International Scholars Journals

International Journal of Public Health and Epidemiology ISSN 2326-7291 Vol. 4 (8), pp. 189-194, August, 2015. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Prevalence of malaria parasitaemia and related anaemia among pregnant women in a semi-urban community Nigeria

[1]Akpan M. O. Edet, [2]Ahmed M. S and [1]Nathan B. Vincent

[1]Department of Medical Microbiology and Parasitology, University of Ibadan, Ibadan, Nigeria.
[2]Department of Biological Sciences, Faculty of Science, Lagos State University, Ojo, Nigeria.

Accepted 24 July, 2015

The study was carried out to ascertain the incidence of malaria parasitaemia and associated anaemia among pregnant women in a semi-urban community nine years after commencement of roll back malaria (RBM) initiative. The study was hospital-based among pregnant women attending antenatal clinic at a central hospital. Structured questionnaires were administered containing relevant information on age, educational level, number of previous pregnancies and methods used for malaria control. Thick and thin blood films from capillary blood were stained with Giema's stain and examined microscopically for malaria parasites. Packed cell volume (PCV) and blood groups were also carried out while body temperatures were measured using mercurial thermometers. Ethical clearance and informed consents were appropriately obtained. Data was analysed using Epi info 6 statistical software. The incidence of malaria parasitaemia was found to be 308 (42.4%); *Plasmodium falciparum* and *Plasmodium malariae* accounted for 302 (98%) and 6 (2%) of the isolates respectively. Anaemia was detected in 221 (71.6%) of the subjects with malaria parasites (P< 0.001). The rate of use of insecticide treated bed nets (ITNs) was 165 (22.7%) with a significantly lower rate of infection (22.2%) among them compared to other control methods (P< 0.001); there was a corresponding significantly higher rate of infection 253 (67.1%) among the uneducated compared to the educated (P< 0.001). Malaria is still a major health problem among pregnant women in Otukpo. Efforts should be intensified towards provision of insecticide treated bed nets (ITNs) and provision of adequate facilities for formal and informal adult education.

Key words: Malaria, parasitaemia, insecticide treated bed nets, pregnant women, Nigeria.

INTRODUCTION

Although quite extensive work has been done on malaria parasite ranging from prevention and control, clinical and laboratory diagnosis, treatment, pathology and patho-genesis, epidemiology and genetic sequencing (Harding et al., 2004; Wang et al., 2006a; Deressa et al., 2008) the disease still continues to bring so much pain and sorrow to several families on the African continent and beyond (Gerritsen et al., 2008; Uneke, 2007; Wang et al., 2006b). Sub-Saharan Africa presently accounts for about 70% of the disease burden worldwide and her pregnant women, children, HIV infected individuals constitute the most vulnerable groups (Dunyo et al., 2006; Tejiokem et al., 2007; Sarkar et al., 2009). Malaria from the western countries is usually as a result of importation from the tropical and subtropical regions of the world where it is endemic (Bunn et al., 2004; O'Brien et al., 2006). In Lagos, Nigeria (Anorlu et al., 2001) the prevalence of malaria

*Corresponding author. E-mail: akpanedet1@ui.edu.ng

among 477 pregnant women studied was 44.2% in primigravida and 33.6% in multigravida with 73.6% of them being anaemic; and in Enugu (Ejekindo et al., 2006) 21.3% prevalence of malaria was recorded among the 108 ante-natal women studied. Findings from Cambodia (Incardona et al., 2007) showed the prevalence of *Plasmodium falciparum* parasitaemia to be 12.3% and in Zanzibar (Msellein et al., 2009) 36.0%. Reports from Papua, New Guinea (Pluess et al., 2009), India (Singh et al., 2009) and Bangladesh (Haque et al., 2009a) have as well corroborated varying but high rate of malaria infections among their respective communities. The strong association of anaemia in pregnancy with malaria from most parts of developing world has severally been documented while control of anaemia in pregnancy has been laid largely on effective control of malaria parasitaemia (Bunn et al., 2004; O'Brien et al., 2006; Anorlu et al., 2001; Ekejindo et al., 2006).

In Nigeria, the main strategy for reducing malaria morbidity and mortality among pregnant women as adopted by the Nigerian Ministry of Health is malaria prophylaxis, intermittent preventive treatment, use of insecticide treated bed nets, presumptive treatment of all fevers with antimalarial drugs. This is in line with the World Health Organization (WHO) recommendation for endemic countries where the availability and use of laboratory facilities are in short supply and also in line with the ongoing 'roll back malaria' (RBM) initiative (Jombo et al., 2009, 2010). The renewed commitment of the world's health community towards malaria eradication from the globe has given the disease more prominence then ever before (United Nations, 1999; Attaran, 2001). Also, the rededication of African leaders towards the malaria control initiative has further domesticated the struggle and placed Africa perfectly in the direction of this global wind of change (Attaran, 2001; Teklehaimanot and Snow, 2002; The Abuja Declaration, 2000). Since Africa's malaria decade has now passed, the need to assess its impact on malaria control among her most vulnerable groups becomes imperative (The Abuja Declaration, 2000; Nabarro and Tayler, 1998). The findings from this study would be useful to assess the impact of the disease in the community and also evaluate the outcome of the implementation of the malaria decade in a typical African community (Attaran, 2001; Nabarro and Tayler, 1998). Hence this study was conducted.

MATERIALS AND METHODS

Study area

The study was carried out in Otukpo, a semi-urban community in Benue state of north –central Nigeria. It is located in the Savannah zone between latitude 7°, 20' N and longitude 8°, 12' W, and latitude 7°, 30' S and longitude 8°, 20' E with annual rainfalls of about 1650 mm from April to October. Based on the 2006 population census, the town is estimated at 600,000 inhabitants, at least 95% are of Idoma ethnic group while the remaining 5% is shared among the Ibos, Yoruba, Tiv, Hausa and Igede ethnic groups. The major occupations of the inhabitants are farming, business, civil service and petty trading while a few others are artisans. Over 95% of the people are the inhabitants of Otukpo are Christians while the remaining practice either traditional religion or Islam.

Sampling procedure, sample collection and procedure

Pregnant women attending ante-natal clinic at General hospital Otukpo between March and August 2009 were consecutively recruited for the study. All the willing subjects were recruited into the study. Structured questionnaires were administered to the respondents and information on age, occupation, marital status, number of previous pregnancies, number of children, mosquito control methods and educational levels were obtained. Blood samples were collected, processed, and examined for malaria parasites and haematological profiles by experienced technologists. Capillary blood samples were collected with the aid of sterile lancet and thick and thin blood films on a clean glass slide were prepared (Anorlu et al., 2001). These were Giemsa stained, air dried and examined microscopically. Heparinized haematocrit tubes were used to collect capillary blood which was sealed using a Bunsen burner flame and centrifuged at 3000 rpm for 5 min in a haematocrit machine and packed cell volume (PCV) was measured (Anorlu et al., 2001). The blood group of subjects was carried out with corresponding antisera on a white tile. Body temperatures were measured from the axilla using mercurial thermometers. Subjects with were positive for malaria parasites and or with low PCV were referred to the clinic for appropriate treatment by medical personnel. Inclusion criteria- pregnant women at all stages of pregnancy who volunteered to enrol for the study.

Exclusion criteria- non-pregnant women and also pregnant women who declined to enrol for the study.

Ethical considerations

Ethical approval for the study was obtained from the Benue State Ministry of Health, confidentiality of information from subjects was maintained while well informed consents were obtained from subjects before enrolment into the study.

Data management and analysis

Data obtained was analysed using Epi info 6 statistical software; Pearson's Chi squared test or Mantel-Haenszel were used to determine associations with a P-value of ≤ 0.05 accepted as significant. Fisher's exact test was calculated for borderline significance and for cells with counts less than five. Analysis of variance (ANOVA) was used to determine the predictors for malaria parasitaemia among the respondents (Folande et al., 2005). Qualitative data was analysed using MAXQDA software.

RESULTS

A total of 726 ante-natal women were studied during the period under review with age range of 16 to 46 years, the mean age was 28 with a bi-modal age of 24 and 31. Those aged 10 to 19 years were 3.4% (n = 25); 20 to 29, 71.8% (n = 571); 30 to 39, 24.2% (n = 176); and 40 to 49, 0.6% (n = 4). The occupation of 85 .0% (n=617) of the women

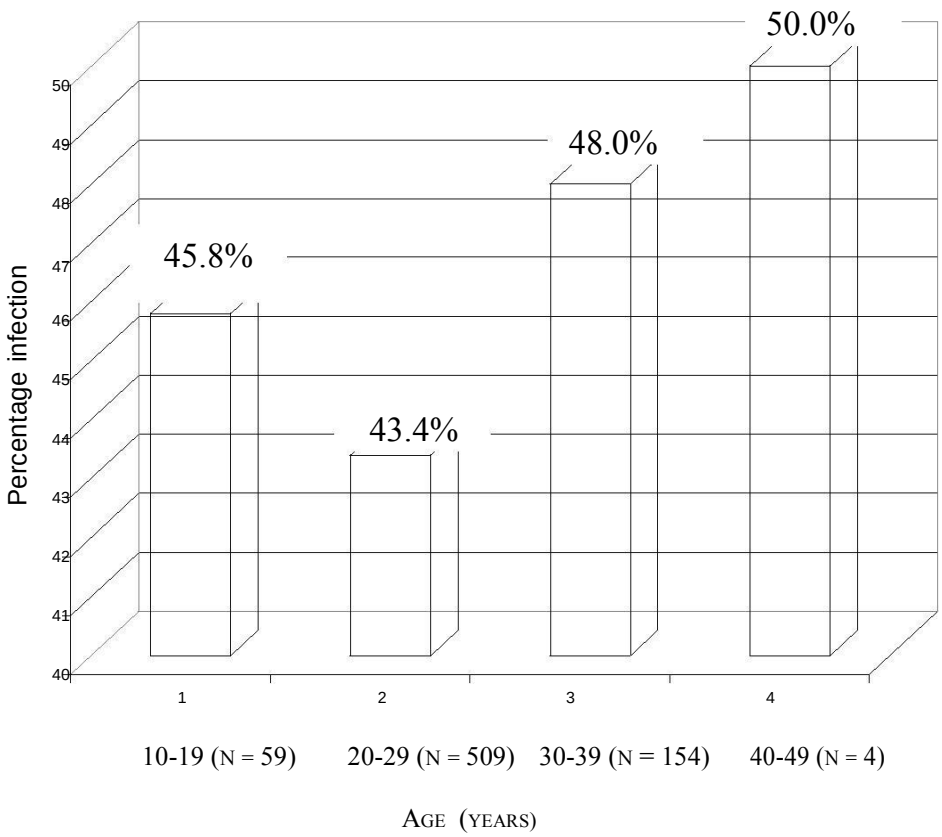

Figure 1. Incidence of malaria parasitaemia in relation to age distribution pattern among pregnant women in Otukpo and environs, north-central Nigeria in 2009. n= total number of subjects in each age interval. X^2 (Mantel Haenszel) = 0.12, OR = 1.09, RR = 1.03, P> 0.05.

women was farming, 6.5% (n = 47) Petty trading, and 8.5% (n = 62), others. The incidence of malaria parasitaemia was found to be 42.4% (308/726), 98.0% (n = 302) and 2.0% (n = 6) were *P. falciparum* and *Plasmodium malariae* respectively; 41.0% (86/210) and 43.1% (222/516) of the primids and multigravids were respectively infected with malaria parasites, [X^2 (Mantel Haenszel) = 0.03, OR = 1.05, RR = 1.01, P> 0.05]. Based on age distribution pattern of the respondents; 45.8% (27/59) of those aged 10 to 19 years were infected; 43.4% (221/509) , 48.0% (74/154), and 50.0% (2/4) of those aged 20 to 29, 30 to 39, and 40 to 49 years were respectively infected, (P> 0.05) (Figure 1). Analysis of the rate of anaemia vis-à-vis rate of malaria parasitaemia among the respondents showed that: 71.6% (221/308) and 10.3% (43/418) of those infested with malaria parasites and those with out were respectively anaemic (PCV< 28.0%) [X^2 (Mantel Haenszel) = 34.81, OR = 0.14, RR = 0.64, P< 0.001]. A review of the distribution of fever among the respondents showed that: 73.0% (11/15) and 27.0% (4/15) of those who had fever (axillary temperatures > 36.5°C) and those with out, were infested with malaria parasites, [X^2 (Mantel Haenszel) = 14.40, OR = 0.37, RR = 0.73, P< 0.001]. Based on malaria control methods among the 726 respondents, it was found that: 22.7% (n = 165) used insecticide treated bed nets (ITNs); 32.6% (n = 237) used untreated bed nets (UTNs); 23.6% (n = 171), nil control method; 3.9% (n = 28), burnt mosquito coil; 11.4% (n = 83) sprayed insecticides; and 5.8% (n = 42) used local methods. Of the 165, 237, and 171 respondents who used ITNs, UTNs, and nil control; 22.2% (n = 36), 37.5% (n = 89) and 48.0% (n = 82) were respectively infested with malaria parasites, while 37.0% (n = 10), 29.0% (n = 24), and 50.0% (n = 21) of those who burnt mosquito coil, sprayed insecticide, and those who used local control methods were respectively infested, (P< 0.05) (Figure 2).

Sources of ITNs among the 165 respondents who owned it were: 157 (95.2%) bought it at a health facility, 7 (4.2%) were given free at a hospital or clinic, and 1 (0.6%) as a gift from relation. A review of association of blood group with malaria parasitaemia showed 43.3% (57/123), 50.0% (9/18), 30.2% (32/106) and 45.8% (215/470) of those whose blood group were A, AB, B and O were respectively infected with malaria parasites, (P> 0.05) (Figure 3). Of the 377 respondents who were uneducated (those who did not have at least ordinary level school certificate), 67.1%

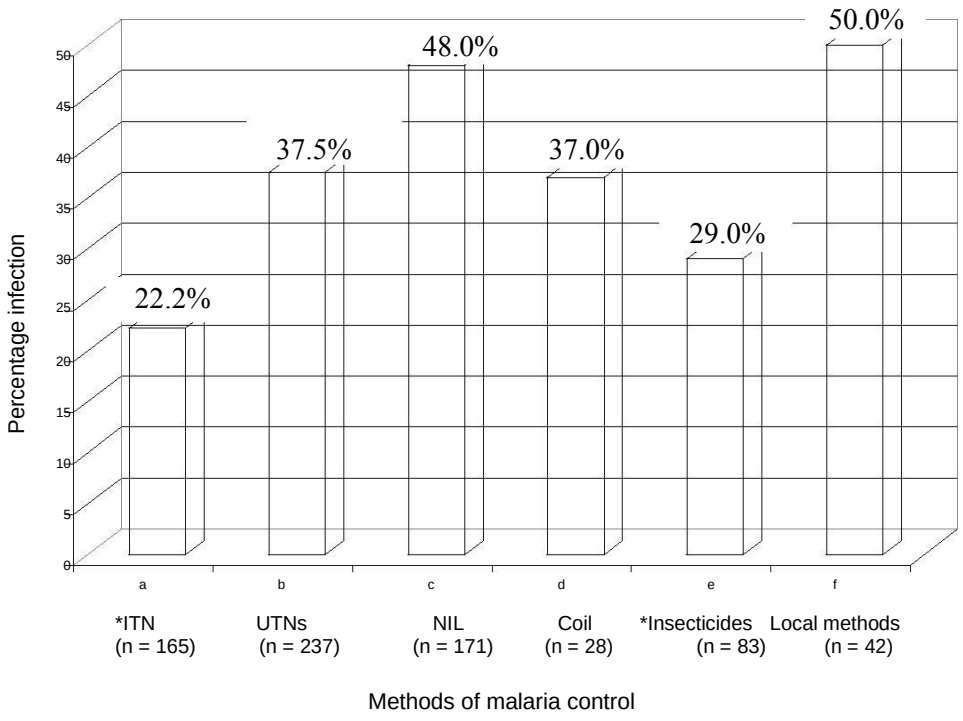

Figure 2. Rate of malaria parasitaemia and methods of control among pregnant women in Otukpo and environs, north-central Nigeria in 2009. Key: n = total number of subjects in each group; ITNs = insecticide treated bed nets; UTNs = untreated bed nets; *= P < 0.05.

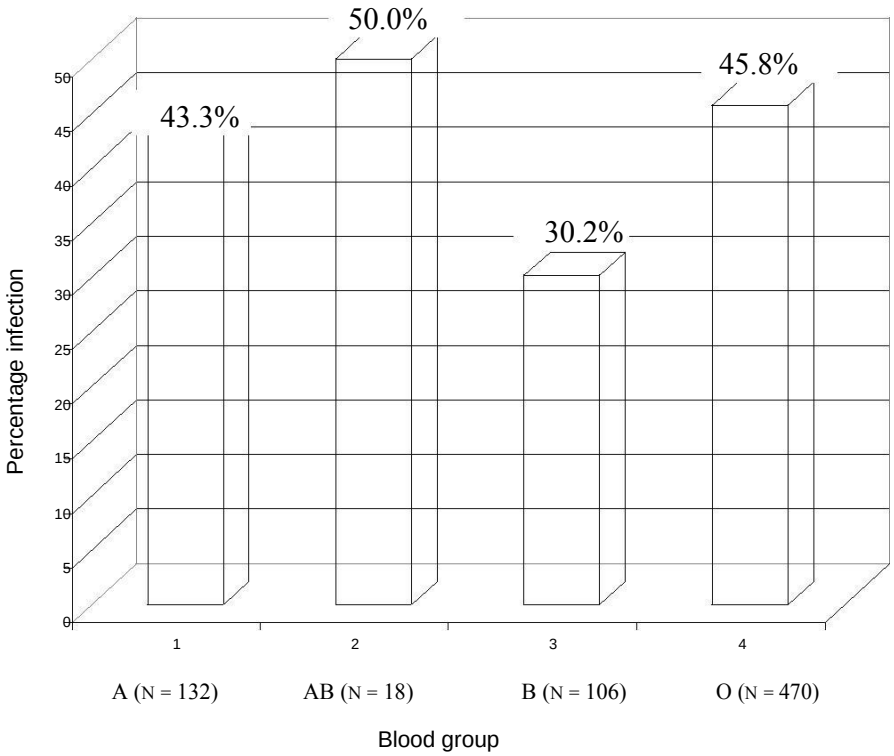

Figure 3. Blood group and rate of malaria parasitaemia among pregnant women in Otukpo and environs, north-central Nigeria in 2009. X^2 (Mantel Haenszel) = 0.03, OR = 1.05, RR = 1.01, P> 0.05; n = total number of subjects in each group.

(253/377) were infected with malaria parasites compared to 8.9% (11/123) and 12.9% (7/54) infection rates among the secondary and tertiary attainders (P< 0.001). There was however no confirmed incidence of maternal death attributed to malaria during the study period.

DISCUSSION

This study aims at assessing the impact of the decade long antimalarial crusade under the RBM initiative in Otukpo community and also offer meaningful suggestions for improvement. The incidence of malaria parasitaemia in Otukpo and environs was found to be 42.4% and associated anaemia 71.6% while another 10.3% without malaria parasites had anaemia (P< 0.001). The high rate of malaria in Otukpo and environs shows that there is need to take the control of the disease more seriously in the community. This is to domesticate the renewed drive to, if possible, wipe out malaria from the African continent (United Nations, 1999; Attaran, 2001; Teklehaimanot and Snow, 2002). Even though there has not been any documented report on malaria burden in the community to comprehensively assess the impact of Africa's malaria decade on the community, the present research findings nevertheless show that malaria is still a major health problem in the community (Anumudu et al., 2007). The findings from this study also point to the fact that implementation of RBM initiative in the community failed to create the desired impact on the target population. The high malaria load witnessed in the present study compares favourably with that of Adah et al. (2009) in Jos who reported 57.3% prevalence (Adah et al., 2009; Anumudu et al., 2007) in Ibadan who reported a higher figure of 78% malaria parasitaemia (Anumudu et al., 2007; Uneke et al., 2008) in Abakaliki who recorded a lower prevalence of 19.7% malaria parasitaemia among pregnant women at child birth (Uneke et al., 2008). Similarly, Ofori et al. (2009) in Ghana reported a lower figure of 19.7% malaria parasitaemia and 35.9% malaria parasites in the placentas of pregnant women (Ofori et al., 2009). Okoko et al. (2002) in Gambia who reported a higher figure of 51.1% prevalence of placental malaria among pregnant women (Okoko et al., 2002). The burden of malaria across Africa as it is in Otukpo and environs is still a major health issue and calls for a more concerted multisectoral approach. This may include the media, NGOs, government, health personnel as well as philan-thropic individuals and donor agencies. Malaria was found to contribute significantly to the anaemic status (71.6%) of the pregnant women in the present study (P< 0.001). The findings from this study clearly unfold the impact of anaemia associated with malaria on maternal and child health in the community. Reduction of maternal morbidity and mortality among pregnant women due to anaemia would therefore require going beyond regular administration of haematinics and iron supplements as is often the practice, to a holistic approach towards malaria control among the vulnerable groups including pregnant women (Kagu et al., 2007; Mbonye et al., 2006; Otten et al., 2009).

The influence of malaria on the impact of anaemia among pregnant women has been well documented in Enugu, Lagos, and parts of northern Nigeria (Ekejindu et al., 2006; Anorlu et al., 2001; Isah et al., 1985). The inclusion of haematinics in the treatment of malaria by, especially, health personnel, at the local and district levels of health care delivery needs to be re-emphasised. The strong association (73%) of malaria with fever (P< 0.001) among the pregnant women points to the advantage of empirical treatment in the management of fever among them especially where facilities for prompt diagnosis are also lacking. Methods adopted by the respondents in the control of malaria included: ITNs (22.7%); UTNs (32.6%); mosquito coil (3.9%), no control (23.6%), spray insecticides (11.4%); and local methods (5.8%). The low ownership and use of ITNs which is a cardinal tool for the success of the present RBM initiative could rightly be considered an important factor behind the high malaria rate recorded in the present study (Curtis et al., 2003). The significantly low rate (22.2%) of malaria parasitaemia (P< 0.05) among those who used ITNs compared to other methods in the present study stresses the great importance of this control tool. More funds should be devoted to the procurement and distribution of ITNs to the most vulnerable groups including children (Winch et al., 1994). The poor utilization of ITNs in Kenya was also strongly implicated in the high rate of malaria burden in several parts of the country (Deressa and Ali, 2009). Over 67% of the uneducated were infected by the malaria parasites compared to 8.9 and 12.9% recorded among those who attended secondary and tertiary education respectively (P< 0.001). A recent statistics quoting over 46% of the Nigerians being illiterate (Daily Champion, 2009) should be a wakeup call for government to step up her both formal and informal adult literacy activities. Establishment of literacy classes at markets, churches, mosques and other regular rural gatherings should be important avenues to reach out to the nation's uneducated population. Inclusion of health education in the literacy campaigns would help reduce the spread of infectious diseases including malaria (Gessler et al., 1995; Julvez et al., 1995; Gedif and Hahn, 2002).

The findings from the present study are however different from that of Mboera et al. () in Tanzania where effective utilization of ITNs was accompanied by a near 100% reduction in malaria cases; Clarke et al. (2003) in Gambia where ITNs utilization was found to be a routine in most households with low malaria incidence; and Sievers et al. (2008) in Rwanda where implementation of community-based malaria control programme with increased distribution of ITNs brought down malaria sharply in the community (WHO, 2004; Clarke et al.,2003

Sievers et al., 2008). Similar feats associated with ITNs utilization were also documented in Bangladesh (Haque et al., 2009b). Logistic support to weak African institutions saddled with the responsibility of actualising the RBM target and that of the MDGs could be strengthened by the multinational key players in these projects. This could be through, in addition to making funds and ITNs available assist in the orderly and equitable distribution of the facility in both rural and urban communities most in need (Noor et al., 2008; Esse et al., 2008). In conclusion, the present study has shown that implementation of RBM programme in Otukpo town is yet to attain appreciable impact on the community as malaria is still a major health problem in the community and its environs as well as its associated anaemia. Efforts should be strengthened and necessary logistics put in place in order to make ITNs readily available and adequate sensitization and public enlightenment of the most vulnerable groups on their benefits and methods of application. Also, serious efforts should be made towards provision of facilities for both formal and non formal education for the people with important components of health education. Finally, malaria prophylaxis with appropriate ACT should be emphasised in the community among pregnant women while such drugs be made available for free delivery to the most vulnerable groups.

REFERENCES

Adah OS, Ngo-Ndomb T, Envuladu EA, Audu S, Banwat ME, Yusuff OT, Zoakah AI (2009). Home management of malaria among under fives presenting with fever in PHC facilities in Jos North LGA of Plateau state. Niger J. Med., 18 (1): 88-93.

Anorlu RI, Odum CU, Essien EE (2001). Asymptomatic malaria parasitaemia in pregnant women at booking in a primary health care facility in a periurban community in Lagos, Nigeria. Afr. J. Med. Med. Sci., 30: 39-41.

Anumudu CI, Okafor CMF, Ngwumohaike V, Afolabi KA, Nwuba RI, Nwagwu M (2007). Epidemiological factors that promote the development of severe malaria anaemia in children in Ibadan. Afr. Health. Sci., 7 (2): 80-85.

Attaran A (2001). Panel should be set up to review malaria control proposals from endemic countries. B.M.J, 322: 174.

Baragatti M, Fournet F, Henry MC, Assi S, Ouedraogo H, Rogier C, Salem G (2009). Social and environmental malaria risk factors in urban areas of Ouagadougou, Burkina Faso. Malar. J., 8: 13.

Biritwum RB, Welback J, Barnish G (2000). Incidence and management of malaria in two communities of different socio-economic levels in Accra, Ghana. Ann. Trop. Med. Parasitol., 94: 771-778.

Bunn A, Escombe R, Armstrong M, Whitty CJM, Doherty JF (2004). Falciparum malaria in malaria-naïve travellers and African visitors. Q.J.M, 97: 645–649.

Clarke SE, Rowley J, Begh C, Walraven GE, Lindsay SW (2003). Home treatment of malaria in children in rural Gambia is uncommon. Trop. Med. Int. Health, 8 (10): 884-894.

Curtis CF, Jana-Kara B, Maxwell CA (2003). Insecticide treated nets: impact on vector populations and relevance of initial intensity of transmission and pyrethroid resistance. J. Vector. Borne. Dis., 40 (1-2): 1-8.

Daily Champion (Nigeria) (2009). 46 million Nigerians illiterate. Daily Champion Newspapers, 22(212): 37, Friday, 10th October.

Deressa W, Fantahun M, Ali A (2007). Malaria-related mortality based on verbal autopsy in an area of low endemicity in a predominantly rural population in Ethiopia. Malar. J., 6: 128.

Deressa W, Ali A (2009). Malaria-related perceptions and practices of omen with children under the age of five years in rural Ethiopia. B.M.C. Public Health, 9 (1): 259.

Dunyo S, Ord R, Hallett R, Jawara M, Walraven G, Mesa E, Coleman R, Sowe M, Alexander N, Targett GAT, Pinder M, Sutherland CJ (2006). Randomised Trial of Chloroquine/Sulphadoxine-Pyrimethamine in Gambian Children with Malaria: Impact against Multidrug-Resistant *P. falciparum*. PLoS Clin. Trials, 1(3): 14.

Ekejindo IM, Udigwe GO, Chijioke IR (2006). Malaria and anaemia in pregnancy in Enugu, southeast Nigeria. Afr. J. Med. Med. Sci., 35 (1): 1-3.

Esse C, Utzinger J, Tschannen AB, Rose G, Pfeiffer C, Granado S, Koudou BG, N'Goran EK, Cisse G, Girardin O, Tanner M, Obrist B (2008). Social and cultural aspects of malaria and its control in central Cote d'Ivoire. Malar. J., 7: 224.

Folande CO, Ogundiran MO, Bolaji MO, Ajayi IO, Akinboye DO, Oladepo O, Adeniyi JD, Oduola AM (2005). The influence of cultural perception of causation, complications and severity of childhood malaria on determinants of treatment and preventive pathways. Int. Q. Community Health. Educ., 24 (4): 347-363.

Gedif T, Hahn HJ (2002). Treatment of malaria in Ethiopian folk medicine. Trop. Doct., 32 (4): 206-9.

Gerritsen AAM, Kruger P, van der Loeff FS, Grobusch MP (2008). Malaria incidence in Limpopo Province, South Africa, 1998–2007. Malar. J., 7: 162.

Gessler MC, Msuya DE, Nkunya MH, Schär A, Heinrich M, Tanner M (1995). Traditional healers in Tanzania: the perception of malaria and its causes. J. Ethnopharmacol. 48 (3): 119-130.

Haque U, Ahmed SM, Hossain S, Huda M, Hossain A, Alam MS, Mondal D, Khan WA, Khalequzzaman M, Haque R (2009)a. Malaria prevalence in endemic districts of Bangladesh. PLoS One, 4(8): 6737. doi: 10. 1371.

Haque U, Ahmed SM, Hossain S, Huda M, Hossain A, Alam MS, Mondal D (2009)b. Malaria prevalence in endemic districts of Bangladesh. PLoS ONE, 4 (8): 6737.

Harling R, Crook P, Lewthwaite P, Evans M, Schmid ML, Beeching NJ (2004). Burden and cost of imported infections admitted to infectious disease units in England and Wales in 1998 and 1999. J. Infect., 48: 139-144.

Incardona S, Vong S, Chiv L, Lim P, Nhem S, Sem R, Khrim N (2007). Large scale malaria survey in Cambodia: Novel Insights on species' distribution and risk factors. Malar. J., 6: 37.

Isah HS, Fleming AF, Ujah IA, Ekwempu CC (1985). Anaemia and iron status of pregnant and non-pregnant women in the guinea savanna of Nigeria.. Ann. Trop. Med. Parasitol., 79 (5): 485-493.

Jombo GTA, Mbaawuaga EM, Anongu SI, Egah DZ, Enenebeaku MNO, Okwori EE, Ejezie GC, Bassey IE, Odey F (2010a). Africa's 9th malaria day celebration in 2009 and its bearing on her most vulnerable groups. Asian Pacific J. Trop. Med., 3 (4): 294-297.

Jombo GTA, Mbaawuaga EM, Anongu SI, Egah DZ, Enenebeaku MNO, Peters EJ, Utsalo SJ, Okwori EE, Akosu JT (2010)b. Socio-cultural factors influencing Insecticide treated bed net utilization in a malaria endemic city in north central Nigeria. Asian Pacific J. Trop. Med., 3 (5): 402-406.

Julvez J, Hamidine M, Boubacar A, Nouhou A, Alarou A (1995). Malaria knowledge a practice. Medical study in Songhay-Zarma (Niger). Sante, 5 (5): 307-313.

Kagu MB, Kawuwa MB, Gadzama GB (2007). Anaemia in pregnancy: a cross-sectional study of pregnant women in a sahelian tertiary hospital in north-eastern Nigeria. J. Obstet. Gynaecol., 27(7): 676-679.

Mbonye AK, Neema S, Magnussen P (2000). Treatment-seeking practices for malaria in pregnancy among rural women in Mukono district, Uganda. J. Biosoc. Sci., 38 (2): 221-237.

Msellein MI, Martensson A, Rotllant G, Bhattaral A, Stromberg J, Kahigwa E, Gercia M, Petzold M, Olumese P, Ali A, Bjorkman A (2009). Influence of rapid malaria diagnostic tests on treatment and health outcome in fever patients, Zanzibar- A crossover validation study. PLoS. Med., 6(4).

Nabarro DN, Tayler EM (1998). The "Roll Back Malaria" Campaign. Science, 280: 2067-2068.

N'Dao CI, N'Diaye JL, Gaye A, Le Hesran TY (2006). Placental malaria and pregnancy outcome in a peri urban area in Senegal. Rev. Epidemiol. Sannte Publique, 54 (2): 149-156.

Noor AM, Moloney G, Borle M, Fegan GW, Shewehuk CT (2008). The use of mosquito nets and the prevalence of *Plasmodium falciparum* infection in rural south central Somalia. PLoS One, 3 (5): 2081.

O'Brien DP, Leder K, Matchett E, Brown GV, Torresi J (2006). Illness in returned travellers and immigrants/refugees: the 6-year experience of two Australian infectious diseases units. J. Travel. Med. 13:145–152.

Ofori MF, Ansah E, Agyepong I, Ofori-Adjei D, Hviid L, Akanmori BD 2009). Pregnancy-associated malaria in a rural community of Ghana. Ghana Med. J., 43 (1): 13-18.

Okoko BJ, Ota MO, Yamuah LK, Idiong D, Mkpanam SN, Avieka A, Banya WA, Osinusi K (2002). Influence of placental malaria infection on foetal outcome in The Gambia: Twenty years after Ion Mcgregor. J. Health Popul. Nutr., 20(1): 4-11.

Otten M, Aregawi M, Were W, Karema C, Medin A, Bekele W, Jima D, Gausi K, Komatsu R, Korenromp E, Low-Beer D, Grabowsky M (2009). Initial evidence of reduction of malaria cases and deaths in Rwanda and Ethiopia due to rapid scale-up of malaria prevention and treatment. Malar. J., 8: 14.

Pluess B, Mueller T, Levi D, King G, Smith TA, Lengeler C (2009). Malaria- a major health problem within an oil palm plantation around Popondetta, Papua New Guinea. Malar. J., 8: 56.

Sarkar J, Murhekar MV, Shah NK, van Hutin Y (2009). Risk factors for malaria deaths in Jalpaiguri district, West Bengal, India: evidence for further action. Malar. J., 8: 133.

Sievers AC, Lewey J, Musafiri P, Fronke MF, Bucyibaruta BJ, Stulac SN, Rich ML, Karema C, Daily JP (2008). Reduced paediatric hospitalizations for malaria and febrile illness patterns following implementation of community-based malaria control programme in rural Rwanda. Malar. J. 7: e167. doi: 10. 1186/1475-2875-7-167.

Singh N, Dash AP, Thimasarn K (2009). Fighting malaria in Madhya Pradesh (Central India): Are we loosing the battle, Malar. J., 8: 93.

Tejiokem MC, Gouandjika I, Béniguel L, Endegue MC Tene ZG, Gody JC, Njamkepo E, Kfutwah A, Penda I, Bilong C, Rousset D, Pouillot R, Tangy F, Baril L (2007). HIV-Infected Children Living in Central Africa Have Low Persistence of Antibodies to Vaccines Used in the Expanded Program on Immunization. PLoS. ONE, 2 (12): e1260.

Teklehaimanot A, Snow RW (2002). Will the Global Fund help roll back malaria in Africa, Lancet, 360: 888-889.

Uneke CJ (2007). Impact of Placental *Plasmodium falciparum* Malaria on Pregnancy and Perinatal Outcome in Sub-Saharan Africa: I: Introduction to Placental Malaria. Yale J. Biol. Med., 80 (2): 39–50.

Uneke CJ, Iyare FE, Sunday-Adeoye H, Ajayi JA (2008). Evaluation of maternal malaria at childbirth using rapid diagnostic test and its relationship with birth weight and fetal haemoglobin levels in Nigeria. The Internet. J. Gynaecol. Obstetr., 10(1): e.

United Nations (UN) (2009). Africa: 2001-2010- Decade to roll back malaria in developing countries, particularly in Africa. www.http://allafrica.com.html. Accessed 29th September.

Wang S, Lengeler C, Smith TA, Vounatsou P, Akogbeto M, Tanner M (2006)a. Rapid Urban Malaria Appraisal (RUMA) IV: Epidemiology of urban malaria in Cotonou (Benin). Malar. J., 5: 45.

Wang S, Lengeler C, Mtasiwa D, Mshana T, Manane L, Maro G, Tanner M (2006)b. Rapid Urban Malaria Appraisal (RUMA) II: Epidemiology of urban malaria in Dar es Salaam (Tanzania). Malar. J., 5: 28.

Winch PJ, Makemba AM, Kamazima SR, Lwihula GK, Lubega P, Minjas JN, Shiff CJ (1994). Seasonal variation in the perceived risk of malaria: implications for the promotion of insecticide-impregnated bed nets. Soc. Sci. Med., 39 (1): 63-75.

World Health Organization (2004). WHO Global strategic framework for integrated vector management. WHO/CDS/CPE/PVC/200410.WHO, Geneva.