

Neonatal Infection in Srinagarind Hospital, 1987-1990

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“การติดเชื้อในการกรากแรกเกิด” โรงพยาบาลศรีนครินทร์

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บทคัดย่อ

การติดเชื้อในทารกแรกเกิด ยังเป็นปัญหาสำคัญปัญหาหนึ่ง การติดเชื้อในกระเพาะโลหิตเป็นสาเหตุการตายนับดับแรกในการตายของทารกวัยแรกเกิดในระยะต้น ในโรงพยาบาลศรีนครินทร์ ได้ศึกษาการติดเชื้อในทารกแรกเกิดที่รับไว้ในหน่วยทารกแรกเกิด โรงพยาบาลศรีนครินทร์ ในช่วงวันที่ 1 มกราคม 2530 - 31 ธันวาคม 2533 ทั้งหมด 310 ราย พบการติดเชื้อทั้งสิ้น 338 ครั้ง คิดเป็นการติดเชื้อ 10.4 ครั้งต่อทารกแรกเกิดมีชีพ 1000 ราย หรือ 15.2 ครั้งต่อทารกที่รับไว้รักษา 100 ราย จำแนกเป็นทารกที่พบริสุทธิ์ในกระเพาะโลหิตร้อยละ 57.4 ทารกที่มีอาการติดเชื้อร้อยละ 34.3 และทารกที่มีภาวะปอดอักเสบแต่กำเนิดร้อยละ 8.3 จำแนกเป็นเพศชายร้อยละ 61.8, ทารกน้ำหนักน้อยร้อยละ 66.9 และทารกเกิดก่อนกำหนดร้อยละ 53.8 เพียงร้อยละ 44 ที่พบว่ามีปัจจัยเสี่ยงของการติดเชื้อและ Hyaline membrane disease เป็นภาวะที่พบปอยที่สุดที่พบก่อนการติดเชื้อ (ร้อยละ 28.2) มีผู้ป่วยที่มีปัญหาทางศัลยกรรมที่ต้องได้รับการผ่าตัดร้อยละ 27

เชื้อก่อโรคที่เป็นสาเหตุพบเป็นแบคทีเรียกรัมลบเป็นส่วนใหญ่ (ร้อยละ 74.1) ภาวะแทรกซ้อนที่พบบ่อยคือภาวะชีด ซึ่งต้องการการรักษาถึงร้อยละ 58 ถึงแม้ได้รับยาปฏิชีวนะที่รวดเร็ว และการรักษาประคับประคองที่เหมาะสม อัตราตายก็ยังสูงถึงร้อยละ 32.2 อาจมีสาเหตุจากเชื้อก่อโรคนี้เกิดการต้อขามากขึ้น การประเมินวิธีการให้การรักษาพยาบาลทารกป่วยหนัก และการใช้ยาปฏิชีวนะในทารกเหล่านี้ จะช่วยลดอัตราตายของทารกลงได้

ABSTRACT

Three hundred thirty-eight episodes of severe systemic infections in neonatal ward were analysed between 1987 and 1990. An incidence of 15.2: 100 admissions or 10.4: 1000 live births of neonatal infection were documented. There were 57.4% (194 episodes) of neonatal septicemia, 34.3% (116 episodes) of clinical sepsis and 8.3% (28 episodes) of congenital pneumonia during the period. Sixty-two per cent were male and 53.8% were premature infants. Sixty-seven per cent were low birth weight with 22.8% had birth weight less than 1500 g. Only 58.9% were in the high risk group for infections. Twenty-seven per cent of cases had surgical problems which needed operation. Most common underlying condition was hyaline membrane disease. Gram negative bacilli were still the most common causative agent. Anemia was the common complication.

Eventhough prompt antibiotics administration and appropriated supportive management, the mortality rate was still high (32.2%). Increasing multiply resistant strain of bacteria is considered to be a problem. Further evaluation of the role of neonatal management including antibiotics usage may decrease the mortality rate.

INTRODUCTION

The incidence of neonatal septicemia varies from 1-10 per 1000 live births, depend on the geographical area. Increasing in the incidence is found in the infants of high risk pregnancy and prematurity. Though during the past decade the importance of methicillin-resistant *Staphylococcus aureus* (MRSA) and *Staphylococcus epidermidis* as the causes of nosocomial infection in newborns has been reported⁽¹⁻⁵⁾. Gram negative bacilli septicemia were still a problem, as the outbreak of *Klebsiella pneumoniae* septicemia occurred in neonatal unit, Srinagarind Hospital during 1987-1989 which there

were another organisms that caused neonatal septicemia as well. At that time there were many newborn infants who need antibiotics administration. This study was undertaken to describe the incidence of severe neonatal infection, causative agents, clinical manifestation and also its outcome during 1987-1990.

MATERIAL AND METHODS

The neonatal unit consisted of 30 cribs (including incubators). The floor space for each incubator in the critical care area were too small. Because of modifying the part of the neonatal ward to be the critical care area so architecture and nursing staff patterns were not reach the current guidelines of the American Academy of Pediatrics⁽⁶⁾. Episodes of neonatal infection were identified by reviewing the medical records of infants in neonatal unit from January 1, 1987 to December 31, 1990.

The medical records included those were diagnosed as neonatal septicemia, clinical sepsis and congenital pneumonia.

Neonatal septicemia : positive blood culture in clinically ill patients

Clinical sepsis : clinical signs suggested sepsis with negative blood culture

Congenital pneumonia : respiratory distress within 24 hours of life with positive chest x-ray but negative blood culture

The incidence of neonatal infection based on the number of episodes per 100 admitted cases during the study period. Cause of death was considered to be sepsis if positive blood culture within 48 hours before death or immediately after death. The patient with growth of the same pathogenic

microorganisms from several blood specimens from the same episode were included only once.

STATISTICAL ANALYSIS

Univariate comparisons of continuous variables were performed with the two-tailed Student t-test and categorical variables were compared by chi-square test with Yates correction.

RESULTS

During these four years, 310 cases had been studied with 338 episodes of severe infection, twenty-three cases developed 2-3 episodes with 4 episodes in one case. There were 194 episodes of positive blood culture of 2,227 admitted cases during this period, 83 positive blood culture inborn infants of 16,198 live births in Srinagarind hospital. Therefore neonatal septicemia rate was 5.1:1000 livebirths or 8.7 per 100 admitted cases.

The following data were analysed based on the 338 episodes of severe infectious conditions. Sixty-two per cent (209/338) were male and 66.9% were low birth weight infants with 22.8% (77/338) had birth weight less than 1500 g. Fifty four per cent were preterm infant (less than 37 weeks gestation). Nearly sixty per cent were early onset infections of less than 5 days of age at onset. The overall mortality rate from infections was 32.2% as shown in Table 1. There were 194 episodes (57.4%) of septicemia, 116 episodes (34.3%) of clinical sepsis and 28 episodes (8.3%) of congenital pneumonia.

Fifty-nine per cent of the cases had predisposing factors related to infection such as preterm delivery (46.7%), premature rupture of membrane (PROM)>24 hours (17.1%) with only 3 cases had chorioamnionitis and only 4% had the history of maternal fever (Table 2).

The details of clinical manifestation were shown in Table 3 of which lethargy and poor feeding were the most common sign and symptom. More

than half of the patients had rectal temperature $< 36.5^{\circ}\text{C}$. Nearly 60% had respiratory symptoms varied from dyspnea to cyanosis. About one-third of the cases developed apnea by the time of admission. There were 36% of hyperbilirubinemia of unknown causes. Twenty-three per cent had septic shock within 48 hours of admission. Sclerema and pulmonary hemorrhage indicated the poor prognostic signs were found in 15%.

Table 1 Demographic features of neonatal infections.

Total cases (no.)	310
Total episodes (no.)	338
Male : female	209:129
Mean birth weight \pm SD (g.)	2164.17 \pm 790.09
Mean gestational age \pm SD (wk)	35.3 \pm 4.3
Birth weight $<$ 2500 g	226 (66.9%)
Birth weight $<$ 1500 g	77 (22.8%)
Gestational age $<$ 37 wk.	178 (53.8%)
Dead from infection	109 (32.2%)

Table 2 History of predisposing factors related to infection.

	NO. (%)
Preterm delivery	93 (46.7)
*PROM>24 hrs	34 (17.1)
Perinatal distress	13 (6.5)
Meconium stained amniotic fluid	8 (4.0)
Maternal fever/genital tract infection	8 (4.0)
Chorioamnionitis	3 (1.5)
Others	40 (20.2)
Total	199 (100.0)

PROM : Premature rupture of membrane

* 1 episode : PROM+preterm labor+maternal fever

1 episode : PROM+maternal fever+maternal genital tract infection

Table 3 Clinical manifestation of infected neonates.

Clinical manifestation	%
Lethargy	72.5
Poor feeding	71.7
Hypothermia	58.3
dyspnea	58.0
Fever	39.0
Hyperbilirubinemia	36.0
Abdominal distention	31.4
Apnea	30.7
Cyanosis	30.4
Septic shock	22.9
Irritability	18.3
Sclerema	15.0
Pulmonary hemorrhage	14.5

Only 194 in 338 episodes (57.4%) were positive blood culture. Most of the etiologic causes were gram negative bacilli (74.1%) eg. Klebsiella, Acinetobacter, Pseudomonas species, Escherichia

coli, and Enterobacter. Gram positive cocci were found only 23.7% that included seven cases of beta streptococci infection as shown in Table 4. Table 5 showed infectious and non-infectious complications.

Table 4 Causative agents of neonatal septicemia

	NO.(%)		NO.(%)
Gram negative bacilli	166 (74.1)	Gram positive cocci	53 (23.7)
Klebsiella species	78 (34.8)	Methicillin resistance <i>Staphylococcus epidermidis</i>	16
Pseudomonas species	25 (11.2)	<i>Staphylococcus coagulase negative</i>	14
Escherichia coli	22 (9.8)	Methicillin resistance <i>Staphylococcus aureus</i>	5
Acinetobacter species	20 (8.9)	<i>Staphylococcus coagulase positive</i>	5
Enterobacter	13 (5.8)	Group B Streptococci	4
Aeromonas	3 (1.3)	α Streptococcus	1
Citrobacter	3 (1.3)	β Streptococcus	3
Providencia	1 (0.4)	γ Streptococcus	2
Proteus	1 (0.4)	Enterococci	3
		Fungus	5 (2.2)
		Yeast	2
		<i>Candida albicans</i>	1
		<i>Candida tropicalis</i>	1
		<i>Candida stellatoid</i>	1

Table 5 Complications

Infectious	%	Non-infectious	%
Pneumonia	40.1	Anemia	54.6
Septic shock	28.0	Hyponatremia	44.7
Meningitis	11.6	Hyperglycemia	35.5
Conjunctivitis	10.3	Hyperbilirubinemia	35.2
Infected wound	10.0	Azotemia	16.7
UTI	8.3	Polycythemia	14.3
Omphalitis	5.3	Hypoglycemia	13.1
Abscess	4.4	Hypocalcemia	11.0
Moniliasis	4.1	PDA	11.0
Ventriculitis	1.5	BPD	5.3
Empyema	1.5	IVH	4.7
Septic arthritis	0.6	Hypomagnesemia	0.3
Osteomyelitis	0.3		

DISCUSSION

The average perinatal mortality rate and early neonatal mortality rate were 8.4:1000 deliveries and 3.6 : 1000 livebirths respectively in Srinagarind Hospital during 1987-1990. Neonatal septicemia was the first leading cause of early neonatal death at that time.

Srinagarind Hospital is the referral hospital of the upper part of north-eastern region of Thailand. Though the referred cases were 22.7% of all admitted cases but severe infectious conditions were one half compared to inborn infants.

In this study, prematurity was found in 53.8% and hyaline membrane disease of 72 cases (28.2%) surgical problems of 69 cases (27.0%); these infants were frequently subjected to multiple invasive procedures that increased the risks of infection.

The most common infectious complications was pneumonia which is found in 40.1%, the other complications included meningitis (11.6%) conjunctivitis (10.3%), infected wound (10.0%) and urinary

tract infection (8.3%). The rare but serious complications were ventriculitis (1.5%) septic arthritis (0.6%) and osteomyelitis (0.3%).

Most abnormal conditions found was anemia (of any causes included iatrogenic). The second most common associated conditions were metabolic abnormalities including hyponatremia (44.7%), hyperglycemia (35.6%) and azotemia (16.7%). Patent ductus arteriosus (PDA) was found only 10.9% and bronchopulmonary dysplasia (BPD) was 5.3%.

Concerning the supportive management, the infants needed respiratory support in 73.4% of which 75.5% was mechanical ventilation. Exchange transfusion was used for the management of disseminated intravascular clotting (DIC) in nearly one-fifth of the cases. Fifty-eight per cent of the infants had low hematocrit level that needed pack red cell transfusion.

Apart from antibiotics usage of penicillin G and gentamicin for the first combination drug of choice, the second regimen included cloxacillin or ampicillin combined with aminoglycosides such as

gentamicin and amikacin were also used. The third generation cephalosporin such as cefotaxime and ceftazidime were used in 17.7 and 12.9% respectively. Imipenem was used only in the case of multiply resistance strain septicemia (10.5%).

The patient should be treated according to the unit's antibiotic policy rather than its own surveillance culture. Caution should be exercised in making decisions about antibiotic treatment based on colonization patterns in neonatal units⁽⁷⁾. One study suggested that routine surveillance cultures were not helpful in predicting and managing pneumonia of late onset⁽⁸⁾.

The high mortality of 32.2% should be considered for the usage of imipenem for severe cases which can be multiply-resistant bacterial infection in order to decrease the mortality.

CONCLUSION

This study reported the incidence of severe neonatal infections. Neonatal septicemia was the main problem in neonatal unit, Srinagarind hospital during 1987-1990. Beware of nonspecific symptoms such as lethargy and poor feeding especially in preterm infants and prompt antibiotics administration with appropriate supportive treatment will decrease the mortality rate for those severe infected infants.

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