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Malaria prevention practices among mothers delivering in an urban hospital in southwest Nigeria

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Abstract

Background & objectives: The pregnant woman is more prone to malaria than her non-pregnant counterpart with grave consequences for both mother and baby. This study aims at determining the malaria prevention practices among pregnant women in an area hyper-endemic for malaria.

Methods: For the study 983 parturient mothers were enrolled in Ibadan, southwest Nigeria. Information was collected on sociodemographic characteristics, use of malaria chemoprophylaxis, use of anti-vector measures, and malaria parasitaemia.

Results: Most mothers [956/972 (98.4%)] reported the use of anti-vector measures for malaria prevention. These include, window screens (78.9%), insecticides spray (69.9%), mosquito coils (25.3%), untreated bednets (2.5%), and insecticide-treated nets (1.1%). Most mothers used anti-vector measures either singly or in combination. About 86% (840/972) of the mothers used drugs for chemoprophylaxis. Thirteen (1.3%) mothers used chemoprophylaxis alone (CP), 135 (13.9%) used anti-vector measures alone (AV) while 820 (84.4%) used chemoprophylaxis plus anti-vector (CPAV). Weekly dose of pyrimethamine [214 (25%)] and intermittent preventive treatment with sulphadoxine-pyrimethamine [598 (71.2%)] were the widely used chemoprophylactic drugs. The prevalence of patent parasitaemia at delivery was 7.7% (1/13), 12.1% (99/820) and 16.3% (22/135) among CP, CPAV and AV groups respectively. Geometric mean parasite densities among the respective groups were 7840/µl, 1228/µl and 8936/µl.

Conclusion: Window screens and insecticide sprays were widely used for malaria prevention while the use of ITN was very low among enrolled mothers. There is a need to pay concerted efforts to improve ITN usage rate in Nigeria.

Key words Malaria – Nigeria – pregnancy – prevention practices

Introduction

Malaria infection during pregnancy is a major public health problem as it predisposes to adverse pregnancy outcomes which include abortion, premature delivery, small for date babies, maternal anaemia and even intrauterine death of the fetus in some cases[1]. Pregnancy increases the risk of malaria in women by reducing their immunity to malaria[2]. This reduction in immunity tends to be more severe in primigravidae than in multigravidae and results in more frequent episodes of parasitaemia and a greater severity of malaria fever in pregnant women[3]. It is, therefore, important for the pregnant woman to be protected from

contacting the infection. Prevention of malaria encompasses a variety of measures that may protect against being bitten by the disease vector or against the development of disease in infected individuals[4]. Based on the available evidence, World Health Organization (WHO) recommends a three-pronged approach to the prevention and management of malaria during pregnancy: insecticide-treated nets (ITNs); intermittent preventive treatment with sulphadoxine-pyrimethamine[5] and effective case management of malaria illness. In addition to ITNs, other protective measures at household level include protective clothing, insect repellents, bednets (plain or insecticide-treated nets) and spraying of insecticides. Large-scale spraying of insecticides and environmental management are other control measures at the community level.

Although insecticide-treated bednets and curtains have emerged in recent years as promising tools, their use in Africa is limited[6]. Various studies have shown that ITN is effective in the control of malaria in pregnant women[7,8]. D'Alessandro *et al*[7] demonstrated that the use of ITNs significantly reduced the number of primigravidae with parasitaemia in villages where it was used compared to control villages. The study by ter Kuile *et al*[8] also showed that women who used ITN had significantly fewer pre-term deliveries and babies with higher mean birth weight than women who did not use ITN.

For many years antimalarial chemoprophylaxis with weekly dose of pyrimethamine or chloroquine was recommended for pregnant women in endemic are as to prevent the adverse effects of malaria in pregnancy[9]. Emphasis was also placed on case management of the clinical disease with chloroquine. Poor compliance and emergence of drug resistant strains of *Plasmodium falciparum* have however compromised the efficacy of these regimens[10,11]. The use of intermittent preventive treatment (IPTp) with a potent antimalarial drug in pregnant women has been shown to be effective in preventing malaria in pregnancy as well as improving pregnancy outcome[12–14]. The WHO has consequently adopted IPTp with sulphadoxine-pyrimethamine as the gold standard for prevention of malaria in pregnancy[15].

This study reports the pattern of malaria preventive measures during pregnancy among parturient women in southwestern Nigeria, hyperendemic for malaria.

Material & Methods

The study was conducted at St. Mary's Catholic Hospital, Eleta in Ibadan, southwest Nigeria between May 2003 and October 2004 as part of a larger study evaluating the epidemiology of congenital malaria[16]. Ethical approval for the study was provided by the University of Ibadan/University College Hospital and the University of Boston Institutional Review Committees. Malaria preventive practices and the associated factors among 983 mothers were examined. Questionnaires were administered by trained research assistants to mothers delivering in the study hospital to collect information on sociodemographic factors and malaria prevention measures used during the index pregnancy. Thick blood smears were prepared from finger prick blood samples from the parturient mothers. Blood smears were air-dried and stained with freshly prepared 10% Giemsa stain at pH 7.2. Blood smears were examined under x100 oil immersion lens of a light microscope for detection and quantification of malaria parasitaemia. Malaria diagnosis was based on the identification of asexual stages of *Plasmodium* in thick blood smears. Parasite densities were calculated using an assumed leukocyte count of 8000/μl[17].

Data analysis: Data collected were double-entered using the Epi info software version 6.04 (CDC, Atlanta) and were transferred to the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, U.S.A.) for further analysis. Frequency tables and graphs were generated for relevant variables. Descriptive statistics such as means ± standard devia-

tions were used to summarize quantitative variables while qualitative variables were summarized with proportions. The χ^2 test was used to investigate associations between two qualitative variables. Analysis of variance was used to compare more than two mean values. All analyses were done at the 5% level of significance.

Results

The mean age of the mothers was 29.6 yr $\pm$ 5.2 with a range of 17–44 yr. The mean gravidity was 3.0 $\pm$ 1.7 with a range of 1–10 while mean parity was 6 $\pm$ 1.83 with a range of 0–7. Table 1 shows details of demographic characteristics of the mothers.

Table 1. Malaria prevention by selected variables

Patient characteristics	Use of malaria prevention measures			p-value
	Yes (%)	No (%)	Total no. (%)	
Occupation				
Senior civil servants/Professionals	132 (13.9)	2 (12.5)	134 (13.9)	
Intermediate civil servants/Senior teachers	88 (9.3)	1 (6.3)	89 (9.2)	
Junior school teachers/Artisans	185 (19.5)	4 (25)	189 (19.6)	0.97
Petty traders/Labourers	462 (48.6)	8 (50)	470 (48.7)	
Students/Unemployed/Housewives/Farmers	83 (8.7)	1 (6.3)	84 (8.7)	
Total	950	16	966	
Age group (yr)				
10–20	26 (2.7)	2 (11.1)	27 (2.7)	
21–30	553 (57)	2 (11.1)	555 (56.2)	0.13
31–40	379 (39.1)	9 (50)	388 (39.3)	
41–50	12 (1.2)	5 (27.8)	17 (1.7)	
Total	970	18	987	
Mother's education				
None/Pry/Quranic	143 (15)	5 (1.3)	148 (15.3)	0.08
Sec/Post-sec	810 (85)	11 (68.8)	821 (84.7)	
Total	953	16	969	
Gravidity				
1	221 (23.1)	6 (37.5)	227 (23.4)	
2	210 (22)	–	210 (21.6)	0.01*
3–4	346 (36.2)	3 (18.8)	349 (35.9)	
>4	178 (18.6)	7 (43.8)	185 (19.1)	
Total	955	16	971	
Parity				
0	219 (23.1)	6 (37.5)	225 (23.3)	
1	233 (24.5)	2 (12.5)	235 (24.3)	0.23
2–3	362 (38.1)	4 (25)	366 (37.9)	
>3	136 (14.3)	4 (25)	140 (14.5)	
Total	950	16	966	

*Significant at 5%.

Anti-vector malaria preventive measures: Nine hundred and fifty-six of 972 (98.4%) mothers who responded to the question on the use of anti-vector measures to prevent malaria responded in the affirmative while 16 (1.6%) said they did not. Eleven of 983 (1.1%) enrolled mothers did not respond to the question. One hundred and thirty-five (13.9%) used anti-vector measures alone (AV) while 820 (84.4%) used it in combination with chemoprophylaxis (CPAV). Seven hundred and sixty-six (78.8%) respondents used window mosquito screens, 679 (69.9%) insecticide sprays, 246 (25.3%) mosquito coils, 24 (2.4%) untreated bednets, while 11 (1.1%) reported the use of ITN (Fig. 1). Most of the mothers used anti-vector measures in various combinations with a large proportion using mosquito screens plus insecticide sprays (540/971; 55.6%). Details of the different combinations of anti-vector measures used are shown in Table 2.

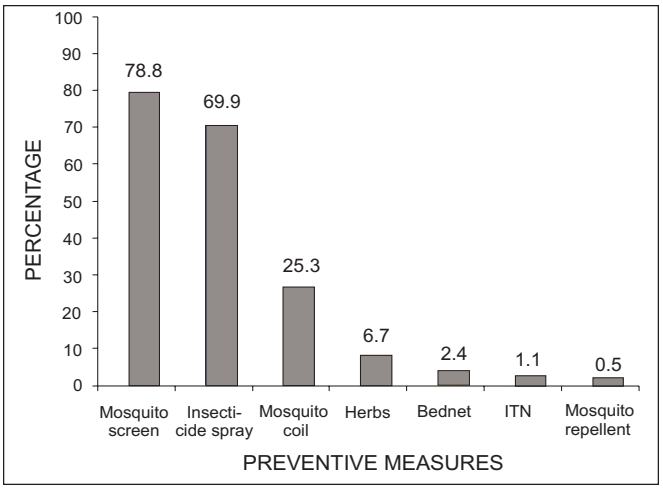

Fig. 1: Pattern of anti-vector measures used by parturient women in Ibadan, Southwest Nigeria

The level of education, type of occupation, age and parity of mothers did not influence the choice of anti-vector measure (Table 1). However, gravidity was statistically significantly associated with the use of anti-vector measures ($p < 0.01$). About a third (346/955; 36.2%) of mothers who used anti-vector measures had a gravidity of 3–4, while 178 (18.6%) had a gravidity of greater than four. Overall, mother's education was not significantly associated with malaria prevention (Table 1). Table 1 also shows malaria

Table 2. Anti-vector measures combinations, parasitaemia and birth weight

Type of combination	No. of user/ No. interviewed (%)	Percentage positive for malaria	Mean parasite density (/μl)*	Mean birth weight ± SD (g)
ITN plus screen	7/983 (0.7)	–	–	3008 ± 615.2
ITN plus coil	4/983 (0.4)	1/4 (0.25)	6269	2937.5 ± 675
Repellent plus spray	1/971 (0.1)	1/1 (100)	480	4000
Bednet plus repellent	1/971 (0.1)	0/1 (0)	–	3000
Coil plus repellent	3/971 (0.3)	0/3 (0)	–	2583.3 ± 425.2
Screen plus repellent	3/971 (0.3)	1/3 (33.3)	480	3050 ± 926
Bednet plus coil	4/972 (0.4)	0/4 (0)	–	3125 ± 250
Bednet plus screen	13/972 (1.3)	0/13 (0)	–	3053 ± 390
Bednet plus spray	13/972 (1.3)	0/13 (0)	–	3076.9 ± 311.3
Screen plus coil	147/971 (15.1)	17/147 (11.6)	1423	3117 ± 498.2
Screen plus spray	540/971 (55.6)	59/540 (10.9)	1088	3197.7 ± 504
Screen plus coil plus spray	75/971 (7.7)	11/75 (14.7)	869	3173.3 ± 405.5

*Geometric means are presented.

Table 3. Type of single anti-vector measures, malaria positivity, birth weight and parasite densities

Anti-vector measures	No. (%)	Maternal malaria positive (%)	Mean parasite density (/µl)*	Mean birth weight ± SD (g)
Mosquito screens	766 (78.8)	90/766 (11.7)	1323	3180.5 ±532.6
Insecticide sprays	679 (69.9)	84/679 (12.4)	1037	3169.7 ±502.4
Mosquito coils	246 (25.3)	36/246 (14.6)	1326	3097.9 ±499.2
Herbs	65 (6.6)	7/65 (10.8)	2163	3095.4 ±502.6
Untreated bednets	24 (2.4)	0/24 (0)	–	2987.5 ±403.1
ITNs	11 (1.1)	1/11 (9.1)	6269	3040 ±597.8
Repellents	5 (0.5)	1/5 (20)	480	2950 ±683.7

*Geometric means are presented.

prevention by some selected variables. One of 11 mothers who used ITNs had patent parasitaemia while 90/766 (11.7%) who used mosquito screen had patent parasitaemia with a geometric mean parasite density of 1323/µl of blood and mean birth weight of the babies was 3181 ± 532.6 g. However, none of the bednet users had patent parasitaemia and the mean birth weight of the babies was 2987 ± 403.1 g. Table 3 shows the malaria positivity and mean birth weights of babies in each group for the various anti-vector combinations.

Pattern of chemoprophylaxis use: A total of 840 mothers (85.6%) reported the use of antimalarial drugs for chemoprophylaxis while 141 (14.4%) did not. Of these, 598 (71.2%) used SP-IPT, 214 (25.5%) used pyrimethamine, 23 (2.7%) used chloroquine while only one (0.1%) used proguanil (Table 4). The effectiveness of these drugs in the prevention of maternal and placental malaria has been reported in another publication[14]. Thirteen mothers (1.3%) used chemoprophylaxis (CP) alone, while 820 (84.4%) used a combination of chemoprophylaxis and anti-vector measures (CPAV). Of the 13 who used chemoprophylaxis alone, seven of them used SP-IPT, five used pyrimethamine while the remaining one did not report the type of chemoprophylaxis used.

Patent malaria parasitaemia: The prevalence of patent parasitaemia among the mothers at delivery was 7.7% (1/13), 16.3% (22/135) and 12.1% (99/820) for CP, AV and CPAV respectively (p>0.05). The geometric mean parasite densities among CP, AV and CPAV were 7840/µl, 8936/µl and 12278/µl respectively (p>0.05) while mean birth weight were 2965.4 ± 268.8, 3054.5 ± 502.9 and 3176.9 ± 530.8 g in the three groups respectively (p < 0.001). Thirty-four of 214 (15.9%) mothers that used pyrimethamine had patent parasitaemia while 62 of 598 (10.4%) mothers that received IPT with sulphadoxine-pyrimethamine (SP-IPT), had patent parasitaemia (p < 0.05). Table 4 shows the relationship between type of drug used for chemoprophylaxis and patent malaria parasitaemia.

Table 4. Type of chemoprophylaxis by malaria parasitaemia

Type of chemoprophylaxis	Malaria parasitaemia		Total no. of mothers (%)
	Negative (%)	Positive (%)	
SP-IPT	536 (89.6)	62 (10.4)	598 (71.2)
Pyrimethamine	180 (84.1)	34 (15.9)	214 (25.5)
Chloroquine	21 (91)	2 (9)	23 (2.7)
Herbs	3 (75)	1 (25)	4 (0.5)
Proguanil	1 (100)	0	1 (0.1)
Total	741	99	840

Discussion

Vector control can significantly contribute to reducing the risk of malaria infection provided that it is well-planned, targeted and timely. This study showed that majority of mothers delivering in the study hospital in urban southwestern Nigeria used chemoprophylaxis and/or anti-vector measures for prevention of malaria during pregnancy with a large proportion combining both methods. The study also revealed that a wide variety of anti-vector measures such as window screens, insecticide sprays, mosquito coils, untreated bednets and ITNs were used. Although ITN has been shown to be effective in the control of malaria in pregnant women[7,8], its use among pregnant women in this study was very low (1.1%). This finding is consistent with another report from rural southwest Nigeria which showed that majority of people in the rural areas used screens and sprays to protect against malaria while the use of ITN was poor[18]. The reported low rate of ITN use in southwest Nigeria underscores the need to address the use of ITN.

The promotion of ITN in Nigeria requires careful consideration, more so when the initial cost of purchase of the net is often out of reach of the most vulnerable persons in endemic areas. Ideally, the Federal Government of Nigeria should make ITN available at highly subsidized rate especially to very young children and pregnant women who are particularly vulnerable to malaria and its deleterious effects. Failing this, soliciting the assistance of international agencies in funding large-scale procurement and distribution of ITN is a viable option which malaria control bodies in Nigeria may wish to pursue. Insecticide-treated nets (ITNs) are estimated to be twice as effective as untreated nets[6] and offer > 70% protection compared with no net[19]. A lower proportion of mothers who used a combination of anti-vector measures and chemoprophylaxis (12.1%) had patent malaria parasitaemia compared with mothers who used anti-vector measures only (16.3%). Mothers who used chemoprophylaxis alone recorded the lowest prevalence of patent parasitaemia when compared to the AV and CPAV groups. These differences were however not statistically significant. The expected advantage in the prevention of maternal parasitaemia by combining chemoprophylaxis and anti-vector measures when compared to the CP and AV groups did not reach a level of significance in this study most probably because most (71.2%) of the mothers enrolled in this study received the highly effective SP-IPT for malaria prevention. This might also explain why they had lower parasitaemia compared to the other groups. Our results showed a complete absence of parasitaemia in the untreated bednet users and also those who used it in combination with other measures. This supports the findings of Bradley *et al*[20] that the use of untreated bednets may protect from malaria. Safekui-Noubissi *et al*[21] also showed that the use of bednets whether treated or not protects against severe malaria. In contrast to the poor usage rate of ITN, a large proportion of parturient women in this study received IPTp with sulphadoxine-pyrimethamine, the current drug of choice in the prevention of malaria in pregnancy. This can be explained by the fact that SP-IPT was administered and supervised at the antenatal clinic, while the choice and use of anti-vector measures depended on the disposition of the individual, affordability and perception.

The findings of this study highlight a high level of awareness on the use of malaria preventive measures by pregnant women attending a secondary urban health facility in southwest Nigeria. This is good for the success of the Global Malaria Control and the RBM strategies which propose to reduce malaria morbidity and mortality among pregnant women. However, the low usage rate for ITNs despite the fact that it is part of the package provided in antenatal clinic is a major concern. This suggests that the various interventions for use of ITNs have not been very effective. The possible causes for this failure need urgent exploration and must be addressed. The value of health education for the pregnant woman on the importance of preventing malaria during antenatal

clinics can not be overemphasized. Efforts at creating awareness should be intensified and the use of ITNs emphasized. The national malaria control unit through the health facilities should promote the use of ITNs as done for SP and the factors mitigating against its use should be circumvented in order to achieve optimal pregnancy outcome which would translate to improved health of mothers and newborns.

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