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Research Article

RISK FACTORS AND CLINICOBACTERIOLOGICAL PROFILE OF EARLY ONSET NEONATAL SEPSIS

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Abstract:

Aim: To examine the risk factors and the clinical-bacteriological profile of early sepsis in newborns in the neonatal intensive care unit.

Study Design: An observational / descriptive.

Place and duration: In the Pediatric Unit II of Services Hospital Lahore for one year duration from March 2019 to March 2020.

Material and methods: Relevant data of maternal risk factors was collected by taking history from mothers and consulting their case records. All infants developing clinical signs/symptoms of sepsis within 7 days of birth with positive blood cultures or supported by at least 2 laboratory parameters were diagnosed to have early onset neonatal sepsis (EONS). Data was analyzed by using SPSS version 19.

Results: Among 2620 live births, 82 neonates were diagnosed as a case of EONS (Incidence 31.3/1000 live births), female to male ratio was 1:1.5 and maximum numbers of cases were in 0-3 day's age group (54.8%). Majority of cases (60.9%) came from low socioeconomic group. Among neonates with EONS 48.8% & 75.6 were low birth weight and preterm respectively. Culture proven cases were only 17.1%. It is noted that among those who developed EONS 71.9% were neonates considered to be at risk for sepsis due to presence of maternal and neonatal risk factors. Prolonged rupture of membranes and foul smelling liquor were the most significant perinatal risk factors. The most important comorbidities were Hyperbilirubinemia (26.8%), metabolic acidosis (19.5%) & DIC (14.6%). In this study, the mortality rate was 7.3%. *Klebsiella pneumoniae* and *Pseudomonas* were the commonest causative organisms found in culture positive cases (42.8%).

Conclusion: Information on the detection of risk factors and the clinical and bacteriological profile of EONS can lead to early diagnosis and rapid therapeutic interventions that minimize mortality and morbidity in newborns.

Key words: early neonatal sepsis, risk factors, low birth weight, early

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INTRODUCTION:

Neonatal septicemia consists of bacteremia, which produces a constellation of symptoms caused by microorganisms or toxic products in the circulation that occur in the first month of life. The terms early neonatal sepsis and late neonatal sepsis refer to the age of onset sepsis in the neonatal period, for example sepsis that occurs before and after 1 week of life. Neonatal septicemia is one of the main causes of neonatal morbidity and mortality. The culturally proven occurrence of sepsis in developed countries ranges from 1 to 8 per thousand live births. In Asian countries, the reported incidence of neonatal sepsis ranges from 7.1 per thousand live births to 37.2 per thousand live births. Early infections occur before or during delivery. The age of onset depends on the vertical transmission time and the virulence of the infected organism. Early purulent infections such as group B streptococci are usually clinically apparent in the first 24 hours of life. Early neonatal sepsis may occur due to an increased number of infections after rupture of the membranes, during the child's passage through the infected birth canal or during resuscitation. Periodic children have a higher incidence of sepsis than periodic children. The gender difference is less pronounced in premature babies and infants with low birth weight. The incidence of sepsis attacks in newborns increases significantly in infants with low birth weight, leading to maternal vasculitis, congenital immune defects, asplenia, galactosemia (*E. coli*) and high bacterial inoculum (obstructive uropathy). . When the mother is a risk factor, such as prolonged rupture of the membrane or fetid fluid, sepsis is usually performed, although the newborn may be asymptomatic shortly after birth. Even if neonates do not have an identifiable maternal risk factor, early onset sepsis may develop. The pattern of causative pathogens is also different in different places and can change over time in the same place⁸. Early treatment with appropriate antibiotics can minimize the risk of severe morbidity and mortality, as well as the emergence of multiple drug resistant organisms through the rational use of antibiotics in neonatal intensive care units. This study was conducted to assess the relationship between maternal and neonatal risk factors with the clinical-bacteriological profile of early neonatal sepsis.

MATERIALS AND METHODS:

This descriptive study was conducted in the Pediatric Unit II of Services Hospital Lahore for one year duration from March 2019 to March 2020. Relevant data of following maternal risk factors was collected from mothers by taking history and consulting their case records.

1. Prolonged membrane rupture for 18 hours.
2. Dai management in unsanitary conditions.
3. Foul smelling liquor

4. Mother's urinary tract infection 2 weeks before delivery.

5. Perinatal pyrexia

For the purposes of the study, all children were identified who had 2 or more of the following clinical sepsis symptoms within 7 days of birth.

1. Irregular body temperature (hypothermia / hyperthermia).
2. Respiratory disorders (observation / bradycardia / apnea).
3. Drowsiness, irritability, anxiety, weak or sharp crying.
4. Poor feeding or sucking.
5. Vomiting, diarrhea, flatulence.
6. Poor perfusion, cyanosis, mottling, pallor.
7. Hypoglycemia or hyperglycemia.
8. Bradycardia, tachycardia or shock.
9. Sunken, bulging or pulsating fontanel.
10. Seizures, tremors or irritability.

Of these cases, with suspected early sepsis in neonates, only a study in which clinical suspicion was confirmed by positive blood cultures or at least 2 or more of the following laboratory parameters was included.

1. Peripheral white blood cell number (WBC) > 20,000 / mm³
- a. <5000 / mm³
2. Absolute neutrophil count <1000 / mm³
3. Highly immature neutrophil (> 25%)
4. Band neutrophil ratio of 0.2 or higher
5. High ESR (> 15 mm1 h)
6. C-reactive protein (PCR)> 6 mg / dl
7. Examination and culture of cerebrospinal fluid (only in cases of suspected CNS infection).
8. Children who had taken antibiotics before the chest x-ray in the ICU with infection detected were excluded from the study.

Neonates who had already been given antibiotics prior to the admission in NICU were excluded. Samples of blood were collected from all the suspected cases of early onset neonatal sepsis for culture and other above mentioned laboratory parameters. Chest X-ray was included in routine investigations in these cases. Socioeconomic status was assessed by modified method of Kappuswami. Data was analyzed by using SPSS version 19. Results were described through percentages, frequencies, ratios and P value.

RESULTS:

During the study period, among newborns 2,620 live births, 82 newborns were diagnosed with early neonatal septicemia, with a frequency of 31/1000 live births. The ratio of women to men was 1: 1.5, the maximum number of cases occurred in the age group from 0 to 3 days (54.8%); 45.2% were in the age group of 4 to 7 days. 60.9% belonged to the low, 36.8% to the medium, and 2.3% to the high socio-economic group. A statistically significant

relationship was found between early neonatal sepsis and low socioeconomic status. The frequency of early sepsis in newborns is much higher in premature babies and infants with low birth weight. Early neonatal sepsis has been proven in culture in 14 newborns, which is 17.1% of total early neonatal sepsis. Of a total of 206 newborns whose potential maternal risk factor was associated with sepsis, 48 (23.3%) developed early-onset neonatal sepsis, while those without these factors had only 34 (1.4 %). It should also be noted that among those who developed neonatal septicemia early, 59 (71.9%) were infants considered to be at risk of sepsis, and

among the cases confirmed in terms of culture, this percentage was as high as 84%. In this study, the most common symptoms of neonatal sepsis in the early stages were respiratory distress and poor nutrition, corresponding to 48 (58.5%) and 20 (24.4%) cases, respectively. The most important comorbidities in infants with early neonatal sepsis were hyperbilirubinemia (26.8%), metabolic acidosis (19.5%) and DIC (14.6%). The positivity of the culture had no significant effect on the incidence of various diseases, with the exception of metabolic acidosis and DIC, which were more likely in culture positive and negative cases, respectively.

TABLE 1: - Neonatal risk factors in Early Onset Neonatal Sepsis (n = 2620)

Neonatal factors	Total No.	No. of cases	%
Low birth weight (1500 – 2499 Gms)	380	40	10.5
Very low birth weight (1000 – 1499 Gms)	76	12	15.8
Extremely low birth weight (< 1000 Gms)	11	6	54.5
Preterm* (Gestational age less than 37 weeks)	291	62	21.3
Male gender	1070	49	4.6

Six newborns with early sepsis in newborns died, with a death rate of 7.3%, while among culturally positive cases, 3 died, the mortality rate was 21.4%, which was significantly higher than culture-negative cases. Among the culturally positive cases of neonatal sepsis with early onset, the most common organisms were Klebsiella pneumonia (21.4%) and Pseudomonas (21.4%), the other organisms found on culture were Staphylococcus-aureus (14.3%), E. coli (14.3 %), group Streptococci B (14.3%) and Staphylococcus-epidermidis (14.3%).

TABLE 2: - Maternal Risk Factors in Early Onset Neonatal sepsis (n = 206)

Risk Factors	Total No.	No. of cases EONNS	%	P. value
Prolonged rupture of membranes	124	33	26.6	0.04
Foul smelling liquor	36	8	22.2	0.002
Dai handling under unhygienic condition	26	3	11.5	0.08
Peripartum pyrexia	21	2	9.5	0.56
Urinary tract infection	14	2	14.3	0.002

TABLE 3: - Morbidity and Mortality among infants with Early Onset Neonatal Sepsis

Morbidity and mortality	Early onset neonatal sepsis	
	Total n=82 (%)	Culture positive n=14 (%)
Deaths	06 (07.3)	3 (21.4)
Metabolic acidosis	16 (19.5)	5 (35.7)
DIC*	12 (14.6)	4 (28.5)
Pneumothorax	04 (4.8)	2 (14.3)
Necrotizing enterocolitis	06 (07.3)	1 (07.1)
Hypoglycemia	09 (10.9)	1 (07.1)
Intraventricular hemorrhage	01 (01.2)	-
Hyperbilirubinemia	22 (26.8)	-
Meningitis	07 (08.5)	2 (14.3)

• Common endovascular coagulation

TABLE 4: - Culture profile of Early Onset Neonatal Sepsis (n = 14)

Organism	No. of cases	%
KlebsiellaPneumoniae	3	21.4
Pseudomonas	3	21.4
S. aureus	2	14.3
E. coli	2	14.3
Group B Streptococcus	2	14.3
S. epidermidis	2	14.3

DISCUSSION:

The overall incidence of early-born sepsis in 31.3 / 1000 live births in this study is significantly higher than 20.7 / 1000 live births and 20.15 / 1000 live births reported from India, but data from Pakistan on the other hand are from 14 up to 63/1000 live births. The proven incidence of early sepsis in newborns in 5.3 / 1000 live births is similar to 5.6 / 1000 live births reported from Karachi Punjab. Studies from developed countries report a lower incidence of sepsis in newborns (1-8 / 1000 live births), representing 58% of early-stage sepsis in newborns. This significant fluctuation in the incidence of early sepsis in newborns reflects not only the difference in predisposing factors, population characteristics and the availability of healthcare facilities, but also in the definitions used.

Neonatal septicemia is more prone to development in male newborns than in women, especially in gram-negative organisms. In this study, we observed a higher incidence of sepsis in newborns in men. Betty Chacko and Somanet et al. They noted that 83.3% and 83% of people with sepsis had a low birth weight, comparable to our observation, i.e. 63.4%. The neonatal study network reported that only 1.9% of children with MBPN showed sepsis in 5.3% of Indian studies, compared to 3.6% in this study. In a study in India, prematurity accounted for 80.6% of early neonatal sepsis, while in this study the proportion was slightly lower (75.6%). Neonatal septicemia is generally considered to be the result of various maternal and neonatal risk factors. In this study, maternal and neonatal risk factors were observed in 71.9% of cases, 77.8% from Indian Punjab and 30% from southern India. As seen in this study, the most important risk factors reported by Oddiet al were premature and membrane rupture 18 hours before delivery. A similar relationship was observed between maternal urinary tract infection and neonatal septicemia in the early stages, as described by Bhutta and Yusaf. Due to the lack of maternal risk factors, the incidence of neonatal sepsis in the early stages is very low (i.e. 0.4 to 4.8%), although there are several high-risk factors for newborns such as low birth weight and prematurity. Therefore, when conducting sepsis in an asymptomatic child, neonatal factors are not

taken into account by themselves. According to the National Neonatal Perinatal Database 2000 report, the usual presentation of early sepsis in newborns is with respiratory failure and pneumonia. Respiratory disorders (58.5%) and malnutrition (24.4%) were the most common presentations in this study. In the current study, the culture positivity index was 17.1%. Take this situation, Chacko et. It was significantly lower than 43.1% in India. Klebsiella Pneumoniae and Pseudomonas (21.4% each) were the most isolated organisms, as reported by Talluret and Chacko et al. In the current study, Staphylococcus aureus only accounts for 14.3%; this is comparable to 13.3% reported in the Indian survey. In the West, group B streptococci (GBS) are the most common isolated microorganism (26.2%), followed by S. epidermidis, E. coli and S. aureus, E. coli, S aureus and S. unlike current studies of group B streptococci epidermis was 14.3%. In this study, case mortality was 7.3%, as was 7.6% mortality reported from the West, and case mortality reported in two different Indian studies was significantly lower than 19.4% and 16.7%.

CONCLUSION:

Early detection of the case and immediate use of appropriate antibiotics as well as intensive care of the newborn can contribute to low mortality. The presence of maternal risk factors requires the detection of early neonatal sepsis. In addition, it was found that their knowledge of causative organisms and their sensitivity to antibiotics are very important in the most rational use of antimicrobials.

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