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Clinics in Mother and Child Health

Case Series

Management of Neonatal Infectious Risk Factors (IRF) in Senegal

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ABSTRACT

The diagnosis of early neonatal bacterial infections (NBI) is difficult because of non-specific clinical signs. The decision to treat is often made on a bundle of anamnestic, clinical and biological arguments. The objectives of this study were to identify the infection risk factors (IRF), the germs responsible of NBI as well as their susceptibility to antibiotics and the evolution of neonates with an IRF. This is a retrospective study conducted in a hospital center in Senegal from December 2017 to August 2018. The study concerned hospitalized newborns with one or more IRF. During this period, 620 neonates were hospitalized and 192 had one or more infectious IRF, an incidence of 30.9%. The average age of mothers was 30 years old [15-46 years]. Most newborns were born premature (53.6%) and 55.2% had low birth weight. Amniotic fluid tinted (42.7%), premature rupture of membranes (25.5%) were the most frequently reported IRF. Of the 55 positive samples, *Escherichia coli* and *Klebsiella pneumoniae* were the predominant germs representing respectively 50, 9% (28/55) and 18.1% (10/55). Mortality was 28.8% in newborns. Among the IRF, only, premature rupture of membranes before labor was significantly associated with the occurrence of NBI (P=0.02). Associated IRF were significantly related to adverse evolution (P=0.035). Mortality was significantly higher in preterm infants (31.1% *vs.* 14.6%) (p=0.007). The recognition of the IRF is a fundamental element for a better management of NBI which constitutes a major cause of mortality.

Keywords: Infection; New-born; Risk factor; Mortality; Senegal

INTRODUCTION

Neonatal mortality is declining worldwide but progress is too slow and the gap is particulary acute in Africa. In 2015, neonatal deaths accounted for 45% of total under-five deaths, up from 37% in 1990, showing an increase in newborn deaths and this number is likely to continue to increase. This increasing share of deaths in the neonatal period illustrates the faster decline in the mortality rate of children aged 1 to 59 months than that of newborns [1]. Of the 5.9 million deaths of children under 5 in 2015, almost half were due to infectious diseases such as sepsis, pneumonia, diarrhea, malaria, meningitis, tetanus and measles [2]. In the neonatal period, defined neonatal bacterial infection (NBI) as a clinical syndrome occurring within the first 28 days of life, manifested as systemic signs of infection with or without the isolation of a bacterium pathogen of the blood circulation, is the third leading cause of death after prematurity and perinatal asphyxia [1,3]. Depending on the age of onset in the newborn, two distinguished entities are described: early NBI (occurring between 0 days and 7 days of life) and late NBI (between 8 days and 28 days of life) [4]. The diagnosis of early NBI is difficult because of nonspecific clinical signs in the newborn. So the decision to treat is often made on a bundle of anamnestic, clinical and biological arguments. In developed countries, the risk factors for neonatal bacterial infections and the causative organisms are well known and the initial treatment well codified [5]. In Senegal, as in most of our countries, infectious risk factors (IRF) identified in Western countries is often used. Outside working conditions and bacterial ecology are not the same. The objective of this study was to evaluate the management of neonates presenting an early bacterial infectious risk at the neonatal department of Dakar Main Hospital. More specifically, the aim was to determine the hospital prevalence of early neonatal bacterial infection, to specify the germs in question, to

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Received: February 06, 2019; **Accepted:** February 21, 2019; **Published:** February 28, 2019

Citation: Gueye M, Sow A, Boiro D, Fall L, Diagne NR, Ndiaye AM, et al. Management of neonatal infectous risk factors (IRF) in Senegal. Clinics Mother Child Health. 2019;16:316.

assess their sensitivity to the antibiotics used, and finally to identify the risk factors for neonatal bacterial infection in our work context.

METHODOLOGY

This is a retrospective study that took place at the pediatric department of the Dakar Main Hospital, which is a Level III center in the health pyramid in Senegal from December 2017 to August 2018. The study concerned hospitalized newborns with one or more IRF. IRF were defined as: maternal fever >38° before or during labor or in immediate postpartum, premature rupture of membranes before labor of 12 hours or more, dysuria or urinary burning, bacteriuria during pregnancy, leucorrhea in the last trimester, tinged or meconium amniotic fluid, unexplained acute fetal distress with APGAR <7 to M5, home delivery and spontaneous prematurity <37 SA .

Neonates with one or more of the IRF had a gastric and blood culture sample after birth before any antibiotic therapy and at H48 a blood count (NFS) and C reactive protein (CRP). All specimens were sent to the laboratory and any isolated pathogens were identified and an antibiogram was done. Data was captured and analyzed with SPSS 13.0 software. The qualitative or quantitative variables were compared with each other using square chi with a significance threshold $p \leq 0.05$.

RESULTS

During this period, 620 neonates were hospitalized and 192 had one or more IRF, an incidence of 30.9%. The average age of mothers was 30 years old [15-46 years]. The 18-to-35 age group was predominant (73.9%). Half of the mothers were well followed with at least 4 antenatal visits 50%), more than half of the mothers were multiparous (56.3%), and 62.5% had not received prophylaxis during delivery. Most infants were born premature (53.6%) and 55.2% had low birth weight. The sex ratio was 1.02. The vaginal birth was predominant (79.7%).

Table 2: Pathogenic germs isolated in the different biological samples.

Pathogenic germs		GJ	Blood culture			CUE	ES	Total	%
		-	1	2	3	-	-	-	-
Bacillus Gram (-)	*Escherichia coli*	20	2	4	-	-	2	28	50.9
	Klebsiella pneumoniae	5	1	3	1	-	-	10	18.1
	Entérobacter cloacae	4	1	-	-	-	-	5	9
	Acinétobacter baumanii	1	1	1	-	1	-	4	7.2
	Klebsiella oxytoca	1	-	-	-	-	-	1	1.8
	Pseudomonas aeruginosa	1	-	-	-	-	-	1	1.8
Cocci Gram (+)	*Streptococcus* group b	2	-	-	-	-	-	2	3.6
	Pyogenic *Streptococcus* group a	1	-	-	-	-	-	1	1 .8
	Staphylococcus aureus	-	1	1	1	-	-	3	5.4
Total		35	6	9	2	1	2	55	100

GJ=Gastric Juice; CUE=Cytobacterioligical Urine Exam; EA=Ear Swabbing

The distribution of newborns according to the type of IRF is shown in (Table 1). Respiratory pathologies (moaning 23.9%, respiratory pauses 8.3% and respiratory distress 58.3%) and neurologic (tone disorders 46.3%, weak sucking 7.8%, anterior fontanel tense 2.6%) were the most frequent. In the newborns (24.8%) had abnormalities in blood count (NFS) (24.8%) and 19% thrombocytopenia.

The CRP was positive in 14%. The different pathogens isolated in the different sampling sites are shown in (Table 2). There was a low sensitivity of the different isolated ampicillin germs with the exception of *streptococcus* b, an intermediate sensitivity to third generation cephalosporins and gentamicin and good sensitivity to fluroquinolones, imipenems and amikacin. In our study 80.2% of newborns had received antibiotic therapy with ampicillin, cefotaxime and gentamycin. The average duration of hospitalization was 27 days [1 to 54 days]. The mortality was 23.4%.

The distribution of neonates according to the IRF is shown in (Table 3). The IRF were significantly associated with the

unfavorable evolution (P=0.035). Mortality was significantly higher in preterm infants (31.1% *vs.* 14.6%) (p=0.007).

Table 3: Correlation between the existence of an infectious risk factor and the occurrence of a neonatal infection.

Infection risk factor	n	%	p value
Amniotic fluid tinted	132	68.75	0.40
Premature rupture of membranes before labor>12 h	67	34.89	0.02
Leucorrhea in last trimester	17	8.85	0.5
Fever before labor	2	1	-
Bacteriuria	2	1	-
Dysuria	1	0.5	-

DISCUSSION

During the study, the incidence of IRF was 30.9%. Cissé and col in Dakar had a comparable incidence [6]. The age of the mothers was relatively young (30 years old) superimposed on the average maternal age found in the literature [6-8]. The most frequently reported IRF in our study were tinted amniotic fluid and premature rupture of membranes before labor greater than 12 h. The preponderance of these factors is reported by most work in our regions [6,7,9].

In addition, according to the high health authority (HAS) >12 h, unexplained prematurity of less than 37 weeks of amenorrhea and maternal fever greater than 38° C before or at the beginning of labor are the major criteria neonatal infection [4]. In our series, most newborns were born premature. The frequency of IRF in premature infants has been widely described in the literature by other authors in varying proportions: Chokoteu [7] in Bamako 23.5%, Yao [10] in Abidjan 16.4% and Cottineau [11] in France 4.7%. Thrombocytopenia (platelets <150000 thrombocytes/mm^3) was the most frequently reported abnormality.

Dissongo [12] in Yaounde also found a predominance of thrombocytopenia with a much higher prevalence (66.41%). The blood count has a very variable sensitivity ranging from 29% to 94% in the literature while the CRP is a good marker, but late infection with specificity and sensitivity respectively of 78% to 91% [13]. The most common germs found in our work were *Escherichia coli, Klebsiella pneumoniae* and *Enterobacter cloacae*. The most common germs identified by the World Health Organization were gram-positive bacteria including *Staphylococcus aureus*, *Streptococcus pneumoniae* and pyogenic *Streptococcus* [14].

The mortality in our series was 23.4%. It is slightly higher than that of Cissé [15] in Dakar (19.5%). Infants born with low birth weight were mainly premature babies with a mortality of 31.1%. Low birth weight is indeed the leading cause of neonatal mortality in the world and the co-morbidity with the infection worsens the prognosis of these newborns even more [4]. Gram negative bacilli were associated with 28.8% mortality. These results objectified in our work were comparable to those of other studies [16,17]. On neonates with IRF alone, 55 neonates had at least one positive specimen.

But all these newborns were put on antibiotic according to the protocols of the service not without consequences on their digestive colonization and the immune response of the gastrointestinal tract. This early exposure to antibiotics contributes to the emergence of resistant bacteria, as well as disruptions in the implantation of neonatal flora. Thus, it seems essential to limit emergency neonatal exposure to antibiotics [18].

CONCLUSION

The recognition of the IRF is a fundamental element for a better management of NBI which constitutes a major cause of mortality.

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