

REVIEW ARTICLE

Epidemiological and Prognostic of Malaria During Pregnancy in N'djamena Mother and Child University Hospital

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Abstract

Introduction: Pregnancy causes immunological changes in women and makes them more vulnerable to malaria.

Objective: Evaluate the epidemiological and prognostic aspects of gestational malaria.

Patients and Method: This was a cross-sectional, analytical study conducted over a period of 12 months from January to December 2022, including pregnant women and/or women in the immediate postpartum period admitted to the department of gynecology and obstetrics of N'djamena Mother and child university hospital with malaria. Studied variables were epidemiological and prognostic. The data were entered and analyzed using SPSS 18.0.

Results: Among 4,472 patients admitted in the department of gynecology and obstetrics, 684 pregnant women were diagnosed for malaria, representing 15.29%. The average age was 26 years. The reason for admission was fever (44.3%), occurring in the third trimester (55%) with prematurity as a complication (15.05%). Artesunate was the most commonly used antimalarial treatment in our series.

Conclusion: Gestational malaria is very common in our context. Efforts must be made to raise awareness and promote prevention.

Keywords: Malaria, Third Trimester, Frequency, CHU-ME, N'Djamena.

1. Introduction

Malaria, caused by parasites of the genus *Plasmodium* and transmitted by mosquitoes, is a major threat to public health, particularly in sub-Saharan Africa. This disease is especially dangerous for pregnant women, whose immune systems are compromised, increasing their vulnerability to infection. Complications of gestational malaria include anemia, premature delivery and serious neonatal consequences [1, 2].

In Chad, malaria is a public health challenge, with alarming infection rates among pregnant women,

despite prevention efforts such as impregnated mosquito nets and preventive treatments [3]. This study focuses on analyzing the epidemiological and prognostic aspects of gestational malaria at the N'Djamena Mother and child university Hospital.

2. Patients and Method

The study was conducted in of gynecology and obstetrics of N'djamena Mother and child university hospital Data were collected from the medical files of patients admitted between January and December 2022. The inclusion criteria included all pregnant

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women with a confirmed diagnosis of malaria. Data were Analyzed were performed using SPSS 18.0, Epi-info and Epi-data software. To compare data we used statistical test p value, and khi 2

3. Results

During 2022, a total of 4,472 patients were admitted to of gynecology and obstetrics of N'djamena Mother and child university hospital ,and 684 pregnant women were diagnosed with malaria, representing a prevalence of 15.29%. The frequency of malaria was high in September, at 17.7%.

Sociodemographic data on pregnant women

The most affected age group was between 15 and 24 years old, representing 53% of cases. Housewives accounted for 65.8% of cases, 48.6% had no schooling, and 89% came from rural areas.

4. Clinical and Biological Data

Fever was the most common reason for admission, accounting for 44.3% of cases. 31.4% of pregnant women had few movements, 65% had attended prenatal consultations, and 55% were admitted in

the third trimester. They were in good general health on admission in 64.3% of cases and had hemoglobin levels below 7 in 13.5% of cases. The thick smear test result was positive for all pregnant women.

4.1 Therapeutic Aspects

All pregnant women were treated with artesunate and 34.2% were hospitalized for more than 3 days.

4.2 Prognosis

4.2.1 Outcome of Pregnancy

The frequency of premature births was 15.05%, and that of abortions, MFIU and stillbirths was 13.3%.

Unfortunately, we did not have any information on the outcome of the pregnancies of 354 pregnant women, or 51.7%.

4.3 Maternal Prognosis

The prognosis was good in 92.4% of cases, with 2.2% of cases resulting in death.

4.3.1 Period of Maternal Deaths

Intermittent preventive treatment and pregnancy outcome

Table 1. Distribution of pregnant women according to intermittent preventive treatment and pregnancy outcome

Outcome test	Preventive treatment (PT)					Statistic	
	yes		no		Total	Chi2	p
	n	%	n	%			
Lost to follow-up	193	54,6	161	45,4	354	2,00	0,157
Full-term delivery	113	83,2	23	16,8	136	87,12	0,000
Premature delivery	84	86,8	13	13,2	97	103,68	0,000
Abortion	8	12,9	53	87,1	61	109,52	0,000
In uterine fetal death (IUFD)	11	36,3	18	63,7	29	15,68	0,000
Stillbirth	4	56,4	3	43,6	7	2,28	0,089
Total	413	60,4	271	39,6	684		

Cases of abortion and (IUFD) were significant among pregnant women who had not received PT ($p=0.000$), while full-term delivery was also significant among pregnant women who had received PT ($p=0.000$).

Table 2. Intermittent preventive treatment and maternal prognosis

Maternal pronostic	PT					Statistic	
	yes		no		Total	Chi2	p
	n	%	n	%			
good	394	62,3	238	37,7	632	9,68	0,001
death	5	33,3	10	66,7	15	23,120	0,000
worst	14	37,8	23	62,2	37	6,48	0,011
Total	413	60,4	271	39,6	684		

The favorable maternal prognosis was highly significant in patients who had taken TPI ($p = 0.001$).

Table 3. Distribution of pregnant women according to level of education and pregnancy outcome

Devenir grossesse	Level of schooled				Total	chi2	p
	No schooled	Primary	Secondary	University			
Abortion	12	2	13	4	31	9,68	0.0018
Death in utero	12	4	6	1	23	0,32	0.572
Premature birth	24	5	21	3	53	2,00	0.157
Full-term birth	37	11	16	4	68	1,28	0.257
Stillbirth	4	2	0	0	6	23,12	0.000
Lost to follow-up	92	13	52	20	177	0,32	0.572
Total	181	37	108	32	358		

Abortion was significant among patients with secondary education ($p=0.000$). Stillbirth was also significant among patients with no education ($p=0.000$).

5. Discussion

During the study period, we recorded 4,472 hospitalized patients, of whom 684 met the inclusion criteria, representing a prevalence of 15.29%. This result is lower than that of Souleymane et al [4] in 2022 in Mali, who found a rate of 27.2%. However, our result is higher than that of Botolahy et al [5] in 2011 in Madagascar, who found a frequency of 6.23%. This difference could be explained by the fact that in our study, we included all patients admitted to the department, including gynecological cases.

Gestational malaria peaks in September at 17.7%, followed by October at 15%. This result is close to that of Diallo M [6] in 2015 in Mali, who observed peaks of 18.33% and 16.67% in September and October, respectively. The stagnation of rainwater responsible for the proliferation of mosquitoes, especially female *Anopheles* mosquitoes, could explain the high frequency of post-winter gestational malaria. However, most mosquitoes are also infesting during this period.

The average age of pregnant women was 26, ranging from 15 to 46. Malaria during pregnancy occurs much more frequently between the ages of 15 and 24, with a frequency of 53%. This result is similar to those reported by Diallo [6] in 2015 and Mallé [7] in 2022 in Mali, which were 47.67% and 53% respectively.

Analysis of our data shows that married pregnant women accounted for the majority of cases, at 91.3%. Our result is comparable to that of Aminata et al [8] in 2011 in Mali, which reported 93%. These results could be explained by the fact that in most African societies, marriage is the preferred setting for procreation.

In terms of educational level, in this series, uneducated pregnant women accounted for 48.6% of cases. This result is significantly higher than that of Demmouche et al [9] in Algeria in 2012, who found that 9.9% of

pregnant women were illiterate. This difference is due to the fact that Chad is a developing country with a low level of education, particularly among women.

In terms of employment, 65.8% of pregnant women were responsible for household chores. Our result is comparable to that of Bakary [10] in 2018, who found a frequency of 64.2%. This result could be explained by the high rate of uneducated women in our society and the fact that housework is the main activity of women, especially those without education.

Regarding the spouse's occupation, 41.5% were traders. This result differs from that of Keita [11] in 2023 in Mali, who found a high frequency (49.17%) among manual workers. This could be explained by the fact that in Chad, particularly in the capital, trade is the most sought-after activity.

Pregnant women residing in urban areas were in the majority, at 89%. This finding is consistent with that of Touré [12] in Mali in 2020, where the figure was 67.6%. This could be explained by the fact that urban areas facilitate access to hospitals and contact with specialized services.

In terms of reasons for admission, fever was the most common reason, accounting for 44.3% of cases. This result is lower than that reported by Dao [13] in Mali in 2022 with 51.2%, but our result is higher than those reported by Zara et al. [14] in Niger in 2020 and Fenomanana et al. [15] in Madagascar in 2014, which obtained 26.4% and 26.5% respectively.

In this series, malaria during pregnancy occurred much more frequently among women who exercised little, at 31.4%. Dembélé M [16] in Mali in 2020 found a similar rate among women with few pregnancies, at 34.1%; however, our result is lower than that obtained by Aminata et al. [17], with a frequency of 39% among women with few pregnancies.

Nulliparous women accounted for 29% of our series. This frequency is comparable to that reported by Dembélé [16], who found a rate of 31.7%.

The majority of pregnant women (65%) had attended at least one antenatal care (ANC) appointment. Aminata et al. [8] in Mali in 2011 showed that antenatal care was attended by 72.8% of pregnant women. Our result differs from that reported by Dao [13] in Mali in 2022, who found a high frequency (67.4%) among pregnant women who had not attended any antenatal care.

During this study, more than half (70.17%) of pregnant women reported having received at least one dose of sulfadoxine-pyrimethamine-based IPT during their pregnancy. This rate is similar to those reported by Aminata [8] in Mali in 2011 and Zara et al. [14] in Niger in 2020, which were 71.2% and 73% respectively. This high rate can be explained by the fact that the majority of our pregnant women had attended antenatal care.

Regarding the use of insecticide-treated mosquito nets, 78.4% of pregnant women reported sleeping under an insecticide-treated mosquito net every night during their pregnancy. This result corroborates that obtained by Aminata [8] in 2011 in Mali, which was 80.7%. This can be explained by the fact that pregnant women receive ITNs free of charge during antenatal care.

During this study, more than half of pregnant women (55%) contracted malaria in the third trimester of pregnancy, followed by 26.9% in the second trimester and 18.1% in the first trimester. The same finding was made by Dembélé [16] in 2020 in Mali, who found that 52.4% of pregnant women were infected in the third trimester, 29.3% in the second trimester and 18.3% in the first trimester. This could be explained by the fact that malaria is more severe and more frequent during pregnancy, especially during the third trimester and at delivery [17].

During this study, all pregnant women had their hemoglobin levels tested. The frequency of anemia is estimated at 67.5%, of which we found 54% of cases of moderate anemia and 13.5% of cases of severe anemia.

Dao [13] found that in 2022, 63.2% of cases were moderate anemia and 13.5% were severe anemia. According to the WHO, malaria is the cause of 15% of severe maternal anemia [18]. These results lead us to conclude that malaria is the main cause of anemia in pregnant women. This study complies with WHO standards and recommendations, which stipulate that:

«malaria is treated after confirmation of the diagnosis by biological examination.» [19].

All pregnant women received antimalarial treatment (100%); 83% received iron supplementation; 68.4% were dewormed; and 13% of our pregnant women with severe anemia received blood transfusions.

At the end of this study, we had follow-up data on the pregnancies of 330 pregnant women, or 48.3%. The number of full-term deliveries was 136 cases, or 41.21%.

We reported 31.21% of premature births. Our result is close to that of Kanouté [20], who found 34.4% of premature births. This could be explained by the fact that malaria was significantly associated with prematurity [21].

Spontaneous abortions accounted for 16.66% of pregnant women. This result is similar to that of Mallé [7], who found 14.54% of cases of miscarriage. Malaria in pregnant women is often associated with anemia, which causes hypoperfusion in the fetus and placenta, one of the consequences of which is spontaneous abortion.

Cases of MFIU and stillbirths account for 10.9%. Mallé [6] found a frequency of 6.41%. This difference can be explained by the fact that our sample is four times larger than Mallé's [6].

The prognosis at discharge is good in 92.4% of cases. Unfortunately, we regret to report 15 deaths, or 2.2%. Our result is comparable to that of Munan et al [22], who found 1.7% of deaths. This result could be explained by the severity of this pathology, the delay in seeking medical advice when warning signs appear, and self-medication, which has become a scourge in this society.

The majority of deaths occurred in the postpartum period, i.e. 46.7%. This could be explained by the seriousness and severity of malaria during this period.

At the end of this study, we observed a significant difference between cases of abortion and MFIU and non-use of IPT ($p=0.000$). We also found that there is a significant difference between full-term delivery and taking IPT ($p=0.000$). Zara et al. [23] found that IPT significantly protects against gestational malaria ($p=0.001$) and that protection is proportional to the number of IPT doses.

There is a significant difference between abortion and secondary education level (0.001). Stillbirth is significant among uneducated pregnant women

($p=0.000$). In Burkina Faso, a study of factors contributing to gestational malaria shows that malaria is significantly higher among uneducated pregnant women [24].

We found a statistically significant association between maternal prognosis and TPI use ($p=0.001$). There is also a significant association between maternal death and non-use of TPI ($p=0.001$).

6. Conclusion

Malaria during pregnancy is a public health problem due to its morbidity, mortality and the severity of its maternal and fetal consequences.

This study shows that the prevalence of malaria during pregnancy remains high, with pregnant women being young, uneducated, nulliparous and in their third trimester of pregnancy.

Taking SP and regularly using good quality IMIs during pregnancy has a protective effect against malaria.

The consequences of malaria on pregnancy are worrying due to the number of cases of anemia, spontaneous abortions, MFIUs, stillbirths and maternal deaths.

Further studies need to be conducted on malaria and pregnancy at the CHU-ME to better assess the frequency, risk factors and impact of malaria on pregnancy.

7. References

1. GENNTILINI M (1993). Tropical medicine. IN malaria. 5th edition, Paris. Flammarion médecine-Sciences;91-122.
2. Accrombessi M, Yovo E, Cottrell G, Agbota G, Gartner A, Martin-Prevel Y (2018). Cohort profile: effect of malaria in early pregnancy on foetal growth in Benin (RECIPAL preconceptional cohort), *BMJ Open*;8(1):019014.
3. World Health Assembly. Report on WHO performance: programm budget 2018-2019: mid-term review. 2019 [cited 23 May 2021]; Available from: <https://apps.who.int/iris/handle/10665/328789>.
4. Diarra S, Kayentao K, Diawara S, Telly N, Soumounou F, Niangaly M (2022). Socio-clinical factors associated with malaria during pregnancy in women in the San Health District (Mali). *Health Sciences and Disease*;23(12):88-94.
5. Botolahy Z, Randriambelomanana J, ImbaraE, Rakotoarisoa H., Andrianampanalinarivo H (2011). Aspects of Plasmodium falciparum malaria during pregnancy based on cases observed at the Toamasina University Hospital in Madagascar. *RARMU*; 3(1): 23-26.
6. Diallo M (2015). Malaria in pregnant women receiving prenatal care at the Kolokani Reference Health Centre. [Medical thesis], Mali: Faculty of Medicine and Odontostomatology.
7. Mallé S (2022). Clinical characteristics and outcomes of pregnant women with anemia and malaria at the Niono Reference Health Centre from 1 July 2020 to 31 December 2021. [Medical thesis], Mali: Bamako University of Science and Technology.
8. Aminata F, Mahamadou D, Diawara S, Seidina A, Seidou D, Karim T et al (2011). Prevalence of maternal and placental malaria and low birth weight during labor and postpartum in a peri-urban area of Bamako. *Cahiers d'études et de recherches francophones/ Santé*;21(1):3-7.
9. Demmouche A, Adda Boudjlal M. Beddek F (2012). Maternal anaemia and pregnancy outcomes at the PMI centre in Sidi Bel Abbés, Algeria ; 26(1):1-10.
10. Bakary M, DIRRA A, DIALLO H, Samira E, Chakib N (2018). Prenatal consultations at the Yirimadio community health centre. *Moroccan Journal of Public Health*;5(8):2-8.
11. Keita A (2003). Knowledge, attitudes and practices of pregnant women on preventive measures for malaria during pregnancy at the CSREF in Kati. [Medical thesis], Mali: University of Science and Technology of Bamako.
12. Ministry of Health and Public Hygiene. Directory of the local health information system; August 2015. - Google Search [Internet]. [cited 23 May 2021]. Available at: <https://www.sante.gov.ml>.
13. Dao T (2022). Prevalence of malaria among pregnant women at the Bandiagara Reference Health Centre. [Medical thesis], Mali: Bamako University of Science and Technology.
14. Zara O, Lamine M, Issaka T, Moumouni K, Alkassoum I, Maman D, et al (2020). Malaria infection in pregnant women in Niamey, Niger. *The Pan Af Med Journal*. ;34:37-40.
15. Fenomanana M, Botomora M, Rakotozanany B, Randriambelomanana J (2014). Epidemiological and clinical aspects of Plasmodium falciparum malaria during pregnancy at the Maternity Ward of the Toamasina University Hospital. *Journal of Anaesthesia, Resuscitation and Emergency Medicine*;6(1):28-32.
16. Dembélé M (2020). Epidemiological and clinical study of malaria in pregnant women at the Bamako district health centre. [Medical thesis]. Mali: Faculty of Medicine, Pharmacy and Odontostomatology.

17. Bourée P. Malaria and pregnancy. Development and Health (2013); Available from: <https://devsante.org/articles/paludisme-et-grossesse> (accessed on 22/11/2023).
18. WHO: Intermittent preventive treatment of malaria (IPT) for pregnant women 2017. <http://www.who.int/areas-pregnancy/>.
19. WHO (2005) Strategic framework for malaria prevention and control during pregnancy in the African region .afr/mal/04/01, Brazzaville.
20. Kanouté B (2008). Malaria during pregnancy in the peri-urban area of Bamako. [Medical thesis]. Mali: Faculty of Medicine, Pharmacy and Odontostomatology.
21. Desai M, ter Kuile F, Nosten F, McGready R, Asamoah K, Brabin B, et al (2007). Epidemiology and burden of malaria in pregnancy. *Lancet Infect Dis*;7(2):93-104.
22. Philémon Mulongo Mbarambara (2016). Factors associated with premature delivery at the Provincial Hospital of Bukavu in the Democratic Republic of Congo. *Moroccan Journal of Public Health*. ;3(4):16-22
23. Munan R, Mutombo J, Ngoy J, Kibambe R, Olivier M, Felix K et al(2020). Malaria during pregnancy: Study of risk factors and maternal and perinatal prognosis. *Congolese Nursing Journal*;4(2):1-7.
24. Ouédraogo C, NéBié G, Sawadogo L, Rouamba G; Ouédraogo A, Lankoandé J (2011). Study of factors contributing to the occurrence of *Plasmodium falciparum* malaria in pregnant women in the Bogodogo health district in Ouagadougou, Burkina Faso. *J Gynecol Obstet Biol Reprod (Paris)*.;40(6):529-34.