Pattern of neonatal septicemia in a Malaysian Maternity Hospital

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Summary

Over a 12 months period, out of 25,411 livebirths, 155 neonates (6.1 per 1000 livebirths) had proven septicemia by blood culture. The mortality rate was 26.5%. Septicemia was more common among the very low birthweight and preterm neonates of gestation of 30 weeks or less. 45.8% of the septicemia occurred during the first 48 hours of life. Staphylococcus epidermidis was the most common causative organism. However, mortality was highest among neonates who acquired multiresistant nosocomial infection during the later part of neonatal life.

Key words: Septicemia, neonates, Malaysian.

Introduction

Neonatal septicemia or sepsis neonatorum is defined as "a disease of infants who are less than one month of age, are clinically ill, and have posive blood cultures".[1] It is an important cause of neonatal mortality and morbidity. There have been numerous studies on the incidence, pattern[2,3,4,5,6] and perinatal risk factors[7] of neonatal septicemia in different countries. These periodic review of cases help to detect changes in the incidence and etiology of this common neonatal condition. Knowledge of the current pattern of neonatal septicemia is important for preventive work and as guideline for the initial choice of antibiotics on sick neonates in each respeetive neonatal unit where monitoring is carried out.

The objectives of our study were to determine: 1) the incidence of septicemia among neonates born in the Maternity Hospital, Kuala Lumpur before they were discharged home, 2) the age of the neonates at which septicemia was diagnosed before discharge, and 3) the common organisms which caused neonatal septicemia in our hospital.

Methodology

This was a prospective study which was carried out over a 12 month period between July 1986 and June 1987.

It was the standard practice in the Maternity Hospital, Kuala Lumpur to carry out full septic work-up on any neonates suspected clinically to have septicemia. Before antibiotics were commenced, a specimen of blood was collected for culture from the peripheral vein of the neonate. The procedure was carried out by sterile technique after skin preparation of the venous puncture site with a 2% iodine solution.

A neonate was suspected clinically to have septicemia when the following conditions were present: there might be a history of foul smelling liquor, and/or intrapartum maternal pyrexia, and the neonate had temperature instability or presented with any of the features such as lethargy, respiratory distress, poor feeding, vomiting, diarrhoea, recurrent apnoea, hepatosplenomegaly, abdominal distension or bleeding tendency.

Specimens of blood were also taken for culture, by direct cardiac puncture with sterile technique, immediately from all neonates who died in the hospital.

During the study period, the records of all neonates with positive blood culture were reviewed within a few days after the results were known. A neonate was diagnosed to have septicemia if positive blood culture was associated with clinical signs suggestive of infection. Septicemia was considered to be the cause of death when there were clinical features suggestive of infection present before death and organisms were isolated from the cardiac blood cultures.

Only neonates who fulfilled the criteria for the diagnosis of septicemia were included in the study. Septicemia was defined to be early onset when it occurred during the first two days of life, intermediate when it occurred between days three and seven, and late onset when more than seven days.

Results

During the 12 month period, 25,411 livebirths were delivered in the hospital. 2,592 neonates (102 per 1000 livebirths) were admitted to the Special Care Nursery of the Hospital. 155 neonates (6.1 per 1000 livebirths) had proven septicemia by blood culture. The incidence of septicemia in the special care nursery was six per 100 admission. 41/155 (26.5 %) died from the infection. Septicemia was more common among the very low birthweight babies (Table 1) and the preterm, especially those babies whose gestation age was 30 weeks or less (Table 2). Neonates delivered by the different modes of delivery and affected by septicemia included: spontaneous vertex delivery 95/1525 (6.2%) of neonates, lower segment Caesarean section 39/647 (6%), and breech delivery 13/186 (7%), forceps delivery 5/107 (4.7%) and vacuum extraction 3/127 (2.4%). Despite instrumental manipulations, babies born by forceps and vacuum extraction contributed to only a low proportion of neonates wich infection.

Forty five point eight percent of the septicemia neonates were found to be infected in the first 48 hours of life (Table 3). However, mortality rate was highest in neonates who acquired infection at an age of more than seven days. Staphylococcus epidermidis was by far the most common cause of septicemia (Table 4), followed by Klebsiella, Acinetobacter and Enterobacter. Flavobacterium meningosepticum was isolated from six neonates. Group B hemolytic Streptococcus was cultured from the blood of two babies during the first 48 hours of life. All the Group B hemolytic Streptococcus isolated were sensitive to penicillin while this was true only in 83% of the Staphylococcus epidermidis isolated. Sixty six percent of the Staphylococcus aureus and more than 50% of the Klebsiela species (52.9%), Enterobacter species (55%) and Escherichia coli (100%) were multiresistant to the common antibiotics including penicillin, ampicillin, cloxacillin and gentamicin. Flavobacterium meningosepticum was sensitive only to rifampicin, erythromycin and novobiocin.

Mortality was highest among neonates with septicemia caused by the gram negative organisms: Escherichia coli, Klebsiella, and Flavobacterium meningosepticum.

Table 1

Number of neonates admitted to SCN with septicemia, according to birthweight distribution, July 1986 – June 1987

	neonates admitted to SCN	neonates with septicemia	
birthweight (grams)	no.	no.	(%)
<1500	232	41	(17.7)
1500–2499	719	53	(7.4)
2500 and above	1641	61	(3.7)
Total	2592	155	(6.0)

Table 2

Number of neonates admitted to SCN with septicemia, according to gestation distribution, July 1986 – June 1987

	neonates admitted to SCN	neonates with septicemia	
gestation (weeks)	no.	no.	(%)
<30	105	22	(20.1)
31–33	165	27	(16.4)
34–<37	362	38	(10.5)
37–42	1880	66	(3.5)
>42	80	2	(2.5)
Total	2592	155	(6.0)

Discussion

Compared with figures from centers in the developed countries where neonatal septicemia occurred in less than 5 per 1000 livebirth,[2,3,5,6] our hospital had a rather high incidence. This difference could be partly explained by our large number of deliveries which had to be handled by the limited number of staff and facilities in this hospital.

Contrary to the findings in many centers, Group B hemolytic Streptococcus was not a common cause of septicemia among our neonates. As there is no local figures on the maternal high vaginal swab culcutes, this low incidence cannot be explained. However, the Group B hemolytic streptococcus caused early onset septicemia in our neonates as was found elsewhere.[8]

The most common causative organism in our hospital was Staphylococcus epidermidis. Our result was similar to the findings reported by Battisti et al.[3] This organism was responsible

Table 3

Age of neonates when bacteremia was first diagnosed from blood cultures, July 1986 – June 1987

Age of neonates when bacteremia was diagnosed	neonates with bacteremia		neonates who died from bacteremia		case fatality rate*
(days)	no.	(%)	no.	(%)	
1–2	71	(45.8)	15	(36.6)	21.1
3–7	51	(32.9)	12	(29.3)	23.5
>7	33	(21.3)	14	(34.1)	42.4
Total	155	(100)	41	(100.0)	26.5

*Case fatality rate = death/cases x 100

Table 4

Outcome of neonatal septicemia in relation to age of onset of disease in Maternity Hospital, K. L. (July 1986 – June 1987)

Causative organism	Age of septicemia						Total number of babies infected	
	day 1 – day 2			>day 2				
	cases	deaths		cases	deaths			
	no.	no.	(%)	no.	no.	(%)	no.	(%)
Staph epidermidis	27	7	(25.9)	20	2	(10.0)	47	(30.3)
Staph. aureus	5	0	(0.0)	7	2	(28.6)	12	(7.7)
Gp. A streptococcus	1	0	(0.0)	0	0	(0.0)	1	(0.6)
Gp. B streptococcus	2	1	(50.0)	0	0	(0.0)	2	(1.3)
Gp. D streptococcus	2	0	(0.0)	0	0	(0.0)	2	(1.3)
Escherichia coli	2	2	(100.0)	7	4	(57.1)	9	(5.8)
Klebsiella	5	3	(60.0)	15	7	(46.7)	20	(12.9)
Pseudomonas	7	1	(14.3)	4	1	(25.0)	11	(7.1)
Acinetobacter	3	0	(0.0)	15	3	(20.0)	18	(11.6)
Enterobacter	6	1	(16.7)	11	4	(36.4)	17	(11.0)
Flavobacterium	1	0	(0.0)	5	3	(60.0)	6	(3.9)
Bacillus	6	0	(0.0)	0	0	(0.0)	6	(3.9)
Others	4	0	(0.0)	0	0	(0.0)	4	(2.6)
Total	71	15	(21.1)	84	26	(31.0)	155	(100)

for both the early and late onset septicemia in our nursery. Studies done elsewhere had suggested that one of the main contributing factors to the high incidence of coagulase-negative staphylococcal sepsis was the use of invasive procedures on neonates, such as centrally located catheters for the administration of total parenteral nutrition, endotracheal tubes, and mechanical ventilation.[9,10] We did not use central lines for total parenteral nutrition in our nursery. However, because of the large number of small babies we had, we did need to intubate and ventilate many of them. This could partly explain our high incidence of Staphylococcus epidermidis septicemia.

The high mortality rate caused by the gram negative organisms which affected the neonates later was due to the fact that they were nosocomial infection and were multiresistant to the common antibiotics used.

As the data were being collected, efforts were taken all the time to try to reduce the rate of the septicemia. These included: increasing hand washing facilities in the nursery, strict adherence to avoid sharing articles among neonate (such as thermometers), use of sterile equipment during resuscitation, and continuous staff education in infection prevention. The monthly trend showed that we had succeeded to a certain extent although still more could be done.

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