Scientific Research Publishing

Open Journal of Obstetrics and Gynecology, 2019, 9, 73-82
http://www.scirp.org/journal/ojog
ISSN Online: 2160-8806
ISSN Print: 2160-8792

Congenital Malaria and Pregnancy Monitoring Parameters in Health Facilities in Guinea

E. M. Bah[1*], I. S. Baldé[1], I. S. Diallo[2,3], B. Adiallo[1], T. S. Diallo[4,5], A. F. M. Soumah[1], M. K. Camara[1], T. Sy[1]

[1]Gyneco-Obstetric Pulpit, Gamal Abdel Nasser University, Conakry, Guinea
[2]Institute of Nutrition and Child Health (INCH), Donka, Guinea
[3]Pediatric Pulpit, Gamal Abdel Nasser University, Conakry, Guinea
[4]Public Health Pulpit, Gamal Abdel Nasser University, Conakry, Guinea
[5]Executive Secretariat/National Comity against AIDS (ES/NCAA), Conakry, Guinea
Email: *belhadjmamoudou70@gmail.com, *elhadjlalya70@yahoo.fr, sytelly@yahoo.fr, baldeisory@yahoo.fr, diallopediatrie@yahoo.fr, boubacardiallo2026@gmail.com, monembo12@gmail.com, aboubacarfodemomo@gmail.com, camarakanta@gmail.com

How to cite this paper: Bah, E.M., Baldé, I.S., Diallo, I.S., Adiallo, B., Diallo, T.S., Soumah, A.F.M., Camara, M.K. and Sy, T. (2019) Congenital Malaria and Pregnancy Monitoring Parameters in Health Facilities in Guinea. *Open Journal of Obstetrics and Gynecology*, **9**, 73-82.
https://doi.org/10.4236/ojog.2019.91008

Received: December 2, 2018
Accepted: January 12, 2019
Published: January 15, 2019

Abstract

Malaria is much more common in pregnant women, especially during the third trimester of pregnancy, causing congenital infestation. Acute and severe complications are noted, including malignant malaria access and maternal and fetal mortality. Method: This was a three-month descriptive and analytical multicenter study, running from 1st January to 31st March 2015, conducted in 16 maternity hospitals at different levels of the health system pyramid. Results: Out of a total of 1772 mothers recruited for this study, 276 cases were tested positive (umbilical cordon and newborn's heel). Among them, we reported 130 cases tested positive at newborn's heel with congenital infestation confirmed by sampling on day 0, with a frequency of 7.3%. The average age of the mothers was 26 ± 14 years. With a predominance in the 20 - 35 age group (4.7%). Among mothers who were not exposed to preventive intermittent sulfadoxine pyrimethamine (IPT/SP) in malaria prevention, 6.1% of newborns tested positive. Of these, mothers who had less than 4 prenatal visits during pregnancy had a congenital malaria rate of 7.3%. Conclusion: Congenital malaria infestation exists in newborns despite adequate measures used in pregnant women (SP, antimalarial drugs). In Guinea, It is often found in newborns of mothers who suffer from malaria during pregnancy and whose prenatal cares are not regular.

Keywords

Congenital Malaria, Pregnancy Follow-Up, Guinea

1. Introduction

Malaria is much more common among pregnant women, mainly during the third trimester and childbirth causing congenital infestations. Acute and severe complications are reported: mainly maternal and fetal mortality or malignant malaria access to in unstable areas where cases are uncommon outside of epidemic episodes. In areas where malaria is endemic, maternal anemia and fetal growth delay are responsible of low birth weight, mainly among primiparous women [1] [2] [3] [4]. Congenital malaria is in reality admitted to be the transplacental infection of the newborn linked to the passage of parasitized red blood cells from the placenta. Congenital malaria infestation is a rare disease. It appears after a variable period of 5 to 60 days and the common clinical sign is fever [4].

According to the National Malaria Control Programme in Guinea (NMCP), malaria is the leading cause of consultation (33.8%), hospitalization (31%) and death (14.2%) in health facilities for all ages [5]. Adequate preventive treatment with sulfadoxine-pyrimethamine (TPIg-SP) in Guinea is poorly followed, resulting in a negative incident of malaria during pregnancy [6]. Preventive treatment is administered between the 16th and 36th week of pregnancy at an interval of one month between two doses. During the rainy season, morbidity is higher (about 80% of fever cases in children). Plasmodium falciparum is the main specie found (98%) [5]. Within endemic areas, congenital malaria is present in two forms: congenital infestation malaria and congenital malaria disease [7]. Congenital malaria infestation (PCI) is defined as the presence of plasmodium in umbilical cord's blood or peripheral blood in an asymptomatic newborn less than seven days old and a congenital malaria disease when it's with a symptomatic newborn [8]. The rate of perinatal and neonatal mortality due to malaria depends on the rate of transmission and the quality of follow-up during pregnancy. Low birth weight can be induced in 30% of cases by malaria, which can increase the risk of abortion or stillbirth [9].

Since data on congenital malariaare obsolete; out of date, and considering evidences of the effectiveness of prevention measures (intermittent prevention method and correct use of the treated net) in the field of pregnancy in endemic countries. The purpose of this study was to contribute to the reduction of maternal and neonatal morbidity and to update data on congenital malaria infestation (CMI in relation to pregnancy monitoring in Guinea). The specific objectives were to:

1) Determine the prevalence of congenital malaria infestation in newborns at birth;

2) Identify the link between congenital malaria infestation and intermittent preventive treatment (TPI/SP);

3) Determine the associated factors in the occurrence of congenital malaria infestation.

2. Methodologie

About 1772 pregnant women were included in our study, the study has concerned

all confirmed CMI cases; confirmation was made by notification of the presence of a thick spot with the search for haematozoon (GERH). This work was conducted in 16 maternities at different levels of the health system pyramid (primary, secondary and tertiary) across the country (Guinea). It is a multi-centric descriptive and analytical study, over a period of 3 months from 1st January to 1st April 2015 in newborns of mothers suffering of malaria.

The diagnosis of congenital malaria was retained if positive search of haematozoon (GERH) in a thick drop of umbilical cord blood, the maternal's placenta side and the heel of the child at day 0 in the maternities during the study period. On the other hand, the diagnosis of congenital malaria infestation was retained in front of the positive test in the umbilical cord and heel of the newborn. All parturient who have accepted to participate to our study have been included. All those who did not agree to participate, premature infants, stillbirths, or those who delivered by caesarean were excluded from our study. We used an exhaustively selected all newborns by the normal route.

The data was collected on pre-established survey sheet. The variables studied were: Maternal age, parity, number of prenatal consultations, using or not PTI/SP or quinine, use of mosquito net, obstetrical precedents (malaria during pregnancy, stillbirths, abortion), birth weight, sampling site.

Helped of our inclusion criteria, we conducted an exhaustive selection of newborns. A survey card was used to collect data from mothers who were interviewed. The pregnancy tracking log completed the information. In neonates and mothers, a clinical examination was performed. Regarding the newborns, it focused on: sex, birth weight, temperature, head circumference. The detection of haematozoa by the thick film, but also the rapid diagnostic test (RDT) were carried out in the newborn and the mother. The sampling sites were umbilical cord, placenta and heel of newborn. The examination was done immediately after delivery. Information linked to socio-demographic characteristics concerning the mother was collected, namely: age, level of education, concept of malaria during pregnancy, existence or not and type of chemo prophylaxis, use the impregnated mosquito net. The sampling was done as follows:

- A first sample was taken from the umbilical cord immediately it had been cut;
- A second sample was taken from the placenta after delivery;
- And a third sample at the heel of the newborn at the 10^{th} minute of life, to confirm the presence of plasmodium.

A check of the diagnostic slides was carried out in the reference laboratory for tropical diseases of Maférinya, in order to carry out a quality control. As a result, a total of 10% of all slides were sent, with 5% of the positive slides and 5% of the negative slides. From this control, it emerged that 98% of the test results were consistent.

The data was entered using 3.1 Epi data version and analyzed by SAS 9.4. The results were presented in counts, percentages, mean and standard deviations for the quantitative variables. The $p < 0.05$ statistically significant or not so the

odd-ratio were calculated for the qualitative variables that were compared.

An authorization was issued by the national ethics committee of the Ministry of Health, after study protocol submission that allowed us to carry out this study.

3. Results

Frequency: Out of a total of 1772 mothers recruited for this study. We reported 276 cases of congenital malaria infestation confirmed by the sampling at day 0, a frequency of 7.3%.

Total of 1772 women were seen in our study and the average age was 26 ± 14 years, minimum 14 and maximum 42 years. The most represented age group among mothers is the group of 20 to 34 years old who's their newborn have tested positive with 64.6% vs 70.8% of mothers who's their newborn have tested negative, odd-ratio 0.46 IC [0.31 - 0.68]. Multipare and primip are who's have their newborns tested positive has represented respectively 47.7% and 38.5% with an OR 1.91 IC [0.87- 4.63]. We found that 74.6% of women who developed malaria during pregnancy, and their neonates were tested positive vs 25.4% of newborn were free of malaria whose mothers did not have malaria with an OR 3.40 IC [2.24 - 5.28]. Among newborns tested positive 83.1% of them had their mother who had not taken prophylactic treatment SP compared to 16.9% of which the mothers had taken (Table 1).

Among women who had the umbilical cord of their newborn tested positive, 7.3% had less than 4 prenatal consultation and 1.1% had achieved at least 4 prenatal consultation with $p = 0.0009$. The mothers who had the internal face of the thick-positive placenta were 10.1% with less than 4 prenatal consultation and 1.3% with a maximum of 4 prenatal consultation with $p = 0.0001$. 6.5% of pregnant women who achieved less than 4 prenatal consultation had the heel of their positive newborn compared with 0.9% of those who had 4 or more prenatal consultation, $p = 0.0002$. The proportion of mothers < 19 years of age and whose newborn were tested positive at heel and achieved less than 4 prenatal consultation was 15.7% compared with 4.5% who achieved 4 prenatal consultation and above. 39.1% of women who received less than 4 prenatal consultation had malaria during pregnancy, compared to 9.3% who had achieved 4 prenatal consultation and above. Intermittent preventive treatment was used by 17.7% of pregnant women who had less than 4 prenatal consultation and 3.4% had 4 or more prenatal consultation. The mosquito net was correctly used by 27.6% who benefited from 4 prenatal consultation and 9.7% of them made more than 4 prenatal consultation. Among women who had their prenatal consultation less than 4 times, 5.6% had children with a low birth weight < 2500 g and 1.7% of them had a maximum of 4 prenatal consultation (Table 2).

Among the newborns who developed congenital malaria, 73.8% had a normal birth weight and 24.6% were low birth weight children (Table 3).

Different examinations were performed to diagnose congenital malaria infestation and we had different results depending on the type of test performed.

Table 1. Characteristic of mother and pregnancy monitoring.

Maternal characteristic and pregnancy monitoring		Newborns with congenital malaria infestation			
		Positive	Negative	OR	IC – 95%
Age	≤19	30 (23.1)	330 (20.0)	0.46	0.31 - 0.68
	20 - 34	84 (64.6)	1159 (70.8)		
	≥35	16 (12.3)	153 (9.2)		
Mean and SD*		26 ± 14 [14 - 42]			
Parity	Primipare	50 (38.5)	680 (41.4)	1.91	0.87 - 4.63
	Multipare	62 (47.7)	766 (46.6)		
	Large multipare	18 (13.8)	197 (12.0)		
Prenatal consultation	<4	117 (89.9)	1234 (75.0)	2.97	1.65 - 5.80
	≥4	13 (10.1)	409 (25.0)		
Malaria during pregnancy	Pregnancy with malaria	97 (74.6)	761 (46.3)	3.40	2.24 - 5.28
	Pregnancy without Malaria	33 (25.4)	882 (53.7)		
IPT/SP**	Yes	22 (16.9)	352 (21.4)	0.75	0.44 - 1.21
	No	108 (83.1)	1291 (78.6)		
Treatment/Quinin	Yes	19 (14.6)	376 (22.9)	0.58	0.33 - 0.96
	No	111 (85.4)	1267 (77.1)		
Treatment not precise	Oui	27 (20.8)	1428 (86.9)	1.74	1.07 - 2.76
	Non	103 (79.2)	215 (13.1)		
Stillborn	Stillborn	16 (13.6)	104 (7.0)	0.48	0.27 - 0.91
	No stillborn	114 (86.4)	1539 (93.0)		
Abortion	Abortion	22 (16.9)	174 (10.6)	0.58	0.35 - 0.99
	No abortion	108 (83.1)	1469 (89.4)		

*Intermittent preventive treatment/sulfadoxine pyrimethamine; **Standard deviation.

11.2% of the thick plating in the placenta was positive versus 8.3% in the umbilical cord and 7.3% in the heel of the newborn (**Figure 1**).

4. Discussion

4.1. Overall Frequency

Some authors assimilate positive parasitaemia at cord or on placenta to congenital malaria, but the majority retain the diagnosis of congenital malaria only if the parasitaemia is positive on the newborn's heel [10]. The prevalence of congenital malaria depends of country and type of study. However, Diouf FN and coll., in 2015 in Senegal, found an incidence of congenital malaria in Ziguinchor Hospital of 1.05% of births [11]. A higher prevalence than ours was found in Burkina in 2014 by KISITO N and colll. That is 170/697 (24.4%) among the newborns of the UN of the CFS [12]. In Cameroon A. Chiabi and coll among

Table 2. Distribution according to pregnancy monitoring parameters.

AGE GROUP AND PREGNANCY MONITORING	<4 ANC		≥4 ANC		P
IPT-SP	N	%	N	%	
Cord	127	7.3	19	1.1	0.0009
Placenta	173	10.1	22	1.3	<0.0001
Hell	113	6.5	17	0.9	0.0002
Age group					
<19	278	15.7	80	4.5	NS
19-35	942	53.1	304	17.2	NS
>35	131	7.4	38	2.1	NS
Malaria during pregnancy					
Yes	693	39.1	165	9.3	<0.0001
No	658	37.1	257	14.5	<0.0001
Sulfadoxine-pyriméthamine					
Yes	314	17.7	60	3.4	<0.0001
No	1037	58.5	362	20.4	<0.0001
Mousquito net used correctly	490	27.6	172	9.7	NS
Mousquito net not used correctly	861	48.7	250	14.1	NS

Table 3. Distribution of congenital malaria infestation cases by impact on birth weight.

Weight birth	congenital malaria	Not congenital malaria	OR IC-95%	P
<2500 g	32 (24.6)	98 (6.0)	5.0 [3.1 - 8.1]	0.0000
2500 - 3999 g	96 (73.8)	1487 (90.5)	3.4 [2.1 - 5.2]	S
≥4000 g	2 (3.3)	58 (3.5)	5.1 [3.2 - 8.2]	S

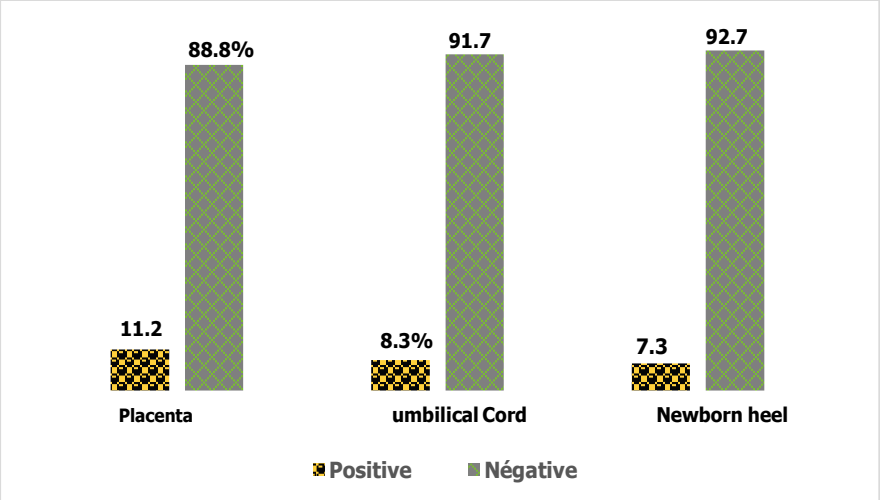

Figure 1. Congenital malaria according to sampling sites.

227 newborns recruited, 54 having a thick positive drop giving a congenital malaria infestation rate of 23.79% [7].

We notice that, these rates of infestation of congenital malaria vary widely according to the area and type of study. This can be explained by methodology differences between the studies, the fluctuation of the endemicity according to the regions and the seasons. In this study, Plasmodium falciparum was the only parasite species involved and this observation is consistent with the national and sub-regional data from West Africa, which confirms that it is the most widespread and potentially fatal parasite (cerebral malaria or malignant malaria), it is a disease that can be both treated and avoided [4]. WHO recommends an intermittent preventive treatment (SP) with three or more doses (a meta-analysis of seven trials to evaluate IPT-SP) [13]. Three or more doses of TPI-SP had a higher mean birth weight and fewer low birth weight babies than two doses of IPT-SP. The relative reduction of the low birth weight's risk was estimated at 20% (95% confidence interval: 6 - 31). IPT-SP is recommended for all pregnant women at each prenatal consultation scheduled from 13 weeks to delivery, provided doses are given at least one month apart [13].

4.2. Maternal Factors That Can Influence Pregnancy Transmission and Follow-Up

Age and Parity

Regarding mother data, the average age was 26 years old with extremes [14 years - 42 years]. The age group 20-34 years was the most concerned 70.8% with an odds at 0.46 IC [0.31 - 0.68], with a predominance of multiparas 47.7% and OR 1.91 IC [0.87 - 4.63]. Thus, increasing parity could be associated with increased risk of congenital malaria infestation. Multiparous and primiparous women were more likely than pauciparous and nulliparous women, and thus more likely to infect their fetuses. Samples for the thick blood were placental positive 11.43% (P = 0.066), umbilical cord 8.38% (P = 0.000) and heel of newborn 7.24% (P = 0.000). The hypotheses that can explain these disparities are:

- Differences in the definition of congenital malaria;
- The degree of maternal immunity;
- The type of sample examined (peripheral blood of newborns or umbilical cord blood);
- Expertise in smear examination, parasite detection method (Giemsa Staining or Polymerase Chain Reaction [PCR]);
- Reflection of environmental differences (15).
- And the Follow-up of the pregnancy:

It's recommended that pregnant women receive at least 4 prenatal consultation during their pregnancy. In our study, we found that 6.5% of our parturients received less than 4 prenatal consultation while those with more than 4 prenatal consultation had 0.9% of positive cases with = 0.0002. Our results were lower than those found by Nagalo and al. in Burkina, with 36.7% women with less than 4 prenatal consultation compared to 37.5% with more than 4 prenatal consulta-

tion [12]. This contrast can be explained by the fact that, in our health structures, especially in rural areas, the culture of prenatal consultation is not totally assimilated. 15.7% of mothers aged less than 19 years old benefited < 4 prenatal consultation compared to 4.5% who achieved more than 4 prenatal consultation. Nagalo's hypothesis of a possible inattention of multipara compared to primipara who have no experience and are more attentive, is raised in our study [12]. Preventive treatment with sulfadoxine-pyrimethamine was observed in 17.7% of women with less than 4 prenatal consultation vs 3.4% with more than 4 prenatal consultation, statistically significant. Mr. Diakité and coll. Found a higher utilization rate than ours at 72% [9].

4.3. The Occurrence of Malaria during Pregnancy and IPT/SP-Mosquito Net

The occurrence of a malaria crisis during pregnancy seems to be a risk factor for the occurrence of congenital malaria in the newborn, with 7.23% vs 43.79%, p value was statistically significant. This observation was shared by Chiabia A *et al.* 2012 in Cameroon [14]. WHO revised sulfadoxine-pyrimethamine intermittent preventive treatment in January 2014 (a meta-analysis of seven IPTp-SP trials) and retained: Three or more doses of IPT-SP were observed higher birth and fewer children with low birth weight than two doses administered. The relative reduction in the risk of low birth weight was estimated at 20% (95% confidence interval: 6 - 31). According to WHO.WHO/HTM/GMP/2014, 2 doses TPI/SP 20% Low Birth Weight (95% confidence interval: 6-31) (F Essiben *et al.* (2016) Cameroon 54.1% Malaria IPT/SP [16], Diouf FN *et al.* 2015 Senegal). These results show that taking IPT did not fully protect our cases from congenital malaria. This same finding was made by Hyacinth in its study that found 75% of women who had taken IPT, 70.8% had given birth to a newborn with malaria [16].

4.4. Birth Weight and PCI

There is a link between the discovery of malaria during pregnancy, especially in the last trimester in mothers with SP-IPT < 4 prenatal consultation, and the occurrence of low birth weight [32 (24.6%) vs 98 (6%) P = 0.0000]. WHO [3] in a meta-analysis of seven trials to evaluate SP-IPT with three or more doses, found that there was a higher mean birth weight and fewer children with low birth weight than with two doses of SP-IPT. The relative reduction in the risk of low birth weight was estimated at 20% (IC-95%, 6-31).

5. Conclusions

Congenital malaria infestation exists in newborns despite adequate measures used by pregnant women (mosquito net, SP, antimalarial). Plasmodium falciparum was found on all positive slides.

The epidemiological profile is that of a primiparous aged between 20 and 34, had less than 4 prenatal consultations and had an episode of malaria during

pregnancy. Until an effective vaccine is available, we should take at least 4 IPT/SP doses, use mosquito net correctly and treat malaria with Arthemizine combination treatment before any prevention.

It appears from this study that congenital malaria infestation, a plasmodium falciparum persistency in newborns despite the various prevention measures (IPT-SP, mosquito net...) and leads to low birth weight in children. We recommend systematic research and treatment of malaria during pregnancy, strengthening of prevention measures, through the use of mosquito net and one IPT-SP dose per month from the 13th week of pregnancy to birth.

The presence of plasmodium falciparum in the blood of newborns should motivate the search for congenital malaria disease in Guinea and endemic countries.

Acknowledgements

To the women who have participated to this study, to the teams of field investigators, to the entire team of the National Institute of Nutrition and Children's Health and the maternity staff.

Conflicts of Interest

All authors declare that they have no conflict of interest.

Authors' Contributions

All authors were involved in the management of the patient as well as in the writing of the manuscript. All authors approve the final version of the manuscript.

References

[1] Mouchet, J. (2004) Biodiversité du paludisme dans le monde. *John Libbey Eurotext*, **35**, 107.

[2] Steketee, R.W., Nahlen, B.L., Parise, M.E. and Menendez, C. (2001) The Burden of Malaria in Pregnancy in Malaria-Endemic Areas. *The American Journal of Tropical Medicine and Hygiene*, **64**, 28-35.

[3] Organization, W.H. (2016) World Malaria Report 2015. World Health Organization, Geneva.

[4] Aubry, P. and Gaüzère, D.B.-A. (2015) Les maladies non transmissibles dans les pays du sud. pp. 6-16. http://medecinetropicale.free.fr/

[5] Plan de Communication PNLP 27 juin 2012 (2012-2015) pour La Lutte contre le Paludisme. pp. 1-47.

[6] Camara, A., Diallo, M.D.D., Guilavogui, T., Delamou, A., Sidibe, S., Bah, E.M., *et al.* (2017) Facteurs associés à l'utilisation du traitement préventif intermittent par la femme enceinte en Guinée: Une analyse des données de l'enquête EDS 2012. *Journal of Health Informatics in Africa*, **4**, No. 1.

[7] Eldridge, B. and Edman, J. (2003) Medical Entomology: A Textbook on Public Health and Veterinary Problems Caused by Arthropods. Springer Science & Business Media.

[8] Nagalo, K., Dao, F., Tall, F.H. and Yé, D. (2013) Morbidité et mortalité des nouveau-nés hospitalisés sur 10 années à la Clinique El Fateh-Suka (Ouagadougou, Burkina Faso). *The Pan African Medical Journal*, **14**, 153. https://doi.org/10.11604/pamj.2013.14.153.2022

[9] Famanta, A., Diakite, M., Diawara, S.I., Diakité, S.A., Doumbia, S., Traoré, K., *et al.* (2017) Prévalence du paludisme maternel, placentaire et du petit poids de naissance au cours du travail d'accouchement.

[10] Mbongo, J.A., Ekouya Bowassa, G., Koulimaya Gombet, C.E. and Iloki, L.H. (2015) Paludisme Congénital au Centre Hospitalier et Universitaire de Brazzaville: Une Étude Épidémiologique de 90 Cas. *Health Sciences and Diseases*, **16**, No. 4. http://www.hsd-fmsb.org/

[11] Diouf, F.N. (2015) Prévalence du paludisme congénital infestation a plasmodium falciparum au centre Hospitalier Régional de Ziguinchor/Sénégal. *Revue du CAMES*: *Science de la santé*, **3**, No. 1.

[12] Nagalo, K., Dao, F., Minodier, P., Sawadogo, O., Sanon, H., Tall, F.H., *et al.* (2014) Congenital Plasmodium Falciparum Malaria: Epidemiological, Clinical, Biological, Therapeutic and Prognostic Aspects in Ouagadougou, Burkina Faso. *The Pan African Medical Journal*, **18**, 47. https://doi.org/10.11604/pamj.2014.18.47.3614

[13] Padonou, S.G.R. (2014) Faible poids de naissance, prématurité et retard de croissance intra utérin: Facteurs de risque et conséquences sur la croissance de la naissance a 18 mois de vie chez des nouveau-nés béninois. Université Pierre et Marie Curie-Paris VI, Paris.

[14] Chiabi, A., Lendem, I., Kobela, M., Mah, E., Tietche, F. and Tchokoteu, P.-F. (2012) Incidence de paludisme congénital dans deux services de néonatalogie à Yaoundé, Cameroun. *Journal de Pédiatrie et de Puériculture*, **25**, 301-308. https://doi.org/10.1016/j.jpp.2012.08.001

[15] Essiben, F., Foumane, P., de Nguefack, M.A.T., Eko, F.E., Njotang, P.N., Enow, R.M., *et al.* (2016) Facteurs prédictifs de l'échec du Traitement Préventif Intermittent du paludisme à la sulfadoxine-pyriméthamine (TPIp-SP) dans une population de femmes enceintes à Yaoundé. *Pan African Medical Journal*, **23**, No. 1.

[16] Diouf, F.N., Faye, P.M., Ba, I.D., Ba, A., Kai, M. and Ba, L.C. (2015) Prévalence du paludisme congénital infestation a plasmodium falciparum au centre hospitalier régional de Ziguinchor/Sénégal. *Rev. CAMES SANTE*, **3**, No. 1.