)	1.30	76.23	0.033
Educational Status					
None	70	52(74.3)	83.02		0.002
Primary	80	50(62.5)			
Secondary	78	48(61.5)			
Tertiary	72	41(56.9)			
Occupational Status					
Civil servant	60	32(53.3)		79.11	0.003
Trading	75	44(58.7)			
Farming	80	58(72.5)			
Unemployed/ House wives	85	57(71.3)			
PREDISPOSING FACTORS					
Presence of stagnant water					
Yes	140	102(72.9)		75.43	0.005
No	160	89(55.6)			
Overgrown weeds/bushes around houses					
Yes	140	102(72.9)		75.43	0.005
No	160	89(55.6)			
Overgrown weeds/bushes around houses					
Yes	130	101(77.7)		72.10	0.001
No	170	90(52.9)			
Use of mosquito insecticide nets					
Yes	147	81(55.1)		74.90	0.002
No	153	110(71.9)			
Covering of Wrapper					
Yes	155	95(61.3)		67.12	0.682
No	145	96(66.2)			
Staying late-night outside					
Yes	125	102(81.6)		75.11	0.001
No	175	89(50.9)			
Antenatal care and Health education					
Yes	156	88(56.4)		82.01	0.002
No	144	103(71.5)			

DISCUSSION

Malaria infection during pregnancy is a significant public health problem with substantial risks for the pregnant woman, her fetus and the newborn child. The result of this study showed that malaria infection is prevalent (P>0.05) among the pregnant women in Mbaitoli Local Government Area. The overall prevalence of 63.7% (table 1) observed in this study, is high, disturbing and constitute a major health threat among pregnant women in the area. Pregnancies in women living in malaria endemic region, particularly in Sub-saharan Africa are associated with a high frequency and density of malaria parasite, with high rates of maternal morbidity (Niganda and Romero, 2003). This prevalence of 63.7% is high when compared with the results obtained from other parts of Nigeria. Bello and Ayede., (2019), Ejike *et al*., (2017), Okoroiwu and Umar, (2019) and Shaibu *et al*.,(2019) obtained 4.3%, 40.0% ,37.0% and 60.0% in their respective studies. It is however, low when compard with the studies by Abdullahi *et al*., (2020), Maureen *et al*., (2016) and Iwuchukwu and Vincent (2021) who revealed 72.0% ; 66.7% and 65.6% respectively. The relatively high prevalence rates of malaria infection among pregnant women in the area, may not be as a result of the development of low levels of acquired anti-malaria immunity among them, but could be attributed to decreased malaria awareness among women of child-bearing age in the area .

Moreso, other studies, for example Adefioye *et al*., (2007) and Nwagha *et al*., (2009) reported high prevalences of 72.0% and 60.0% respectively. The cause of high prevalence of malaria in pregnancy is unknown but studies by Okpere *et al*., (2010) have explained this increased risk to be due to changes in the cellular immune responses that otherwise should offer protection, and increased attractiveness of the pregnant mothers to mosquitoes. In addition, cellular immune responses change, result from the increased level of circulating maternal steroids in pregnancy. This has caused pregnant women to attract twice the number of mosquitoes compared with their non-pregnant counterparts (Lindsay *et al*., 2000).

The variations in the reported prevalences may be attributed to the skills and experiences of the laboratory personnels in preparation , staining and reading of the blood films (Agomo *et al*., 2009) . Other factors that may have contributed to the differences in prevalence rates could be due to several environmental factors such as socio-economic condition of the study population, level of exposure, disparities in nutritional status and unhygienic living conditions (Worral *et al*., 2003). Ignorance , level of education of the people (Anthonio-Nkonjio *et al*., 2006)

This study has shown that age of the pregnant women, educational status, occupational status, stagnant water around residence, overgrown weeds/bushes around houses, not using of mosquito insecticide mosquito nets, staying late-night outside and not attending antenatal care and health education were the predisposing/risk factors associated with malaria infection among pregnant women in the area. However, covering of wrapper during sleeping never made any significant difference in malaria infection among the women which suggested that women and every other body should not use wrapper in place of mosquito insecticide treated net.

Not using Insecticide Treated Net, increases the chances of malaria infection during pregnancy. Indeed, World Health Organization and President's Malaria Initiatives have advocated for a three-pronged approach to eradicate and prevent malaria infection and one of the strategies is the use

of insecticide treated net(WHO,2017). The result of this assessment, moreover, was in agreement with work done in Malawi (Boudova *et al*.,2015). The studies in Nigeria (Okoroiwu & Umar, 2019) and Arbaminch, Ethiopia (Nega *et al*.,2015) buttressed the effectiveness of use of insecticide treated nets by reporting in their different revelations that use of bed nets has a significant impact on decreasing malaria infection. The possible explanation for this association could be that nets effectively reduce human-mosquito contact which can prevent malaria infections.

The relationship between the ages of the pregnant women and prevalence of malaria parasite is shown in table 2, which showed that there were more infections (73.5%; P = 0.001) in the 26-30 years age group while 21-25 years age cohort recorded an infection rate of 63.4%. Meanwhile, 61.4% of those in 18-20 years age group were infected. 31-35 years age group had 54.5% while 36-40 years has 50.0%. This observation is not in agreement with the statement made by WHO, (2000), that malaria infection is significantly high in pregnant women within the age bracket of 36-39 years and are more susceptible, which may be due to declining immunity as a result of their ages. Further saying, it could also be attributed to their nutritional standards, type of population and level exposure. Nevertheless, this did corroborate the work of Anthonio-Nkonjio *et al*.,(2006), who posited that younger women(21-30) appeared to be more susceptible to malaria infections by recording a prevalence of 68.8% among the age group of 21-25 years old , and this has the support of Dicko *et al*., (2003) who opined that adolescents and young adult pregnant women were more susceptible to malaria infection than the older ones, due to continuous development of immunity against malaria in older women. Moreso, in laying credence to this age relationship, Shaibu *et al*.,2019 discovered highest prevalence among 15 years and below and Bello *et al*.,2019 revealed highest prevalence among age-bracket of 25-29 years pregnant women in Ibadan. While, Ejike *et al*.,2017 had highest prevalence of 60.0% among the age group of 15-20 years of pregnant women in Aba South LGA, Abia state, as Maureen *et al*.,2016 and Iwuchukwu & Vincent discovered highest prevalence of 73.8% and 61.9% among age-groups of 26-30 and 26-35 years respectively.

In conclusion, the burden of malaria infection among pregnant women in Mbaitoli Local Government Area is significant across the various examined depended variables which implies that malaria remains one of the highest prevalent diseases facing pregnant women., hence, effort should be geared towards improving their environmental conditions and educational backgrounds. Moreso, insecticide treated mosquito nets should be provided. Also the Federal government administration and the local government area should not only target the treatment of the age groups, but by creating more awareness on the importance of sleeping under insecticide treated nets, keeping the surroundings clean and attending antenatal care and health education programmes . Nevertheless, early antenatal booking for effective monitoring and prompt treatment of malaria infection in pregnancy will contribute significantly in reducing maternal morbidity and mortality due to malaria infection.

REFERENCES

Abdulazeeze M.A., Oderinde G.P., Abdullahi M.S., Aminu, A., Mudassir L.(2020) Analysis of Haematological indices of pregnant women attending antenatal care in general Hospital Dutsin-Ma, Katsina State.   Asian Haematological Research Journal, 3(4):*34-40*

Adefioye O.A., Adeyeba O.A., Hassan W.O.& Oyeniran O.A.(2007). Prevalence of Malaria   parasite infection among pregnant women in Osogbo, Southwest, Nigeria. *American-Eurasian* Journal of Scientific Research, 2(1): 43-45.

Agomo O.C., Oyibo A.W., Anorlu I.R.& Agomo U.P.(2009). Prevalence of malaria in Pregnant women in Lagos, Douthwest, Nigeria. Korean Journal of Parasitology, 47(2): 179-183.

Andy E., Grace O.& Esther F.A.(2018). Malaria in pregnancy: Two-year prevalence among Women attending antenatal clinics in a Nigerian hospital. African Journal of Midwifry & Women's Health, vol.12(3)

Anthonio-Nkonjio C., Kerah C.H.F., Simard P., Awono-Ambene C.C.M.,Tchuinkan T., Fontenille D.(2006). Complexity of malaria transmission. Journal of Medical Entomology, 41:1215-1221

Ayanlade A., Adeoye N.O., Babatimehin. (2010). Climate change variability and malaria transmission in Sub-Saharan Africa:A case of Nigeria; In :An International Conference on the occasion of the 25th anniversary of the Royal Norwegian Society of Sciences and Letters, Trondhein, Norway, 21-24

Bello F.A. & Ayede A.I.(2019). Prevalence of malaria parasitaemia and the use of malaria prevention measures in pregnant women in Ibadan, Nigeria. Ann.Ib.Postgrad. Med. 17(2):124-129

Boudova S., Divala T., Mawindo P., Cohee L., Kalilani-Phiri L., Thesing, P.(2015). The prevalence of malaria at first antenatal visit in Blantyre. Malar. J. 14(1*):*422.

Buhari H.A., Erhabor O., Momodu I.(2016). Plasmodium falciparum malaria among pregnant
Women attending antenatal clinic in Sokoto, North Western Nigeria. Journal of Medical Laboratory Science, 1(1):187-193.

Chico R.M., Mayaud P., Ariti C., Mabey D., Ronsmans C., Chandramohan D. (2012). Prevalence of malaria, sexually transmitted and reproductive tract infections in Pregnancy in sub-Saharan Africa. JAMA. 307:2079-86*.*

Dicko A., Mantel C., Thera M., Doumbia S.& Diallo M.(2003). Risk factors for malaria infection and anaemia for pregnant women in the Sahel area of Bandiagara, Mali. Acta.Trop., 89:17-23.

Ejike B.U., Ohaeri C.C., Amaechi E.C., Ejike E.N., Okike-Osisiogu F.U., Irole-Eze O.P., Belonwu A.C.(2017). Prevalence of malaria (falciparum malaria) amongst pregnant Women in Aba South LGA, Abia State, Nigeria. Nigerian Journal of Parasitology, 38(1):48-52

Grima B.G.(2020). Prevalence and associated factors of malaria among pregnant women in
Sherkole district, Berishanful Gumuz Regional State, West Ethiopia. BMC Infectious Diseases, vol.20(1)*:*573; doi:10.1186/s12879-020-05289-9

Igiri B.E., Paul C.I., Igwo B.O., Ofonime M.O., Okodurwa S.I.R., Gabriel C.E(2018). Prevalence of malaria and available practice for its prevention among patients with Febrile illness attending Ahmadi Bello University Teaching Hospital, Zaria, Nigeria. Public Health and Preventive Medicine, 4(2):44-45

Iwuchukwu I.C & Vincent C.N.(2021). Studies on the prevalence of malaria and its adverse Fetal outcomes in Federal Medical Center(FMC), Owerri, Imo State, Nigeria. Archives of Community Medicine and Public Health,7(2):151-163.

Kades A.S., Okon K.O., Alkali M., Jibrin Y.B., Balogun S.T., Baffa M.A., Dattijo L.M. (2019). Low prevalence of asymptomatic malaria in pregnancy among subjects attending antenatal clinic at a tertiary Hospital in Bauchi, Nigeria. A preliminary report. Journal of Advance in Medicine and Medical Research, 29(4):1-8.

Kimberly E.M., Paul M.A., Naomi W.L. & Kathrine R.T.(2019). Malaria Surveillance. Surveillance summaries, 68(5):1-30.

Lindsay S., Ansell I., Selman C., Cox V., Hamilton K. & Walraven G.(2000). Effe of pregnancy on exposure to malaria mosquitoes. Lancet, 355(9219): 1972-1975

Maureen D.F., Grace C.R.B., Gloria O.A.(2016). Prevalence of malaria parasitaemia among Pregnant women attending three selected Health Centers in Ideato South LGA, Imo State. Obstet Gynecol Inte J. 4(3):0-0111

Murphy S.C. & Breman J.G. (2001). Gaps in the childhood malaria burden in Africa: cerebral malaria, neurological sequelae, anaemia, respiratory distress, hypoglycemia and complications of pregnancy. American J Trop Med Hyg. 64 : 57-67.

Mwangagia J.M., Mbogo C.M., Muturi E.J., Nzovu J.G. & Githuri J.I. (2007). Spatal Distribution and Habitat Characterization of *Anopheles* larvae along the Kenya Coast. Journal of Vector Borne Diseases, 44:44-51.

Naing L., Winn T. & Rush B.N.(2006). Practical issues in calculating the sample size. Archives of Orofacial Sciences, 1:9-14.

National Malaria Elimination Programme (NEMP)(2015). Nigeria Malaria Indicator Survey 2015, Abuja, Nigeria.

Nega D., Dana D., Tefera T., Eshetu T.(2015). Prevalence and predictors of asymptomatic Malaria parasitaemia among pregnant women in the rural surroundings of Arbaminch town, South Ethiopia. PLos one, 10(4):eo123630

Niganda G. & Romero M.(2003). Women's opinion on antenatal care in developing countries. BMC. Public Health, (3): 17.

Nwagha U.I., Ugwu V.O.,Nwagha T.U. &Anyaehie U.S.B.(2009). Asymptomatic plasmodium parasitaemia in pregnant Nigerian women: almost a decade after Roll Back. Malaria. Trans. Roy. Soc. Trop.Me.Hyg.,103:16-20.

Ochei J., Kolhatkar A.(2008). Theory and Practice: In Medical Laboratory Science.

Ohalete C.N., Dozie I.N.S,. Nwachukwu M.I., Obiukwu C.E. (2011). Epidemiology and Economic consequences of malaria in pregnant women, Imo State, Nigeria. African Journal of microbiology Research, 5:3895-3900, 9th Print, New Delhi: Tata McGraw-Hill Publishing Company Limited: Pp 960-969.

Okpere E.E., Enabudoso E.J. & Osemwenkha A.P.(2010). Malaria in pregnancy. Nigerian Medical Journal, 51(3): 109-113.

Okoroiwu G.I.A & Umar S.A.(2019). Prevalence of malaria parasites in pregnant women in Abaji Area Council, FCT, Abuja, Nigeria. Noun Journal of Physical and Life Sciences, vol.

Okwa O.O., Akinmolayan F.I., Cartar V. & Hurd H. (2009). Transmission Dynamics of malaria in four selected ecological zones of Nigeria in the rainy season. Analysis of African Medicine, vol.8(1):1-9.

Oluwagbemiga O.A., Bamidele A., Babatunde A., Rahman O. (2018). Prevalence of malaria in Pregnant women attending antenatal clinic in primary health centers in Lagos, South West , Nigeria. Journal of Advances in Medicine and Medical Research, 25(12): 1-9.

Onyenekwe C.C., Meludu S.C., Dioka C.E. & Salimonu L.S. (2002). Prevalence of Asymptomatic malaria parasitaemia amongst pregnant women in Nnewi, South-east, Nigeria. Indian J Malarial., 39(3-4):60-65.

Raimi O.G. & Kanu C.P.(2010). The prevalence of malaria infection in pregnant women living in a suburb of Lagos, Nigeria. African Journal of Biochemistry Research, vol.4(10):243-245.

Samaila A.B., Uchendu S.C., Yarma A.A.(2017). Prevalence of plasmodium falciparum Malaria in pregnant women and non-pregnant women attending specialist hospital Bauchi, Bauchi State, Nigeria. Palgo Journal of medicine and medical sciences, 4(1): 139-144.

Shaibu A.M., Aliyu K., Igiri B.E., Otori M.O., Shaibu A.R.(2019). Prevalence of malaria among pregnant women attending Ahmadu Bello University Medical Center, Zaria, Kaduna State. FUDMA Journal of Science, vol. 3(3): 95-101.

Steketee R.W., Nahlen B.L., Parise M.E. & Menendez C. (2001). The burden of malaria in pregnancy in malaria endemic areas. Am J Trop Med Hyg. 64: 28-35

Taura D.W. & Oyeyi T.I. (2009). Prevalence of malaria parasite in pregnant women attending Sir Muhammad Sunusi Specialist Hospital, Kano, Nigeria. Bayero Journal of Pure and Applied Sciences, vol2(1):186-188

Wogu M.N & Nduka F.O.(2018). Evaluating malaria prevalence using clinical diagnosis Compared with microscopy and rapid diagnostic tests in a tertiary health car Facility in Rivers State, Nigeria. Journal of Tropical medicine, 4:5-10.

Worral E., Basu S. & Hanson K.(2003). Is Malaria a disease of Poverty? A review of the Literature. Tropical Medicine & International Health, 10(10): 1047-59.

World Health Organization.(2000). Bench Aids for Malaria Microscopy. 1-12

World Health Organization (2010). World Malaria Report

World Health Organization (2013). World malaria report. Geneva.

World Health Organization (2016). Malaria factsheets 2016.

World Health Organization (2017). Malaria in pregnancy.

Yartey J.E.(2016). Malaria in pregnancy. Access to effective interventions in Africa. Inter Journal of Gynecology and Obstetrics, 95: 364-373.