

Neonatal Infections at the University Hospital Center of Libreville: Epidemiological, Clinical and Biological Characteristics

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Abstract

Introduction: Neonatal infections are a common cause of neonatal mortality. This study aimed at describing its epidemiological, clinical and biological characteristics among hospitalized newborn in Libreville.

Material and Methods: This was a prospective descriptive study carried out in the neonatology intensive care unit of CHU Libreville from June to November 2015. All newborn with a suspicion of a neonatal infection were included. Blood cell count, C reactive Protein and blood and stool culture were performed.

Results: The data of 100 newborns were analyzed, their mean age was eight days, 53% were male, and the majority came from the delivery unit and had a normal birth weight.

The majority of mothers were young, unemployed, single, multiparous, and without any history of infection during pregnancy. The main reasons for medical consultation were abnormal adaptation to extra uterine life (23.0%) and respiratory distress syndrome (22.0%).

Keywords: Newborn; Neonatal infection; Characteristics; Libreville

Introduction

According to the WHO, neonatal infection (NI) represent for almost 30-40% of neonatal mortality in low- and middle-income countries [1]. In 2006, it accounted for 23% of all newborn deaths in Africa [2].

Early NIs or maternal-fetal infections (MFIs) are diagnosed between day 0 (D0) and day 4 (D4) of life and are responsible for 12% of perinatal mortality, 9% of early neonatal mortality, and 12% of late neonatal mortality [3]. Late neonatal infections (LNI) correspond to primary late infections (J4-J28) and nosocomial infections [4]. These definitions are identical in industrialized countries and in developing countries where they represent the leading cause of mortality and transfer to secondary or tertiary hospitals. Their actual incidence remains poorly known, mainly because of the lack of information on a large proportion of births as well as their immediate complications.

The MFI diagnosis is based on a bundle of anamnestic, clinical and paraclinical arguments [5]. Several authors of the literature had identified clinical signs pointing to the diagnosis of IN. In 1987, in the Ivory Coast, Houenou, et al. proposed an infectious score based on anamnestic data pointing to a choice of antibiotic treatment or not according to the graduation of the score [6]. In 2001, Akaffou developed criteria for therapeutic decisions of NI based on anamnestic and clinical data [7].

In Gabon, there are no studies to identify the most frequent criteria for NI and to compare them with those of the various arguments cited in the literature. The management, particularly therapeutic, remains too often probabilistic.

The objective of this study was to describe the characteristics of mothers and newborns suspected of NI at the Neonatology Department of the University Hospital Center of Libreville (CHUL) in order to optimize the sorting of newborns on admission and their care.

Materials and Method

This was a prospective and cross-sectional descriptive study, conducted between June 1st and November 30th, 2015, in the CHUL Neonatal Resuscitation and Neonatal Unit.

Neonates aged 0 to 28 days in a perinatal infection context or suspected of being admitted to hospital, whether admitted to hospital or not, were included. The criteria for non-inclusion were age greater than 28 days, absence of a biological check-up, newborns whose mothers were on antibiotic pre- or per-partum. The classifications of Aujard's materno-fetal bacterial infection (MFBI) and the National Agency for Accreditation and Evaluation in Health (ANAES) were used as reference frames for defining anamnestic and clinico-biological criteria for infection [5,8]. The data were collected on a standardized collection card. Maternal characteristics included: age, marital status, work status, parity, number of prenatal consultations (ANC), and existence of a genitourinary infection in the third trimester of

pregnancy, presence of hyperthermia above 38 °C before or at the onset of labor, duration of water pouch rupture, mode of delivery and color of amniotic fluid (AF). Newborn parameters included adjustment to extrauterine life as assessed by APGAR score at one minute of life, sex, weeks amenorrhea, birth-weight in grams (g), the origin, the postnatal age at admission, the reason for consultation, the clinical signs found during the examination during hospitalization. The biological assessment consisted of the completion of a blood count, with the assay of the Protein C Reactive (CRP) after the 12th hour of life. The bacteriological analyzes (blood cultures) were carried out from central samples.

The pregnancy was considered followed from 4 ANC. The PDE break-up time was considered extended for more than 12 hours. Misfit with extra-uterine life (MEUL) was defined for an APGAR score less than 7, and apparent death status for a score at 3 or less. The term was defined for a gestational age (GA) between 37 and 42 weeks of age. The prematurity was defined for a GA lower than 37 weeks; distributed in extreme prematurity for a GA lower than 28 weeks, in great prematurity for a GA between 28 and 32 weeks and in average prematurity for a GA between 33 and 36 weeks. The birth weight was considered normal between 2500 and 4000 g, low between 1500 and 2499 g, very low when it was less than 1500 g and large for a value greater than 4000 g. Criteria suggestive of an NI were: anemia (hemoglobin in g/dL interpreted according to GA and post-natal age); leukopenia for a white blood cell count below 5,000/mm³, or leukocytosis for a higher than 25,000/mm³, thrombocytopenia when the platelet count was less than 100,000/mm³, and a high CRP for a value greater than 6 mg/L.

The data was collected on an Excel file with double entry. Statistical analysis was performed using the Statview software (SAS Insitut Cary, USA). She used classical descriptive analyzes. The Chi-2 or Exact de Ficher test was used to compare the proportions. Quantitative data were compared using nonparametric and Anova tests.

Result

Characteristics of newborns and mothers

The records of 100 newborns hospitalized for NI and meeting the inclusion criteria during the study period were analyzed. The sex ratio was 1.12. Table 1 summarizes the general characteristics of these newborns and their mothers. Term newborns were the majority (55.0%). For 47.0% of them the birth weight was normal and for half of the newborns, it was low or very low. Most were born (76.0%) vaginally and more than half of the newborns had a good adaptation to ectopic life. Less than one-third (27.0%) came from outpatient visits; 12.0% of maternity hospitals and 9.0% of other public or private health facilities. Age at admission was less than eight days for three-quarters (77.0%). More than half of the mothers (51.0%) were over 25 years old. The majority were unemployed, single, primiparous and pauciparic (Table 1). Pregnancy monitoring was more frequently incorrect (60.0%).

	N	%
Male gender	53	53
Prematurity		
Extreme prematurity	4	4

Great prematurity	23	23
Middle prematurity	18	18
Birthweight		
Low birth weight	31	31
Very low birth weight	19	19
Big birth weight	3	3
Cesarean	24	24
Origin		
Birth room	52	52
Age at admission		
D0	37	37
D1-D7	40	40
D8-D15	9	9
D16-D28	14	14
Mother's age (years)		
<18	5	5
18-24	44	44
≥25	51	51
Professional occupation		
Scholar	22	22
Student	11	11
Avec emploi	19	19
Sans emploi	48	48
Marital status		
Single	67	67
Free union	29	29
Married	4	4
Parity		
Primiparous	26	26
Pauciparic	49	49
Multiparity	25	25
Number of ANC*		
None	10	10
≤3	50	50
≥4	40	40
Genitourinary infection	1	1
*ANC: antenatal consultation		

Table 1: General characteristics of newborns and mothers.

Anamnestic, clinical, biological and bacteriological criteria

Table 2 represents the anamnestic, clinical, biological and bacteriological criteria.

The WP rupture duration was 12 to 18 hours in 14.0% of mothers and more than 18 hours in 20.0%. Amniotic fluid was clear (n=46, 55.0%), tinted (n=26, 31.0%), meconium (n=7; 8.4%) or sanguineous (n=4). Its value was not reported to 17 mothers. The clinical signs suggestive of infection were dominated by respiratory signs, hemodynamic signs and digestive signs. Among neonates with respiratory distress, cyanosis was found in 33.0% of them and 4.0% were coughing. The hemodynamic signs were pallor (21.0%), greyish skin (14.0%), tachycardia (17.0%) and bradycardia (14.0%). Digestive disorders consisted of poor intake of head (38%), vomiting (6.0%) and abdominal bloating (6.0%). The neurological disorders consisted of hypotonia (28.0%), seizures (16.0%), anterior fontanelle tension (6.0%), drowsiness (18.0%) and somnolence (14.0%). The cutaneous signs were jaundice (23.0%), purpura (6.0%) and bullous eruption (4.0%). The disorders of the thermal regulation manifested themselves by a hyperthermia (67.0%) and hypothermia (30.0%). The reasons for external consultation are shown in Table 3. Two-thirds (30.0%) of neonates, thrombocytopenia, and about one-quarter (24.0%) of leukocytosis were found to have laboratory abnormalities suggestive of infection. The CRP assay was positive in 50.0% of cases and the majority of blood cultures (61.5%) were positive.

	N	%
Water pouch rupture (hours)		
Rupture ≥12	34	34
Amniotic fluid (n=83)		
stained	37	44.6
Mother's hyperthermia	4	4
APGAR score		
Misadaptation to extra uterine life	37	37
Apparent death	6	6
Signs		
Respiratory disorders	61	61
Hemodynamic disorders	54	54
Intestinal disorders	51	51
Thermal disorders	48	48
Mucosal and cutaneous	44	44
Blood Cell count		
Anemia	52	52
Hyper leukocytose	24	24
Leukopenia	38	38
Thrombocytopenia	30	30
CRP elevated	50	50

Blood culture positive (n=26)	16	61.5
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Table 2: Anamnestic, clinical, biological and bacteriological criteria.

Motifs de consultation	N	%
Misadaptation to extrauterine life	23	23
Acute respiratory distress	22	22
Hyperthermia	14	14
Diarrhea	9	9
Convulsions	6	6
Generalized hypotonia	6	6
Fetal asphyxia not explained	6	6
Hypotrophy	5	5
Jaundice	5	5
Prematurity	2	2
Irritability	1	1
Dehydration	1	1

Table 3: Distribution of the sample according to the reasons for consultation externally.

Discussion

Characteristics of mothers and newborns

In this study, mothers over the age of 18, at the primary, unemployed, and single level are the most exposed population in the IN; it is a fragile population, often in precarious situation. Djoupomb in Cameroon reports that most of the mothers were between 20 and 29 years old, multiparous, married, had a high school education and practiced a liberal profession [9]. The significant proportion of students (22.0%) poses the problem of continuing schooling during the occurrence of teenage pregnancy and the need for sex education in this segment of the population. Pregnancy monitoring, which was mostly incorrect, did not allow the detection of infectious risk situations, whereas incorrect monitoring of pregnancy is associated with high maternal and neonatal morbidity and mortality [10]. In addition, there is an association between some obstetrical history and the occurrence of IN [11]. The low rate of genitourinary infection in the mother is also found by Emira, et al, who notes a single case of genital infection of the third trimester; this highlights the importance of researching and treating other NI gateways [12]. Gibbs has established a relationship between uro-genital infection and the risk of premature membrane rupture [13]. Also, the low socio-economic level of women giving birth at CHUL and the lack of awareness of the need for proper prenatal follow-up and assessment, despite the introduction of health insurance, are recognized as factors in significant risk of IN.

NMIs were more frequently associated with low-birth, low-birth-weight, male births, confirming evidence from the literature that MFIs predominate in boys. The proportions observed at the CHUL are similar to those of Djoupomb who found 66.51% of newborns at term and a sex ratio of 1.11 [9]. The latter is weaker than that presented by

Akaffou, et al. [1,9] [14]. N'guessan, et al. [15] found 77.5% of term newborns, 87.6% eutrophic, a sex ratio of 2.07 and vaginal delivery in 60.0% of cases. The rates of prematurity and low birth weight are correlated with the fragility of newborns subjected to an intrauterine environment that has become unfavorable. These rates are respectively for prematurity and low birth weight 20.0% and 8.8% for N'guessan, et al. [15]; 22.9% and 18.8% for Ben Hamida, et al. [12]. For Djoupomb, the proportion of premature newborns affected was 32.57%. Wolkowicz shows that newborns with 34-36 weeks of age have a 2-fold higher risk of early neonatal bacterial infection than those born at term [16]. Age at admission suggests a predominance of maternal-fetal infection rather than post-natal infection, as in the study by Akaffou, et al. [14] whose average age at admission showed that the majority of newborns were admitted before the third day of life; as in Emira et al. where clinical symptomatology appeared in the first 48 hours of life in 95.8% of cases [11].

Anamnestic, clinical, biological and bacteriological criteria

The main maternal infectious risk criteria identified are reported by other African authors. It was the prolonged rupture of the membranes greater than or equal to 12 hours, abnormalities of the color of the amniotic fluid. N'guessan, et al. [15] found frequencies of 62.5% and 57.5%; Akaffou, et al. [14] 33.8% and 28.5%, respectively, for PDE rupture and LA color. Ben Hamida, et al. [12] reports a premature and/or prolonged rupture of membranes greater than or equal to 12 hours in 63.2% of cases and this predominance is found by Kago, et al. [17]. Failure to break water pouch does not exclude the risk of maternal-fetal infection; because in the presence of endometritis or placentitis, contamination with intact membranes is by hematogenous means. In the history of pregnancy, a maternal fever during or after delivery was rare in CHUL, but was found in 57.7% of cases at Charles Nicolle Hospital in Tunis [11]; it was 18.81% at Djoupomb [9] and at 17.0% for Akaffou, et al. [14]. This may be due to a lack of evidence of this factor or inadequate supervision of parturients in relation to often overburdened health staff and lack of equipment. The study of infectious risk criteria showed a majority of newborns with a misadaptation to extra uterine life. In contrast, a high incidence of poor APGAR was found to be 50.0% in the Houenou study [18]. Brabant [19] notes that the main anamnestic criteria correlated with neonatal infection were maternal fever, premature delivery, urinary tract infections and fetal distress. Even in good childbirth conditions, the child can become infected during the passage of the genital chain.

The clinical signs of IN are polymorphic and nonspecific, discrete or delayed onset; this diversity is described in the literature [4,20]. In two studies comparing the frequency of clinical signs in Ivory Coast, brain pain (46.0%), digestive disorders (45.3%) and respiratory distress (42.3%) predominated in one, then in the second, in another, the signs were dominated by respiratory disorders (36.0%) and neurological disorders (26.0%) [21,22]. In his study, Chemsî in Morocco found a predominance of neurological disorders (49.5%) as convulsions, hypotonia, moaning, refusal of suckling, followed by respiratory distress (41.0%) and septic shock (13.0%) [23]. Sanou in Burkina-Faso found a prevalence of hyperthermia (40.1%), followed by respiratory disorders (7.9%), neurological disorders (2.5%) with an inability to suck in 1.2% cases [24]. The biological and bacteriological assessment coupled with the anamnesis makes it possible to make the diagnosis of IN. However, hematological abnormalities are inconsistent and not very early. Anemia would be classic, delayed and not very specific; thrombocytopenia is reported to be frequent, not very specific and late [25]. Abnormalities suggestive of infection in the blood count were

noted in 26.3% of cases by Ben Hamida, et al. in Tunisia [12]. These changes were observed in Mourtada in Morocco [26] with leukocytosis (86.1%), thrombocytopenia (17.0%), thrombocytosis (6.3%) and anemia (9%). For Chokoteu in Mali [27], 31.6% of patients presented with anemia and 68.7% with leukocytosis. The CRP assay remains a guiding element that peaks in 24-48 hours; it is reliable and accurate [25]. It was positive in 98.5 to 38.0% of newborns with NI in African series [11,26,27]. Moreover, in the Mourtada study, blood culture performed in 92.6% of cases, did not find germs in 35.4% of cases [26]. Less than one-third of newborns had blood cultures that were positive in more than half of the cases. This observation highlights the difficulty of carrying out this examination, which, despite health coverage, is still expensive for low-level socio-economic patients whose newborns are most at risk of NN. In addition, frequent ruptures of reagents and haemoculture balloons contribute to the difficulty of carrying out the assessment.

Conclusion

Neonatal infections, especially bacterial infections, represent a major public health problem. It should be approached with precise protocols, diagnostic, therapeutic and especially prophylactic. The systematic search for risk factors is of interest. Those identified in this study were essentially perinatal and therefore select a target population. In the Gabonese context, clinical examination is still at the center of the diagnostic approach, respiratory distress being the most prominent and most evocative sign. The fight against neonatal infections imposes an optimization in the strategies of follow-up of the mother and the child, the prenatal follow-up and the hygiene of life of the pregnant women on the one hand and on the other hand, a more appropriate load of newborns.

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