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Research Article

Neonatal Malaria in a Rural Refereral Hospital in East Party of Democratic Republic of Congo: Prevalence, Signs, Determinants and Drugs Used in this Series Cases

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Abstract

Background: Malaria is a common parasitic disease which affects rarely new born. It can be transmitted vertically from transplacental barrier or a fresh infection due to neonate transfusion, or mosquito bites. Neonatal malaria present similar clinical signs with neonatal sepsis. In East party of Democratic Republic of Congo, malaria testing isn't routine to neonates with fever or other's disorders at born. The objective of this study is to explore prevalence, review signs, determinants and drugs used in treatment of neonatal malaria in our area and period study.

Methods: This study was a case-control conducted from January 1st, to December 31, 2018 at neonatology unit of Kirotse General Referral Hospital. This Hospital is located in Kirotse health rural zone, East Democratic Republic of Congo, North-Kivu Province.

Finding: During our study period, a total of 119 children were admitted in neonatal unit of Kirotse General Referral Hospital t. 29 new born (24.4%) presented neonatal malaria and 1 neonate (3.4%) had congenital malaria. The common clinical sign was fever 63.0%, Parasitology report that all new born in case group had RDT-Malaria positive contrary to microscopic detection confirmed only 65.5% of neonatal malaria. Significant determinants associated to neonatal malaria in this study was insufficient ANC < 3, irregular compliance use of IPT, no correct use of LLIN during pregnancy, low maternal education level, maternal fever before, during and after birth. Quinine 23/29 cases (79.3%), Artesunate 6/29 cases (20.7%) was used in treatment of neonatal malaria and 26/ 29 neonates (89.7%) received antibiotic

Conclusion: This study confirmed that neonatal malaria is not rare in East party of Democratic Republic of Congo Introduction of routine malaria testing to neonates with fever and similar sepsis disorders can improve survival chances for new born.

Keywords: Malaria; Neonatal; Sepsis; New Born

Introduction

Neonatal malaria, defined as asexual parasites detected in the cordon blood or in the peripheral blood during the first week of life is due to parasite transmission from the mother through the placenta just, before or during delivery in congenital malaria [1], while in neonatal malaria, this affection is due to an infection mosquito bite after birth to 8 - 28 days of new born life [2].

In current medical practice, difference between congenital and acquired neonatal malaria is difficult especially in endemic malaria area [3], because of malaria in neonate's present similar signs with neonatal septicaemia [4].

In 2016, 1.2 billion people were exposed at high risk of malaria, 216 million cases of malaria notified, and 445 000 childhood deaths worldwide [5,6].

In Sub-Saharan African countries, malaria has been recognised as a leading cause of infantile morbidity and mortality [7], in this party of Africa, it's caused between 75 000 and 200 000infants deaths each year [8] and neonatal malaria would be rare.

Malaria in pregnancy has significant impact on maternal and neonatal health particularly in high endemic malaria area [9-11]. Neonatal malaria is considered rare because of several factors whose the milk diet of children being deficient in para-benzoic acid [12], which leads parasite growing, the presence of erythrocyte foetal haemoglobin in new born [13], the selective biting by mosquito among different age-groups, maternal immunity transplacentally acquired in utero, passive maternal antibodies inhibit parasite growth such as lactoferin and secretory Ig A found in the breast milk after birth. Those antenatal and neonatal factors, play an important role in the protection of new born and infant in the first few months of life [14-16]; but recently several authors reported a growing incidence of neonatal malaria in endemic area in more Sub-Saharan African countries [17-20]. The objective of this study is to explore prevalence, review signs, determinants and drugs used in treatment of neonatal malaria in our area and period study.

Materials and Methods

Study design and area

This case-control study was conducted from January 1st, to December 31, 2018 at neonatology unit of Kirotse General Referral Hospital. This Hospital is located in Kirotse health rural zone, esat Democratic Republic of Congo, North-Kivu Province in Masisi territory, 27 Km from Goma city on the road Goma -Bukavu. This Hospital covers a popular density of 191 inhabitants/Km. It's also, located in a stable malaria endemic zone with two ecosystems, one lacustrine and the other mountainous ecosystem. The climate is temperate with two seasons, one of rain and the other dry. The neonatology service organization is rudimentary with limited human and material resources. Paediatrics department has specific capacity of 33 beds.

Participants and eligible criteria

New born aged 0 - 28 days were included in this study during. Case group (n = 29) were new born with asymptomatic or symptomatic sign which have neonatal malaria positive detected by rapid diagnostic on admission at the neonatology unit of Kirotse General Reference Hospital control group (n = 90) was represented by new born without neonatal malaria at their admission. Were excluded new born aged more 28 days new born dead before admission no parent consent to the blood sample, febrile new born with RDT negative.

Laboratory methods [21-24]

Malaria diagnosis involves identifying malaria parasite or antigen products in patient blood. Detection of neonatal malaria used following laboratory methods.

1. Malaria rapid diagnostic test (RDT) for plasmodium falciparum (SD Biotine Malaria Antigen P/f Pan Standard Diagnostic). This methods has been found useful as an alternative to routine microscopy with good sensitivity and specificity profiles, it's was easy to perform and to interpret according WHO recommendations.
2. Conventional microscopic diagnosis by staining thin and thick peripheral blood smears of new born by using Giemsa according WHO recommendations. No molecular diagnostic methods such as polymerase chain reaction (PCR) realize in this study and could be a limiting factor for this study.

Data collection, treatment and statistical analysis

Recoding and treatment data were done in word and excel 2016. Encoding and analysis data was performed using SPSS 20.0. Odd ratio was applied in this study to assess the risk factor associate to neonatal malaria. Confidence interval at 95%, the significant level was taken at $P < 0.05$.

Variables considered

The variables analysed in this study, were incidence, age, sex, birth weight, number of antenatal care (ANC), compliance with intermittent preventive therapy (IPT) of malaria, use of long-lasting insecticide treatment nets (LLINS), maternal fever before, during and after delivery, maternal education level.

Ethical considerations

Necessary clearance was obtained from the Kirotse General Referral Hospital authorities and Hospital ethics committee. Written consent were also obtained from the children's caretakers. Moreover confidentiality was maintained during data collection and processing and procedures did not endanger or have adverse effects on the patients

Results

Prevalence of neonatal malaria

During our study period, a total of 119 children were admitted in neonatal unit of Kirotse General Referral Hospital t. 29 new born

(24.4%) presented neonatal malaria and 1 neonate (3.4%) had congenital malaria. This study confirmed that neonatal malaria isn't rare in endemic malaria countries (Table 1 to3 and Figure 1).

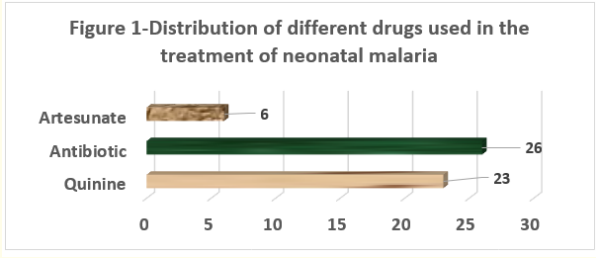

Figure 1: Distribution of different drugs used in the treatment of neonatal malaria.

Quinine 23/29 cases (79.3%), Artesunate 6/29 cases (20.7%) was used in treatment of neonatal malaria and 26/ 29 neonates (89.7%) received antibiotic.

	Case group	Control group	
Variables	**n=29 (24.4%)**	**n=90 (75.6%)**	**N=119 (100%)**
Age(days)			
0-7	01 (3.4)	53 (45.4)	54 (45.4)
8-28	28 (24.4)	37 (54.6)	65 (54.6)
Gender			
Male	17 (58.6)	47 (52.2)	64 (53.8)
Female	12 (41.4)	43 (47.8)	55 (46.2)
Weight (g)			
<2500	13 (44.8)	08 (8.9)	21 (17.6)
≥2500	16 (55.2)	82 (91.1)	98 (82.4)

Table 1: Demographic data presentation of neonates.

It clearly appear that 54.6 % of neonates was aged between 8 - 28 years, males was 53.8 %. Low birth weight < 2500 g was 17.6 %.

	Case group	Control group	
Signs	**N=29(24.4%)**	**N=90(75.6%)**	**N=119(100%)**
Clinical			
Fever	24(82.8)	51(56.7)	75(63.0)
Neurological disorders	08(8.9)	03(10.3)	11(9.2)
Cardiac disorders	06(20.7)	14(15.6)	20(22.2)
Respiratory disorders	08(27.6)	21(23.3)	29(25.7)
Digestive disorders	02(6.9)	05(5.6)	07(7.8)
Skin infection	04(13.8)	11(12.2)	15(16.7)
Biological			
RDT-Malaria			
Positive	29(100)	00(0.0)	29(24.4)
Negative	00(0.0)	90(100)	90(75.6)
Microscopic detection			
Positive	19(65.5)	00(0.0)	19(16)
Negative	10(34.5)	90(100)	100(84)
Hb(g/dl)			
<13	03(10.3)	00(0.0)	03(2.5)
≥13	26(89.7)	90(0.0)	116(97.5)
SaO_2			
<90 %	01(3.4)	08(8.9)	09(7.6)
≥90 %	28(96.6)	82(91.1)	110(92.4)

Table 2: Distribution of clinical and biological signs.

The common clinical sign was fever 63.0 %, Parasitology report that all new born in case group had RDT-Malaria positive contrary to microscopic detection confirmed only 65.5 % of neonatal malaria.

	Case Group	Control Group	
Risk factors	**N =29(24.4)**	**N=90(75.6)**	**OR IC 95%**
Number of ANC[1]			
< 3	23(62.9)	17(18.9)	16.46[5.81-46.67]
≥3	06(37.1)	73(81.1)	
Compliance of IPT[2]			
Irregular	27(93.1)	29(32.2)	28.4[6.32-127.64]
regular	02(6.9)	61(67.8)	
Correct use of LLIN[3]			
No	19(65.5)	43(46.7)	2.08[0.87-4.97]
Yes	10(34.5)	47(53.3)	
Maternal education[4]			
Primary	21(72.4)	61(76.8)	1.25[0.49-3.16]
Secondary and more	08(27.6)	29(32.2)	
Maternal fever B,D,A,D[3]			
Present	15(51.7)	06(6.7)	17.5[5.69-53.83]
None	12(48.3)	84(93.3)	

Table 3: Determinants associates to neonatal malaria.

Significant determinants associated to neonatal malaria in this study was insufficient ANC <3, irregular compliance use of IPT, no correct use of LLIN during pregnancy, low maternal education level, maternal fever before, during and after birth.

1. ANC: Antenatal care.
2. IPT: Intermittent Preventive Therapy.
3. LLIN: Long-lasting insecticidal nets.
4. Maternal fever B,D,A,D: Maternal fever before, during and after delivery.

Discussion

Neonatal malaria prevalence

This study aims successfully to determine prevalence, signs, risk factors associated and drugs used in treatment of neonatal malaria in our area study. Neonate required specific care from health professional to improve their chances of survival especially in resource limited countries as Democratic Republic of Congo (DRC).

During our period study, 29 neonates (24.4%) out of 119 neonates admitted to neonatology care unit of Kirotse General Referral Hospital, presented neonatal malaria. Iyabo., *et al.* in Nigeria have also corroborated this result, their reported neonatal malaria prevalence of 24.8% [17], lower than 58.6% observed by Hyacinth., *et al* [25]. However, in this study 3.4% of newborn presented congenital malaria and was aged under 7 days. This incident is lower than 13. 6% documented in Ghana [26], lower than 35.7% observed by Obu., *et al.* in Gambia [11]. This different congenital malaria prevalence shows that malaria is more and it's also a reminder that this affection still exists despite IPT and other malaria preventive measures in endemic areas during pregnancy.

In our context, four factors would explain this important neonatal malaria prevalence, foetal immunity uncompleted, possible Sulfadoxin Pyrimethamine (SP) combination resistance, poor compliance with SP and inappropriate use of LLIN.

Demographic characteristic of neonates

In a total of 29 neonates admitted with neonatal malaria in neonatology unit during our study period, 58.6% was male and 41.4% female with a sex ratio of 1.41. This result differs from Hyacinth.,

et al. series cases [26], in which no sex predilection were reported similar distributed (50.0%) males and (50.0%) females contrary to Obu., *et al.* result [11]. who observed 74.1% males predominance with significant statistical difference. Low birth weight < 2500 g was 17.6% in our series studies. Malaria infestation during pregnancy, is the most important preventable cause au low birth weight.

Distribution of clinical and biological signs

The diagnosis of neonatal malaria usually poses a challenge, because its clinical sign may be indistinguishable from those of neonatal sepsis. Many neonatal diseases can manifest with instability temperature, irritability, cardiac disorders, respiratory disorders, digestive disorders, feeding problems, anaemia, skin infection and low birth weight. Clinical distinction from other neonatal diseases rests based maternal history of exposure to malaria [4]. In our series, the common clinical sign was fever 82.8% for new born with neonatal malaria. Similar findings was observed by studies in Sub-Saharan countries [11,17,18].

The parasitology reported that all new born in case group had RDT-Malaria positive contrary to microscopic detection confirmed only 65.5% of neonatal malaria. The detection of malaria parasite in new born blood smears technics could be negative if there are low parasite counts under 50 Parasites/µL blood. Some authors suggested to repeat blood smears over 48 hours later before excluding the diagnosis of malaria [4]. Also, microscopic technic depends to good technique of thick and thin blood smear, good reagent and microscopist's skill in endemic malaria area.

Determinants associates to neonatal malaria

Significant determinants associated to neonatal malaria in this study was insufficient ANC < 3, irregular compliance use of IPT, no correct use of LLIN during pregnancy, low maternal education level, maternal fever before, during and after birth.

Adequate antenatal care or visits offers the opportunity to provide interventions likes tetanus immunization, calcium, iron supplementation and intermittent preventive therapy (IPT) by use Sulfadoxine-Pyrimethamine (SP) that can improve neonatal survival [27,28]. Within some Congolese sociocultural context, it's thought that non initiation of care in the first trimester seems to be a wide-spread cultural practice. In East party of DRC women don't announce pregnancy early while further and obligatory qualitative research is required to evaluate women pregnancy beginning. Late first or insufficient antenatal care, exposes foetus to several complications and neonatal infection as neonatal malaria or neonatal sepsis.

In our study, 93.1% of mothers had irregular compliance to IPT with significant statistical difference. This is a big problem in malaria prophylaxis during pregnancy in this part of DRC. The IPT approach is very key component of effort to control vertical transmission malaria in pregnancy that result congenital and neonatal malaria [29]. In our context, this could be explain by low level maternal education. In our series 72.4% of mothers had primary level. This result is corroborated by several authors. Childhood malaria infection is most prevalent among women reporting no formal education across several countries. In Angola, childhood malaria burden among women without any formal education was 38% compared with 26% among women with more than just primary education. This result is similar to those finding in Tanzania and Uganda without statistical significant difference in their reporting [30].

65.5% of mother didn't used correctly LLIN during pregnancy and after delivery. Correct using of LLIN provide protection from malaria to communities living in endemic regions and reduce the risk of malaria infection by 50% [31]. In our context, population uses the LLIN for covering plant's, fish the fish out by ignorance on one hand and on the other hand because of insufficient sensitization on correct use of LLIN in le local community. This is one of the determinant exposes women to contract malaria in our country during pregnancy.

Maternal fever before, during and after delivery was also risk factor of neonatal malaria in our study. Other author reported this observation. However, maternal history of febrile illness in the last trimester, during and after delivery is significantly associated to malaria infestation. All new born of such mothers with such history should be placed under observation in neonatal unit for screening malaria parasite or neonatal sepsis [17].

Treatment of neonatal malaria

They are very few studies reporting on the use of Quinine or Artesunate in treatment of neonatal malaria [32]. In our series, Quinine 23/29 cases (79.3%), Artesunate 6/29 cases (20.7%) was used in treatment of neonatal malaria and 26/ 29 neonates (89.7%) received antibiotic, certainly because of confusion of new born with neonatal malaria sign similar to clinic sign with neonatal sepsis.

Conclusion

This study confirmed that neonatal malaria is not rare in East party of Democratic Republic of Congo. It's present similar clinic sign with neonatal sepsis and associate to insufficient antenatal care, irregular compliance use of IPT, no correct use of LLIN during pregnancy, low maternal education level, maternal fever before, during and after birth. This neonatal infection should be included in the differential diagnosis of neonatal sepsis in malaria endemic zones.

Introduction of routine malaria testing to neonates with fever and similar sepsis disorders, so that rapid diagnosis and early treatment can be instituted in line with the concept of roll back malaria 2016 to 2030.

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