Original Research Article

Neonatal morbidity and mortality in the pediatric ward at the Ambohimiandra Antananarivo Madagascar hospital

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ABSTRACT

Background: The 28 firsts days of life have high-risk of diverse aggression. To achieve the goal of ODD3 in reducing preventable neonatal death, our study was to evaluate main pathologies of newborn, newborn's mortality.
Methods: This is a retrospective descriptive and analytical cross-sectional study extending over a period of 8 months, December 2014 to July 2015.
Results: We collected 132 newborn, the sex ratio was 1.13. Main newborn's pathologies are neonatal infection (59.85%). Mortality rate was 14.39% and majority of neonatal death occurs early (73.68% of all deaths). Main causes of death are neonatal infection by septic shock. The most lethal pathology was hypoxic-ischemic encephalopathy. We have identified as a risk factor for neonatal death: admission age of 24 hours or less (OR 7; 95% CI 2.5-20.10; p = 0.00006), presence of resuscitation at birth (OR 3.48, 95% CI 1.28-9.44, p = 0.01), Apgar index less than 7 at the fifth minute (OR 4.22, 95% CI 2.25-14.87, p = 0.03) and birth weight less than 2500g (OR 3.80, 95% CI 1.39-10.36, p = 0.006).
Conclusions: The mortality rate remains high. The prevention of low birth weight, asphyxia and infections has shown strategies to reduce neonatal morbidity and mortality.

Keywords: Delivery, Morbidity, Newborn, Risk factor

INTRODUCTION

The neonatal period is a period in which the fragility is highest because the newborn needs to adapt to extra-uterine life and undergo many physiological changes, and then their immune system is immature.[1] Neonatal morbidity may be the consequence of conditions before, during or after the delivery, or it may be congenital pathologies.[2-3]

Neonatal mortality is a public health problem in the world, where nearly 2.6 million children die each year before the age of one month.[4] The 98% of these neonatal deaths occur in developing countries.[1,3,5-6] This neonatal mortality accounts for 40% of deaths in children under 5.[1,5,7,8] For Madagascar, the reduction of neonatal mortality is low, from 24 per 1000 births in 2009 to 22 per 1000 in 2012 despite the introduction of emergency obstetric and neonatal care systems (SONU).[9-11]

Up to two thirds of newborn deaths could be prevented if known and effective health measures were provided at birth and during the first week of life.[4] Thus, the Sustainable Development Goals (SDGs) were adopted by the United Nations in 2015, to ensure a healthy life and

promote well-being for all children, and in which, target 3.2 in SDG3 is to eliminate preventable deaths of newborns and children under 5 from 2015 to 2030.[12] Knowledge of the determinants, the main causes of neonatal morbidity and mortality, can help us to improve the health status of child, by setting up preventative measures; it can lead us to screen newborn's diseases early.

Our objectives were to define the characteristics of neonatal morbidity and mortality in Ambohimiandra pediatrics hospital and to identify the main risk factors for newborn's mortality; with a view to improving management.

METHODS

This study was done at Ambohimiandra's Hospital, at Pediatric ward; which is one of pediatric reference centers at Antananarivo Madagascar. It was a retrospective analytical transversal study over a period of 8 months from December 2014 to July 2015. All newborns hospitalized in the pediatric ward were included. Those who had no morbid pathology were excluded secondarily. We have used a questionnaire form that allowed us to collect data: epidemiological variables, family history, personal history, and evolutionary profile of newborns. We have classified the age of the mother into three slices: young mothers: under 18, middle-aged mothers: aged 19 to 34, elderly mothers: 35 years old and over. Newborns have been classified into four categories according to their birth weight (PN): eutrophic: between 2500 and 3999g, small birth weights: less than 2500g, hypertrophic: 4000g and over, unknown: when the child has not weighed at birth. According to the age of death, we distinguished early neonatal deaths at 0 to 6 days of life, late neonatal deaths: 7 to 28 days of life. A number of prenatal consultations greater than or equal to 4 was considered satisfactory. The data was then analyzed by software EPI info version 7 and software R. We used the Khi2 test for percentages and the analysis of variances for averages as a statistical test, with a 95% confidence interval; an association was considered significant when p is less than 0.05.

RESULTS

During our study period, the pediatric ward at Ambohimiandra Hospital received 137 newborns, 7 of them were excluded secondarily because they had no pathology.

Characteristics of mothers

Mothers were aged on average 25.48±5.88 years, with extremes of 15 years and 45 years. The majority of mothers were between 18 and 34 years of age (65.91%), followed by young mothers (23.48%) and finally elderly mothers (10.61%). The majority of mothers performed a sufficient number of prenatal consultations during their pregnancy (69.70%); 30.30% had a number of antenatal visits less than 4. The majority of deliveries, 53.9%, took place in a medico-surgical structure (University Hospital Center, District Hospital Center, or clinic).

Characteristics of newborns

There was a slight male predominance with 70 male and 62 female newborns, sex ratio was 1.13. The average age of newborns was 9.31±8.49 days, with predominantly newborns older than 7 days of life (50.76%); and 25.76% had less than 24 hours of life. The majority were born at term (51.52%), followed by premature infants (31.82%), then post-terms (11.36%) and finally those of unknown term (5.30%). Fifty-nine point eighty-five percent were eutrophic at birth, 31.06% had a birth weight less than 2500g; and for the rest the birth weight could not be evaluated. The majority of these newborns (71.21%) were referred by a health staff, against 28.79% self-referred.

Morbidity

Respiratory signs were the main reasons for hospitalization of newborns, followed by neurological signs (Table 1).

Table 1: Distribution of newborns by reason of admission.

Reason of admission		Effective n= 132	%
Respiratory signs	Respiratory distress	32	24.24
	Cough	3	2.27
Neurological signs	Difficulty suckling	30	22.73
	State of apparent death	6	4.55
	Groan	8	6.06
	Abnormal movements	3	2.27
	Discomfort	1	0.76
	Hypotonia	1	0.76
	No cry at birth	1	0.76
Digestive signs	Gastrointestinal bleeding	2	1.52
Cutaneous signs	Icterus	16	12.12
Fever	Fever	12	9.09
Other	Prematurity	5	3.79
	Low birth weights	8	6.06
	Weight loss	2	1.52
	Umbilical bleeding	1	0.76
	Therapeutic follow-up of hydrocephalus	1	0.76

On average, the disease would have evolved 51.83±73.86 hours before admission of the newborn, with extremes of 1 hour and 25 days, a median of 24 hours. Neonatal

infection was the first pathology that affected our newborns (59.85%) followed by prematurity and neonatal bronchiolitis (Table 2). Pathologies associated with each other, mostly neonatal infections with prematurity or with perinatal asphyxia. The hospitalization duration ranged from a few hours to 66 days with an average of 9.46±8.31 days, a median of 8 days.

Table 2: Distribution of neonates according to their pathology.

Diagnostics	Effective N=132	%
Neonatal bacterial infection	79	59.85
Prematurity	42	31.82
Bronchiolitis	27	20.45
Hypoxic-ischemic encephalopathy	13	9.85
Intrauterine growth restriction	10	7.58
Whooping cough	5	3.79
Respiratory viral infection	3	2.27
Interventricular communication confirmed on echocardiography	2	1.52
Meconium Aspiration Syndrome	1	0.76
Convulsions in the fifth day of life	1	0.76
Hydrocephalus	1	0.76
Hypoglycemia	1	0.76

Mortality

The mortality rate in our department was 14.39%, the majority of which occurred early, in the first week of life (73.68%). The main charts preceding the deaths were: shock (6.81%), hemorrhage (5.30%) and respiratory muscle fatigue (2.27%).

The first pathology leading to these deaths was neonatal infections (11 cases), resulting mainly in septic shock; then, the consequences of prematurity, and hypoxic-ischemic-encephalopathy.

The most lethal disease was hypoxic-ischemic encephalopathy with a lethality rate of 30.76%, followed by prematurity (21.42%), neonatal infections (13.92%) and neonatal bronchiolitis (11.11%).

We identified four risk factors for neonatal mortality: admission age of 24 hours or less (OR 7, 95% CI 2.5-20.10; p = 0.00006), presence of resuscitation at birth (OR 3.48, 95% CI 1.28-9.44, p = 0.01), Apgar index less than 7 at the fifth minute (OR 4.22, 95% CI 2.25-14.87, p = 0.03) and low birth weight (OR 3.80, 95% CI 1.39-10.36, p = 0.006) (Table 3).

Table 3: Distribution of newborns and risk factors for mortality.

		Deceased	Living		Deceased	Living	OR	P value	IC
Age	≤24 hours			>24hours					
	12	7		22	98	7	0.00006	2.5-20	
Birth weights	<2500g			>2500g					
	11	30		8	83	3,80	0.0006	1.39-10.36	
Resuscitation at birth	Yes			No					
	11	32		8	81	3.48	0.01	1.28-9.45	
Apgar index at fifth minute	< 7			>7					
	7	12		11	87	4.22	0.03	2.25-14.87	
Maternel age	≤18 years			18- 35 years					
	4	27		14	73	0.77	0.15	0.22-2.58	
	≥35years			18- 35 years					
	1	13		14	73	0.4	0.79	1.16-7.31	
Home delivery	Yes			No					
	2	14		17	99	0.83	0.82	0.1-3.99	
Child birth	Vaginal birth			Cesarean					
	18			99		2.55	0.36		
Gender	Male			Female					
	12	58		7	55	1.62	0.33	0.59-4.43	
Prematurity	Yes			No					
	9	33		10	80	2.18	0.11	0.81-5.86	

DISCUSSION

The retrospective nature of the study was a limitation.

Neonatal morbidity

Neonatal infection was the most common pathology that affected the newborns included in our study, 59.85%. The same has been found in Burkina Faso, in 2013 but with a much lower prevalence (23.5%).[2]

This magnitude of the prevalence of neonatal infection may be related to overestimation because the diagnosis was mostly clinical; as in other developing countries, where bacteriological evidence was rarely available.[8]

And in developing countries, hospital-born babies are at increased risk of neonatal infections because of poor intrapartum and postnatal infection-control practices.[13]

Neonatal mortality

In our study, the neonatal mortality rate was high, 14.39%. Same eventuality was found Fateh-Suka Ouagadougou Clinic (13.1%); and at Charles de Gaulle Ouagadougou Hospital (15.3%).[1,7] But this neonatal mortality rate in our study was significantly lower than that found in other hospitals in Madagascar, to be mentioned at University Hospital Center in obstetrics and gynecology Befelatanana in 2008 (28.1%).[14] On the other hand, the neonatal mortality rate in our establishment was very high compared to developed countries such as France, Germany, Slovakia, Spain, Portugal, Ireland, Greece and Austria which have a neonatal mortality rate of 2.6 per 1000 live births, and in Korea with a rate of 1.7 per 1000 live births.[3,15] This is probably due to the difference in socio-economic level, material default, and differences in level and quality of care in obstetric and pediatric settings.[16]

In our study, the leading causes of newborn deaths were neonatal infections, that were the same in many studies in developing countries.[2,7] In France, however, congenital anomalies accounted for over a quarter of the causes of death, perinatal infections accounted for only 4.9%.[3,17] According to WHO, the leading causes of newborn deaths are prematurity and low birth weight, infections, asphyxia and obstetric trauma.[4]

In our study, the majority of neonatal deaths occurs early (73.68%), accounting 10.60% of newborns included. This fact has also been highlighted in other studies done in Madagascar; as in some African countries, such as Burkina Faso (93.4%), Charles de Gaulle Hospital (97.3%), Ethiopia (73%); and in developed countries, as in France where nearly three-quarters of deaths occurred in the first six days of life.[2,6,14-18] This early neonatal mortality could be due to the severity of the clinical picture, the quality of supervision, the quality of the material resources and the delay in management.[19]

Risk factors for neonatal mortality

As risk factors for neonatal mortality, we could first identify that infants aged less than or equal to 24 hours had a higher death rate (35.29%) than other newborns. They were 7 times more likely to die than other newborns. A study conducted at the Androva Mahajanga University Hospital showed that 88% of early neonatal deaths occurred in the first twenty-four hours of life.[20] The same was shown in a study conducted in a Level 1 maternity in Yaounde, where all of early neonatal deaths occurred in the first twenty-four hours of life.[21]

It was estimated that three-quarters of neonatal deaths happen in the first week and the highest risk of death is on the first day of life.[22] In fact, a large part of the mechanisms of adaptation of the fetus to extra-uterine life takes place in the first hours of life, including reabsorption of pulmonary fluid that lasts about four to six hours; rapid decay of pulmonary vascular resistance, and thermoregulation. Thermal exchanges with the environment are particularly high and fast, especially at the beginning of the first minutes, and represent significant energy expenditure.[23]

Second, we found that the notion of resuscitation at birth significantly increased the risk of neonatal death. This was also highlighted in the study by Fla Kouéta and al.[7] Then, Apgar score at fifth-minute less than 7 was a risk factor for neonatal mortality in our study. A study conducted at the maternity hospital of Befelatanana by L RAVAOARISOA showed the same fact.[14] Indeed, the Apgar score of less than 7 at the fifth minute and the presence of resuscitation at birth suggests the existence of a disorder of fetal oxygenation during delivery; thus exposing the risk of hypoxic-ischemic encephalopathy, organ failure and neurological sequelae.[24-25]

Lastly, low birth weight was identified as a risk factor for neonatal mortality; which was also highlighted in other studies.[2,8,14,15,26-29] Newborns with low birth weight are likely to have multiple complications, ranging from metabolic disorders to neurological and sensory disorders, sometimes irreversible. The smaller the weight, the higher the risk of death. These newborns constitute a vulnerable group because the problems they pose are also related to the requirements inherent to their care.[30]

CONCLUSION

This study showed that neonatal morbidity is dominated by prematurity and infections. Mortality, dominated by early deaths, remains high. Hypoxic-ischemic encephalopathy represents the most lethal pathology followed by infections. Four risk factors for death were identified: age less than or equal to 24 hours, need for resuscitation at birth, Apgar score less than 7 at M5, and birth weight less than 2500g. Strict and rigorous monitoring of pregnancy, a good collaboration between obstetrician, resuscitator and pediatrician as well as an

improvement of the hospital infrastructures and training of the medical personnel, would be beneficial in the reduction of morbid pathologies and newborn mortality.

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