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Malaria Endemicity among Pregnant Women in Urban and Semi-Urban Areas in Southwest, Nigeria

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Abstract: The comparative study on malaria endemicity among pregnant women of various age groups at two different locations (urban and semi urban) in Southwest of Nigeria was carried out in antenatal clinics at LUTH (Idi - Araba) and OAUTH (Ile - Ife) to determine prevalence rate and areas of higher endemicity. Both thick and thin blood films were made and stained using parasitological standard procedures. A face-to-face questionnaire relating to their health status was distributed and completed before being recruited into the study. 178 of 250 women examined had significant malaria parasites in their blood films and the frequency was higher in Idi - Araba which recorded 93 (52.2 %) with mean parasite density of 700dl^{-1} against Ile-Ife that had 85 (47.7 %) with mean parasite density of 640 dl^{-1} for Ile - Ife. The percentage infection rate was the same in both locations at 41.2 %, but at different age groups: in LUTH the prevalence was higher among age group of 26-30 years while in OAUTH, it was higher among age group of 40 years and above. Those that lived under bad environmental conditions had the highest mean parasite density of 1200 dl^{-1} with prevalent rate of 81.3 %. The use of mosquito proof nets was also looked into in which those that did not use mosquito net had the highest mean parasite density of 740 dl^{-1}, with infection rate of 68.8 %. However, the prevalence of malaria parasite in these two geographic locations is statistically significant at $P < 0.025$.

Key words: Malaria infection · Endemicity · Pregnant women · Parasite density

INTRODUCTION

Malaria parasitaemia is one of the most highly prevalent tropical and subtropical diseases with high morbidity and mortality and high socioeconomic impact [1]. Malaria is a life devastating parasitic disease transmitted by female anopheles mosquitoes. It is the commonest cause of pyrexia in many parts of the tropics among various age groups. The effects of malaria parasite infection during pregnancy are of serious public concern in the tropical and subtropical regions throughout the world [2]. Benson *et al.* [3] reported that over 75 % of the malaria cases are African children and observed that malaria exposure begins at birth. The most common malaria parasite in Africa is *Plasmodium falciparum* and it causes the most dangerous malignant form of malaria which does not have relapses [4-6]. In Nigeria, the prevalence of placenta malaria in indigenous area is approximately 30 %. The incidence of congenital malaria in infants to immune mothers is estimated to be 0.3 %, but as high as ten percent in those of non-immune mothers, infection therefore occur leading to increase risk for the child [7].

A number of parameters are commonly used to classify malaria in an area such as malaria incidence, malaria prevalence and spleen rates (hypoendemic, mesoendemic and hyperendemic). Areas with high rate of malaria infection semi immune adult may acquire substantial resistance to local stream of plasmodium though, the prevalence of the infection is high; its severity is usually greater in pregnant women, especially during the second trimester [8]. In a given population,

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malaria infection can be said to be stable or unstable. It is stable when natural transmission occur over many successive years and there is a predictable constant incidence of cases, malaria transmission is generally high and epidemic is unlikely or unstable when the amount of transmission is varies from years to years, collective immunity is low and epidemic is therefore likely to occur [9].

The extent to which man becomes victim of malaria depends in the first place on how his own habits affect his accessibility to vector. For instance, location and type of housing with reference to vector breed habit, night travels in malarious areas, out-door sleeping, migration and cooperation in control and eradication operations, all are factors that may determine presence or absence of infections. Also, the feeding habit of the vectors could be twilight or night feeders, some species are day feeders and could contribute to the spread of the infection [10]. When an infectious *Anopheles gambiae* bites, it introduces about 3000 sporozoites into the person at each feeding. The sporozoites travel to the liver whereas series of development take place [10].

With the numerous complications associated with malaria infection in mind and in order to determine the area of higher endemicity, a comparative study of the prevalence of malaria parasite infection among pregnant women of various age-groups and at different locations (urban and semi-urban) in southwest of Nigeria was undertaken. The aim of the study was to examine environmental conditions and social pattern of living as they affect gravid mothers' exposure to malaria parasite infection.

MATERIALS AND METHODS

Study Subject: 250 samples of blood were collected from pregnant mothers attending antenatal clinic of Lagos University Teaching Hospital (LUTH), Idi - Araba and Obafemi Awolowo University Teaching Hospital (OAUTH) Ile-Ife, for the purpose of this study. These patients were selected randomly without prior knowledge of their clinical and family history. The women were of various ages ranging from 20 to 40 years and above and also of different social status. Ethical procedures were adopted during sampling. Blood samples were obtained by finger pricking with lancet from those that know their blood groups and genotype and otherwise 2 ml of venous blood were delivered into EDTA anticoagulant bottles for new antenatal patients. Those blood samples were screened for presence of malaria parasite using the "gold standard" method, i.e. thick and thin blood films method and stained with giemsa stain as recommended by World Health Organisation [11].

Data Collection: The consent of the patients was taken before commencing the study. A face-to-face questionnaire relating to their pregnancy (trimester period), haematological status (PCV, Blood group and genotype), environmental and social economic status was executed. It was designed to include the age, drugs taken as prophylaxis, method of mosquito control and occupations. Other haematological parameters such as the packed cell volume, blood grouping and haemoglobin genotypes were carried out adequately, but not shown in this paper. The statistical analysis for the significance was done using chi-square and Duncan multiple range test.

Microscopy: Examination and Clinical Scores: The stained slides were allowed to dry very well on the rack and examined using x100 objective lens (immersion oil) and several fields were examined. Thick films were used for detection of the presence of parasite, while the thin films were used for species identification, infective stage and diagnosis. Slide with malaria parasite less than 10 in a high power field was scored positive: < 3 as scanty, 3 - 10 as (+), 10- 19 as (++), >20 as (+++) or more according to the degree of infection (parasitaemia). Taking the number of leucocytes per micro liter (μl) of blood as 8000, Malaria Parasite Density (MPD) of blood using the thick film was expressed as parasite count x 8000 divided by the total white blood cells counted as the standard [11].

RESULTS

The correlation of the prevalence of malaria parasite infection among pregnant women according to age in two different locations is shown in table 1. Of the 250 samples examined, 178 (71.2 %) had malaria parasite in their peripheral blood; 93 (37.2 %) from LUTH and 85 (34.0 %) from OAUTH, with more than 3 parasites per high power field, though in some of them the infection was light while in others the infection was heavy. 32 % of 250 that were examined had never been down with malaria fever since they took in till the time the blood samples were collected. It was observed that pregnant women of ages ranging between 26 and 30 years had the highest prevalence of malaria parasite infection in LUTH and lowest among ages ranging 36-40 years (28.0 %); the case was different in OAUTH whereas the prevalence was higher among pregnant women of ages 40 years and above (with same infection rate of 41.2 % in both locations) and lowest among ages of 31-35 years (30.6 %).

Table 1: Prevalence of Malaria Parasite Infection among Pregnant Women in Luth and Oauth Antenatal Clinics According to Age

				LUTH		OAUTH	
Age group	No. examined	No. infected	% infected	No.infected	% infected	No.infected	% infected
20-25	30	22	73.3	12	40.0	10	33.3
26-30	68	50	73.6	28	41.2	22	32.4
31-35	85	60	70.6	34	40.0	26	30.6
36-40	50	34	68.0	14	28.0	20	40.0
>40	17	12	70.2	05	29.0	07	41.2
Total	250	178	71.2	93	37.2	85	34.0

Table 2: Malaria Parasite Infection among Pregnant Women in Two Different Antenatal Clinics

Antenatal clinics	No. examined	No. infected	% infected	Mean Parasite Density (MPD)
LUTH, Idi-Araba	125	93	52.3	700
OAUTH, Ile-Ife	125	85	47.7	640
Total	250	178	71.2	---

Table 3: Distribution of Malaria Parasite Infection among Pregnant Women in Relation to Environmental Conditions

Environmental	No. examined	No. infected	% infected	Mean Parasite Conditions Density (MPD)
Good environmental conditions	90	48	53.3	500
Bad environmental conditions	160	130	81.3	1200
Used mosquito nets	150	115	76.7	600
Did not use mosquito net	80	55	68.8	740

Good environmental condition - used netting on windows and doors, no water logged channels and clean surrounding.

Bad environmental conditions - did not use netting on windows and doors, water logged channels and dirty surrounding

It was also shown in table 2, that malaria infection in the two different geographical locations are heavy, Among 178 women examined, Lagos (LUTH, Idi - Araba) had 93 (52.3 %) with malaria parasite infection in their peripheral blood with mean parasite density of 700 dl^{-1} and against 85 (47.7 %) recorded in (OAUTH, Ile-Ife) with mean parasite density of 640 dl^{-1}. The prevalence of malaria parasite in pregnant women in relation to environmental conditions is shown in table 3. 160 lived in bad environment such as overcrowded houses, stagnated water, dirty surrounding and blocked drainages which enhance mosquito breeding. 81.3 % of them had malaria parasite infection with mean parasite density of 1200dl^{-1} and 53.3 % of the 90 pregnant women that lived in good environment had the infection with a lower mean parasite density of 500 dl^{-1}. Also, the table shows that 150 pregnant women used mosquito proof (nets) on windows, doors and on their beds and 115 (76.7 %) was positive for malaria parasite with mean parasite density of 600 dl^{-1}. 20 pregnant women used mosquito nets only on their beds (not on their doors or windows) and 14 of them had malaria parasites in their blood samples. 80 women did not use mosquito net and 55 (68.8 %) was positive for malaria parasite with higher mean parasite density of 740 dl^{-} .

DISCUSSION

Malaria is a life-threatening parasitic infection and the most prevalent tropical disease, with considerable high morbidity and mortality and high economic and social impact, especially among children and pregnant mothers. Pregnant women living under holoendemic condition in western Kenya show that the peak prevalence of malaria infection in primigravidae was 86 % while in multigravidae was 52 % and occurred between 14^{th} and 17^{th} weeks gestation, though there was a significant number of recoveries in both groups during the second and third trimesters [12]. The prevalence of clinical malaria is higher and its severity greater in pregnant women than in non-pregnant women [13-14]. This is also true in this study, in which the prevalence rate of infection was 71.2 % within the studied groups. This also was in agreement with the report of Brabin [12], who recorded 86 % prevalence of malaria parasite infection among pregnant women in Kenya, but at variance with the work of Uko *et al.* [7] that recorded a low prevalence rate of 6.8 % in Calabar. The infection rate was the same in the two locations at 41.2 % but at different age groups: in LUTH, the prevalence was higher within age group of

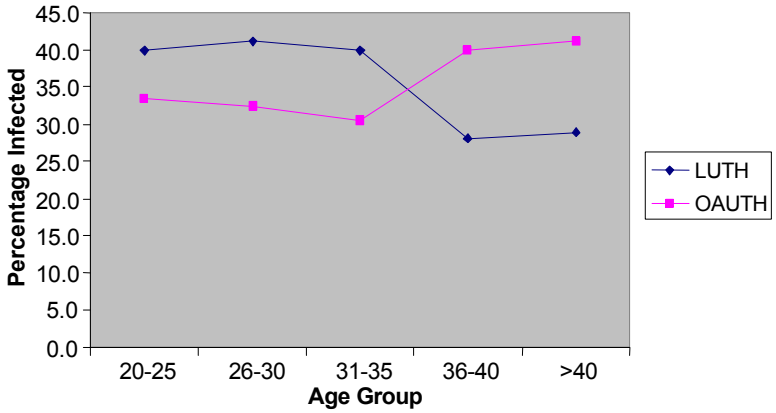

Fig. 1: Frequency polygon showing co-relation between malaria parasite infection among pregnent women in LUTH and OAUTH Antenatal Clinics according to age

26-30 years while in OAUTH it was higher among women of age range of 40 years and above (Figure 1). This could be due to the fact that some of them are traders and civil servants, who after moving around in the day time would come back home tired, down with pains which they did not attribute to malaria fever symptoms but perhaps to the day's hard work. It was also observed that the mean malaria parasite density was higher among those that lived in bad environmental conditions (water logged areas, blocked channels and drainages) and out-door activities outside places where there is mosquito proof (nets). This is probably because they are more exposed to malaria vector due to the bad environmental condition that encourages the breeding of mosquitoes, coupled with their individual life style that keep them out-door for longer hours [15]. It was noted that illiteracy also contributed to the exposure to the infection because there was no keen interest on prevention, control, proper diagnosis and prompt treatment on the sensation of malaria attack among the illiterate pregnant mothers. Instead, they resorted to self- medication and delayed antenatal care till there was complication. The use of chemoprophylaxis alone could not be relied on as substantive measure for the control of malaria during pregnancy [15]. There is need to protect themselves with mosquito proof to reduce contact with infective mosquitoes at all times. The use of insecticide nets reduced both the number of malaria cases and malaria death rate in pregnant women [16]. In this study, it was observed that the mean malaria parasite density of 740 dl^{-1} was recorded among those that did not use mosquito proof (nets) while those that used the mosquito proof (nets) recorded 600 dl^{-1}, The difference is statistically significant at $P<0.05$. And again, the use of mosquito proof confined to the house alone cannot be relied on as an effective measure as they could be exposed to day-feeder species of female anopheles during their out-door activities. However, the combination of the two approaches could have a synergy effects on the management of malaria parasite infection during pregnancy.

The comparative results of this study showed that the frequencies of malaria parasite infection among pregnant women attending antenatal clinic in Lagos (LUTH) was 6.4 % higher than that of Ile-ife (OAUTH). This is not unconnected with the ubiquitous presence of mosquitoes (vectors) in the dirty, poorly drained channels that retain pockets of water as breeding sites in the suburb of the city and overcrowded houses. In Ile-ife there was a 100 % negative malaria parasite in the peripheral blood samples from four pregnant mothers who used locally produced herbs as prophylactic treatment. This could have been recommended except for the teratogenic and toxigenic effects on the system, which could not be determined in the course of this work. However, the prevalence of malaria parasite in these two geographical locations in the Southwest of Nigeria is statistically significant at $P<0.025$.Therefore, government should provide subvention for research institutes to go into more research in local herbs in attempt to develop new and effective drugs to address the issue of multiple drug resistant plasmodiasis. It is also essential to avoid water-logging and blockage of our drainage channels which encourage the breeding of mosquitoes. It is also recommended that insecticide - treated nets be made readily available and evenly distributed among the populace since the ultimate goal of malaria control is to prevent mortality and reduce socio-economic loss by reducing morbidity through progressive interventions.

CONCLUSION

The study shows that the malaria endemicity is high in both locations and it is age dependent. The use of mosquito proof nets at home could not be relied on alone but proactive steps: cleaning of the waterways, maintaining a healthy environmental condition, use of mosquito - proof nets and effective prophylactic treatment could have a synergy effect on the control of malaria infection among pregnant women.

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REFERENCES

1. World Health Organization, 2001. WHO recommended strategies for the prevention and control of communicable disease WHO/CDLS/ CPE/SMT/2001, 13: 107-110.
2. Nosten, F., F. Terkuile and L. Malankiri, 1991. Malaria in pregnancy in an area of unstable endemicity Trans. Royal Soc. Trop. Med. Hyg., 48: 154-160.
3. Benson, J., J.C. Reader, S.J. Rogerson and G.V. Brown, 2001. Parasite adhesion and immune evasion placental malaria Trends Parasitolo., 17(7): 331-337.
4. Moluneaix, L. and C. Cramicara, 1980. Research on Epidemiology and Control of Malaria in Sudan Savannah of West Africa. The Garth Project. WHO Geneva.
5. Smyth, J.D., 1996. Sporozoa malaria in man and animal kingdom on Animal Parasitology, Cambridge press, pp: 126-129.
6. Nchinda, T.C., 1998. Malaria: A re-emerging Disease in Africa: J. Emerging Infectious Disease, 4(3): 398-405.
7. Uko, E.K., A.O. Emeribe and G.C. Ejezie, 1998. Malaria infection of the placenta and Neo Natal Low Birth Weight in Calabar J. Med. Lab. Sci., 7: 7-20.
8. Bruce-Chwatt, L.J., 1986. Malaria in Africa children, infant and children in Southern Nigeria. Ann. Trop. Med. and Parasitol., 46: 173-200.
9. Olumese, P., 1995. Stable and Unstable malaria. A publication of the Department of Clinical Pharmacology, University College Hospital, Ibadan, Nigeria September, 1995.
10. Faust, E.C. and R.C. Jung, 1977. Craig and Faust Clinical Parasitology, 8th edition, Henry Kimpton Publishers, London, pp: 183-224.
11. Chersbrough, M., 1998. District Laboratory Practical in Tropical Countries. University Press Cambridge, 1: 222-225.
12. Brabin, B.J., 1990. Failure of Chloroquine Prophylaxis for Falciparum malaria in pregnant Women in Madang Papua New Guinea. Ann. Trop. Med. and Parasitol., 46: 176-200.
13. Adefioye, O.A., A.O. Adeyeba, W.O. Hassan and O.A. Oyeniran, 2007. Prevalence of Malaria Infection among pregnant women in Osogbo, Southwest, Nigeria Am. Eurasian J. Scientific Res., 2(1): 43-45.
14. Shulmun, C. and E. Dorman, 2000. Malaria in pregnancy, African Health Incorportating Medicine Digest. Malaria Suppl., pp: 26-29.
15. Ojiezeh, T.I., I.N. Ibeh and D.O. Opedun, 2007. Malaria Parasitaemia in different segments of pregnant women in Nigeria J. Nat. Acad. Adv. Sci., 5: 305-307.
16. World Health Organization, 1993. Implementation of the Global malaria control strategy. Report of a WHO Study Group. General: ISBN 9231208392.