***Original Research Article***

# Clinical features and outcome of birth asphyxia in Hôpital du Cinquantenaire of Kisangani: a cross-sectional study


## ABSTRACT

**Aims:** There paucity of studies on asphyxia, one of the three main reasons for newborn deaths in Democratic Republic of Congo (DRC). In this country, newborn mortality is among the highest in Africa. This study was conducted to identify the clinical features and outcome of perinatal asphyxia. Risk factors associated with asphyxia were also determined.
**Study design:** A cross-sectional study.
**Place and Duration of Study:** it was conducted in the pediatric department of Hôpital du Cinquantenaire of Kisangani (HCK), from March 2013 to March 2017.
**Methodology:** Clinical and biologic parameters (prenatal, perinatal and postnatal) of term newborns, hospitalised for perinatal asphyxia in the HCK were retrospectively collected and analysed. Data of dead newborns were compared to those who survived to determine risk factors associated with asphyxia mortality. One case matched three controls of the same sex.

**Results: Results.** During the period above, 612 newborns were received in the HCK, and 146 died. One hundred and nineteen out of 612 had perinatal asphyxia (19.4%), and 26 out of 119 died (17.8% of all newborn deaths and 21.8% of all asphyxia cases). The most frequent perinatal antecedents were premature rupture of the membranes, meconium-stained amniotic liquid, pre-eclampsia and eclampsia. In bivariate analysis, factors associated with asphyxia lethality were low birthweight (*P*=.02),reference from another hospital (*P* =.01), age more than 24 hours (*P* =.02), associated sepsis (*P* =.003), asphyxia severity (*P*<.001) and the Stage 3 of Sarnat (*P*<.001).

**Conclusion.** The frequency of the asphyxia is high in the HCK and its mortality associated with avoidable factors. Networking newborn referral, improving skills of nurses about obstetrical and neonatal emergency cares, and making available equipment for newborn resuscitation can reduce that mortality.



*Keywords: Perinatal asphyxia, newborn, risk factors*


## INTRODUCTION

Up to 7,6 millions of children under 5 years-old deceased during 2010: three million were newborns, ( 40% of whole deaths). Prematurity, intrapartum complications and sepsis were the main reasons of newborn death [1]. In the world health statistics 2010 published by the WHO, DRC appeared among the 3 countries having the strongest infanto-juvenile mortality, just before Angola and Chad, with a rate of 199 per thousand [2]. The Demographic and Health Survey of 2014 found a rate of 104 [3], what was a meaningful reduction of neonatal mortality in 2014. However, these rates remain high, and the same report underlines that neonatal mortality did not significantly vary [2]. The poor performance of health worker has multiple determinants ranging from proximal ones such as a lack of knowledge, skill and motivation to distal factors such as disabling working environment in health facilities (poor clinical practices, leadership and supervision; lack of adequate supplies and equipment; health workers' ineffective participation in planning; and lack of peer support) [4]
Close to 75% of newborn deaths occur in the first week of life, due to prematurity (35%), perinatal asphyxia (23%) and sepsis (23%) [1,4, 6, 7]. Other studies found that perinatal asphyxia was the second cause of neonatal mortality [7-9].
It also causes a lot of complications: cerebral palsy, psychomotor development impairment, a socioeconomic burden for the family. The prevalence of peripartum asphyxia is low in developed countries: while in low-income countries, about one out of 5 newborn suffers from asphyxia at birth and 10 to 33% of them die [10-11].

In DRC, the health system encounters several difficulties [3], and the problem of under-equipment for neonatal resuscitation is widespread in many hospitals. There is paucity of literature on asphyxia are available. Biselele found preeclampsia, urogenital infection, and mild asphyxia as most frequent perinatal features of asphyxiated newborns. The same study found an association between the severity of hypoxo-ischemic encephalopathy and asphyxia mortality [12]. This study was conducted to identify the clinical features and outcome of perinatal asphyxia. Risk factors associated with asphyxia were also determined.

## 2. MATERIAL AND METHODS

### 2.1 Operationalization of variables

Perinatal asphyxia was diagnosed when term newborn had an Apgar score less than 7 at the 5$^{th}$ minute of life. Asphyxia was classified as the mild Apgar score at the if 5$^{th}$ minute, ranged between 4 and 6. If the Apgar score ranged between 0 and 3, the asphyxia was considered as severe.
Hypoxo-ischemic encephalopathy (HIE) was classified according to Levene and Sarnat & Sarnat: Grade 0 for wellbeing newborn, grade 1 or light HIE, grade 3 or mild HIE and grade 3 or HIE severe [13]. Neonatal sepsis was diagnosed when a newborn had a positive C reactive protein realised at the 12$^{th}$ hours or later.

### 2.2 Study design, sample, inclusion criteria, variables

This was a cross-sectional study. Data were collected from medical folders of all newborns hospitalised in the HCK with asphyxia from March 2013 to March 2017. Some were born in HCK and other referred from other hospitals of the city. Transferred cases with asphyxia who died during transportation to HCK were excluded. All premature, as well as term newborns with life-threatening congenital malformations and those leading to surgical emergency (anal imperforation, primitive peritonitis, necrotizing enterocolitis), were excluded.
There are no therapeutic hypothermia facilities in the HCK. The cases of asphyxia received a symptomatic medical treatment solely, based on oxygen, 10% glucose infusion enriched of trace elements, phenobarbital if there were seizures. Descriptive analysis were performed on antenatal features (mode of childbirth, maternal history of pre-eclampsia or eclampsia, placenta prævia, cord procidence, dystocic presentation) and postnatal (meconium stained amniotic fluid, Apgar at 1 and 5 minutes, clinical signs in the following hours, duration of hospitalization, mortality within 24 and 48 hours). Bivariate analysis compared features of survival newborns to those of dead in the purpose of idenfying risk factors associated to mortality. Three controls matched 1 case on the basis of sex.
Statistical analysis was realised by Microsoft Excel® 2016 and Epi info™ 7.1.5.Pearson's chi-square and odds ratio were used to analyse the association between variables and to determine risk factors. Quantitative data. were compared with the Student t-test.

## 3. RESULTS AND DISCUSSION

### 3.1 Socio-demographic and clinical data

From March 2013 to March 2017, 612 newborns were hospitalized into the HCK, among whom 119 were asphyxiated (19,4% of all newborn hospitalisations). One hundred and forty-six died for miscellaneous causes, including 26 with perinatal asphyxia (17.8% of all newborns deaths and 21.8% of asphyxia lethality).
The sex ratio F/M was 0.7 (52/67). Most of the newborns were male and ≤1 day old. The mean age at arrival in neonatology department was 1.7 days (median: 1 day). Majority of them came from Makiso township (61.3%) and Kabondo (20.1%). Birthweight varied between 1845 g and 4250 g (mean 3120.1 ± 551.2 g; median 3095 g), and 13% of the newborn had low birthweight (<2500 g).

Table 1. Antenatal, perinatal and clinical features of asphyxiated newborns

| | Features | freq | % |
|---|---|---|---|
| Antenatal | Pre-eclampsia/eclampsia | 26 | (22.1%) |
| | Premature rupture of membranes | 22 | (18.1%) |
| | Premature rupture of membranes | 22 | (18.1%) |
| | Prolonged labor | 14 | (11.6%) |
| | Dystocic presentations | 13 | (10.5%) |
| Perinatal | Meconium stained amniotic fluid | 43 | (36.4%) |
| Clinical signs | Respiratory distress | 59 | (49.4%) |
| | Pallor | 26 | (22.1%) |
| | Lethargy | 20 | (16.9%) |
| | Seizures | 19 | (15.6%) |
| | Fever | 19 | (15.6%) |
| | Excessive crying | 15 | (13%) |
| | Gastro-intestinal tract hemorrhage | 9 | (7.8%) |
| | Unconsciousness | 5 | (4 %) |
| | Twins | 5 | (4%) |
| Origin | Born in HCK | 58 | (48.74%) |
| | Referred from other hospitals | 61 | (51.26%) |
| Fatal outcome | All deaths among asphyxiated newborns | 26 | (21.85 %) |
| | Mortality during the first 24 hours (n=26) | 20 | (77.6%) |

Respiratory distress was the most common clinical feature at admission. About HIE, 13 cases were in grade 0 (healthy newborns), 18 cases in grade 1, 33 cases in grade 2 and 17 in grade 3. The mean hospitalization duration was 7.6 ± 4.2 days (median 5 days)

### 3.2 Analytic data (N =368*)*

Table 2. Factors associated with mortality

| | | Deceased | Alive | OR* (CI† 95%) | *P* |
|---|---|---|---|---|---|
| Birthweight | < 2500 g | 8 | 9 | 3.4 (1.1 – 10.3) | **.02** |

| | | | | | |
|---|---|---|---|---|---|
| | > 2500 g | 19 | 84 | | |
| Sex | Female | 11 | 41 | .9 (.3 – 2.2) | .8 |
| | Male | 15 | 52 | | |
| Origin | Referred | 19 | 42 | 3.2 (1.2 - 9) | **.01** |
| | HCK | 7 | 51 | | |
| Age at admission | ≤ 1 day | 17 | 79 | 2.9 (1.1 - 8) | **.02** |
| | > 1 day | 9 | 14 | | |
| Sepsis | Yes | 15 | 25 | 3.7 (1.5 – 9.1) | **.003** |
| | No | 11 | 68 | | |
| Asphyxia severity | Light | 7 | 81 | .05 (.01 – .1) | **< .001** |
| | Severe | 19 | 12 | | |
| HIE Sarnat grade | 0 | 1 | 44 | | **< .001** |
| | 1 | 4 | 28 | | |
| | 2 | 9 | 19 | | |
| | 3 | 12 | 2 | | |

*OR: odds ratio;†CI: confidence interval.

Deceased newborns had a lower birth weight (2912.3 ± 609.8 g) than those who survived (3178.2 ± 522.5g):t (117) = -2.21;*P* = .02). The low birthweight had a three-fold risk of dying with asphyxia than those who had a normal birth weight.
Referral from other hospitals, arriving at HCK at an age older than 1 day, sepsis, severe asphyxia, Sarnat grade 2 and 3 were associated with higher risk of mortality.

### 3.3 Discussion

The majority of our newborns were male, from Makiso township. The hospital is located in Makiso and Kabondo is the nearest township.Other authors reported the male predominance with a meaningful difference in favour of the boys [14,15]. Tina Katamea in DRC found that the neonatal mortality was associated to masculine sex [16]. In this study, there was no meaningful difference between boys and girls.
The peripartum asphyxia represented 19.4% of all newborns hospitalizations in to the HCK and 17.8% of neonatal mortality. This rate was higher than the 10.94% found in India [10] but close to the 18% found in Cameroon [11].
Mortality related to perinatal asphyxia (table 1) was higher than 10% found in India [10], 18.5% in Nigeria [7] and 21% in Ghana [9]. It was lower than 32% in Liberia [8], 30% in Nepal [17], 25% in Kenya [6] and Malawi [18].
Availability of nurses and basic resuscitation kit (suction device, ambu bag, masks) contributed to this result, especially for babies born in HCK. Nevertheless, the prevalence was high. The late arrival of a referred newborn in inappropriate transport conditions can explain this higher rate among referred newborn [19]. Another reason was the lack of facilities for therapeutic hypothermia in HCK. Many studies reported the usefulness of the therapeutic hypothermia in the management of HIE [20, 21].

Low birthweight, a reference from another hospital, age superior to 24 hours, severe asphyxia, elevated Sarnat grade (Table 2) were factors associated with mortality among asphyxiated newborn.

These data agree with those of the other previous studies: the low birthweight newborn is more fragile and at high risk of developing hypoglycemia.

The Sarnat grade describes the severity of HIE: higher grades had more severe HIE. Therefore, in this study, like in many others, mortality was associated with highest grades [10-12, 19, 21].

Reference from other motherhoods and age at admission were evident risk factors [7]. For the best moment to avoid asphyxia is the period of the 4 first minutes. If asphyxia could not be avoided, the first 6 hours of life were the most important time to use the cooling device to prevent HIE and neurologic damage [20]. This shows how bad can be the prognosis of newborn arriving later than 24 first hours. No cooling device was available in HCK. So, only children born there could be immediately resuscitated and that explains the significant difference between them and those referred from other hospitals.

## 4. CONCLUSION

The mortality rate of perinatal asphyxia was high in HCK and associated with the preventable factors. Networking newborn referral, improving skills of nurses in the motherhood staffs of hospitals in Kisangani about emergency obstetric and neonatal care, and providing to them devices for neonatal resuscitation is necessary interventions to reduce mortality due to neonatal asphyxia.

## ETHICAL APPROVAL

This study received the agreement of Research authorities of Faculty of Medicine and Pharmacy of University of Kisangani.

## REFERENCES


1. Li liu, Hope l J, Cousens S, Perin J, Scott S,Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000, *Lancet* 2012; 379: 2151–61
2. WHO, world health statistics2010, Geneva, 2010
3. Ministère du plan et suivi de la mise en œuvre de la révolution de la modernité (mpsmrm), ministère de la santé publique (msp) et ICF international, 2014. *Enquête démographique et de santé en république démocratique du Congo 2013-2014*. Rockville, maryland, usa : mpsmrm, msp et ICF international
4. Brantuo M, Cristofalo E, Mehe M, Ameh J, Okai B, Evidence-based training and mentorship combined with enhanced outcomes surveillance to address the leading causes of neonatal mortality at the district hospital level in Ghana, *Tropical medicine and international health*. 2014, 19:4, p 417–426,
5. Ashish KC, Målqvist M, Wrammert J, Verma S, Raj aryal D, Implementing a simplified neonatal resuscitation protocol-helping babies breathe at birth (hbb) at a tertiary level hospital in Nepal for an increased perinatal survival, *BMC Pediatrics* 2012, 12:159
6. Yego F, Stewart W, Byles J, Nyongesa P, Aruasa W and D'este D, A retrospective analysis of maternal and neonatal mortality at a teaching and referral hospital in Kenya, *Reproductive health* 2013, 10:13
7. Ekwochi U, Ndu IC, Nwokoye, Ezenwosu, Amadi, Osuorah D, Pattern of morbidity and mortality of newborns admitted into the sick and special care baby unit of Enugu state university teaching hospital, Enugu state, *Nigerian journal of clinical practice*, 2014, 17:3,
8. Jody R, Facnm, Ffaan, a case series study of perinatal deaths at one referral center in rural post-conflict Liberia, *Matern child health j*. 2014 January; 18(1)
9. Welaga P, Moyer C, Aborigo R, Adongo P, Williams J et al. Why are babies dying in the first month after birth? A 7-year study of neonatal mortality in northern ghana. *Plos one*, 2013, 8(3): e58924
10. Kumar A, Suruchi S, VimalK, ApekshaP, DebaP B, Clinical profile and short term outcome of hypoxic ischemic encephalopathy among birth asphyxiated babies in Katihar medical college hospital*, Journal of clinical neonatology, 2014; 3(4)*
11. Monebenimp F, Tietche F, EtekiN, Asphyxienéoonatale au centrehospitalier et universitaire de Yaoundé, Cameroon, *Clinics in mother and child health, 2005;* 2(2): 335-338
12. Biselele T, Naulaers G, Bunga M, Nkidiaka E, Kapepela M et al, A descriptive study of perinatal asphyxia at the university hospital of Kinshasa (Democratic Republic of Congo), *JTrop Pediatr,* 2013; 59 (4): 274-279
13. Antonucci R, Porcella A, Pilloni M, Perinatal asphyxia in the term newborn, Journal of pediatric and neonatal individualized medicine, 2014, 3 (2): 1- 14
14. Mohamed M, Aly H, impact of race on male predisposition to birth asphyxia, *j perinatol.* 2014;34(6):449-52
15. Eghbalian F, frequency of hypoxic-ischemic encephalopathy among hospitalized neonates in west iran, IRAN, *J Pediatr, 2010; 20 (2), 244-245,*
16. Tina K, Mukuku O, Kamona l, Mukelenge K, Mbula O, Facteurs de risque de mortalité chez les nouveaux-nés transférés au service de néonatologie de l'hôpital jason sendwe de Lubumbashi, République Démocratique du Congo, *Pan african medical journal*. 2014 ; 19 :169,
17. *Lee C, Mpha M, Mullany L, James M, Tielsch, Katz, Risk factors for neonatal mortality due to birth asphyxia in southern Nepal: a prospective, community-based cohort study, Pediatrics. 2008; 121(5): e1381–e1390*

18. Michael K H, Olmsted K, Kiromera A, Chamberlain, a neonatal resuscitation curriculum in Malawi, Africa: did it change in-hospital mortality? *International journal of pediatrics,* 2012, 10:1155
19. Memon S, Shaikh S, Bibi S. To compare the outcome (early) of neonates with birth asphyxia in-relation to place of delivery and age at time of admission. *J pak med assoc*. 2012;62(12):1277-81
20. *Daetwylera K, Brotschib B, Bergerc T, WagneraP, F*easibility and safety of passive cooling in a cohort of asphyxiated newborn infants, *Swiss med wkly*. 2013;143: 13767
21. Qureshi AM, Rehman a UR, Siddiqi T, Hypoxic ischemic encephalopathy in neonates, *J Ayub Med Coll Abbottabad*. 2010;22(4):190-3.