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Obstetrical Risk Factors for Neonatal Malaria in The Democratic Republic of Congo

Research Article

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Abstract

Neonates in the Democratic Republic of Congo are challenged by a low resource health care system and endemic malaria. Current practices to reduce malaria rates involve widespread blood smear testing and administration of antimalarials to febrile infants. However, the ongoing threat of resistance and associated cost indicate the need for targeted guidelines on malaria treatment amongst neonates. The present study investigates obstetrical risk factors for neonatal malaria in order to guide current practices. Factors investigated included febrile illness, hypertension, premature rupture of membranes (PROM), urinary tract infections, placental complications and diabetes during pregnancy and their association with neonatal malaria. Chi-squared analysis and odds ratios with a 95% CI revealed that PROM had a significant association with neonatal malaria.

Introduction

Each year, malaria kills more than one million children in sub-Saharan Africa.[1] Studies conducted across the continent have revealed that malarial parasites can be found in 7-10% of newborns.[1] Several studies conducted over the last two decades have revealed an increase in this percentage, with a more recent review reporting that malaria is responsible for up to 25% of infant mortality in countries such as Nigeria.[2,3]

The risk of malaria increases threefold during the second and third trimesters of pregnancy, as a result of alterations in the balance of Th1 and Th2 immune factors.[4,5] Along with increased frequency of malaria in pregnancy, there is an increase in severity of individual infections, most notably in primigravids.[6] The increased risk of severe malaria has significant adverse consequences on the developing child.[7] It is estimated that 6% of all infant deaths in malaria-endemic areas are a result of malaria infection that occurred in the child's prenatal life.[1] In addition to maternal malaria during pregnancy, primigravidity and fever during pregnancy are obstetrical factors known to have an association with neonatal malaria. Previous studies have also demonstrated that use of insecticide treated bed nets are protective against neonatal malaria.[8,9]

Within the Democratic Republic of Congo (DRC), a country where only 30% of the population has access to health services, malaria is a principal cause of morbidity and mortality.[10] Malaria accounts for more than 40% of all outpatient visits and 19% of deaths among children under five years of age.[10] Current practices involve taking a blood smear of every febrile child who presents to the hospital. Alternatively, parents can purchase antimalarials without prescription. The associated costs and ongoing threat of antimalarial resistance indicate the need for targeted guidelines on malaria diagnosis and treatment. Furthermore, there is paucity of data on neonatal malaria in the eastern part of the DRC, particularly in Goma.

The present study aims to investigate obstetrical risk factors for neonatal malaria, to guide current practices in DRC. Results from this work will allow policy makers to establish guidelines to diagnose and treat neonatal malaria.

Methods

Data was collected at the HEAL Africa Hospital's neonatal intensive care unit (NICU). This hospital is a 197-bed tertiary referral site located in Goma, North Kivu Province in eastern DRC. It is a training hospital, and one of three referral hospitals in the DRC. It provides general surgery, orthopedics, obstetrics and gynecology, pediatrics, internal medicine, radiology, and pathology services.

The study population includes 388 infants that were admitted between April 2016 and April 2018. The sole exclusion criteria was an incomplete neonatal record, which excluded 897 neonates. Records of included participants were reviewed and analyzed for maternal health and obstetrical history. Factors associated with risk of neonatal malaria were analyzed using chi-square tests and odds ratios with 95% confidence intervals.

Results

The prevalence of neonatal malaria was 20.1% amongst neonates with complete neonatal records admitted to HEAL Africa's NICU during the 2 year study period. Amongst obstetrical complications, premature rupture of membranes (PROM) during the index pregnancy was found to increase the risk of neonatal malaria. Obstetrical factors not associated with increased neonatal malaria risk include febrile illness during pregnancy, hypertension, placenta previa, gestational diabetes, maternal HIV or presence of urinary tract infections during index pregnancy.

Obstetrical Complication	χ2	DF	p-value	Odds Ratio (95% CI)
Febrile Illness	0.112	1	0.737	1.163 (0.482 to 2.806)
Hypertension	0.793	1	0.373	1.505 (0.609 to 3.718)
Placental Problems	1.172	1	0.279	0.449 (0.102 to 1.985)
Gestational Diabetes	0.046	1	0.830	0.790 (0.091 to 6.857)
HIV	0.004	1	0.949	0.959 (0.264 to 3.487)
UTI	0.606	1	0.436	1.220 (0.739 to 2.013)
PROM*	4.661	1	0.031	1.895 (1.054 to 3.406)

Table 1. Statistical Analyses of Obstetrical Risk Factors for Neonatal Malaria
DF, degrees of freedom; CI, confidence interval; HIV, human immunodeficiency virus; UTI, urinary tract infection; PROM, premature rupture of membranes
*Statistically significant

Discussion

PROM during pregnancy was found to be associated with an increase in the risk of neonatal malaria. Very little is known about this relationship, indicating the need for further research in this area. A recent study showed that maternal malarial infections can predispose infants to neonatal infections and that maternal malaria can affect the placenta through cellular adhesion, cytokine production and mononuclear cell infiltrates causing increased infant morbidity.[13] PROM has infection related risk factors (ex. sexually transmitted infections) and complications (ex. chorioamnionitis) that may predispose the infants to infection. These factors were not evaluated in this study, and this causation has not been studied with regards to malaria. Thus, it is unknown if this interaction can account for the observed association.

This study did not reveal any significant association between fever during pregnancy,

hypertension, placenta previa, gestational diabetes, maternal HIV infection or urinary tract infection and neonatal malaria infection. Previous studies have demonstrated that HIV increases the risk of severe malaria, while malaria increases HIV replication in vitro and in vivo.[11] Prevalence of placental parasitemia decreases significantly as gravidity increases and infants born to primigravid mothers are significantly more likely to be infected with P. falciparum than infants born to multigravid mothers.[12] Furthermore, a study in Nigeria found an association between neonatal malaria with parity, primigravidity, fever during pregnancy or maternal malaria parasitemia.[8] Differences in the patient population, selection criteria, and study design may account for the differing results between this study and previous results.

This study is not without limitations. One major limitation is that the study only included neonates admitted to the NICU, and thus may not be representative of the general population. 69.8% of charts from the inclusion period were incomplete or missing, and therefore results from those charts were not included, introducing another element of selection bias. In addition, full obstetrical records were not kept and therefore obstetrical data was obtained from the neonatal charts. As a result, accurate data on malaria and antimalarial use during pregnancy was not available.

Conclusion

In conclusion, this study reveals new information about risk factors associated with neonatal malaria. PROM was found to be associated with neonatal malaria amongst neonates admitted to HEAL Africa's NICU. The mechanism or causality of this association is unknown and requires further research. However, this finding may indicate the need for more diligent preventative measures including maternal education, use of insecticide treated mosquito nets, increased temperature monitoring of neonates and/or increased diagnostic screening for infants born following PROM. In addition, this study further emphasizes the importance of malaria prevention during pregnancy in order to improve outcomes for newborns.

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Assessment of the prevention of mother-to-child transmission of HIV services effectiveness in the Rorya District, Tanzania

Research Article

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Abstract

In Tanzania, a country with a national mother-to-child HIV transmission (MTCT) rate of 9%, the provision of services to prevent the spread of the virus during pregnancy and breastfeeding constitutes a crucial activity. The primary objective of this study was to assess the effectiveness of the prevention of mother to child HIV transmission (PMTCT) services in the Rorya District (rural northwestern Tanzania), after the implementation of the 2013 Tanzania National Guidelines for PMTCT. The study revealed that additional efforts are needed to completely eliminate the MTCT in the area. There is a need to promote early HIV testing and antiretroviral therapy adherence in pregnant women, as well as the retention of infants at risk of HIV infection along the PMTCT continuum of care.

Introduction

In 2016, 1.8 million individuals became newly infected with HIV, including 160,000 children. Most of these children are living in Sub-Saharan Africa and become infected by their HIV-positive mothers during pregnancy, childbirth or breastfeeding.[1] In the absence of any intervention, HIV is transmitted from mother infected with the virus to their infants in 15 to 45% of cases.[2] However, with effective interventions this rate can be reduced to below 5%.[2]

The latest WHO guidelines on prevention of mother-to-child HIV transmission (PMTCT), published in 2012, places pregnant HIV+ women on lifelong antiretroviral therapy (ART) regardless of clinical or immunological stage.[3] In September 2013, the latest WHO recommendations on PMTCT were introduced in all the reproductive and child health facilities in Tanzania through the 2013 Tanzania National Guidelines for PMTCT, leading to a decline in the mother-to-child HIV transmission (MTCT) rate at the national level.[4,5] Nevertheless, MTCT still accounted for 1 of every 5 new cases of HIV infection in 2014. These numbers are mainly due to the lack of adherence and retention to the PMTCT services cascade by HIV+ mothers and their newborns.[4]

The current study was intended to gain insight into the current PMTCT service provision in the Rorya District. For this purpose, we explored the PMTCT services provided by the Shirati Rorya District's Hospital facilities, community health