Analysis of Infant Mortality in Three Hospitals in the Eastern Democratic Republic of the Congo

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Abstract

**Background:** Infant mortality refers to deaths that affect children during their first year of life per 1,000 live births. It is composed of early neonatal mortality (0-7 days of birth), late neonatal mortality (8-27 days) and post-neonatal mortality (28-365 days). The objective of this study was to determine the prevalence and associated risk factors of infant mortality in Butembo, Democratic Republic of the Congo.

**Methods:** This was a retrospective study carried out from January 2015 to December 2016 in 3 Congolese hospitals (Cliniques Universitaires du Graben (CUG), Matanda Hospital and Kitatumba General Referral Hospital) on 8033 children.

**Results:** The prevalence of infant mortality was 14.31‰. A child under one year hospitalized at CUG has 6.66 times the risk of death than those hospitalized at other hospitals. Age <7 days, male sex, weight <2499 grams, history of hospitalization during pregnancy, less than 4 sessions of antenatal care, APGAR score <7, dystocic delivery, irregularities in immunization schedule, pathologies such as HIV/AIDS, acute respiratory infection, prematurity, and neonatal infections were the risk factors contributing to infant mortality.

**Conclusion:** Actions aiming to reduce the occurrence of risk factors should be done in order to get the possible lowest prevalence of infant mortality.

Keywords: Infant mortality; Analysis; Cliniques Universitaires du Graben (CUG); Kitatumba referral hospital; Matanda hospital

Introduction

Infant mortality is the number of deaths of infants under one-year old per 1,000 live births in a given period. It consists of a death of an infant before his or her first birthday [1-5]. This is one of the parameters which reflect the health of a given population [2,3]. Infant mortality is composed of early neonatal mortality (0-7 days from birth), late neonatal mortality (8-27 days) and post-neonatal mortality (28-365 days) [1,2].

The World Health Organization (WHO) estimates that 46% of all under 5 child deaths were among newborn infants, babies in the neonatal period (0-28 days old), and among them, 2.6 million died in their first month of life [4,6].

In sub-Saharan Africa, the average infant mortality rate is 92.2 per 1,000 live births and 10% of children born in this region die before the first year of life. The major causes of infant mortality in sub-Saharan Africa are, in order of importance, neonatal causes (26%), child pneumonia (21%), malaria (18%), diarrhea (16%), HIV/AIDS (6%), measles (5%) and accidents (2%) [7].

The Democratic Republic of the Congo is not spared from this issue. According to the United Nation Children's Fund (UNICEF) report, 80% of child deaths occur in five countries, and the Democratic Republic of the Congo is the fifth one [8]. The majority of newborn deaths occur in countries with low income, and this is due to the fact that health care access is low [6]. The insecurity generated by armed groups in the eastern part of the country has forced people to instability. Housing conditions are difficult (no water, no medical care, insufficient nutrition) [9]. Children under one year pay a heavy price, exposing them to a high infant mortality rate [8,9].

Based on the magnitude of the consequences of infant mortality on the population and on the future of a country, the issue is a real public health problem and requires further studies at the local or regional level, especially in Butembo which is one of the Eastern DRC cities which is experiencing a growing insecurity. Therefore, this study aims to determine the prevalence and associated risk factors of infant mortality in Butembo.

Methodology

This was a retrospective study carried out from January 2015 to December 2016 in 3 hospitals (Cliniques Universitaires du Graben (CUG), Matanda Hospital and Kitatumba General Referral Hospital)
on 8033 children. The three hospitals are located in Butembo, Eastern DRC.

Our sample was exhaustive including all children who were aged of equal or less than one year, alive or deceased, having been hospitalized in the paediatric or neonatal unit of the hospitals mentioned above, and whose health files were found and well completed. Thus, 8033 children were screened.

The following parameters were analysed: individual characteristics of the child (including the age, sex and weight), past medical history (including the antenatal, perinatal and postnatal cares and the diseases contracted by the child).

Data were processed and analysed using the Epi-Info software, version 3.5.4. The odds ratio (OR) test was used and P-value ≤0.05 was considered significant at a confidence interval of 95%.

This study did not have an ethical problem. An ethical clearance was obtained from the local research ethics committee of the Faculty of Medicine at the Université Catholique du Graben. The study was conducted following the principles of the Declaration of Helsinki.

Results
Out of the 8033 children screened, the overall prevalence of infant mortality in Butembo is 14.31‰ (Table 1). The CUG shows a high rate (50.49‰) of infant mortality (Table 2). The early neonatal mortality is 20.66‰ and the late neonatal mortality is 6.95‰ and the males are more concerned (22.17‰) than females (9.10‰) (Table 3). Children with low birth weight increase have a high rate mortality, respectively 96.15‰, 38.83‰ and 22.29‰ for children of a weight <1000 grammes, in between 1000 and 1499, and in between 1500-2499 grammes (Table 3). Regarding relation between the past history and the infant mortality, the mothers of 34.23‰ of children dead had hospitalization during their pregnancy, mothers of 32.63‰ children had less than 4 cessions of prenatal consultation, 28.69‰ children had a low (<7) score of APGAR, 20.80‰ children were bone by dystocic delivery and 57.72‰ followed irregularly the immunization program (Table 4). The most frequent pathologies responsible for infant mortality are respiratory infections (25.11‰), prematurity (24‰) and neonatal sepsis (23.31‰) (Table 4).

Table 1: Prevalence of infant mortality.

| Year   | Total population | Cases of Infant mortality | Rate (%) |
|--------|------------------|---------------------------|----------|
| 2015   | 4163             | 54                        | 12.97    |
| 2016   | 3870             | 61                        | 15.76    |
| Total  | 8033             | 115                       | 14.31    |

Table 2: Study sites and infant mortality.

| Variable(s) | Study sites | n (N=8033) | Cases of Infant mortality (n=155) | Rate (%) | O.R | 95%CI | P-value |
|-------------|-------------|------------|----------------------------------|-----------|-----|------|---------|
| -           | CUG         | 1209       | 61                               | 50.49     | 6.66| 4.52 | 9.82    | 0       |
| -           | Matanda     | 3880       | 18                               | 4.63      | 0.19| 0.11 | 0.33    |         |
| -           | Kitatumba   | 2944       | 36                               | 12.22     | 0.79| 0.52 | 1.19    |         |
| Total       |             | 8033       | 115                              | 14.31     |     |      |         |         |

Table 3: Individual characteristics of the infants dead.

| Variable(s) | n (N=8033) | Cases of Infant mortality (n=155) | Rate (%) | O.R | 95%CI | P-value |
|-------------|------------|----------------------------------|-----------|-----|------|---------|
| -           | Hospitalization during pregnancy | 1986      | 68                                | 34.23     | 4.53| 3.06 | 6.7     | 0.00 |
| -           | Number of Antenatal care sessions | 6047      | 47                                | 7.77      | 0.22| 0.15 | 0.33    |       |

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Discussion

From Table 1 it can be seen that out of the 8033 children aged of 0 to 1 year hospitalized at the Cliniques Universitaires du Graben, Kitatumba and Matanda hospitals, 115 children died. Thus, the infant mortality prevalence is 14.31%. This prevalence is lower than the one found in Algeria by Bchi et al. (25.2‰) [10], it is also lower than the mean infant mortality rate in the sub-Sahara African region (92.2 deaths per 1,000 live births) [7]. However, it is higher than the infant mortality rate of the USA (5.9 deaths per 1,000 live births) [11]. According to the UNICEF, a child who was born in Sierra Leone runs 30 times more risks to die before his fifth birthday than the one who was born in the United Kingdom [8]. The WHO justifies these inequities by the fact that in developing countries, the health care access is low [6].

It appears that a child under one year hospitalized at CUG runs 6.66 times the risk of infant mortality. This risk is statistically significant (P<0.05) comparing to the two other hospitals.

CUG is a tertiary referral medical structure for all hospitals in the city. In addition, the lateness of transferring patients may explain the high infant mortality in this hospital.

Infants under seven days have 1.91 times the risk of dying. This risk is statistically significant (P<0.05). Male children are 2.47 times more likely to die and weighing less than 2499 grams increases by 1.75 times the risk of infant mortality.

According to Ravaoavariosa, et al., in their study on the determinants of early neonatal mortality in the Belelatanana maternity ward in Antananarivo, an age <7 days, Apgar score less than 7 and weight <1500 g increased the risk of infant mortality. Thus, the deaths of male children accounted for 29.3% (173 deaths out of 580 male newborns) compared to 27.1% (138 deaths out of 210 female newborns) for females. Meanwhile, according to their findings, the gender has no significant influence on the neonatal mortality [12]. Katamea, et al. found that male sex was strongly associated with neonatal mortality in Lubumbashi, in the Democratic Republic of the Congo [13]. McCormick found in 1985 that low-birth-weight infants run more risk of mortality than the infant with normal weight at birth [14], the effects of birth weight and gender on neonatal mortality in north central Nigeria found that the birth weight <1500 g increased the risk of infant mortality.

Children whose mothers had had episodes of hospitalization during pregnancy were 4.53 times the risk of infant mortality. Similarly, those whose mothers had completed less than 4 sessions of the antenatal care were at 5.61 times the risk of infant mortality. Ravaoavariosa, et al. found that a non or insufficient participation of pregnant women to antenatal care consultation is associated with a high rate of neonatal mortality [12]. According to the WHO, skilled health care during pregnancy, childbirth and in the postnatal period lead to a prevention of complications of pregnancy for the mother and her new-born [6].

### Table 4: Past history and infant mortality.

| Pathologies of the child | HIV/AIDS | Respiratory infection | Prematurity | Neonatal infection | Other |
|-------------------------|----------|-----------------------|-------------|-------------------|-------|
| **HIV/AIDS**            | 20       | 2270                  | 1000        | 815               | 3928  |
| **Respiratory infection** | 5        | 57                   | 24          | 19                | 10    |
| **Prematurity**         | 250      | 25.11                 | 24          | 23.31             | 2.54  |
| **Neonatal infection**  | 23.47    | 2.53                  | 1.84        | 1.77              | 0.1   |
| **Other**               | 71.9     | 7.47                  | 1.14        | 1.04              | 0.05  |
| **Pathologies of the child** | 0.00   | 3.72                  | 2.95        | 2.86              | 0.19  |

Table 4: Past history and infant mortality.
The APGAR score <7 and the dystocic delivery mode by caesarean section or not successively multiplied the risk of infant mortality by 3.43 and 1.84. The relationship between low APGAR score and neonatal and infant death has been also demonstrated by Stamatina, et al. in 2014 [17], and Ravaoarisoa, et al. noticed that an APGAR score under 7 increases to 2 times the risk of early neonatal mortality [12].

Children who had irregularities in the immunization schedule were 7.16 times exposed to the risk of infant mortality. In fact, vaccines have a primordial role in the prevention of diseases.

Infants suffering from HIV/AIDS, respiratory infections, prematurity and neonatal infections successively run 23.47; 2.53; 1.84 and 1.77 times the risk of infant mortality. These findings are different from what is seen in sub-Sahara African region, where causes of infant mortality are neonatal causes (26%), child pneumonia (21%), malaria (18%), diarrhoea (16%), HIV/AIDS (6%), measles (5%) and accidents (2%). But, there are differences between countries [7]. Studies conducted at the Hanoi gynaecology and obstetrics hospital in Vietnam by Haon, et al. report that, early neonatal mortality is due to perterm complications first. Their findings are different from ours as they considered only the early neonatal period [18].

Conclusion

The infant mortality prevalence in Butembo is 14.31%. Factors incriminated in the occurrence of the infant mortality are the age ≤7 days, the male sex and the weight <2499 grams at birth, the history of hospitalization during pregnancy, the number of antenatal care session <4, the Apgar score <7, the dystocic delivery mode, the irregularity of children in the immunization schedule increased the risk of infant mortality. HIV/AIDS, respiratory infections, prematurity and neonatal infections are responsible for infant mortality in Butembo. Thus, actions aiming to reduce the occurrence of these risk factors should be done in order to get the possible lowest prevalence of infant mortality.

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