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Epidemiological, clinical and bacteriological profile of maternal-fetal infection in Libreville and Lambarene in Gabon

Abstract

Background: Maternal-fetal bacterial infection remains a concern for pediatricians due to diagnostic and therapeutic difficulties and increased morbidity and mortality. The objective of this work was to describe the epidemiological, clinical and bacteriological profile of maternal-fetal infection in Libreville and Lambaréné. **Methods:** This is a prospective and descriptive study carried out in 2 university hospitals in Libreville and the regional hospital of Lambaréné. We included newborns with at least one criterion from the National Agency for Accreditation and Evaluation in Health ANAES.

Results: we collected 53 newborns. The ANAES criteria were time to rupture > 18 hours (17%), prematurity <37SA and ≥35SA (24.5%), maternal perinatal fever (18.7%), and abnormal amniotic fluid (66%). Newborns were symptomatic (35.9%). Symptoms were dominated by respiratory signs (30.2%). On biology, anemia and thrombocytopenia accounted for 22.6% and 20.8% respectively. The bacterial ecology was dominated by Gram+ cocci (66.7%) consisting of coagulase negative Staphylococci (*Staphylococcus lentus* = 29.2%). Sensitive antibiotics were vancomycin and ofloxacin. For Gram Negative Bacilli (*E. coli* = 41.7%), the sensitive antibiotics were amikacin and imipenem.

Conclusion: The infectious risk criteria of the ANAES remain relevant in our practice. The bacterial ecology is different from that known with a high sensitivity to unusual antibiotics. Optimization of these antibiotics would reduce morbidity and mortality linked to maternal-fetal infection.

Keywords: maternal-fetal infection, newborn, gram cocci, gram bacillus, Libreville

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Introduction

Maternal-foetal bacterial infection is an early primary infection contracted during pregnancy or childbirth, with onset between the 1st and 3rd day of life.[1] In 2019, according to the World Health Organisation, 2.4 million (47%) children under the age of 5 will die during the neonatal period. Sub-Saharan Africa is the region of the world with the highest neonatal mortality rate, with 27 deaths per 1,000 live births. Neonatal infections are the 3rd leading cause of neonatal death.[2] Lack of knowledge of bacterial ecology and the sensitivity of antibiotics to isolated germs make it difficult to manage this condition in our context. In Gabon, the lack of data on the bacterial ecology of maternal-foetal infections has resulted in the use of western bacterial epidemiology based on the predominance of 3 germs: Group B *Streptococcus, E. coli*, L. monocytogenes. Treatment is currently based on the use of a triple course of probabilistic antibiotics. In view of these data and the resulting morbidity and mortality, we conducted this study with the aim of improving the management of neonates in our setting. The specific objectives were to describe the characteristics of newborns suspected of having a maternal-foetal infection, to describe the clinical pictures of maternal-foetal infection, to identify the germs responsible, to determine their sensitivity to antibiotics, and to identify the germs in the maternal vaginal flora.

Patients and methods

This was a cross-sectional, prospective, descriptive study conducted from 1 December 2020 to 31 March 2021 (4 months). The study took place in urban areas in the birthing rooms of the University Hospital Centres of Libreville and Owendo, and in rural areas in the birthing room of the Regional Hospital Centre of Lambaréné. All newborns, regardless of gestational age, with at least one ANAES 2002 infectious risk criterion, whether symptomatic or not, and whose parents had signed an informed consent form, were included in our study. Raw data were collected on a pre-established standardised form. We collected the mothers' socio-demographic data (age, place of residence, level of education, occupation); data relating to monitoring of pregnancy and delivery; newborn parameters (weight, height, head circumference, Apgar score, temperature); ANAES anamnestic criteria and results of biological tests (CBC, CRP, blood culture and vaginal swab). Our study included a selection bias due to the small sample size. This could be explained by the measures taken to combat the Covid 19 pandemic, in particular the introduction of curfews and the requirement to obtain a travel permit, which reduced travel to Lambaréné. We took a vaginal swab from the mother using a sterile swab as soon as she arrived in the delivery room and after analysing the selection criteria. We drew 5 ml of cord blood (maternal side) in a syringe (including 3 ml for the haemogram in an EDTA tube and the CRP in a dry tube and 2 ml for the blood culture in a paediatric blood culture flask). The samples were immediately sent to the laboratory for analysis. The blood samples for blood culture were incubated in an automated system (BacT/⟦ALERT⟧^R) for automatic detection of microbial growth at 37°C for a maximum of 5 days. The broth sample was then inoculated onto specific media (Chapman, blood agar, Hektoen, Eosin mehylene blue and bromocresol BCP) for 24 hours in an oven at 37°C. Data were entered using Excel 2016 software. Descriptive statistical analyses were performed using Statview version 5.0 software. Results were expressed as a percentage for qualitative values and as an average for quantitative values. Comparisons were made using Chi-square tests for proportions. The significance level (p) was set at 0.05. The research for this study was authorized by the

administrative authorities of these facilities. The free and informed consent of the parents was obtained. Confidentiality and anonymity were respected.

Results

During the study period, 53 newborns from 51 mothers presented at least one ANAES infectious risk criterion. Newborns from the CHUL accounted for more than half of our population (52.8%). They were born vaginally (96%), in good adaptation (98.1%), at term (75.6%) with a mean gestational age of 39.1 SA (range 30 SA to 42 SA). The mean birth weight was 2620.9g ± 80.9g with extremes of 1250 and 4000g and 73.6% (n=39) had a weight greater than 2500g. The sex ratio was 0.8 (54.7% boys). The average age of the mothers was 26.9±0.8 years, ranging from 17 to 44 years. They had a secondary education (62.8%), were poor (62.7%), unemployed (50.9%), and lived in a common-law relationship (56.9%). The pregnancy was monitored in 54.9% of cases by midwives (92.2%) with more than 3 ANC. 17.7% of mothers had presented with an intercurrent pathology, dominated by malaria (44.4%) and urinary tract infection (22.2%) (Table 1). The most common risk factors for infection were PMR before 37 days' gestation (15.1%), water break > 18 hours (17%), prematurity <37SA and ≥35SA (24.5%), meconium or stained amniotic fluid (66%), maternal fever before and during delivery (18.7%) and an abnormal FHR (5.7%) (Table 2). Nineteen newborns were symptomatic (35.9%). Clinical manifestations were dominated by respiratory signs (30.2%), neurological signs (26.6%) and thermal dysregulation (7.6%). Biological tests revealed hyperleukytosis (3.8%), anaemia (22.6%) and thrombocytopenia (20.8%). There was no leukopenia or neutropenia. The CRP at H12 was negative at birth in all neonates. Blood cultures were positive in 36 newborns (67.9%). Of these, 70.6% were asymptomatic. The bacterial ecology was dominated by Gram+ cocci (66.7%, n=24), led by *Staphylococcus lentus* (29.2%), *Staphylococcus* epidermidis (20.8%) and *Staphylococcus haemolyticus* (16.7%). Among the Gram- bacilli (33.3%), we found *E. coli* (41.7%), *Klebsiella oxycota* (16.7%), and 8.3% for *Klebsiella pneumoniae* (Table 3). Vaginal swabs were taken from 44 mothers. It was positive in 27 of them (61.4%), with a predominance of Gram- bacilli (66.7%) (*Serratia marcescens* =18.5%, *Enterobacter aerogenes* and *Protéus mirabilis* =11.1%). In 8% of cases (n=4), the germs found were identical in the mother and the newborn. Gram- bacilli were sensitive to imipenem (83.3%), amoxicillin-clavulanic acid (75%), amikacin (83.3%), ciprofloxacin and levofloxacin (58.3%). They were resistant to the usual antibiotics: cefotaxime (58.3%), ampicillin (58.3%). Gram+ cocci were sensitive to vancomycin (47.8%) and ofloxacin (47.8%). They were resistant to penicillin (100%) and gentamicin (90.5%).

Table 1 Distribution of newborns by mother's characteristics

Mothers' characteristics	Workforce	Percentage (%)
Level of study		
Out of school	3	5,9
Primary	7	13,7
Secondary	32	62,8
University	9	17,6
Profession		
Without	26	50,9
Student	15	29,4
Retailer	6	11,8
Official	3	5,9
Liberal Profession	1	2,0
Marital status		
Single	17	33,3
Cohabitation	29	56,9
Marieed	5	9,8
Intercurrent pathologies		
None	42	82,4
Malaria	4	7,8
Gestational hypertension	2	3,9
Urinary infection	2	3,9
Threat of premature delivery	1	2,0

Table 2 Distribution of newborns according to ANAES criteria

ANAES criteria	Workforce	Percentage (%)
Major criteria		
Chorioamniotitis chart	0	0
Twin damage	0	0
Maternal temperature before or at the start of labour	10	18,7
Spontaneous prematurity <35SA	3	5,7
Opening of the water sac ≥18H	9	17,0
Premature rupture of membranes before 37SA	8	15,1
Group B Streptococcal bacteriuria during pregnancy	0	0
Minor criteria		
Duration of opening of the water sac ≥12H et <18H	8	15,1
Prematurity <37SA et ≥35SA	13	24,5
Unexplained foetal asphyxia or cardiofoetal rhythm abnormality	3	5,7
Stained or meconium amniotic fluid	35	66,0

ANAES = Agence Nationale d'Accréditation et d'Evaluation en Santé

Table 3 Distribution of newborns according to blood culture germ

ANAES criteria	Workforce	Percentage (%)
Major criteria		
Chorioamniotitis chart	0	0
Twin damage	0	0
Maternal temperature before or at the start of labour	10	18,7
Spontaneous prematurity <35SA	3	5,7
Opening of the water sac ≥18H	9	17,0
Premature rupture of membranes before 37SA	8	15,1
Group B Streptococcal bacteriuria during pregnancy	0	0
Minor criteria		
Duration of opening of the water sac ≥12H et <18H	8	15,1
Prematurity <37SA et ≥35SA	13	24,5
Unexplained foetal asphyxia or cardiofoetal rhythm abnormality	3	5,7
Stained or meconium amniotic fluid	35	66,0

ANAES = Agence Nationale d'Accréditation et d'Evaluation en Santé

Discussion

The small sample size is a limitation of this study. This could be explained by the measures taken to combat the Covid 19 pandemic,

in particular the introduction of curfews and the requirement to obtain a travel permit, which reduced travel to Lambaréné and the greater Libreville area. Nevertheless, we believe that the objectives set were achieved. Our study population consisted mainly of full-term neonates (75.5%). These results are similar to those found by Mourtada et al[3] (67%), Minko et al[4] in Gabon, N'guessan et al[5] in Côte d'Ivoire, and Nouaili et al[6] (74.4%) in Tunisia. In contrast, Kemeze et al[7] and Konate et al[8] found a predominance of premature newborns, with 61.5% and 63.5% respectively. This difference can be explained by the fact that newborns in our study were recruited in the delivery room and not in hospital, as premature babies are the most symptomatic and are therefore mostly hospitalised. The infectious risk criteria in our study were dominated by minor risks, notably tainted or meconium LA (66%) and prematurity <37 SA and ≥35 SA (24.5%). These results were similar to those of Mbarambara et al[9] in Congo (59.8%) and Akaffou et al[10] in Côte d'Ivoire (67.2%). Balaka et al in Togo[11] and Nouaili et al[6] in Tunisia reported that the predominant infectious criterion was RPM ≥18H (major criterion) with 88% and 63.2% respectively. Clinical manifestations were dominated by respiratory signs (30.2%), followed by neurological disorders (26.6%). These results are similar to those of Diallo et al,[12] Balaka et al[11] and Akaffou al[10] who found respiratory signs to be predominant with 18.9%, 34% and 70.7%. For Harkani et al[13] and N'guessan et al,[5] neurological signs predominated, with 44.5% and 52.5% of cases respectively. The predominance of these signs may be explained by the fact that adaptation primarily concerns the respiratory and neurological systems. The incidence of INN positivity was 67.9%. This is higher than in Cameroon (24%)[7] and comparable to Morocco (64.6%).[3] A predominance of Gram+ cocci (66.7%) consisting of coagulase-negative staphylococci. This was the case in Côte d'Ivoire (65.5%)[5] and Morocco (32.85%).[3] A proportion of Gram- bacilli (33.3%) were identified, with *E. coli* (41.7%) and *Klebsiella oxycota* (16.7%) respectively. In Cameroon, Kemeze et al[8] found a higher proportion of Gram- bacilli (56%) with *E. coli* (36.8%) and *Klebsiella* (10.5%). The germs found in our study are mostly represented by unusual germs in maternal-foetal infection. These have also been found by other authors.[3,5,11,14] In most cases, these are nosocomial germs. Could the bacterial ecology of early neonatal infections be updated by the emergence of new germs? The absence of blood cultures in mothers also means that we cannot conclude that there is a correlation between the germs found in the mother and those found in the newborn. Gram-negative bacilli had good sensitivity to imipenem in 83.3% and to amikacin in 83.3%. In Cameroon, Kemeze et al[7] observed that the antibiotics effective against Gram- bacilli were imipenem (100%) and amikacin (60%), while in Morocco, Chemsi et al[15] reported a sensitivity of Gram- bacilli to 3rd generation cephalosporins (100%) and ampicillin (48%). Gram-positive cocci had good sensitivity to vancomycin (47.8%) and ofloxacin (47.8%). They were resistant to penicillin (100%) and gentamicin (90.5%). For Chemsi et al,[15] ampicillin retained better sensitivity. In Mali, Folquet et al[16] reported a sensitivity of coagulase-negative staphylococci to oxacillin, lincomycin, vancomycin, pristamycin, gentamicin and fusidic acid. These results, compared with the literature, show that the bacterial ecology in sub-Saharan Africa and the Maghreb is not the same as in the West, and consequently the usual first-line antibiotics do not appear to be suitable.

Conclusion

Maternal-foetal bacterial infection remains a major public health problem in our context. The ANAES criteria for infectious risk remain valid. Respiratory signs are the most frequent clinical manifestation. The bacterial ecology was dominated by Gram+ Cocci (Coagulase *Staphylococcus*) with a high sensitivity to unusual antibiotics. Optimisation of these antibiotics would reduce the morbidity and mortality associated with maternal-foetal infection.

Current knowledge on the subject

Neonatal infection is a major public health problem in sub-Saharan Africa in general and in Gabon in particular;

Neonatal infection is responsible for increased mortality linked to the physiological and immune characteristics of the newborn;

The bacterial ecology is that of the West and is represented by 3 germs: *E. coli*, *listeria, streptococcus*.

Contribution of our study to knowledge

No study on the subject has previously been published on bacterial ecology in our context in Libreville, Gabon;

The proposed study is the first multicentre study in our country to integrate general data, bacterial ecology and antibiotic sensitivity;

The main germs found were: *Staphylococcus, E.coli, Klebsiela*.

Contributions to the authors

All authors contributed to the writing of this manuscript, read and approved the final version.

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Conflicts of interest

The authors declare no conflict of interest.

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