



Uncomplicated malaria among pregnant women in the Brazilian Amazon: Local barriers to prompt and effective case management

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ABSTRACT

Malaria in pregnancy is associated with increased risks of maternal anemia, spontaneous abortion, low birth weight, premature delivery and other adverse effects on health. In Brazil, disease transmission is highly concentrated in the multi-state region that constitutes the Brazilian Amazon (more than 99% of all cases). This study, conducted between the first bimesters of 2007 and 2008, aims to identify the local barriers to prompt and effective case management of malaria in pregnancy and was carried out in health facilities located in three endemic municipalities of the Brazilian Amazon (Manaus, Presidente Figueiredo and Porto Velho). The study design combined both qualitative and quantitative descriptive methods. The qualitative design involved semi-structured interviews with health personnel who routinely deal with malaria care. The quantitative design involved a review of medical records of pregnant women in the visited health facilities. Additionally, data were abstracted from SIVEP-Malaria Epidemiological Surveillance Information System (Brasil, 2007) and Primary Care Information System (SIAB) databases. Flaws were detected in diagnosis (only 6.8% of women tested for malaria) and treatment (for *Plasmodium falciparum* infections, only 44.8% of patients received recommended first-line therapy; 10.2% of prescription presented treatments were not found in national guideline and 7.3% of the prescriptions for *Plasmodium vivax* and 17.9% of the prescriptions for *P. falciparum* were not sanctioned by the official guidelines). Training (only 37.3% had had some training), knowledge and counseling were also sub-optimal. These results indicated the need to improve the health-worker performance through training. Close supervision and feedback on the health-worker performance are also needed. These findings also highlighted the need to put into practice a series of government recommendations that encourage close collaboration between the National Malaria Control Program and Primary Health Care actions in order to achieve safer pregnancies.

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1. Introduction

Malaria in pregnancy is associated with increased risks of maternal anemia, spontaneous abortion, low birth weight, premature delivery, congenital infection, and neonatal and/or maternal death (Desai et al., 2007).

In Brazil, disease transmission is highly concentrated in the multi-state region that constitutes the Brazilian Amazon (more than 99% of all cases), with a greater prevalence of *Plasmodium vivax* (83.7%) (Oliveira-Ferreira et al., 2010). Although over the years there has been success in reducing deaths, severe cases and hospitalizations, malaria continues to be a major public health problem, with more than 300,000 registered cases in 2009 (Oliveira-Ferreira

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et al., 2010). Additionally, despite the considerable impact of the disease, there is limited available information regarding the burden of malaria in pregnancy in the Brazilian Amazon (Desai et al., 2007; WHO, 2007).

The National Malaria Control Program (*Programa Nacional de Controle de Malária – PNCM*) is the permanent policy for prevention and control of the disease in the country (Brasil, 2003). The control rationale focuses on prompt access to the parasitological diagnosis and the provision of the appropriate treatment. Considering the recommended treatment for uncomplicated malaria infection in pregnancy, the first-line antimalarial treatment for those women diagnosed with *P. vivax* is chloroquine monotherapy (primaquine is contraindicated in pregnancy and in lactating women). For *Plasmodium falciparum* episodes, the official recommendation is quinine monotherapy or quinine plus clindamycin. The guideline also recommends artemether plus lumefantrine or mefloquine as alternative options for *P. falciparum* in the second and third trimesters of pregnancy (Brasil, 2001, 2006a; Nosten et al., 2007).

The success of malaria case management depends, in part, on adherence to the official recommendations (Zurovac et al., 2004). However, studies have shown that health professionals frequently do not comply with the guidelines. The attributed reasons for the discrepancies between guidelines and practices include, among other explanations, lack of training and knowledge of guidelines (Kalilani-Phiri et al., 2011; Osorio-de-Castro et al., 2011), unfamiliarity with diagnosis and treatment (Tarimo and Malekela, 2007; Wijesinghe et al., 2011) and personal perceptions about treatment (Osorio-de-Castro et al., 2011; Tarimo and Malekela, 2007; Wijesinghe et al., 2011).

In this study, we described epidemiological and treatment characteristics of malaria in pregnant women and assessed the training, work experience, knowledge, and perception of health workers and professionals regarding malaria in pregnancy in order to identify the local barriers to prompt and effective case management of malaria.

2. Methods

The data presented in this paper were derived from a broader study, the Mafalda Project, conducted between the first bimesters of 2007 and 2008. This project assessed pharmaceutical services in the treatment of non-complicated malaria (organization of services, prescribing, dispensing and adherence). The conceptual framework for the study was published elsewhere (Osorio-de-Castro et al., 2009).

The Mafalda Project was carried out in health facilities located in six selected municipalities of the Brazilian Amazon (Manaus and Presidente Figueiredo, in the state of Amazonas; Porto Velho and Ariquemes, in the state of Rondônia; and Cruzeiro do Sul and Rodrigues Alves, in the state of Acre). The eligibility criteria for these municipalities included: malaria high-risk classification (an API – Annual Parasitic Index – greater than 50 cases per 1000 inhabitants), a count of, at least, 7000 cases of malaria per year, adoption of the 2001 national guideline and the existence of a prescription or a written instruction given to the malaria patient (Brasil, 2001; Osorio-de-Castro et al., 2011; Suárez-Mutis et al., 2011).

Eligible health units were all primary health facilities and health centers in municipal urban areas involved in Primary Health Care and distancing not more than 50 km from city-center (Osorio-de-Castro et al., 2011; Suárez-Mutis et al., 2011) and the chosen unit of analysis was the municipality. In order to accomplish the Mafalda Project purposes, health managers, health personnel and malaria patients of both genders aged 15 years or more were invited to participate in the study. Qualitative and quantitative designs were

used and the data collection instruments included questionnaires, observation forms, interviews forms and charts review forms that were applied successively during the study period by a team of trained field researchers. Data collection took around 10 days for each municipality (Osorio-de-Castro et al., 2009, 2011; Suárez-Mutis et al., 2011).

2.1. Study area

Three municipalities, among the six investigated in the scope of the Mafalda Project, counted with maternity services and were selected for the present study: Manaus and Presidente Figueiredo, in the state of Amazonas, and Porto Velho, in the state of Rondônia. Manaus is the capital city of the state of Amazonas with 1,802,014 inhabitants. Presidente Figueiredo is a municipality of 27,175 inhabitants located in the northern metropolitan region of Manaus, distancing 107 km from the city. Porto Velho is the capital of the state of Rondônia with 428,527 inhabitants. These cities are malaria endemic.

2.2. Study design

As in Project Mafalda, this, study combines both qualitative and quantitative descriptive designs. The qualitative design involved semi-structured interviews with health personnel who routinely deal with malaria care. In each municipality six health units were visited, among primary health facilities, health centers and reference centers. These facilities were chosen because they concentrated a high number of malaria cases, according to information from the State Health Secretariats. Questions exploring information on pre/in-service training, work experience, possession of the official national treatment guideline (*Manual de Terapêutica da Malaria – MTM Brasil, 2001*), perceptions of the hazards associated with malaria in pregnancy, local experience with malaria treatment in pregnancy and general recommendations for malaria treatment in pregnancy were discussed.

The quantitative design involved a review of medical records of pregnant women. Data were collected in health units which were more likely to have records of pregnant women, based on information from the State Health Secretariats. These health facilities included four primary health facilities/health centers and two reference centers for malaria treatment (one in Manaus and one in Porto Velho). Selection of records was based on pre-identification of prescriptions for uncomplicated malaria (Osorio-de-Castro et al., 2009). Data on the following variables were collected: malaria diagnosis, maternal age, gestational age, parity, pregnancy type (single or multiple pregnancy), number of prenatal visits, prescribed antimalarial treatment, reports of adverse effects.

The prescribed antimalarial treatments were classified in accordance with the official guideline version adopted at the time of the study (Brasil, 2001). A combined artemisinin treatment regimen that was introduced in 2006 and published as a pamphlet by the PNCM (Brasil, 2006b) was also acknowledged as harboring official antimalarial treatment options.

Additionally, data were abstracted from the following available Brazilian National Health System (*Sistema Único de Saúde – SUS*) databases: SIVEP-Malaria Epidemiological Surveillance Information System (Brasil, 2007) and Primary Care Information System (SIAB). The SIVEP-Malaria database contains information of malaria cases diagnosed in Brazil since 2003. The SIAB database contains population indicators (morbidity, mortality and health care delivery) for a given area. Information within these two databases was collected for the year 2007, to coincide to Mafalda's investigation period. The guideline indicates that all pregnant women in endemic areas must be screened for malaria (Brasil, 2006c).

Table 1

Municipality, number and percentage of cases in pregnant women among women of fertile age (15–49 years), 2007.

Municipality	Pregnant women (n)	Women of fertile age (n)	Percentage of cases in pregnant women among women of fertile age (%)
Manaus	1107	15.043	7.4
Presidente Figueiredo	73	1.079	6.8
Porto Velho	580	10.334	5.6
Total	1760	26.456	6.7

Data source: SIVEP-Malaria.

2.3. Data analysis

2.3.1. Quantitative data

Analysis was carried out by means of descriptive statistics expressing data as frequencies and percentages. The statistical software package SPSS 13.0 for Windows (IBM Corporation, USA) was used.

2.3.2. Qualitative data

The interviews were transcribed and analyzed using content analysis and categorization. Work was carried out by two independent groups of researchers. The first group identified specific content in discourse, while the second group classified discourse materials according to predefined theoretical background. The use of this method enabled the identification, coding and validation of categories and sub-categories, which were established by consensus technique.

2.4. Ethical considerations

This study was approved by the Ethics in Research Committee of the Sergio Arouca National School of Public Health, Oswaldo Cruz Foundation (Fiocruz) (Approval number 91/06; CAAE 0086.0.031.000.06). Previous contact was established with all malaria managers and health workers and written consent was given before visits for access to patient records and for interviews.

3. Results

3.1. Quantitative data

3.1.1. Malaria cases in pregnant women

In 2007, 1760 cases of malaria in pregnant women were registered in Manaus, Presidente Figueiredo and Porto Velho (Manaus accounted for 63% of the total). Approximately, 80% of cases were caused by *P. vivax*. Table 1 presents women of fertile age (15–49 years), numbers of malaria cases for pregnant women, and the percentage of cases in pregnant women among women of fertile age for each municipality. Malaria cases among pregnant women accounted for 6.7% of the cases reported among women of fertile age.

Table 2 presents the estimates of pregnant women in the total population and the total of pregnant women examined for malaria.

Table 2

Municipality, total of pregnant women in the population, total of pregnant women examined for malaria, 2007.

Municipality	Total of pregnant women	Pregnant women tested n(%)
Manaus	43.486	2835 (6.5)
Presidente Figueiredo	2.293	73 (3.2)
Porto Velho	6318	657 (10.4)
Total	52.097	3.565 (6.8)

Data source: SIVEP-Malaria and SIAB databases.

Only 6.8% of the pregnant women in these municipalities were tested for malaria. Porto Velho showed the highest percentage of pregnant women tested for malaria (10.4%).

3.1.2. Medical records review

A total of 250 medical records of pregnant women were reviewed in the visited facilities. Gestational age was located in 200 registers (80.0% of total) and ranged from 1 to 44 weeks (mean = 23.0 weeks; [SD = 9.70]). The majority of the pregnant women were in the second trimester (44.0%). Type of pregnancy was found in only 26.4% (n = 66) records. The majority of these patients bore one fetus (97%; n = 64). The number of prenatal visits was found in only 113 (45.2%) records. For the greater part of these 113 women the number of prenatal visits amounted to three at most (61.9%).

The prescribed antimalarial treatment was found in almost all registers (n = 248; 99.2%). Table 3 presents the *Plasmodium* type stratified by the prescribed therapeutic regimens. According to the official guidelines (Brasil, 2001, 2006a) and considering malaria infections caused by *P. vivax* (n = 182), the majority of patients (90.1%) received the standard recommended treatment. In respect to *P. falciparum* infections, however, only 44.8% of the patients received the recommended first-line therapy. Treatment regimens not listed in the national guideline were found in 10.2% of prescriptions. Considering the therapeutic regimens according to the *Plasmodium* type, 7.3% of the prescriptions for *P. vivax* and 17.9% of the prescriptions for *P. falciparum* were not sanctioned by the official guidelines.

3.2. Qualitative data

In the visited facilities, 51 health personnel were involved in malaria care. Nearly all of them (49) were health agents that specifically attend to malaria patients, carrying out diagnosis, therapy indication and dispensing of antimalarial treatment (Brasil, 2006d) and represent the front line of malaria health care work in the municipalities of the Brazilian Amazon. Included in this group were also a physician and a nurse.

All 51 health personnel were interviewed. Content analysis of interviews resulted in three categories (and various sub-categories) established after consensus: training (content/quality of training

Table 3

Plasmodium type and classification of the therapeutic regimens prescribed according to the official guidelines. Mafalda Project, 2007/2008.

Plasmodium type	Classification of the therapeutic regimens prescribed	Frequency n (%)
<i>P. vivax</i>	First-line therapy	164 (92.7%)
	Other ^a	13 (7.3%)
<i>P. falciparum</i>	First-line therapy	30 (44.8%)
	Alternative option	25 (37.3%)
	Other ^a	12 (17.9%)

^a Prescribed treatment not officially sanctioned by the national guidelines.

and duration); perceptions and attitudes toward malaria in pregnancy (perceptions on pregnant women; association between malaria and specialized care; disease monitoring; disbelief in and lack of knowledge about treatment) and counseling (paternalistic attitude; absence of counseling skills; views on combined artemisinin, CoartemTM).

3.2.1. Training

A low percentage of interviewees (only 37.3%) reported they had attended any type of training. This referred training was mostly provided by the National Health Foundation (FUNASA) and the state Health Secretariats (SES) of Amazonas and of Rondônia, varying in content (diagnosis, case management or preventive actions such as indoor insecticide spraying, counseling on use of insecticide-treated nets and case management for pregnant women) and duration (from one week up to three months). Moreover, these participants could not precise when they received the mentioned training: *"I have participated in (...) health agent training, you know. It was in another municipality, in another state."* (Health worker)

According to interviews, quality of training is questionable. Theory was offered but learning only came with everyday practice: *"Actually, we really learned in practice, day by day, because at first we were only given a general view, you know. The rest we got as things went on, day by day."* (Health worker)

What the majority of the interviewees expressed, in fact, was their lack of training: *"Well, we didn't have a conventional training, you see."* (Health worker)

3.2.2. Perceptions and attitudes toward malaria treatment in pregnancy

The health workers perceive pregnant women as an easy, conscious and collaborative malaria patient: *"Pregnant women are good. They're calm. They're more careful than other people in order not to harm the child."* (Health worker)

For these health workers, malaria in pregnancy is associated with the need of specialized medical care. They refer pregnant women to health centers or reference centers for malaria treatment, where there are physicians: *"We refer the pregnant women to the physician. We do not manage the treatment for these patients."* (Health worker)

The health workers report that pregnant women should be monitored during the treatment up to six months after delivery: *"We must see if the woman is taking the medicines properly, if she is having a relapse, because if she is (or) if she is not getting better with the prescribed medicines, we must then refer the patient to a health center, to a physician for better follow-up."* (Health worker)

Regarding the therapeutic regimen, the interviewees demonstrate inconsistencies regarding the guideline: *"The medicine, CoartemTM, can be used after the sixth month of pregnancy."* (Health worker)

For these health workers the cure can only be achieved after the breast-feeding period: *"We must follow the pregnant woman because she is a patient that will always be infected, she will never be cured (during pregnancy). She will never be cured during her pregnancy and for the next six months after she gives birth, will she?"* (Health worker)

We may also note a certain disbelief in treatment effectiveness in pregnancy that is explicit in speech: *"Because she is different from other patients who are able to take all the antimalarials, the common treatment, and can be cured soon, am I right?"* (Health worker)

3.2.3. Counseling

Health workers perceive the pregnant woman as a vulnerable patient. This perception makes them more attentive toward the pregnant woman: *"She is a patient that we are more affectionate towards, that we have a special concern (in face of), just to be sure that she will be really cured. (...) "* (Health worker)

In light of the perceptions related to treatment during pregnancy and to the way health workers view the pregnant patient, it is important to observe the way in which they actually counsel patients. The first characteristic is the lack of a pro-active attitude in face of the patient: (Counseling occurs) *"Only when they have doubts."* (Health worker)

The health workers perceive themselves as having a supporting role in the counseling process, which they exercise only if physicians have been unable to comply with patient needs in understanding treatment regimen: *"Because many times doctors say a lot, say things the person does not understand, in another language, they (patients) don't understand. They come and ask us, and we explain."* (Health worker)

Health workers are very brief in reporting instructions they give to pregnant patients: *"Just go to the counter, hand it to her (the medication) and say, 'take this every twelve hours, don't mess up schedules, you shouldn't take it before hand for the baby's sake' (...) "* (Health worker)

The advent of the artemisinin combination artemether plus lumefantrine (Coartem) (Brasil, 2006a) was celebrated because of easiness of therapeutic regimen: *"Then everything got easy and simple, easy with CoartemTM."* (Health worker)

4. Discussion

Malaria remains a major public health problem in Brazil, which more than 99% of registered cases coming from the Amazon Region (Oliveira-Ferreira et al., 2010). This study indicated *P. vivax* as the most important malaria species associated to infection in pregnant women. This was an expected result, since *P. vivax* infection is more frequent than the *P. falciparum* one both in the general population and among pregnant women of the studied region (Brasil, 2008; Martínez-Espinosa et al., 2004).

On the other hand, the study was conducted in a malaria endemic area of the Brazilian Amazon, in municipalities where services should be expected to be structured and organized to fight the disease. However, the results of this investigation suggest the existence of potential local barriers to the implementation of actions determined by the National Malaria Control Program (PNCM) and by the World Health Organization (WHO) (Brasil, 2003, 2006d; WHO, 2007).

The findings revealed, for instance, the existence of gaps in terms of malaria diagnosis. The national recommendation are to provide, at least, six antenatal clinic visits and a parasitological diagnostic test for malaria to all pregnant women (Brasil, 2006d), but the estimates show that only 6.8% of the pregnant women in the study area were actually tested. Effective case management strongly depends on a correct diagnosis (Font et al., 2001) and is essential to avoid unnecessary exposure of the mother and the fetus to antimalarial treatment. Besides, regardless of the presence of detectable symptoms, the simple presence of plasmodial parasites in the body is injurious for the mother and the fetus (Nosten et al., 2007). The low percentage of pregnant women tested also contributes to hinder reliable estimations of malaria risks in this population group which in turn may compromise malaria control strategies.

Furthermore, the medical records review showed that the majority of the malaria cases in pregnant women were diagnosed during the second trimester of pregnancy. This particular result could be explained by the fact that many women only present for their first prenatal visit in their second or third trimesters (Crawley et al., 2007). However, contrary to this evidence, and according to SIAB (DATASUS, 2012a), 66.5%, 83.0% and 69.0% of pregnant women in Manaus, Presidente Figueiredo and Porto Velho, respectively, attended prenatal clinics during their first trimester of pregnancy during 2007. These data reinforce the hypothesis that

many pregnant women are not having access to malaria diagnosis. Additionally, since an association between malaria infection in the first trimester and miscarriage has been established (McGready et al., 2012), it is also possible that many infected pregnant women have suffered spontaneous abortion, and as such eluding mandatory notification.

In respect to the prescribed treatment, it is of concern that 10.2% of the prescriptions or written instructions were considered inappropriate in relation to the official guidelines. Besides, almost one in five of the prescriptions of *P. falciparum* was not officially sanctioned by the national guidelines (Brasil, 2001, 2006b), supporting future focused intervention by the PNCM for this important segment of patients due to risk associated to *P. falciparum* infection in pregnancy. According to the literature, the lack of adherence to malaria treatment guidelines by health professionals is not uncommon (Kalilani-Phiri et al., 2011; Meremikwu et al., 2007). However, for pregnant women, this practice can pose additional health risks, especially considering infections caused by *P. falciparum*, which are mostly responsible for the excessive malaria-related mortality and morbidity (Nosten et al., 2007). Safety and efficacy of the available antimalarials are poorly documented (Nosten et al., 2007), but the ones recommended in the guideline for use during pregnancy have been considered safer (Brasil, 2010).

A previous investigation in the scope of the Mafalda Project that included individuals of both genders ≥ 15 years of age but not pregnant women, found that 4.6% of the prescriptions were not listed in the national guideline (Suárez-Mutis et al., 2011). Comparing to our result, pregnant women are facing over two-fold risk of ineffective case management of malaria. The relevant shortage of medical professionals in Manaus, Presidente Figueiredo and Porto Velho confronts the fact that malaria in pregnancy is associated with the need of specialized medical care (Brasil, 2006b) – which was also reinforced by the interviewees. According to data from The National Registry of Health Facilities in the Ministry of Health (the CNES database (DATASUS, 2012b) the estimated ratios per 1000 population for gynecologists/obstetricians, were, 0.09, 0.01 and 0.08 respectively, for these three municipalities. The corresponding ratios for infectologists were 0.01, 0.00 and 0.01. These estimated ratios severely contrast to the recommended national ratio of 0.2 for (any) specialized physician per 1000 inhabitants (WHO, 2005).

Another local barrier identified in this study was related to the training of personnel. The WHO recommends that the staff should be trained in the control of malaria in pregnancy during the previous 12 months and have had at least one supportive supervision per facility per year to reinforce knowledge and skills acquired during training (WHO, 2007). The PNCM also emphasizes the need of training in order to achieve the program goals (Brasil, 2003). In spite of these recommendations, however, this study reveals a lack of quality and duration in training.

The health professionals showed deficiencies in basic knowledge of malaria case management and counseling regarding pregnant women. Skilled and well-informed health workers are a prerequisite for successful control of malaria during pregnancy. The results are in contrast to the official recommendations (Brasil, 2006b) and may represent a barrier to malaria prevention and control in pregnant women.

In general, the results of this investigation showed that there are many local barriers to proper manage malaria cases in pregnancy. Flaws in diagnosis, treatment, training, knowledge and counseling were detected and these results indicated the need to improve the health-worker performance through training. Close supervision and feedback on the health-worker performance are also needed.

Above all, these findings highlighted the need, to put into practice a series of government recommendations that encourage close collaboration between the PNCM and Primary Health Care actions

in order to achieve safer pregnancies (Brasil, 2006b,e). Especially, the local integration of malaria control with reproductive health programmes is urgently needed to strengthen antenatal care. The different health professionals may be able to work together to provide joint actions in malaria control. In the same manner, health facilities should provide comprehensive healthcare practices to promote, to prevent and to assist all patients infected with malaria (Brasil, 2006e).

Despite the relevance of this disease, limited information is currently available regarding the overall burden of malaria during pregnancy in the Amazon Region (Almeida et al., 2010; Martínez-Espinosa et al., 2004) and this study is, for the best of our knowledge, the first effort to identify the local barriers to prompt and effective case management of malaria in pregnancy. Once the three municipalities evaluated in this study densely concentrate malaria cases (Oliveira-Ferreira et al., 2010) we believe our results can be generalized to all malaria high risk municipalities in the region.

Conflict of interest

The authors declare that they have no conflict of interest.

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