ISSN: 3065-4483
Research Article
Science Set Journal of Pediatrics

Audit of Early Deaths in the Pediatric Department of the Pikine National Hospital Center

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Submitted: 25 October 2024 **Accepted:** 04 November 2024 **Published:** 11 November 2024

https://doi.org/10.63620/MKSSJP.2024.1018

Citation: *Cissé, D. F., Diagne, G., Ndongo, A. A., & Ly, F. (2024). Audit of early deaths in the pediatric department of the Pikine National Hospital Center. Sci Set J of Pediatrics, 2(4), 01-06.*

Abstract

Background and Aim: *Infant and child mortality constitute a major public health problem throughout the world. Most of these deaths are due to preventable or treatable causes. Globally, it is linked to pathologies such as pneumonia, diarrhea and malaria. No study has been carried out on early mortality among children at the Pikine National Hospital (CHNP). The main objective was to study the indicators of early deaths in the pediatric department of the Pikine National Hospital (CHNP). The specific objectives were to assess early mortality rates among children aged 0 to 15, to describe the epidemiological characteristics linked to their deaths and to identify the causes of early death.*

Material and Methods: *This were a prospective and descriptive study carried out over a period of 24 months from January 1, 2022, to December 31, 2023, and was conducted at CHNP. It concerned children aged 0 to 15 years hospitalized, whether they arrived deceased or died within 72 hours of their hospitalization whatever the cause. Clinical data were entered into Epi info V 7.2 and SPSS version 23 software.*

Results: *The number of hospitalizations was 3136 children, including 110 early deaths, representing a mortality rate of 3.5%. The average ages of children 0 to 28 days, 1 to 59 months, and 5 to 15 years were 2.6 days, 9.1 months, and 9.6 years, respectively. The sex ratio was 1.2. The main symptoms were respiratory distress (22.7%), lethargy (18.2%) and fever (9%). Hypoxemia and hypothermia were found in 65.4% and 63.6% respectively on physical examination.*

The diagnoses retained in newborns were neonatal infection (48.4%) and neonatal asphyxia (34.4%). In children aged 1 to 59 months, pneumonia (41.6%) and gastroenteritis (33.3%) were found. Children who died within the first 6 hours after hospitalization were 39.1% of cases. Among newborns, the causes of death were prematurity, neonatal infection and asphyxia respectively at 56.9%, 50.5% and 35.5%. In children aged 1 to 59 months (n = 12), pneumonia and malnutrition were noted in 66.7% and 41.7% respectively. In children older than 5 years (n = 5), the causes were varied.

Conclusion: *Pediatric mortality remains a major public health problem with deaths linked to preventable or treatable causes. Hence the importance of early, rapid and optimal care for children.*

Keywords: Early Mortality, Children, Pikine, Senegal

Introduction

Child mortality is a major public health problem worldwide. In 2019, there were 500,000 deaths among children aged 5 to 9 [1]. Between 2021 and 2022, the number of deaths among children aged under five fell from 5 million to 4.9 million, half of them in the first month of life [2]. In Senegal, according to the ongoing Demographic and Health Survey (EDSc 2023), there has been a clear reduction in infant and child mortality from 121‰ in 2005 to 40‰ in 2023. However, this infant-juvenile mortality is still high for the achievement of the millennium goals. Most of these deaths are due to preventable or treatable causes. At the Pikine National Hospital, neonatal mortality was 15.15% between 2008 and 2012, with most deaths occurring in the first week of life [3].

However, no study has yet been carried out on early mortality in children aged 0-15 years. In our context, the identification of the different causes of infant and child mortality is necessary for the development of strategies to improve survival in this age group. This justifies the present study, the main objective of which is to examine the indicators of early deaths occurring within 72 hours in the pediatrics department of the Pikine National Hospital (CHNP). The specific objectives were to evaluate early mortality rates in children aged 0 to 15, to describe the epidemiological characteristics associated with these deaths, and to identify the causes of early death.

Methodology

This was a prospective and descriptive study over a period of 24 months from January 1, 2022, to December 31, 2023, in children aged 0 to 15 years hospitalized in the pediatric department of the Pikine hospital center. All children aged 0 to 15 years who arrived dead and those who died within 72 hours of their hospitalization regardless of the cause were included. Stillbirths were not included. Data were collected on a pre-established survey form. The parameters collected were sociodemographic, clinical, therapeutic and evolutionary. Data entry and analysis were done with SPSS software version 23.0 and Epi info V 7.2. Continuous variables were described as mean and standard deviation, while categorical variables were described as number and percentage.

The Variables Were Defined as Follows

Death was considered early when it occurred on admission or within 72 hours of admission.

Prematurity: defined as any live birth occurring between 22 weeks and 36 + 6 days. It is classified into 4 categories based on gestational age: extreme prematurity (< 28 weeks), big prematurity (28 – 31 weeks + 6 days), moderate prematurity (32 – 33 weeks + 3 days) and late prematurity (34 – 36 weeks + 6 days)

Neonatal Bacterial Infection: defined as any symptomatic newborn with infectious risk factors associated or not with disturbed biological assessments (blood culture, CRP and blood count). It is considered early when it occurs before 72 hours of life and late after 72 hours of life.

Perinatal Asphyxia (PNA) was defined by an absence of cry and/or an Apgar score of less than 7 at the 5th minute.

Respiratory Distress: it was defined by the presence of abnormalities in respiratory rate and rhythm, signs of respiratory struggle with or without hypoxemia (partial oxygen saturation less than 95%). It was classified according to the Silverman scores in newborns and the CRS (Clinical Respiratory Score) in those over 1 month old.

Results

Epidemiological and Sociodemographic Aspects

Among the 3136 hospitalized children, 379 deaths (12%) were noted, including 110 or 29% deaths within 72 hours. The early hospital death rate was 3.5%. Among the 110 deaths, 84.5% of deaths were noted in children aged 0 to 28 days, 11% and 4.5% of deaths respectively for children aged 1 to 59 months and 5 to 15 years. The average age for the neonatal population was 2.6 days. For children aged 1 to 59 months, the average age was 9.1 months. The average age for children aged 5 to 15 years was 9.6 years. The sex ratio was 1.2. Among the deceased patients, 90.9% of cases came from the Dakar suburbs.

Clinical Aspects

The average age of the mothers was 27 years with a minimum of 13 years and a maximum of 44 years. Of the 110 children who died, 98 had a health record available and usable. Pregnancies were followed up with an average of 3.5 CPN; the maximum being 8 CPN for a minimum of one consultation. Maternal pathologies encountered during pregnancy showed 6 cases of diabetes and 17 cases of cardiovascular pathologies. Table 1 shows us this distribution according to the pathologies encountered in mothers during pregnancies.

Table 1: Distribution of Deceased Children According to Maternal Pathologies.

Maternal pathologies (N = 98)	Effective	Percentage (%)
Diabetes	6	5.5
HTA	6	5.5
Placenta previa	4	3.6
Retroplacental hematoma	4	3.6
Anemia	3	2.7
Multiple pregnancies	4	3.6
Preeclampsia	9	8.2
Chorioamnionitis	2	1.8
Others	9	8.2

Others: Placental abruption (1), double circular cord (1), HELLP syndrome (2), cord prolapse (1).

Concerning the place of delivery, 64.5% of the children were born in Pikine, i.e. 71 cases, the rest came from health centers or posts, private structures or were born at home. In the neonatal population (n = 93), premature babies represented 56.9% (n = 53); the average gestational age was 35 weeks with a minimum of 24 weeks and a maximum of 42 weeks. Among the children, 44 newborns had not cried at birth. The average resuscitation time was 14.8 minutes. Table 2 shows the distribution according to perinatal history.

Table 2: Distribution of the Deceased Infant and Juvenile Population According to Perinatal History.

Variables		Newborns (n = 93) Workforce (%)	Children aged 1 to 59 months (n = 12) Number (%)
Presentation	Seat	22 (23.6)	1 (8.3)
	Cephalic	71 (76.4)	11 (91.7)
Amniotic fluid	Clear	73 (78.5)	12 (100)
	Meconial	5 (5.4)	0
	Tinted	9 (9.7)	0
	Hemorrhagic	6 (6.4)	0
Cry at birth	Yes	44 (47.3)	12 (100)
	No	49 (52.7)	0
Resuscitation	Yes	42 (45.1)	0
	No	51 (44.9)	12 (100)
Apgar	< 7 to M5	39 (41.9)	0
	> 7 to M5	54 (58.1)	12 (100)

Distribution of deceased children according to reasons for admission

Among the reasons for admission, respiratory distress, lethargy and fever were found in 22.7%, 18.2% and 9% respectively. Table 3shows the distribution according to the reasons for admission in deceased children.

Table 3: Distribution of Deceased Children According to Reasons for Admission.

Variables (N = 110)	Frequency (N)	Percentage (%)
General signs		
Fever	10	9
Lethargy	20	18.2
Respiratory signs		
Difficulty breathing	25	22.7
Cough	3	2.7
Rhinorrhea	4	3.6
Wheezing	1	0.9
Nasal obstruction	1	0.9
Digestive signs		
Abdominal pain	1	0.9
Diarrhea	5	4.5
Vomiting	6	5.4
Constipation	1	0.9
Bloating	3	2.7
Neurological signs		
Headaches	1	0.9
Convulsions	2	1.8
Refusal to suckle	9	8.1
No screaming	1	0.9
Incessant crying	3	2.7
Others		
Pallor	3	2.7
Malformations	1	0.9
Trauma	1	0.9
Yellow discoloration of mucous membranes	4	3.6

Distribution of Deceased Children According to Time of Onset

The children in our study had been taken to the emergency department within the first 24 hours following the onset of symptoms, i.e. 84 children (76.4%). In our population, 21 children (19.1%) had been referred; they all came from a structure before their referral to the CHNP. All children had been taken care of within the first 15 minutes following their admission.

Distribution of Deceased Children According to Vital Signs

Among the vital signs abnormalities, hypoxemia and hypothermia and bradycardia were found at 65.4% and 63.6% respectively. Table 4 shows this distribution.

Table 4: Distribution of deceased children according to vital signs anomalies.

Vital constants (N=110)	Frequency (n)	Percentage (%)
Fever	11	10
Hypothermia	70	63.6
Tachycardia	24	21.8
Bradycardia	16	14.5
Polypnea	23	20.9
Hyperglycemia	8	7.3
Hypoglycemia	12	10.9
Hypoxemia	72	65.4

Among the clinical pictures, respiratory distress, metabolic disorders and hemodynamic disorders were respectively at 86.4%, 70% and 66.4% and 70%. Table 5 shows us the distribution of deceased children according to clinical signs at admission.

Table 5: Distribution of Deceased Children According to Clinical Signs on Admission

Clinical signs on admission	Staff (n)	Percentage (%)
Respiratory distress	95	86.4
Neurological distress	69	62.7
Hemodynamic disorders	73	66.4
Metabolic disorders	77	70
Hemorrhagic syndrome	14	12.7
Physical injury from abuse	2	1.8

Therapeutic Aspects

The 110 children who died had been treated within the first 15 minutes of admission. On admission, 93.6% of the children had received resuscitation measures. Oxygen therapy was administered in 93.6% of cases, including 96.20% with CPAP and 3.80% with simple goggles.

Evolving Data

Children who died within the first 6 hours of hospitalization were 39.1% of cases. The causes of death varied depending on the age of the children.

Distribution of Newborn Deaths According to the Causes of Their Death

In newborns (n = 93), prematurity, neonatal infection and asphyxia were found in 56.9%, 50.5% and 35.5% respectively. Hyaline limb disease was found in 43% of cases of death. Several pathologies can exist in the same patient.

Distribution of Children Aged 1 to 59 Months who Died According to Causes of Death

In children aged 1 to 59 months (n = 12), pneumonia and malnutrition were noted at 66.7% and 41.7% respectively. Deshydration are found in 25% of case. Many causes can be found in the same patient.

Distribution of Children Aged Over 5 Years who Died According to Causes of Death

In children aged over 5 years (n = 5), the causes were: severe hemolytic crisis due to sickle cell disease, hypertensive encephalopathy due to malignant hypertension, ruptured appendiceal abscess complicated by peritonitis, amoebic dysentery complicated by severe dehydration with multi-organ failure and one case of intracranial suppuration.

Discussion

Limitations of the Study

Some parameters could not be assessed because several files and the pregnancy monitoring booklet were not correctly filled out, thus not having all the information such as the Apgar score for infants from 1 to 59 months. Concerning children over 5 years old, all the mothers no longer had their pregnancy monitoring books.

Epidemiological and Sociodemographic Data

Early deaths during our study were 29% of the 379 deaths, i.e. an early hospital mortality rate of 3.5%. A clear predominance

for newborns at 84.5%, i.e. an early hospital neonatal death rate of 2.9%. A similar neonatal death rate was found in Niger in 2013 (85.72%) and in Cameroon in 2014 (83.26%). This can be explained by the fact that newborns represent a vulnerable population, and their survival will depend on resuscitation measures and the quality of the technical platform. Indeed, even though we have a mother-child center, pediatricians are not informed in time of high-risk clinical pictures; moreover, there is a lack of monitoring, sometimes leading to a lack of monitoring at the origin of complications that can threaten the newborn's life [4].

Children aged 1 to 59 months accounted for 11% of all these early deaths, figures different from those of Akolly et al in Togo in 2023, i.e. 46.65%; this difference would be linked to the fact that our study targeted deaths in the first 72 hours. Deaths in older children are less frequent and/or often linked to trauma or some disease.

The most represented age group was newborns, like most studies, however, in Togo in 2029, there was a predominance for the group of children aged 1 to 59 months. This difference was linked to the fact that we have a maternity ward in place which means that the number of newborns hospitalized is greater than that of children over 1 month old.

Clinical Data

Most children had hemodynamic instability on admission, i.e. 65.4%; a higher number than that of Togo in 2019 (59.4%). This slight difference may be linked to the fact that we had cases of children who arrived deceased. Similarly, there is a delay in the population accessing care, they will only take the child for consultation in the event of a serious clinical condition, either due to ignorance of the severity of the picture or due to lack of finances according to most.

On physical examination, hypothermia was the most common finding at 63.6%, a significantly higher result found in Asrat et al in 2020 (79.6%). This is explained by the fact that the neonatal population is predominantly taken and/or transferred to our emergency departments in inadequate temperature maintenance conditions. Similarly, in the neonatology unit of the maternity ward where newborns are received from birth, the material and environmental conditions are not favorable to maintaining the temperature [5,6].

Diagnostic data

In the neonatal population, the main diagnoses retained at admission were neonatal infection (48.4%) and perinatal asphyxia (34.4%). A similarity found in Cameroon in 2014, in Mali in 2006 and in Burkina Faso in 2017 [8-10]. Perinatal asphyxia and neonatal infection are two major health problems in our context, this is because many pregnant women are not well followed; also, there is a lack of monitoring during childbirth. All these factors are at the origin of the death rate linked to perinatal asphyxia. Added to this is the lack of a technical platform (lack of a neonatal resuscitation unit and therapeutic hypothermia) adequate for the management of perinatal asphyxia with anoxo -ischemic encephalopathy stages 2 and 3. As for the infection, this is explained by the fact that the assessment is not always carried out on pregnant women and many infections go unnoticed and untreated in the peripartum period with often inadequate antibiotic therapy.

Which is the Cause of the High Rate of Neonatal Infection

In children aged 1 to 59 months, sepsis (50%), pneumonia (41.6%), gastroenteritis (33.3%) and malnutrition (25%) were the most common diagnoses. This was the same in Togo in 2019, Senegal in 2015 and Mali in 2013 [6, 11, 12]. Respiratory and digestive infections remain a global public health problem. In our context, the high death rate from respiratory infections is linked to the fact that consultation times are late and that for some cases of toxic pneumonia, there is the unavailability of anti-toxin antibiotics which constitute the cornerstone of treatment. Added to this is the lack of vaccination against pneumococcus in children over 3 years of age but also in children at risk such as sickle cell patients and the malnourished.

Therapeutic Data

The 110 children had been taken care of within the first 15 minutes of admission. 93.6% had received resuscitation with oxygen therapy in the same number of cases (CPAP in 96.2% of cases). Only 10.9% of cases had been able to receive a transfusion. Figures like those of Faye et al in 2016 and Mbusa et al in 2016 [13, 14]. The difficulty of the care lay in the absence of a satisfactory technical platform. There was a lack of effective oxygen therapy. Indeed, high-flow non-invasive ventilation (NIV) is more effective and indicated in the management of moderate to severe respiratory distress that can quickly progress to acute respiratory failure. In the absence of a CPAP device.

oxygenation with glasses is more used in the department in children, however, we use bubble CPAP more in newborns than in older children. Concerning blood transfusion, the lack of availability of blood was the main problem encountered.

Evolving Data

The complications observed were mainly related to signs of shock, whether hypovolemic and/or septic, cardiogenic and hemorrhagic at 19%. The time to death was less than 6 hours in 39.1% of cases. Mbusa et al found a rate of 9.9% of deaths within 24 hours [14]. This observation is linked to the unfavorable conditions of care in our department, especially concerning patients with severe hemodynamic instability with the absence of emergency resuscitation equipment in the emergency room; there is a difficulty in the availability of inotropic drugs and other emergency medications. Similarly, the absence of a pediatric resuscitation unit is a problem for the care of these children.

Conclusion

Infant and child mortality remains high in our context. Better organization of emergencies is necessary to improve the care of children. Further studies are needed to better characterize the factors associated with early death in children.

Conflicts of Interest

None

Consent

Written informed consent was taken from parents of patients

Ethical Approval

The study was carried according to the respect of confidentiality and was hospital-based research in routine condition.

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