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# Trends in Neonatal Mortality in Lubumbashi (Democratic Republic of Congo) from 2011 to 2018

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## Abstract

Neonatal mortality is an essential indicator of the quality of care in a community. In the Democratic Republic of Congo, it remains a real problem despite the efforts made in the last decade. The aim of this study was to make an inventory of neonatal mortality at University of Lubumbashi Clinics during the last 8 years, from 2011 to 2018. It is a question of studying the evolution of the frequency of intra-hospital deaths, to determine the causes and the essential epidemiological characteristics.

The frequency of deaths remained fairly constant with an average of 40.04%, of which 77.9% occurred in the first week of life. The death concerned more low birth weight (63%) and males newborns (sex ratio =1.23). The most common causes of death are prematurity (50.09%), infections (21.26%), respiratory distress (11.78%), perinatal asphyxia (9.57%) and congenital malformations (8.83%). However, a significant reduction in deaths due to perinatal asphyxia was noted (from 26.56% in 2011 to 2.81% in 2018). Newborns transferred from others hospitals had higher mortality than those born at University Clinics in Lubumbashi, 42.57% *vs.* 38.22%.

Neonatal mortality remains a concern at University of Lubumbashi Clinics. Substantial efforts must be made and should be geared towards prevention through optimal monitoring of pregnancy, capacity building in neonatal emergency management and improvement of the technical platform as well as the inter institutional referral system.

**Keywords: Mortality; Newborn; Etiology; Lubumbashi**

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## Introduction

Child mortality remains a concern in sub-Saharan Africa. Of all infant deaths, nearly 40% are newborns [1,2]. This proportion becomes even more important as child mortality decreases.

In the Democratic Republic of Congo (DRC), despite considerable progress in reducing the child mortality rate from 148 per 1,000 live births in 2007 to 104 per 1,000 in 2017, the number of newborn deaths remains high [3]. Several actions at both the global and regional levels are being conducted to reduce the burden of neonatal mortality, especially in the most affected countries. These include capacity building in neonatal resuscitation, proper antenatal care follow-up and ensuring a safe delivery in a medical setting. DRC is among the world's highest neonatal deaths [4,5]. Although there has been an improvement in the numbers at the national level, there are nevertheless differences depending on the regions and the local health realities. Neonatal mortality remains a better indicator of the quality of care in a country and especially in a health institution.

It is therefore with a view to making a state of the University of Lubumbashi Clinics that we report this study in order to guide actions to improve problems related to newborn's health.

It is therefore necessary in our study to calculate the frequency of neonatal deaths and its evolution over 8 years, to determine the causes of death and the particular characteristics of the newborns that died.

## Methods

This is a retrospective descriptive study of the cases of newborns that died in the neonatal unit of

**Table 1**: Frequency of deaths by year.

| Year | Total number of hospitalizations | Deaths |
|---|---|---|
| 2011 | 195 | 75 (38.5%) |
| 2012 | 173 | 71 (41.0%) |
| 2013 | 174 | 76 (43.7%) |
| 2014 | 164 | 70 (42.7%) |
| 2015 | 162 | 57 (42.7%) |
| 2016 | 143 | 51 (35.7%) |
| 2017 | 160 | 65 (40.6%) |
| 2018 | 185 | 78 (42.2%) |
| **Total** | **1356** | **543 (40.0%)** |

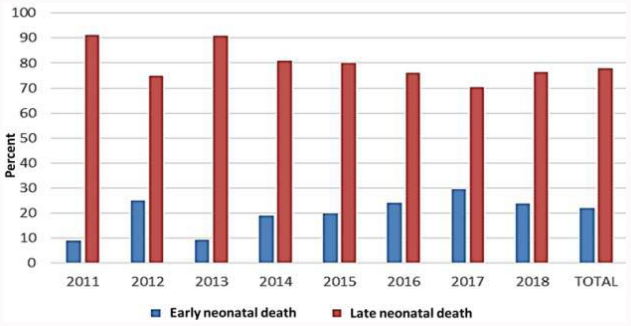


**Figure 1:** Frequency of early and late neonatal deaths by years.

University of Lubumbashi Clinics. The study population consisted of newborns admitted and cared for in this neonatal unit from January 2011 to December 2018. Of a total of 1356 admissions during the study period, 543 newborns died during their hospitalization between 0 and 28 days of life and were the subject of our analyzes. Data were collected on admission records and patient hospital records.

The following variables were studied: age of patients at death, sex, and maternal parity, mode of admission or source of patients (transferred from another hospital or born in the University of Lubumbashi Clinics) and the diagnosis of death.

The analysis of the data was carried out using the software Epi info version 7.2. Proportions and medians were calculated.

## Results

The hospital frequency of neonatal death is 40.04% over the entire study period. The lowest frequency was in 2016 (35.7%) and the highest in 2013 (43.7%) (Table 1).

The majority of deaths occurred in the early neonatal period, i.e. 77.9% of cases. The lowest frequency of early deaths was in 2017 (70.31%) and the highest in 2011 (91.04%) (Figure 1). The median age of newborns who died is 2 days (Q1=1; Q3=6) for a median hospital stay of 1 day (Q1=1; Q3=5) (Table 2). We noted a male predominance (sex ratio M/F=1.23). Sixty-three percent of the cases weighed less than 2500 grams (median weight: 1900 grams; Q1=1350; Q3=2800) (Table 2).

The diagnosis retained at the patient's death was in decreasing order of frequency: prematurity (50.09%), infections (21.26%), respiratory distress (11.78%), perinatal asphyxia (9, 57%) and congenital malformations (8.83%) (Figure 2).

Nevertheless, we observed a significant decrease in deaths from

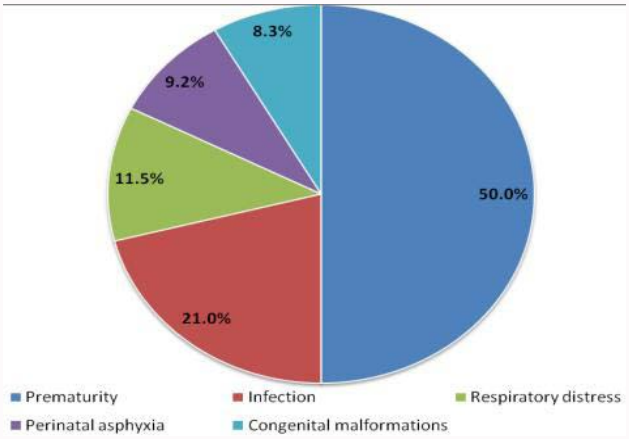


**Figure 2:** Frequency of neonatal death diagnoses.

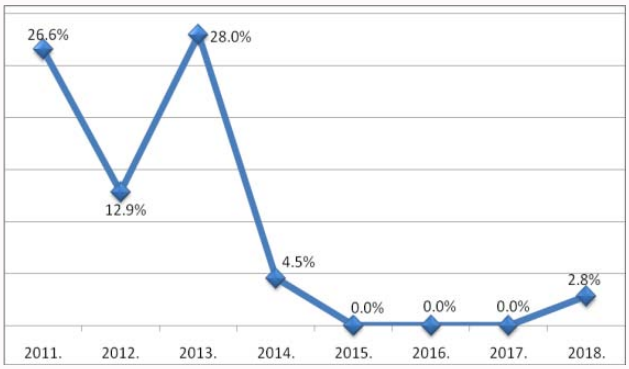


**Figure 3**: Evolution of the frequency of death by perinatal asphyxia from 2011 to 2018.

perinatal asphyxia during the eight years of study, ranging from 26.56% in 2011 to 2.81% in 2018 (Figure 3).

With regard to specific mortality, perinatal asphyxia is found to be more deadly (78.78%), followed by congenital malformations (64%), prematurity (53.43%) and respiratory distress (52.89%). Neonatal infection is the least lethal in our series with a lethality of 37.66% (Table 3).

Of the 566 newborns from another hospital, 241 (42.47%) died, compared with 302 (38.22%) of the 790 newborns from the University of Lubumbashi Clinics (Table 4).

**Table 2:** Distribution of death cases by sex and birth weight.

| Variable | Number (%) N=543 |
|---|---|
| **Age** | |
| <7 days (early neonatal death) | 423 (77.9%) |
| ≥ 7 days (late neonatal death) | 120 (22.1%) |
| Median | 2 days (Q1=1; Q2=6) |
| **Sex** | |
| Male | 299 (55.1%) |
| Female | 244 (44.9%) |
| **Birth weight** | |
| <2500 gr | 342 (63.0%) |
| ≥ 2500 gr | 201 (37.0%) |
| Median | 1900 gr (Q1=1350; Q3=2800) |

**Table 3:** Specific mortality for each death diagnosis.

| Diagnosis | Number of deaths | Number of hospitalizations | Lethality (%) |
|---|---|---|---|
| Perinatal asphyxia | 52 | 66 | 78.78 |
| Congenital malformations | 48 | 75 | 64 |
| Prematurity | 272 | 509 | 53.43 |
| Respiratory distress | 64 | 121 | 52.89 |
| Infection | 116 | 308 | 37.66 |

**Table 4:** Distribution of death cases according to the mode of admission and specific mortality.

| Mode of admission | Transferred | No transferred | Total |
|---|---|---|---|
| Number of hospitalizations | 566 | 790 | 1356 |
| Deaths | 241 (42.47%) | 302 (38.22%) | 543 (40.04%) |

## Discussion

The frequency of neonatal deaths at University of Lubumbashi Clinics is higher than most hospitals in the sub-Saharan region [3,6]. The average over the study period from 2011 to 2018 was 40.04%. Some regions of the DRC note an improvement in rates over time. These include the general referral hospital in Bukavu where an overall rate of 26.6% was reported in 4 years, an improvement ranging from 40.8% in 2009 to 21.2% in 2013 [7]. Similarly, Mashako et al. [8] in Goma noted an intra-hospital mortality of 19.7%. African studies reported significantly lower frequencies than ours: 20.3% and 8% respectively in a referral hospital in 2015 [9] and a district hospital in 2014 in Douala, Cameroon [10] and 26.5% in a rural hospital in 1993 in Côte d'Ivoire [11]. As in several other studies, neonatal deaths in our environment could be explained by late references in appropriate care structures [10,12].

Indeed, a higher lethality concerns the newborns transferred from another hospital than those born in the University of Lubumbashi Clinics (42.57% against 38.22%). Significant mortality in transferred newborns is also reported by Traore et al. in Mali [13], Dan et al. in Benin [14] and Katamea et al. in the DRC (Lubumbashi) [15]. Mashako et al. [8] found that transferred newborns were up to 5 times more likely to die than those born in the same neonatal care institution.

In addition to the delay in decision making at the appropriate level of care, transport conditions are often responsible for worsening the prognosis for neonatal survival [15,16]. The example of some resource-limited countries is evidence that the causes of neonatal deaths are manageable and manageable without resorting to expensive means. Efforts would revolve around capacity building for Emergency Obstetric and Neonatal Care (EmONC) and improving the conditions and means for inter-institutional transfer. Respect of the reference chain in the health system, and supervision of the mode of transportation of patients would contribute to improving the survival of newborns coming from community hospitals [15,17].

This study shows that 77.9% of deaths occurred during the first 7 days of life. The early neonatal period is a time of high vulnerability for the newborn. The same finding is also reported by Agbéré et al. [18], in Togo and Koum et al. [10], in Cameroon with 95.6% and 64.6% respectively of early neonatal deaths. As reported by the World Health Organization [2], the majority of neonatal deaths (75%) occur during the first week of life, and about 1 million newborns die within the first 24 h.

The transition from intra- to extra-uterine life is an important step in newborn survival. Although a physiological process, the presence of qualified health workers is necessary for the correction of disorders that may affect the life of the new being at this crucial time. Surveillance during the first week of life would therefore allow early detection and correction of health problems. Four post-natal followings are therefore recommended in the health facility or at home [2]. They play a vital role in reaching these newborns.

As reported in several African studies [6,10,12,13], we found that prematurity, infections and respiratory distress are the most important causes of neonatal death. The defect of the adapted technical platform and the lack of resource in our settings are essential limits to the management of the prematurity especially that of less than 32 weeks of gestation. The susceptibility of the premature infant to develop complications (infectious, respiratory and nutritional) putting into play its prognosis would explain the high rate of death in this group of children [19,20]. The management of prematurity recommends strict measures integrating asepsis, temperature management and nutritional intake. Practical actions at lower cost such as hand washing, thermal management by skin-to-skin contact (Mother Kangaroo care method) [19,21], and the promotion of breastfeeding, are likely to significantly reduce the morbidity and mortality of premature infants. In the low-resource context, these measures would be good for newborn care. Nevertheless, a number of therapeutic and diagnostic means remain inaccessible [2,17]. These include oxygen therapy, parenteral nutrition inputs, respiratory support materials, and others.

With regard to infections, almost all cases benefit from an empirical therapeutic approach. Diagnostic aetiological means with orientation of the antibiogram being expensive and often not accessible for the population. This management exposes to sometimes unjustified exposures to anti-infective with the significant risk of developing bacterial resistance [22-24]. That is why, whether for prematurity or for infections, the best policy would be prevention by optimal monitoring of pregnancy, a healthier lifestyle at lower risk during pregnancy, access to care by qualified personnel and strict adherence to post-natal aseptic rules.

We noted a significant decrease in deaths due to perinatal asphyxia (from 26.56% in 2011 to 2.81% in 2018). Efforts to build capacity in neonatal resuscitation would be the basis for this progress. Indeed, the first minutes of life are crucial for the new being both in terms of its immediate prognosis and in the long term [25].

By analyzing the mortality rates specific to each diagnosis, it

appears that urgent actions are to be undertaken in the improvement of early neonatal management and optimal monitoring of pregnancy.

To do this, an obstetric-pediatric collaboration with a focus on the presence of the pediatrician in the birth room is essential in our setting. This collaboration will enable the early diagnosis of antenatal malformations, the reduction of the risk of preterm delivery and the effective management of perinatal pain [25].

We noted a male predominance (55.1%) with a sex ratio of 1.23. Other studies make the same observation, notably Cissé et al. [12] in Senegal (53.8%), Kambale et al. [7] in DRC (56.8%) and Koum et al. [10] in Cameroon (55%).

The fragility of the male sex seems statistically obvious in several studies, but no scientific argument seems to explain this observation in depth. Nevertheless, faster pulmonary maturation in the female sex could explain the protection against respiratory complications compared with men [26].

This study reports that low birth weight was predominant among the deceased (63% of cases). In fact, low birth weight, associated or not with prematurity, is a condition exposing the newborn to infectious, metabolic and even functional complications. Numerous studies have identified underweight as one of the major risk factors for neonatal death in Africa [14]; the mortality is greater than the birth weight is low [2,8,26]. Low birth weight monitoring also requires a minimum of equipment and skills for postnatal surveillance and monitoring. Essential childcare approaches integrating nutritional management, temperature management and rigorous aseptic measures are necessary to guarantee the survival of these newborns at risk (dysmature or premature) [19,20].

## Conclusion

The inventory of neonatal mortality remains worrying at the University of Lubumbashi Clinics. Very little progress has been recorded over 8 years of observation in terms of mortality rate. The causes and associated factors are well identified and yet avoidable by less expensive approaches.

Actions based on capacity building in neonatal emergency management and obstetric-pediatric collaboration should support efforts to improve newborn health. The establishment of a surveillance structure should help to regularly evaluate the actions carried out, to guide the training programs of the staff in charge of neonatal care and to propose a strengthening of the technical platform.

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