



Knowledge and Practice Pattern of Malaria Prevention and Control in Pregnancy by Healthcare Providers within the Context of Focused Antenatal Care in Enugu State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author UIN designed the study wrote the protocol and wrote the first draft of the manuscript. Author OAM performed the statistical analysis and managed the literature searches. Author CAN helped in the design of the work and literature searches. All authors read and approved the final manuscript.

Original Research Article

Received 1st April 2014
Accepted 18th May 2014
Published 16th June 2014

ABSTRACT

Aim: To assess the knowledge and practice pattern of malaria prevention and control in pregnancy by healthcare providers within the context of focused antenatal care.

Study Design: A prospective cross-sectional survey study.

Place and Duration of Study: Health facilities from the three levels of care in Enugu, Southeast Nigeria, between July to September, 2011.

Methodology: Data collection was with a pre-tested structured questionnaire administered to the healthcare providers that were directly involved in antenatal care services. They consisted of 113 respondents (Doctors, Pharmacists and Nurses). The questionnaire elicited information on their knowledge about malaria, treatment and prevention practices.

Results: Many providers had high knowledge of malaria in pregnancy. Malaria diagnosis was mainly by symptom recognition 102 (90.3%). Treatment of uncomplicated malaria was mainly with Artemisinin-Combination Therapies (ACTs) both in the 1st 43 (38.1%), 2nd and 3rd 55 (48.7%) trimesters. Severe malaria was also treated with ACTs 24 (24.8%) by

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majority of the providers. Quinine was used by only few providers in treating 1st trimester uncomplicated malaria 8 (7.1%) and severe malaria 19 (16.8%). Sulphadoxine-Pyrimethamine (SP) was mostly used by the providers 88 (77.9%) for malaria prevention while proguanil 29 (25.4%) was usually given as an alternative to SP. SP was given by directly-observed treatment by 55.8% of the providers while only 18.6% actually withheld folic acid supplementation for the recommended two weeks following SP administration. Other antenatal care (ANC) - MIP integrated services rendered by the providers were Iron folate supplementation 90 (79.6%), Insecticide-Treated-Nets (ITNs) Provision 87 (77.0%) and Deworming 30 (26.5%).

Conclusion: The level of knowledge on malaria in pregnancy was high among the providers. However, there was sub-optimal delivery of current best practices, especially in the area of drug prescriptions for both treatment and prevention. Multiple strategies are required to improve healthcare providers' practices in MIP prevention and control.

Keywords: Malaria; prevention; pregnancy; knowledge; practices.

1. INTRODUCTION

Malaria is an infectious disease which poses a major public health burden, especially in sub-Saharan Africa. Pregnant women and their unborn children are especially vulnerable to malaria. An estimated 25 million women are at risk of becoming infected with *Plasmodium falciparum* during pregnancy in sub-Saharan Africa each year [1,2]. Adverse birth outcomes due to malaria in pregnancy include an increased prevalence of maternal anaemia, low birth weight, premature birth and neonatal mortality [3,4]. In Nigeria, up to 30% of childhood mortality and 11% of maternal mortality has been attributed to malaria [5,6].

Currently, the WHO Strategic Framework for Malaria Prevention and Control during Pregnancy in the African Region² recommends a three-pronged approach using: Intermittent preventive treatment during pregnancy (IPTp), Vector control including use of Insecticide Treated Nets (ITNs) and Case management of malaria illness and anemia. Before now, prevention of malaria in pregnancy using antimalarials, had centered on regular administration of drugs throughout pregnancy in order to sustain protective blood levels (Chemoprophylaxis) [7]. The drugs used were chloroquine, pyrimethamine and proguanil [8]. However, this has changed to the new concept of IPTp which involves administration of full curative dose of an effective antimalarial drug at pre-defined intervals during pregnancy. For now, IPTp with sulphadoxine-pyrimethamine (SP) is given irrespective of peripheral blood malaria parasite status, to all pregnant women after 16 weeks of pregnancy [2,7].

The Nigeria National Guideline hitherto recommended the practice of malaria prevention in pregnancy through the administration of four chloroquine (CQ) tablets as a start dose followed by weekly administration of pyrimethamine tablets as chemoprophylaxis during antenatal and up to six weeks post-delivery period [7]. However, in 2005, Nigeria adopted the policy of IPT with SP which has been recommended by the World Health Organisation (WHO) since 2000. Weekly prophylaxis with chloroquine proved unsuccessful because of logistical constraints, the spread of high-grade CQ-resistant malaria parasites and pruritus (itching) following CQ use [9].

The National Guideline stipulates that pregnant women be given at least two dose of SP, given one month apart in the second and third trimesters using the directly-observed treatment strategy.

Vector control aims to reduce illness and death associated with malaria by preventing human-vector contact, thus decreasing the levels of transmission [10]. The WHO recommends that pregnant women in areas of stable and unstable transmission sleep under an ITN nightly, starting as early in pregnancy as possible, and continue to do so postpartum with their newborns and children under five.

Case management of malaria in pregnancy entails providing both appropriate diagnosis and treatment to pregnant women with clinical cases of malaria. Ideally, diagnosis of malaria should be based on parasitological diagnosis if reliable light microscopy or Rapid Diagnostic Test (RDT) were available. Alternatively, symptom history can be used as a basis of initiating treatment. The National Guideline [7] recommends the use of quinine for the management of both uncomplicated and severe malaria in all trimesters, especially in the first trimester while Artemisinin-Combination Therapies are to be used for uncomplicated malaria both in the second and third trimesters. Quinine has been found the most effective of the drugs considered safe in first trimester for both uncomplicated and severe malaria in pregnant women [11].

The WHO/AFRO *Strategic Framework* recommends antenatal clinics as the platform to implement MIP programs [2] because nearly 70% of women in Africa attend antenatal clinics at least once during their pregnancy, and many attend at least twice [12]. The framework for Focused Antenatal Care (FANC) is provision of a minimum package of evidence-based services to all pregnant women during ANC to promote health, detect existing diseases, prevent and detect complications of pregnancy, and foster birth preparedness [10]. Thus, as part of FANC, skilled providers give women information and counseling on the dangers of malaria in pregnancy as well as steps to protect themselves, their newborns and their children under five years of age. These messages include the importance of practices such as continuing antenatal care, taking iron and folate to prevent and treat anaemia, taking the next scheduled dose of IPTp and sleeping under an ITN among other healthcare interventions [13]. Also, Provision of ITNs should be part of the ANC package for pregnant women during routine ANC services.

All MIP interventions are evidenced-based, thus the healthcare professionals' knowledge and practice of these services, especially those directly involved in ANC, are crucial to effective malaria control. This information will be useful for improving the delivery of these effective interventions in the treatment and prevention of malaria in pregnancy. This paper sought to assess the knowledge and practice pattern of these healthcare professionals concerning the delivery of recommended MIP services in the context of focused antenatal care.

2. METHODS

This was a cross sectional descriptive study conducted in Enugu State, South-Eastern Nigeria. The State is made up of seventeen local government areas and three Senatorial Districts. The State's health delivery is through a system of formal and informal private and public health facilities. Malaria transmission in the area is stable and holoendemic.

2.1 Sampling

The study was a combination of probability and non-probability sampling technique involving grouping hospitals into the Senatorial Zones that make up the State and conveniently

selecting primary, secondary and tertiary hospitals from the three senatorial districts. The convenient selection was based on proximity and accessibility of the hospitals. The study was carried out in 22 health facilities in Enugu. It included: one tertiary hospital, seven secondary hospitals, nine primary hospitals and five private hospitals. The study included only hospitals that offer ANC services. The sample size was computed using a power of 80% and a confidence level of 95% and assuming that at least 85% will be knowledgeable about malaria in pregnancy prevention and control. Epi Info software package was used to give a sample of 84. However, a sample of 113 was used.

2.2 Data Collection

A self-administered pre-tested structured questionnaire was used to collect relevant knowledge and practice information from all consenting healthcare professionals that were directly involved in the provision of ANC services on the day of visit to the hospitals.

A questionnaire was designed with information from literature [7,14]. It comprised of 23 questions categorized into 3 sections: demographic characteristics, knowledge and practice of malaria prevention and control using drugs or vector control. The knowledge section 'Yes or No' questions were mainly extracted from a reference manual for healthcare providers on prevention and control of malaria in pregnancy [14]. The study was carried out between July and September 2011.

The study received approval from the Department of Clinical Pharmacy Review Board and also obtained permissions from the respective hospitals' administrations. A verbal consent was also obtained from the respondents before administration of the questionnaire.

2.3 Data Analysis

Simple descriptive statistics was used to assess the levels of both knowledge and different practices on prevention and control of malaria in pregnancy. Also the knowledge level was categorized as either 'high knowledge' or 'low knowledge' based on a cutoff point of greater than or equal to 70% score on the 10 knowledge questions. This cutoff point was chosen based on the fact that the reference manual¹⁴ used a score of 70% and above as pass mark for the assessment test administered at the end of training with the manual. The level of association between high or low knowledge and the different practices was also accessed with Pearson correlation with the level of significance set at $p < 0.05$. The statistical analysis was carried out using SPSS version 14.0 software.

3. RESULTS

3.1 Demographics

A total of 113 questionnaires were administered to healthcare providers across the health facilities Table 1. Most of the respondents were from public hospitals 85 (75.2%) and were mostly nurses 92 (82.1%). A total of 52 respondents had received training on malaria prevention and control in pregnancy.

3.2 Knowledge of Malaria in Pregnancy Prevention and Control

Table 2 shows that majority 88 (77.9%) of the healthcare providers had 'high knowledge' on MIP prevention and control. More than 90% of the healthcare providers could answer

correctly questions on MIP-ANC integrated services (Q 1 and Q7), malaria transmission (Q2) and malaria vector control (Q4). The question that addressed the use of DOT strategy in deployment of IPTp-SP was the most incorrectly answered as only few did not believe that SP should be given to the women to take at home 39 (34.5%).

Table 1. Socio-demographics of the healthcare providers

Variables	N=113 n (%)
Facility type	
Private	28 (24.8)
Public	85 (75.2)
Facility level	
Primary	39 (34.5)
Secondary	62 (54.9)
Tertiary	12 (10.6)
Professional cadre	
Nurses	92 (82.1)
Pharmacists	5 (4.5)
Doctors	15 (13.4)
Age	
20 – 30 years	33 (33.7)
31 – 40 years	36 (36.7)
41 – 50 years	29 (29.6)
Marital status	
Single	16 (16.0)
Married	81 (81.0)
Widowed	1 (1.0)
Separated	2 (2.0)
Number of year of practice	
< 5 years	32 (31.1)
5 -9	17 (16.5)
10 – 14	16 (15.5)
>14	38 (36.9)
Practice volume	
1 – 25 patients/day	36 (38.7)
26 -50 patients/day	31 (33.3)
50 patients/day	26 (28.0)
Training on MIP prevention and control	
Nurses	44 (48.4)
Pharmacists	2 (40.0)
Doctors	6 (40.0)

3.3 Treatment Practices

The different treatment practices in terms of diagnosis and treatment of clinical cases of malaria are shown in Table 3. Malaria was mostly diagnosed using recognition of symptoms by the healthcare providers 103 (90.3%), while RDT 27 (23.9%) was rarely used. Treatment of uncomplicated malaria in the 1st trimester was mostly with ACTs and only a few 8 (7.1%) use quinine. During the 2nd and 3rd trimesters, majority of the providers also use ACTs 55 (48.7%). The same was the case for severe malaria, as a greater percentage 24 (24.81%) also use ACTs for treatment of severe malaria in pregnant women. However, the use of ACTs for treatment of uncomplicated malaria in 1st trimester (0.216) was significantly associated with having a high knowledge of prevention and control of malaria in pregnancy.

Table 2. Questions assessing healthcare providers' knowledge of malaria prevention and control in pregnancy

S/N	Questions (True/False)	N = 113 n (%)
1.	ANC education and counseling should include consequences of malaria in pregnancy to both mother and child. [True]	112 (99.1)
2.	Malaria can be transmitted by eating contaminated food. [False]	108 (95.6)
3.	Malaria parasite in the blood of pregnant women interferes with transfer of nutrients (food) to the baby. [True]	78 (69.1)
4.	Use of insecticide-treated-nets (ITNs) do not reduce malaria incidence.[False]	104 (92.0)
5.	Sulfadoxine-Pyrimethamine (SP) should be given to women in 1 st trimester. [False]	77 (68.1)
6.	SP should be given in 2-doses to HIV negative pregnant women. [False]	68 (60.2)
7.	Comprehensive ANC package includes giving iron/folate and anaemia screening to control material anaemia. [True]	109 (96.5)
8.	First-line treatment for uncomplicated malaria in 1 st trimester include the Artemisinin-Combination Therapy (ACTs) e.g. Coartem. [False]	60 (53.1)
9.	Sulfadoxine-Pyrimethamine (SP) should be given to a woman who had received recent treatment with SP less than 1 month ago. [False]	84 (74.3)
10.	Pregnant women should be given SP to take at home. [False]	39 (34.5)
	Percentage of women with > 70% correct answers	88 (77.9)

Data shows the percentage of respondents who correctly answered each question

Table 3. Treatment Practices

Variables	N (%)	Pearson correlation coefficient
Diagnosis		
Physical Examination	38 (38.6)	0.106
Symptom Recognition	102 (90.3)	-0.076
Microscopy	94 (83.2)	0.080
RDT	27 (23.9)	0.013
Self-recognition	20 (17.7)	0.154
Drugs used in 1st trimester uncomplicated malaria		
Quinine	8 (7.1)	0.147
Artemisinin-Combination Therapy	43 (38.1)	0.216
Sufadoxine-pyrimethamine	18 (15.9)	-0.118
Chloroquine	16 (14.2)	0.155
Proguanil	3 (2.7)	-0.045
Amodiaquine	7 (6.2)	0.049
Artesunate	4 (3.5)	0.072
Artemether	2 (1.8)	-0.013
Drugs used in 2nd and 3rd trimesters uncomplicated malaria		
Sufadoxine-pyrimethamine	29 (25.7)	0.069
Artemisinin-Combination Therapy	55 (48.7)	0.057
Chloroquine	5 (4.4)	0.115
Drugs used for severe malaria		
Artemisinin-Combination Therapy	24 (24.8)	
Quinine	19 (16.8)	
Artemether	16 (14.2)	
Sulfadoxine-Pyrimethamine	12 (10.6)	

Significant at p<0.05

3.4 Prevention Practices

Practices involved in the ANC integrated services of MIP prevention and control are shown in Table 4. Sulphadoxine-pyrimethamine (SP) was prescribed by majority of the healthcare providers for prevention of malaria in pregnancy. A small proportion of the respondents still prescribe chloroquine 22 (19.5%) and pyrimethamine 19 (16.8%) for prevention of malaria in pregnancy. As an alternative to SP, most healthcare providers prescribe proguanil 29(25.4%) for women who cannot take SP for any reason. Sleeping under an ITN was given as an alternative advice to women who cannot take SP by only a few of the respondents 4 (3.5%).

Table 4. Prevention and control practices

Variables	N (%)	Pearson correlation coefficient
Drugs used for malaria prevention		
Proguanil	31 (27.4)	0.11
Pyrimethamine	19 (16.8)	-0.191*
Chloroquine	22 (19.5)	-0.032
Sulfadoxine-pyrimethamine (SP)	88 (77.9)	0.218*
Quinine	12 (10.6)	0.104
Artemisinin-combination therapy	30 (26.5)	0.054
Drugs used as alternatives to SP		
Proguanil	29 (25.4)	0.167
Artemisinin-combination therapy	24 (21.2)	0.016
Quinine	13 (11.5)	0.059
Insecticide-treated nets (ITNs)	4 (3.5)	-0.013
Chloroquine	10 (8.8)	0.016
Amodiaquine	8 (7.1)	-0.102
SP administration by DOT	63 (55.8)	-0.131
Withholds folic acid when giving SP	21 (18.6)	0.071
Reasons for non-DOT SP administration		
Clean drinking water	7 (6.2)	-0.163
SP shortage	23 (20.4)	0.008
Empty stomach	51 (45.1)	0.024
Heavy workload	22 (19.5)	0.198
Other ANC components offered		
Iron folate	90 (79.6)	-0.060
Deworming	30 (26.5)	0.020
ITN provision	87 (77.0)	0.041
Advise using ITN	99 (87.6)	0.007

*Significant at $p < 0.05$, DOT = Directly-Observed Treatment, SP= Sulfadoxine-pyrimethamine, ITNs = Insecticide-Treated Nets, ANC = Antenatal Care

The strategy of using directly-observed treatment strategy were observed by 55.8% of the healthcare providers while only a few 21 (18.6%) advised on withholding folic acid supplement for two weeks while taking SP. Insecticide Treated nets were provided by majority 87 (77%) of the respondents as a form of vector control within the ANC services.

The use of SP as malaria preventive drug in pregnancy was positively associated with having a high knowledge of MIP prevention and control (0.218) while prescribing pyrimethamine was negatively associated with having a high knowledge of prevention and control of MIP.

4. DISCUSSION

The knowledge level of prevention and control of malaria in pregnancy was high among the healthcare providers but the practice pattern was fraught with irrational prescribing practices, especially in the area of chemotherapy. Almost all the questions assessing knowledge were correctly answered by more than half of the healthcare providers except two questions addressing chemotherapy in 1st trimester and the use of directly-observed treatment (DOT) strategy in the deployment of IPTp-SP, respectively. These knowledge gaps may have reflected in their unrecommended prescriptions for chemotherapy, especially in the 1st trimester and the fact that just a little above 50% of them practice the DOT strategy in the deployment of IPTp-SP. The reason given by most providers for not practicing DOT was that women often came to ANC without eating and thus could not take the drug on empty stomachs. This finding was not consistent with the new WHO Updated Recommendation which said that SP can be taken even on an empty stomach [15]. Another important reason for non-implementation of the DOT scheme in IPTp-SP was nonavailability of SP at the hospitals which has also been noted as an important factor working against DOT scheme in other studies [16,17]. These reasons have to be taken note of by the appropriate authorities for the full implementation of the DOT scheme to work.

In the provision of malaria clinical case management, diagnosis of malaria was mainly by symptom recognition and microscopy. These were in line with the WHO recommendations that clinical history which involves symptom recognition should be used as a basis for initiating therapy when parasitological investigations by either microscopy or RDT are not available [18]. However, parasitological investigations by microscopy and RDT have been recommended specifically for confirmation of malaria [19].

The most commonly used drugs for treatment of uncomplicated malaria in the 1st trimester were ACTs, SP and chloroquine while quinine, the recommended drug, was prescribed by just few providers. Quinine, SP, chloroquine, proguanil and pyrimethamine are considered safe in 1st trimester, but quinine is considered the drug of choice because it is the most effective and can also be used in all trimesters [20]. Issues of increasing resistance to chloroquine [21] and SP [22] have limited their use for clinical management of malaria. Besides, SP is not given early in 1st trimester because of theoretical concerns over the association of folate antagonists with neural tube defects and congenital abnormalities [23]. As regards the treatment of uncomplicated malaria in the 2nd and 3rd trimesters, the use of ACTs by majority of the providers was in line with both WHO recommendations [2] and National Guideline [5]. On the other hand, ACTs which were mainly prescribed for treatment of severe malaria by the providers, are not the recommended therapy in cases of severe malaria. Instead, quinine or an artemisinin derivative is the current recommendation for treating severe malaria in high transmission areas [24] like Nigeria.

Surprisingly, healthcare providers who had high knowledge were more likely to prescribe ACTs in the first trimester. Artemisinin combination therapies are recommended by WHO for the treatment of all *P. falciparum* malaria [24] except in the first trimester because results from animal studies [25,26] suggest that artemisinins are embryotoxic. However, recent studies [27-29] of first-trimester exposures to artemisinin derivatives in humans, have recorded no significant adverse effects. Nevertheless, caution need to be exercised till further information, preferably from a randomized trial of Artemisinin-Combination Therapy in the first trimester and possibly more pregnancy registries' pharmacovigilance reports, before definitive statements on their safety can be made.

The observation that some providers still prescribed chloroquine, SP, amodiaquine and even artesunate monotherapies raises concern over such irrational prescribing, bearing in mind the issue of resistance to such drug choices. These unrecommended prescribing practices were also seen in the area of malaria prevention that saw providers prescribing chemoprophylaxis with pyrimethamine, chloroquine and proguanil and even recommending ACTs and quinine for prophylaxis against malaria. A recent study [30] in the same study area found that a good proportion of healthcare providers not only use chemoprophylaxis with proguanil, chloroquine and pyrimethamine, but also stated that the drugs were still useful in control of MIP. The increasing levels of *P. falciparum* resistance to some of the drugs and poor adherence due to the complex drug regimen used for chemoprophylaxis with such drugs, have limited their use [31]. It was however, heartwarming that most of the providers recommended SP according to Guidelines [7,2], as a preventive drug for control of MIP. However, very few withheld folic acid administration for two weeks following SP administration according to National Guideline. Some invitro [32] and invivo [33] studies have shown that folic acid, especially in high doses of 5mg or more can antagonize the antimalarial action of SP. This has led to some public authorities recommending that folic acid be temporarily withheld after SP administration. However, it has been shown [33] that folic acid supplementation at a dose of 0.4mg, does not counteract the antimalarial action of SP. Thus, the new WHO updated Policy recommendation [15] states that only folic acid supplementation at a dose of 5mg, as used in Nigeria, or above should not be given together with SP. The National Guideline [7] recommends the use of ITN from early pregnancy for those who cannot take SP for any reason. Only very few recommend the use of ITN as an alternative to SP. Rather, they prescribed proguanil. This was so even though majority of them not only advised on the use of ITN, but also provided ITN as part of the ANC-integrated MIP control services rendered. Ownership of ITN may not necessarily translate to usage, thus there is need to seek ways to ensure usage, probably through the use of Information, Education and Communication (IEC) strategies. Iron supplementation was also one of the major ANC-integrated MIP control services rendered by most providers as anaemia has been implicated as a major adverse effect of MIP [34].

The study was limited by the convenience sampling employed in study site selections. However, it could be argued that its spread of up to 22 hospitals was wide enough to capture a good representation of the providers' knowledge and practices as regards control of malaria in pregnancy. Further studies should explore, probably through qualitative studies, the reasons behind some of these unrecommended prescribing practices observed in this study.

5. CONCLUSION

This study has highlighted some prescribing practices among health providers involved in MIP prevention and control that are at variance with Standard Guideline Recommendations. Focused interventions towards the prescribing practices of the providers are recommended. Also, there is need for periodic assessments of practice that will also yield insights regarding quality of care given to pregnant women, especially, as relevant to control of malaria in pregnancy. This will likely discover gaps that can be addressed through increased Information, Education and Communication Campaigns targeting both the consumers and providers.

CONSENT

A verbal consent was also obtained from the respondents before administration of the questionnaire.

ETHICAL APPROVAL

The study received approval from the Department of Clinical Pharmacy Review Board and also obtained oral permissions from the respective hospitals' administrations. (See attachments 2 and 3)

ACKNOWLEDGEMENT

We are grateful to Abonyi Chijioke and Obioma Ogbu for their assistance in various aspects of the study. We are grateful to all the administrative heads of the health facilities used in the study for granting us permission to use their facilities.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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