Original Article

Iran J Pediatr
Mar 2012; Vol 22 (No 1), Pp: 87-91

Summary Description of 24 Cases of Neonatal Malaria Seen at a Tertiary Health Center in Nigeria

Hyacinth I. Hyacinth[1*], MBBS; Stephen Oguche[2], MBBCH, and Christopher S. Yilgwan[2], MBBS

1. Department of Microbiology, Biochemistry and Immunology, Morehouse School of Medicine, Atlanta Georgia, USA
2. Department of Pediatrics, University of Jos, Jos University Teaching Hospital, Jos, Plateau State, Nigeria

Received: *Jun 24, 2011*; Final Revision: *Dec 26, 2011*; Accepted: *Jan 03, 2012*

Abstract

Objective: Neonatal malaria is a serious cause of morbidity and mortality in sub-Saharan Africa. Diagnosis of neonatal malaria is difficult because of the similarity in clinical presentation with other neonatal infections. This study aim to highlight the clinical presentations and high mortality still associated with neonatal malaria.

Methods: Twenty four out of 41 neonates seen during a 6 months period were studied. Gestational age, age at presentation, birth weight and other clinical symptoms were documented. Questionnaires were used to collect pertinent pregnancy and perinatal history from the mothers. Data was analyzed using SPSS v18 and results expressed in tables using means, frequencies and percentages.

Findings: All 24 neonates, 50% of whom were males, had a positive smear for malaria parasite. 29.2% were preterm, 17(70.8%) had congenital malaria, 18(75.0%) mothers used intermittent preventive treatment (IPT) of malaria prophylaxis in the index pregnancy and 1(4.2%) mother had HIV in pregnancy. Fever was the principal presenting symptom and 83.0% responded to treatment with amodiaquine.

Conclusion: Neonatal malaria is still an important cause of mortality, a more effective malaria prophylaxis program and routine malaria parasite screening for neonates is recommended.

Iranian Journal of Pediatrics, Volume 22 (Number 1), March 2012, Pages: 87-91

Key Words: Neonatal malaria; Neonatal mortality; Congenital malaria; Acquired neonatal malaria

Introduction

Malaria is responsible for an estimated 1 million "under five" deaths annually [1], with about 500 – 700 children dying daily in Nigeria from malaria infection [2]. In Jos, malaria ranks among the top three causes of mortality among children visiting the emergency room of a tertiary hospital [3]. Prior reports have suggested that neonatal malaria is a rare clinical condition even in endemic regions, because of some reported "protective" factors [4]. Contrary to such assertions, more recent review indicate that the incidence of neonatal malaria is on the rise in Nigeria [5].

A well documented risk factor for developing neonatal and congenital malaria is maternal 3rd trimester malaria infection[6]. Ibhanesebhor reported that presentation of neonatal malaria is not different from that of other neonatal infectious diseases, thus increasing the rate of under or miss diagnosis, neonatal morbidity and mortality [7]. The diagnosis of neonatal malaria is also difficult

*** Corresponding Author;**
Address: Department of Microbiology, Biochemistry and Immunology, Morehouse School of Medicine, 720 Westview Dr. SW, Atlanta Georgia 30310, USA
E-mail: hhyacinth@msm.edu; h.hyacinth@hotmail.com

because of inconsistencies in the results reported from available test samples [8]. Studies suggest considering a diagnosis of neonatal malaria in critically ill neonates with fever, unresponsive to antibiotics [7, 9], because malarial complications like convulsion, seen in older children have also been documented in neonates [10]. This study aimed at describing and discussing the clinical presentations and outcome of 24 cases of neonatal malaria seen at our facility, and to emphasize the high mortality still associated with this infection.

Subjects and Methods

This is a prospective descriptive study, done at the Special Care Baby Unit (SCBU) of the Jos University Teaching Hospital (JUTH), which is a 500 bed government owned tertiary hospital in Nigeria. For the purpose of this study, we adopted the following definitions; normal weight infant is birth weight of ≥2500g, low birth weight (LBW) is <2500g and preterm is a gestational age (GA) of <37 completed weeks. All consecutive infants seen within a 6 months period (January to June) at the SCBU were considered for recruitment. Parental informed consent and JUTH's ethical committee approval was obtained prior to enrolling neonates and administering questionnaires. Neonatal maturity/GA was estimated using Dubowitz's method of GA assessment. Each baby was weighed fully undressed using BabyWeigh™ electronic scale (Medela® Inc. model no. 040.7012, accuracy of 0.034-0.042g).

Clinical information collected include; use of intermittent preventive treatment (IPT) of malaria at least twice in the index pregnancy, maternal HIV status, and birth history until admission; applicable information was verified from the prenatal clinic records. Thick and thin blood films were made for malaria parasite identification and quantification respectively. Films were fixed and stained using 4% Giemsa stain for thirty minutes and was washed off in tap water. Dried slides were examined under ×100 magnification with oil immersion lens. Parasite density was determined by counting parasites against 400 leucocytes in a thick film and multiplying by 6000 (the average white blood cell count/µl). Blood samples were drawn for full blood count, serum electrolytes and urea, microscopy and culture to exclude or confirm the presence of other co-morbidities. Data was analyzed using SPSS v18 for Windows and results presented in tables using means (SD), ranges, frequencies and percentages.

Findings

Thirty one neonates were inborn, 10 were admitted via the emergency room (out-born), 24 of 41 i.e. 58.5% of neonates had malaria, 12(50%) of whom were males. There was no difference in infection rate between inborn and out-born neonates.

Table 1: Pregnancy history, demographic characteristics and malaria types

Characteristics		Frequency (*n*=24)	Percentage
Gestational Age	**Term**	17	70.8
	Preterm	7	29.2
Maternal use of IPT in index pregnancy	**Yes**	18	75.0
	No	6	25.0
Maternal HIV status	**Negative**	23	95.8
	Positive	1	4.2
Maternal malaria infection in index pregnancy	**Yes**	2	8.3
	No	22	91.7
Sex	**Male**	12	50.0
	Female	12	50.0
Malaria type	**Acquired (Neonatal)**	7	29.2
	Congenital	17	70.8

Table 2: Mean (SD), minimum and maximum values of some clinical characteristics of the neonates

Clinical characteristics	Mean (SD)	Minimum - Maximum
Gestational age (weeks)	36.88 (3.71)	29.00 - 40.00
Birth weight (kg)	2.51 (0.65)	1.40 - 3.50
Age at presentation (days)	5.88 (4.52)	1.00 - 14.00
Pre-treatment parasite count (ml^{-1})	480.00 (320.00)	120.00 - 1560.00
Duration of hospital stay (morbidity) (days)	3.71 (1.94)	2.00 - 10.00

SD: Standard Deviation

Microscopy confirmed that all neonates had *Plasmodium falciparum* malaria. Seven neonates (29.2%) were preterm and 18(75.0%) mothers used IPT. Twenty-three (95.8%) neonates had a negative maternal HIV status, 2(8.3%) had a "positive" history of maternal malaria infection in pregnancy with majority or 70.8% having congenital malaria which is neonatal malaria diagnosed in the first 7 days of life (Table 1). Mean age at presentation was 6.17±4.98 days, average GA, birth weight, pre-treatment parasite count and duration of hospital stay were 36.88±3.710 weeks, 2.51±0.65kg, 480±320/ml and 3.71±1.94 days respectively (Table 2).

All neonates presented with fever, with the next most common symptom being inability to suck (45.8%) followed by anemia (37.5%). Other co-morbidities were jaundice 6(25.0%), respiratory difficulty 6(25.0%), features of sepsis 8(33.3%), convulsion 5(20.8%), disseminated intravascular coagulation, diarrhea, vomiting, cyanosis, birth asphyxia, and myelomeningocoele (Table 3). All neonates with malaria responded to treatment as evidenced by an average post-treatment parasite count (PTPC) of almost zero (not shown), although 1 neonate had a PTPC of 2/ml. Amodiaquine was the most commonly used anti-malaria therapy (it is the standard of care for neonatal malaria in our center) with 83.0% responding to it, mortality among our patients was 25.0% (Table 4). There was diagnosed case of maternal 3rd trimester malaria infection and all mothers reported using mosquito nets at home during the index pregnancy.

Discussion

This study, although with a small sample size, shows that neonatal malaria is more common than earlier report suggested [4]. It is not clear why this is the case, but one hypothesis might be increasing resistance of *Plasmodium falciparum* to sulphadoxine/pyrimethamine (Fansidar™), the

Table 3: Distribution of clinical presentation and co-morbid medical conditions among neonates

Symptoms/Presentation	Frequency (*n*=24)	Percentage
Fever	24.0	100
Poor suck	11.0	45.8
Anemia	9.0	37.5
Sepsis	8.0	33.3
Jaundice	6.0	25.0
Respiratory difficulty	6.0	25.0
Convulsion	5.0	20.8
Bleeding (DIC)	4.0	16.7
Diarrhea	2.0	8.3
Vomiting	1.0	4.2
Cyanosis	1.0	4.2
Others	4.0	16.7

Table 4: Anti-malaria drug used for treatment and neonatal outcome

Variable	Frequency (*n*=24)	Percentage
Drug		
Amodiaquine	20.0	83.0
Quinine	3.0	12.5
Amodiaquine + Quinine	1.0	4.2
Outcome		
Alive	18.0	75.0
Died	6.0	25.0

chemoprophylaxis commonly used for IPT in many centers in Nigeria.

All neonates had fever at presentation, with others having in addition, anemia, pallor, feeding difficulty, jaundice, respiratory difficulty, convulsion, bleeding, diarrhea, vomiting and cyanosis. This symptomatology is akin to that reported for severe, complicated *Plasmodium falciparum* malaria [12]. All neonates in our study were exclusively breastfed, which does not support prior reports that breastfeeding confers protection from neonatal malaria [4]. The IPT approach is a very key component of effort to control malaria in pregnancy and vertical transmission that results in congenital and neonatal malaria [1]. Our data showed that there was a 75.0% uptake of IPT among mothers; but with 58.5% of neonates having malaria, and 70.8% having congenital malaria, there may be a problem with the prophylaxis program or its implementation. Although increasing parasite resistance could partly explain this observation.

Our study firmly support prior report of malaria being a cause of premature birth [12], since 7(29.2%) neonates were born pre-term. We have also shown that the clinical presentation of neonatal malaria can vary widely, and support similar findings in another study from Nigeria [7]. Majority of neonates responded to amodiaquine, with four neonates needing an alternate form of anti-malarial therapy. These 4 neonates later had culture proven sepsis in addition to a positive malaria parasite test.

The percentage of neonates diagnosed with neonatal malaria in our study was surprisingly high, given that the study was done during the off-peak season for malaria transmission in Jos [3]. In addition, none of the cases of neonatal malaria were transfusion related, because none of the patients had blood transfusion. It could be reasoned that the problem in our environment might be resistance to chemoprophylaxis and/or non-compliance. It is also plausible to argue for increasingly ineffective malaria control effort. Whatever the cause(s), the incidence of neonatal malaria seems to be making a comeback or getting worse in Nigeria [5]. The high percentage of neonates with neonatal malaria in our study is a small testament to this.

Conclusion

Neonatal malaria is one more child health problem to deal with amidst a myriad of other causes of poor neonatal outcome. This study demonstrates a high percentage of neonates with malaria compared with earlier reports. Improvement in the IPT program, routine blood screening and early intervention could reduce neonatal mortality.

Acknowledgment

The staffs of SCBU of the Jos University Teaching Hospital and support in part by NIH/NHLBI-R21HL092358 (to J.M.H.).

Conflict of Interest: None

References

1. United Nations Children's Fund (UNICEF). Malaria prevention and treatment. The Prescriber: A United Nations Children's Fund (UNICEF) Publication. 2000;18:1-16. Available at: http://www.unicef.org/prescriber/eng_p18.pdf. Access date: May 2011.
2. World Health Organization. Health and Millennium Development Goals. Available at: http://www.who.int/mdg/goals/en/. Access date: Oct 3, 2010.
3. Oguche S, Bode-Thomas F, Hyacinth HI, et al. The triple scourge of HIV/AIDS, tuberculosis and malaria are the leading cause of morbidity and mortality in the emergency pediatrics unit in North Central Nigeria. *Int J Malaria Trop Dis* 2009;5:256-63.
4. Bruce-Chwatt LJ. Malaria in African children in Southern Nigeria. *Ann Trop Paediatr* 1952;46(2): 173-5.
5. Mukhtar M. The growing incidence of neonatal malaria--a situational review in developing countries. *Nig J Med* 2007;16(1):25-30.
6. Sotimehin SA, Runsewe-Abiodun TI, Oladapo OT, Njokanma OF, Olanrewaju DM. Possible risk factors for congenital malaria at a tertiary care hospital in Sagamu, Ogun state, southwest Nigeria. *J Trop Pediatr.* 2008;54(5):313-20.
7. Ibhanesebhor SE, Okolo AA. Placental malaria and pregnancy outcome. *Int J Gynaecol Obstet* 1992;37(4):247-52.
8. Nyirjesy P, Kavasya T, Axelrod P, et al. Malaria during pregnancy: neonatal morbidity and mortality and efficacy of chloroquine chemoprophylaxis. *Clin Infect Dis* 1993;16(1): 127-32.
9. Falade C, Mokuolu O, Okafor H, et al. Epidemiology of congenital malaria in Nigeria: a multi-centre study. *Trop Med Int Health.* 2007;12(11):1279-87.
10. Thapa BR, Narang A, Bhakoo ON. Neonatal malaria: A clinical study of congenital and transfusional malaria. *J Trop Paediatr* 1987; 33(5):266-68.
11. Ibhanesebhor SE. Clinical characteristics of neonatal nalaria. *J Trop Paediatr* 1995;41(6): 330-3.
12. World Health Organization. Severe and complicated malaria. *Trans R Soc Trop Med Hyg* 1990;84(Suppl 2):S1-S65.