

# Respiratory Distress in Neonates at the Teaching Hospitals of Lomé, Togo

Mawouto Fiawoo\*, Manani Hemou, Foli Agbéko, Nouffou Faissale Galinaba, Mensa Amblasso, Manate Kamaga, Koffi Edem Djadou, Adama Dodji Gbadoe, Nadiedjoa Kokou Douti

Department of Pediatrics, Faculty of Health Sciences, University of Lomé, Lomé, Togo

Email: \*michaelisfirst@yahoo.fr

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## Abstract

**Introduction:** Respiratory distress in neonates is a neonatal emergency that can lead to serious complications if not treated appropriately. The aim of this study was to describe the epidemiology, the diagnostic, and the outcomes of neonatal respiratory distress. **Methods:** This was a cross-sectional study carried out in the pediatric wards of Lomé Teaching Hospitals (CHU Sylvanus Olympio and CHU Campus), including neonates treated for respiratory distress (dyspnea associated with the use of accessory muscles of respiration, noisy breathing and with or without cyanosis) from January 1, 2021 to December 31, 2021. Data were entered using Epi Data 3.1 and SPSS software version 12.0. **Results:** The total number of neonates hospitalized for respiratory distress was 353, with a frequency of 12.5% and a sex ratio of 1.5. The mean age was  $0.82 \pm 3.20$  days; the 0 - 6-day age group accounted for 92.4% of cases. Neonates had been resuscitated at birth in 46.7% of cases. Dyspnea was tachypnea in 94% of cases and bradypnea in 6%. Dyspnea was associated with cyanosis in 21.5% of cases. The severity of the respiratory distress was moderate in 64.9% of cases. Perinatal asphyxia (49.1%), inhalation pneumonitis (17.1%) and neonatal bacterial infection (14.1%) were the main etiologies. The mortality rate was 20.4%. Age greater than or equal to seven days, no neonatal resuscitation were protective factors against death. Prematurity, no antenatal consultations follow up, neonatal resuscitation, severe respiratory distress were risk factors of death. **Conclusion:** Neonatal respiratory distress was common in the early neonatal period and its mortality was high.

## Keywords

Respiratory Distress, Neonates, Silverman and Andersen Score, Togo

## 1. Introduction

Respiratory distress (RD) in neonates refers to any respiratory difficulty encoun-

tered before the age of 28 days, linked to disturbances in gas exchange that may lead to cerebral anoxia [1] [2]. It is characterized by dyspnea associated with the use of accessory muscles of respiration, noisy breathing, and with or without cyanosis [3]. It is an emergency which, in the absence of appropriate treatment, can result in sudden cardiorespiratory arrest due to hypoxia, leading to serious neurological sequelae [4]. According to WHO estimates, 3% of the 120 million children born each year in developing countries present RD at birth and require resuscitation. It is estimated that almost 900,000 of them die because of hypoxia [5]. Every year, there are 1.4 million neonates' deaths and 1.3 million stillbirths; a quarter of these deaths are due to RD, during the first week of life [6]. The prevalence of RD in neonates remains variably high (20% - 60%) in developing countries [7] [8] [9] [10]. In Togo, the Teaching Hospitals of Lomé, the country's two principal referral centers, have neonatology units that regularly receive cases of neonatal RD. The aim of this study was to describe the epidemiology, the diagnostic, and the outcomes of neonatal RD.

## 2. Methods

This was a cross-sectional, descriptive, and analytical study, carried out in the pediatric wards of Lomé's two principal referral centers, the Teaching Hospital of Lomé (CHU Sylvanus Olympio and CHU Campus). The study period ran from January 1, 2021, to December 31, 2021.

The study population was composed of neonates of both sexes hospitalized in the pediatric wards of Lomé Teaching Hospitals. We performed an exhaustive sampling of all neonates with RD hospitalized during our study period. Neonates aged 0 - 28 days hospitalized for RD (dyspnea associated with the use of accessory muscles of respiration, noisy breathing and with or without cyanosis) and treated in the pediatric wards of Lomé Teaching Hospitals were included in this study. Hospitalized neonates with incomplete records (gestational age, respiratory rate, severity of RD) were not included in this study.

The study was based on medical records of hospital admissions to the pediatric wards of Lomé's teaching hospitals. A survey form was drawn up to collect the following parameters: general (identification of the neonate, age on admission); neonatal (sex, gestational age, condition of the neonate at birth); maternal (age, history, parity, pregnancy follow-up); delivery (mode of delivery, aspect of amniotic fluid); clinical (respiratory rate, cyanosis, severity of the RD according to the Silverman and Andersen score [11]); and outcomes (recovery, death).

Tachypnea was defined as a respiratory rate > 60 per minutes and bradypnea was defined as a respiratory rate < 40 per minutes. Amniotic fluid aspect was defined according to the clarity of the amniotic fluid, it was categorized as clear (clear thin yellowish color), stage I (fresh meconium stain), stage II (old meconium stain) and stage III is (blood-stained fluid) [12].

The clinical parameters of the Silverman and Andersen score were upper chest movement, lower chest retractions, xiphoid retractions, nares dilatation, expira-

tory grunt. These are rated from 0 - 2 points, to reflect the increasingly impaired work of breathing. A summary score of 0 - 10 points is obtained, suggesting none or mild (0 - 3 points), moderate (4 - 6 points) or severe RD (7 - 10 points) [13].

Data were entered using Epi Data 3.1 and analyzed using SPSS version 12.0. Pearson's chi 2 statistical test was used to compare proportions, and a  $p < 0.05$  was considered significant; the confidence interval for Odds ratios was 95%.

### 3. Results

The total number of neonates hospitalized for RD in the Teaching Hospitals of Lomé was 353 cases out of 2813 hospitalized neonates, *i.e.* a frequency of 12.5%. The number of neonates presenting a neonatal RD in the pediatrics department of CHU Sylvanus Olympio was 276 cases out of 2431 hospitalized neonates, *i.e.* a prevalence of 11.4%, and that of the pediatrics department of CHU Campus was 77 cases out of 382 hospitalized neonates, *i.e.* a prevalence of 20.2%.

The mean age of neonates hospitalized for RD was  $0.82 \pm 3.20$  days, with ranges from 0 to 28 days. The early neonatal period (0 - 6 days) was found in 92.4% of cases and neonates were born at full term in 96.2% of cases (Table 1).

The mean age of the mothers was  $24.30 \pm 6.08$  years. The age range between 25 and 35 years was found in 47% of cases (Table 1). Male neonates were 212 (60.1%). The sex ratio was 1.5. The neonates had been resuscitated at birth in 46.7% of cases.

Dyspnea was the reason for consultation in all neonates and was tachypnea in 94% of cases and bradypnea in 6%. Dyspnea was associated with cyanosis in 21.5% of cases. RD was moderate in 64.9% of cases. In 67.7% of cases, mothers had attended at least 4 antenatal consultations follow up. The mode of delivery was a vaginal delivery in 69.7% of cases. The amniotic fluid aspect was clear in 40.5% of cases (Table 1).

Maternal parity was 2 or 3 in 42.5% of cases and mothers were primiparous in 39.6% of cases (Figure 1).

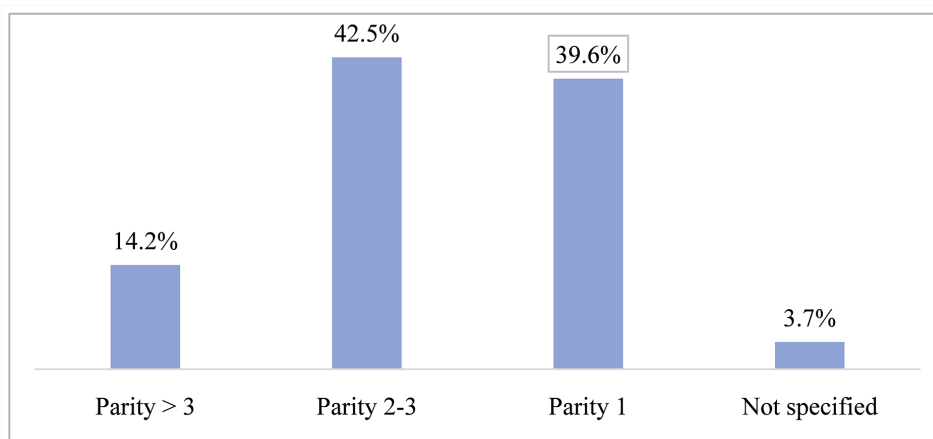


Figure 1. Distribution of mothers by parity.

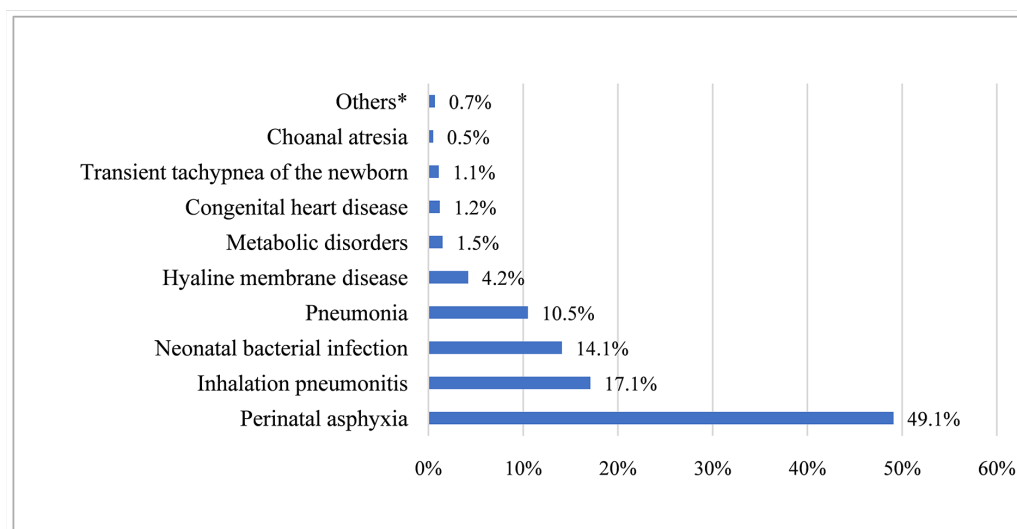
**Table 1.** Distribution of neonates by socio-demographic and clinical characteristics.

	N	%
<b>Age of neonates (days)</b>		
0 - 6	326	92.4
≥7	27	7.7
<b>Sex of neonates</b>		
Male	212	60.1
Female	141	39.9
<b>Gestational age (weeks)</b>		
Prematurity (<37)	9	2.6
Full term (37 - 40)	340	96.2
Born after term (>40)	4	1.2
<b>Mothers age (years)</b>		
<18	4	1.1
[18 - 25[	125	35.4
[25 - 35[	166	47.0
≥35	58	16.5
<b>Number of antenatal consultations follow up</b>		
<4	92	26.1
≥4	239	67.7
Not done	16	4.5
Not specified	6	1.7
<b>Mode of delivery</b>		
Vaginal delivery	246	69.7
Caesarean section	106	30.0
Notspecified	1	0.3
<b>Aspect of the amniotic fluid</b>		
Clear	143	40.5
Fresh meconium stain	112	31.8
Old meconium stain	48	13.6
Blood-stained fluid	28	7.9
Not specified	22	6.2
<b>Neonatal resuscitation</b>		
Yes	165	46.7
No	169	47.9
Not specified	19	5.4
<b>Severity of the respiratory distress</b>		
Moderate <sup>†</sup>	229	64.9
Mild <sup>*</sup>	113	32.0
Severe <sup>‡</sup>	11	3.1

Mild<sup>\*</sup>: Silverman and Anderson score 0 - 3; Moderate<sup>†</sup>: Silverman and Anderson score 4 - 6; Severe<sup>‡</sup>: Silverman and Anderson score 7 - 10.

The main etiologies identified were perinatal asphyxia (49.1%), inhalation pneumonitis (17.1%) and neonatal bacterial infection (14.1%) (**Figure 2**).

The in-hospital mortality rate was 20.4% (N = 72). Age greater than or equal to seven days, no neonatal resuscitation were protective factors against death. Prematurity, no antenatal consultations follow up, neonatal resuscitation, severe respiratory distress were risk factors of death (**Table 2**).



Others\*: Neonatal hemorrhagic syndrome (1 case); Nonatal tetanus (1 case); Malformative syndrome (1 case); Some newborns had several etiologies.

**Figure 2.** Distribution of neonates by etiology of respiratory distress.

**Table 2.** Outcomes in neonates by age, term, and birth routes.

	Total N (%)	Recovery N (%)	Death N (%)	p-value	OR*	CI** [95%]
<b>Age of neonates (days)</b>						
0 - 6	326 (92.4)	256 (91.1)	70 (97.2)	0.63	1.87	[0.84 - 4.90]
≥7	27 (7.6)	25 (8.9)	2 (2.8)	<b>0.04</b>	<b>0.62</b>	[0.38 - 0.90]
<b>Sex of neonates</b>						
Male	212 (60.1)	172 (61.2)	40 (55.6)	0.37	1.55	[0.45 - 3.65]
Female	141 (39.9)	109 (38.8)	32 (44.4)	0.25	1.25	[0.15 - 2.45]
<b>Gestational age (weeks)</b>						
Prematurity (<37)	9 (2.6)	7 (2.5)	2 (2.8)	<b>0.005</b>	<b>1.91</b>	[1.60 - 3.14]
Full term (37 - 40)	340 (96.3)	270 (96.1)	70 (97.2)	0.20	2.81	[1.22 - 4.98]
Born after term (>40)	4 (1.2)	4 (1.4)	0 (0.0)	<b>0.002</b>	<b>0.52</b>	[0.20 - 0.82]
<b>Mothers age (years)</b>						
<18	4 (1.1)	4 (1.4)	0 (0.0)	<b>0.002</b>	<b>0.46</b>	[0.20 - 0.72]
[18 - 25]	125 (35.4)	98 (34.9)	27 (37.5)	0.06	1.30	[0.98 - 2.4]
[25 - 35]	166 (47.0)	133 (47.3)	33 (45.8)	0.07	1.42	[0.47 - 4.52]
≥35	58 (16.5)	46 (16.4)	12 (16.7)	0.26	1.11	[0.82 - 3.19]

## Continued

Number of antenatal consultations follow up						
<4	92 (26.1)	71 (25.3)	21 (29.2)	0.11	2.41	[1.16 - 3.31]
≥4	239 (67.7)	192 (68.3)	47 (65.3)	0.31	2.82	[1.57 - 3.12]
Not done	16 (4.5)	12 (4.3)	4 (5.5)	<b>0.02</b>	<b>1.91</b>	[1.16 - 2.52]
Mode of delivery						
Caesarean section	106 (30.0)	92 (32.7)	14 (19.4)	0.29	1.95	[0.92 - 2.75]
Vaginal delivery	246 (69.7)	189 (67.3)	57 (79.2)	0.68	2.63	[1.65 - 3.74]
Aspect of the amniotic fluid						
Clear	143 (40.5)	112 (39.9)	31 (43.1)	0.3	1.34	[0.28 - 5.46]
Fresh meconium stain	112 (31.7)	96 (34.2)	16 (22.2)	0.24	1.27	[0.22 - 3.32]
Old meconium stain	48 (13.6)	36 (12.8)	12 (16.7)	0.1	1.04	[0.60 - 3.12]
Blood-stained fluid	28 (7.9)	19 (6.8)	9 (12.5)	0.06	1.03	[0.70 - 4.10]
Neonatal resuscitation						
Yes	165 (46.7)	110 (39.2)	55 (76.4)	<b>0.002</b>	<b>1.95</b>	[1.28 - 2.95]
No	169 (47.9)	153 (54.5)	16 (22.2)	<b>0.002</b>	<b>0.40</b>	[0.22 - 0.73]
Severity of the respiratory distress						
Moderate <sup>†</sup>	229 (64.9)	196 (69.8)	33 (45.8)	0.06	0.65	[0.41 - 1.03]
Mild <sup>***</sup>	113 (32.0)	81 (28.8)	32 (44.4)	0.07	1.54	[0.95 - 2.50]
Severe <sup>‡</sup>	11 (3.1)	4 (1.4)	7 (9.8)	<b>0.0006</b>	<b>6.83</b>	[1.94 - 23.96]

OR\*: Odds ratio; CI\*\*: Confidence Interval; Mild\*\*\*: Silverman and Anderson score 0 - 3; Moderate<sup>†</sup>: Silverman and Anderson score 4 - 6; Severe<sup>‡</sup>: Silverman and Anderson score 7 - 10.

#### 4. Discussion

The frequency of neonatal RD was 12.5% in the Lomé Teaching Hospitals. This frequency was higher in Faye *et al.* in Senegal (34.8%) and Baseer *et al.* in Egypt (46.5%) [14] [15]. This observed frequency of neonatal RD can be explained by the existence of other pediatric referral centers outside the teaching hospitals of Lomé, and by the low rate of premature neonates included in this study. Indeed, prematurity is a cause of hyaline membrane disease due to surfactant deficiency [3].

The mean age of neonates was 0.82 days, with a standard deviation of 3.20; the 0 - 6-day age group (early neonatal period) was the most represented (92.4%). Neonates aged seven days, or more were less likely to die of RD. These results are comparable to those of Guedehoussou *et al.* [16] in Togo, who found 94.5% for the 0 - 7-day age group. The early neonatal period is a period of major vulnerability (high morbidity and mortality) for neonates who need to adapt effectively to extra-uterine life [17] [18] [19]. The neonatal death rate remains high in this study. Achieving the Sustainable Development Goals 3.2, which call for reducing the neonatal mortality rate to less than 12 per 1,000 live births by 2030 [20], requires raising awareness and training Togolese healthcare personnel in the prevention and effective management of neonatal emergencies, including

newborn respiratory distress.

We observed a male predominance with a sex ratio of 1.5. Kam *et al.* in Burkina Faso [21] made similar observations, with a sex ratio of 2. Lower levels of cortisol in amniotic fluid have been found in boys, and cortisol is known to play a major role in lung maturation and respiratory adaptation [22] [23]. So male fetuses need a little more attention in the prevention of respiratory distress in newborns in health facilities in Togo.

The mean age of the mothers was  $24.30 \pm 6.08$  years; the 25 to 35 years group was the most represented (47%). Baseer *et al.* [15] in Egypt and Aynalem *et al.* [24] in Ethiopia reported a mean maternal age of  $27.6 \pm 6.8$  and  $28 \pm 5.42$  years respectively, with the 18 - 45 and 20 - 34 years groups accounting for 56% and 74.6% respectively.

Mothers with a parity of 2 or 3 (pauciparous) were the most represented at 42.5%, followed by primiparous mothers at 39.7. Tochie *et al.* [25] in Cameroon reported 33.7% pauciparous mothers and 28.4% primiparous mothers. Primiparity is one of the risk factors for perinatal and maternal complications, which would explain these results. Primiparous mothers are more likely to be in the younger age group, more susceptible to malpresentation and dystocic labor, and more exposed to various complications (anemia, preeclampsia/eclampsia) during pregnancy [26].

Perinatal asphyxia (49.1%) was the main etiology identified. Perinatal asphyxia is a frequently reported cause of neonatal RD in developing countries [7] [8] [9] [27]. It is often associated with lack of antenatal care, delivery in the absence of qualified health workers [28]. In Togo, the rate of home births is still high (5%) [29].

This study is limited by the fact that it was carried out in the country's two largest referral centers, which could increase the number of the most severe cases. Also, the existence of some missing data constitutes a non-response bias that could alter the power of the comparison tests. This requires the correct completion of reference sheets and pregnancy follow-up records.

## 5. Conclusion

Neonatal RD was common in the early neonatal period, and mortality was high. Most etiologies could be prevented by rigorous monitoring of pregnancy, special attention during delivery with fetal monitoring to detect fetal distress, and appropriate management of the neonate in the delivery room.

## Conflicts of Interest

The authors declare no conflict of interest.

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## Survey Form

N°.....

### I. HOSPITAL

➤ CHU SO ; CHU Campus

### II. NEONATE'S IDENTITY

➤ Sex: Male ; Female

➤ Gestational age: .....weeks of gestation

➤ Chronological age at admission: .....days

### III. HISTORY

#### A. Maternal history

➤ Maternal age: ..... years

➤ Gestity: .....; Parity: .....

➤ Maternal pathologies: Hypertension ; Asthma ; Diabetes mellitus ; Sickle Cell Anemias ; Other.....

➤ Level of education: Illiterate ; Primary school ; College ; High school ; University

➤ Profession: Housekeeper ; Reseller ; Seamstress ; Hairdresser ; Secretary ; Other.....

#### B. Prenatal history

➤ Number of antenatal consultations: .....; Not done ; Not specified

➤ Positive serology: Toxoplasmosis Yes  No  / / Not done ; Rubella Yes  No  Not done ; HIV Yes  No  Not done ; Other.....

#### C. Perinatal history

➤ Duration of labor: .....hours

➤ Premature rupture of membranes: Yes ; No ; If yes ..... hours

➤ Aspect of amniotic fluid: Clear ; Blood-stained fluid ; Fresh meconium stain ; Old meconium stain ; Not specified

➤ Mode of delivery: Cesarean section ; Vaginal

➤ Neonatal resuscitation: Yes ; No

### IV. SIGNS

➤ Respiratory rate: ..... per minute

➤ Cyanosis: Yes ; No

➤ Severity of the respiratory distress (Silverman and Anderson score): .....

➤ Other signs: Dyspnea Yes  No ; Consciousness Disorders Yes  No ; Seizures Yes  No ; Other Yes  No  if yes specify: .....

### V. ETIOLOGIES

➤ Medical: Perinatal asphyxia ; Inhalation pneumonitis ; Neonatal bacterial infection ; Pneumonia ; Hyaline membrane disease ; Metabolic disorders ; Transient tachypnea of the newborn ; Other: .....

➤ Surgical: Esophageal atresia ; Diaphragmatic hernia ; Choanal atresia ; congenital heart disease ; Other: .....

## VI. EVOLUTION/OUTCOMES

- Recovery: |\_\_|
- Death: |\_\_|