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PREVALENCE OF MALARIA PARASITAEMIA AND THE USE OF MALARIA PREVENTION MEASURES IN PREGNANT WOMEN IN IBADAN, NIGERIA

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ABSTRACT

Background: **Malaria complicates up to 58.1% of pregnancies in Nigeria. Preventive measures include intermittent preventive treatment and consistent use of insecticide-treated nets. However, uptake of these interventions can often be sub-optimal.**

Objective: **This study aimed to assess the prevalence of malaria in pregnancy in peri-urban and rural communities of Ibadan, Nigeria and its association with the use of preventive measures.**

Methods: **In this cross-sectional study, pregnant women were recruited from selected primary health centres and blood films were taken for malaria parasites. Explanatory variables were the use of bed nets and chemoprophylaxis; the primary outcome was presence of peripheral malaria parasitaemia.**

Results: **Malaria prevalence was 4.3% (67 of 1570 participants); two-thirds of women with parasitaemia had malaria symptoms. Four hundred and thirty-eight (27.9%) used prescribed sulphadoxine-pyrimethamine prophylaxis, 784 (49.9%) women reported that they consistently slept under insecticide-treated nets, and 236 (15%) complied with both interventions. Bed net use appeared more protective than chemoprophylaxis. However, the protection from malaria in those who used preventive measures was not statistically significant (p=0.075).**

Conclusions: **Malaria prevalence was low. No association was determined between malaria and the use of preventive measures; the lack of association may be due to the low prevalence.**

Keywords: Malaria, Pregnancy, Chemoprevention, Insecticide-treated bed nets

INTRODUCTION

Malaria causes about 11% of maternal deaths in Nigeria.[1] Malaria complicates 8.4% to 58.1% of pregnancies in Nigeria.[2,3] Pregnant women in their first or second pregnancies are particularly susceptible to malaria.[4] Placental parasitaemia limits transfer of nutrients and oxygen to the foetus, leading to intra-uterine growth restriction, low birth weight or intrauterine death.[5]

The World Health Organization (WHO)'s guidelines included at least two doses of intermittent preventive treatment in pregnancy (IPTp) after quickening, consistent use of insecticide-treated nets (ITNs), and effective case management of malaria.[6] The most recent guideline recommends that IPTp is commenced from 14 weeks' gestational age,[7] then subsequently, at least one month apart at each scheduled antenatal visit until delivery (with no upper limit on the number of doses).[7] This is, however, yet to be taken up by many facilities.[8,9] The updated Nigerian National Guideline's[10] uptake has been slow; the initial policy is still in use in many places, including the study area.

Several studies have shown the impact of IPTp on prevalence of malaria in pregnancy.[11,12,13] Direct Observation Therapy (DOT) is recommended for IPTp to ensure compliance.[6] This is however not done in many clinic settings due to the high patient load, the medication not being dispensed free, or the impracticability of making drinking water available for clients. In rural South-west Nigeria, pregnant women did not use IPTp because of their uncertainty of drug safety in pregnancy (even though prescribed by their caregivers); many also say they would have used the drugs if allowed to bring their own water or cups.[14] In low-resource environments such as this, availability of potable water and the unhygienic sharing of public cups, are reasonable deterrents to DOT.

Intermittent shortages of SP, which was being supplied by the government at the time, also limited DOT of IPT_p.[14]

Despite awareness of insecticide-treated nets and their importance in prevention of malaria, the uptake is often poor. Reasons proffered include the cost of the nets, heat entrapment (in a tropical environment) over bed space when nets are spread, concerns with toxicity of insecticide, the mere inconvenience of having to tuck in a net every day, or even forgetting to use it.[15,16] Even though ownership of a bed net does not always result in its utilization, wide distribution is important for universal coverage.[17]

The rationale behind the primary care setting employed in this study was based on the WHO model of community-based care, described as "care the consumer can access nearest to the home, which encourages participation by the people".[18] The Comprehensive Community and Home-based Health Care Model (CCHBHC) is defined as "an integrated system of care designed to meet the health needs of individuals, families and communities in their local settings.".[19] Antenatal care in primary health centres (PHCs) falls under this definition. The investigators thus expected that the findings would mirror the community as closely as possible.

This study aimed to determine the prevalence of malaria in peri-urban and rural communities of Ibadan, Nigeria and assess its association with the use of malaria preventive measures.

MATERIALS AND METHODS

This was a community-based,[19] cross-sectional study of pregnant women recruited from selected PHCs selected by mixed methods. Of the eleven Local Government Areas (LGAs) in Ibadan, South-West Nigeria, six of them are peri-urban and rural. Three of these six LGAS were randomly selected for the study: Egbeda, Lagelu, and Ona-Ara. Fourteen PHCs in these LGAs were purposively sampled (6 from Lagelu, 4 from Egbeda and 4 from Ona-Ara LGA) based on their relatively higher patient loads. Ethical approval was obtained from the Oyo State Research Ethical Review Committee (reference number AD 13/479/571).

The study tool was a structured questionnaire; validated by colleagues' reviews and by a pilot of ten antenatal clients at the University College Hospital, Ibadan. It was administered by trained research assistants after patient's written consent was obtained. At least two doses of IPTp-SP were routinely prescribed in the study centres as from the second trimester, four weeks apart. ITNs were also routinely supplied to all pregnant women at their first visit. This was documented on their appointment cards when it was supplied; all participants in the study had received nets. A Likert scale was employed to determine the regularity of ITN use ("never", "seldom", "sometimes", "often" and "always"); those who stated "often" or "always" were described as those who used ITNs. Patients were to be excluded if they were on alternative malaria prophylaxis or on cotrimoxazole prophylaxis for HIV infection. Participants were included if they had booked at least four weeks before recruitment. Consecutive, eligible patients were recruited as participants. Blood film for malaria parasites were evaluated at this time. Malaria parasites were tested using the standard thin and thick film, Giemsa staining and x1000 microscopy view, as described in WHO's standard operating procedures for malaria microscopy evaluation.[20] The slides were prepared and read by two trained laboratory scientists. Every tenth slide was re-assessed by a senior scientist for quality control, but no significant differences were found. The study's explanatory variables were the use of bed nets and chemoprophylaxis; the primary outcome was presence of peripheral malaria parasitaemia.

Dual data entry was done using EpiData version 4 (The EpiData Association, Odense, Denmark), after which data checks were done by verification and consistency checks and specific data editing was made. All data were re-coded during data cleaning with none linked to individuals. Data were then transferred to IBM® SPSS Statistics® version 20.0 (IBM Corp., Armonk, USA) for analysis. Descriptive and bivariate statistical analyses were performed at 5% level of significance.

RESULTS

Socio-demographic characteristics

One thousand, five hundred and seventy women completed the questionnaires and had malaria parasite tests done out of the total 1,645 that were recruited giving a 95.4% response rate. The demographic data of participants are summarized in Table 1. Most of them were within the age bracket 20-29 years, with a mean age of 27.1 ± 5.7 years. Over a third of them were primigravid. Most participants were recruited in the third trimester (925; 59.1%), while 579 (37.0%) were sampled in the second trimester. The average gestational age at booking was 21.1 ± 6.6 weeks.

Prevalence of malaria parasitaemia

Of the 1,570 malaria parasite tests done, 67 women had positive results giving a malaria prevalence of 4.3%. Forty-three (64.2%) women of the 67 that tested positive for malaria had associated symptoms of

Table 1: Demographic characteristics of participants

Variable		Malaria Parasite Positive (%)	Malaria Parasite Negative (%)	P-value
Age				
	≤19	6 (8.96)	75 (4.99)	0.248
	20-24	21 (31.34)	460 (30.61)	
	25-29	22 (32.84)	467 (31.07)	
	30-34	12 (17.91)	333 (22.16)	
	35-39	3 (4.48)	141 (9.38)	
	≥40	3 (4.48)	27 (1.80)	
Level of education				
	None	0 (0.00)	22 (1.47)	0.571
	Primary	6 (8.96)	193 (12.87)	
	Secondary	49 (73.13)	1020 (68.00)	
	Tertiary	12 (17.91)	265 (17.67)	
Husband's level of education				
	None	0 (0.00)	17 (1.14)	0.455
	Primary	3 (4.48)	100 (6.69)	
	Secondary	47 (70.15)	919 (61.47)	
	Tertiary	17 (25.37)	459 (30.70)	
GA at blood sampling				
	First trimester	3 (4.48)	57 (3.81)	0.957
	Second trimester	25 (37.31)	554 (37.01)	
	Third trimester	39 (58.21)	886 (59.19)	
Parity				
	Para 0	34 (50.75)	530 (35.26)	0.012 *
	Para 1	19 (28.36)	367 (24.42)	
	Para 2-4	13 (19.40)	578 (38.46)	
	≥Para 5	1 (1.49)	28 (1.86)	
Ethnicity				
	Yoruba	64 (96.97)	1434 (95.98)	0.816
	Igbo	2 (3.03)	31 (2.07)	
	Hausa	0 (0.00)	7 (0.47)	
	Others	0 (0.00)	22 (1.47)	

**Significant at 5% level of significance*

malaria (fever, malaise, nausea and/or vomiting, headache and loss of appetite). The rest (24; 35.8%) had asymptomatic malaria. Multigravidae were significantly less likely to have malaria parasites, while primigravidae were more likely to (p=0.012).

Utilization of malaria prevention methods

All the participants were prescribed SP; no one was prescribed any alternative prophylaxis. There were six (0.38%) HIV-positive participants; however, none of them were on cotrimoxazole in place of SP. Only 438 (27.9%) of the participants used sulphadoxine-pyrimethamine as prescribed for them. Most of this sub-group had used only one dose (333 women; 21.2%), while 97 (6.2%) had two doses and 8 (0.5%) had three doses. The first dose was used averagely at 23.3 ± 6.7 weeks. The second dose was used at averagely 27.8 ± 7.6 weeks. Seven hundred and eighty-

Table 2: Association between use of preventive measures and malaria parasitaemia

IPT/ITN use	Malaria Parasite Positive N=67 (%)	Malaria Parasite Negative N=1503 (%)	Total N=1570 (%)	Chi-square	P value
None	31 (46.27)	553 (36.79)	584 (37.20))	6.898	0.075
IPT only	8 (11.94)	194 (12.91)	202 (12.87)		
ITN only	25 (37.31)	523 (34.80)	548 (34.90)		
IPT & ITN	3 (4.48)	233 (15.50)	236 (15.03)		

Table 3: Association between use of preventive measures and symptomatic malaria

IPT/ITN use	Malaria symptoms (N=67)*		Total N=67 (%)	Chi-square	P value
	Asymptomatic (n=24) (%)	Symptomatic (n=43) (%)			
None	10 (41.67)	21 (48.84)	31 (46.27)	4.2896	0.258
IPT only	1 (4.17)	7 (16.28)	8 (11.94)		
ITN only	11 (45.83)	14 (32.56)	25 (37.31)		
IPT & ITN	2 (8.33)	1 (2.33)	3 (4.48)		

four (49.9%) women used ITNs regularly during pregnancy. Only 15% (236) of the participants used both ITNs as well as at least one dose of IPTp-SP.

Association between compliance with malaria prevention methods and malaria parasitaemia

Table 2 shows that there was no statistically significant relationship between the reported compliance with either of the two preventive measures studied and the prevalence of malaria parasitaemia. Participants who used *both* preventive measures were less likely to have parasitaemia, howbeit, insignificantly associated. Table 3 shows there were no significant associations between symptomatic malaria and the reported use of these preventive measures, though women who used both measures also tended to be less likely to suffer malaria symptoms.

DISCUSSION

Prevalence of malaria parasitaemia

The prevalence of malaria parasitaemia in pregnant women of peri-urban and rural communities of Ibadan in south-west Nigeria, was much lower than in other national sub-regions: 42% in the north-east,[21] 58% in the south-south,[3] and 92-99% in the south-east.[22,23] The sample size was relatively larger than most of these other studies; and most of the participants were of low parity (women of low parity have the highest risk of malaria in pregnancy, as was also corroborated in this study).[4,24] The prevalence is therefore likely to be reliable for the studied population. Other prevalence figures from the same geographic region ranged from a low 8.4%,[2] to higher 21.3% and 41.8%, respectively.[25,26] These higher figures were derived from relatively smaller studies, as found in the other subnational regions.

About a third of participants with peripheral parasitaemia had asymptomatic malaria. Other authors have recorded higher prevalence of asymptomatic parasitaemia: 48% [27] and 89% [2] (the latter study used fever only to determine symptomatic malaria, thus the very low prevalence).

Utilization of malaria prevention methods

Anecdotal evidence shows that ITNs are routinely distributed free in the study areas. However, only half of the study population claim to sleep under these nets. Reasons discussed previously in the Introduction may explain this.[15,16] Fifty-three percent of the general population in sub-Saharan Africa are estimated to sleep under nets, which is accredited to the improved access to these nets.[28] However, evidence from meta-analysis shows that even though getting free nets improve ownership compared to paying a subsidized cost or in full; it had no effect on its utilization.[29] Educational intervention was found to have a positive effect on its use; therefore, more emphasis should be placed on health education about this control strategy.[29]

About 55% of pregnant women in sub-Saharan Africa have at least one dose of IPTp-SP during pregnancy, while 31% have three doses.[28] Yet, less than a third of this study's participants had had at least one dose. SP is neither supplied free at the study areas nor dispensed under direct observation, so this maybe an obvious explanation for its poor utilization as compared to ITNs which are supplied free. IPTp use has been shown to reduce the risk of malaria in pregnancy,[8,13] and strategies to increase its uptake are therefore desired. The World Health Organization noted in its current guidelines[7] that its previous recommendation for at least two doses[6] resulted in countries (including Nigeria) formulating their national programs to target the administration of two doses in pregnancy. This has been modified to unlimited monthly doses, with a target of at least three doses.[7] The findings of this study were far behind these guidelines, as most providers have been slow to implement the update.

The late gestational age at booking that was prevalent in this study, is not uncommon in the study area. In the Demographic and Health Survey, only 17.6% booked in the first trimester; median pregnancy age of booking was at 5 months.[30] In a similar local study, 2.5% booked in the first trimester, while the average booking time was 23.5 weeks.[25] Late booking limits the benefit that can be derived from preventive measures; IPT should

have been commenced from the early second trimester. Despite the fact that most participants were recruited in the third trimester, low utilization of SP was found. Late booking may also have contributed to this.

Association between compliance with malaria prevention methods and malaria parasitaemia

The recommended combination of both preventive measures (as self-reported) resulted in the lowest prevalence of both parasitaemia and symptoms, as expected. However, despite a lack of statistical significance (which may be due to the low prevalence of malaria in pregnancy in the study area), this study suggests that the use of bed nets only is associated with a lower prevalence of malaria, when compared to the use of chemoprophylaxis only. As SP is paid for out-of-pocket and used at home, it may be more difficult to ensure full compliance. Targeting a hundred percent of these pregnant women sleeping under a net may currently be more feasible in the study area, as nets are distributed free at antenatal clinics.

The study was limited in that chemoprophylaxis and ITN use were not observed, but rather reported. This may limit the interpretation of the findings; however, the low prevalence of malaria suggests that the claims to adherence were probably not embellished. The study also assumed that most clients booked after the first trimester, as is often so in the study area. The assumption is that participants would have been prescribed IPT at their first visit, before being recruited at subsequent visits. This assumption is not always so, as a few register early, so may not have been prescribed IPT before recruitment.

CONCLUSION

This study found a low prevalence of malaria among pregnant women in selected rural and peri-urban communities in Ibadan, with reported uptake of preventive measures in about two-thirds of them.

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