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RISK FACTORS & CLINICO-BACTERIOLOGICAL PROFILE OF EARLY ONSET NEONATAL SEPSIS

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Abstract:
Aim: *To investigate the risk factors and the clinical-bacteriological profile of early neonatal sepsis in the neonatal intensive care unit.*
Study Design: *observational / descriptive.*
Place and duration: *In the Pediatric Unit-II of Jinnah Hospital Lahore for one-year duration from April 2019 to April 2020.*
Material and Methods: *Relevant data on maternal risk factors was collected by collecting maternal histories and consulting their case files. All infants who develop clinical signs of sepsis that are culture positive or confirmed by at least 2 laboratory parameters within 7 days of birth have been diagnosed with early onset neonatal sepsis (EONS). Data was analyzed using SPSS version 19.*
Results: *Out of 2,620 live births, 82 newborns were diagnosed with EONS (incidence 31.3 / 1,000 live births), the ratio of women to men was 1: 1.5, and the maximum number of cases was in the 0-3 days age group (54.8%). Most of the cases (60.9%) were from the lower socioeconomic group. Among newborns with EONS, 48.8% and 75.6% had low birth weight and premature babies, respectively. Culturally confirmed cases accounted for only 17.1%. It should be noted that of those developing EONS, 71.9% were neonates judged to be at risk of sepsis due to the presence of maternal and neonatal risk factors. The most important perinatal risk factors were prolonged rupture of membranes and foul-smelling liquid. The most important comorbidities were hyperbilirubinemia (26.8%), metabolic acidosis (19.5%), and DIC (14.6%). In this study, the mortality rate was 7.3%. Klebsiella pneumoniae and Pseudomonas were the most common causative organisms found in positive cultures (42.8%).*
Conclusion: *Detecting risk factors and knowing the clinical-bacteriological profile of EONS can lead to early diagnosis and rapid therapeutic interventions that minimize neonatal mortality and morbidity.*
Key words: *early-onset neonatal sepsis, risk factors, low birth weight, premature baby*

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INTRODUCTION:

Neonatal sepsis is bacteremia, which produces a constellation of signs and symptoms in the circulation, caused by microorganisms or their toxic products, during the first month of life. The terms early neonatal sepsis and late-onset neonatal sepsis refer to the age at which neonatal sepsis started, as sepsis occurring before and after 1 week of life2. Neonatal sepsis is one of the leading causes of neonatal morbidity and mortality. The overall prevalence of culturally proven sepsis in developed countries ranges from 1 to 8 cases per thousand live births. In Asian countries, the reported incidence of neonatal sepsis ranges from 7.1 per thousand live births5 to 37.2 per thousand live births. Early-onset infections are acquired either before or during labor. The age of onset depends on the time of vertical transmission and the virulence of the infecting organism. Purulent early infections, such as group B streptococci, are usually clinically apparent within the first 24 hours of life. Early-onset neonatal sepsis can occur from ascending infections after rupture of membranes, during passage of a baby through an infected birth canal, or during resuscitation. Term male infants have a higher incidence of sepsis than term infants. The gender difference is less marked in premature babies and low birth weight babies. The incidence of neonatal sepsis increases significantly in low birth weight infants with maternal inflammation of the membranes, congenital immune defects, asplenia, galactosemia (E. coli), and malformations leading to high bacterial inoculum (obstructive uropathy). Screening for sepsis is usually performed when any maternal risk factor, such as prolonged rupture or foul fluid, is present, even though the newborn may be asymptomatic soon after birth. Newborns may develop early neonatal sepsis even without any identifiable maternal risk factors. The pattern of causative pathogens also varies from site to site, and can change at the same site over time. Early treatment with an appropriate antibiotic can minimize the risk of serious morbidity and mortality, in addition to reducing the emergence of multi-drug resistant organisms in neonatal intensive care units through the rational use of antibiotics. This study was undertaken to evaluate the association of maternal and neonatal risk factors with early neonatal sepsis and the clinical-bacteriological profile of early neonatal sepsis.

MATERIALS AND METHODS:

This descriptive study was conducted in the Pediatric Unit-II of Jinnah Hospital Lahore for one-year duration from April 2019 to April 2020. Data were collected from case reports of all infants in hospital during the study period. Appropriate data on the following maternal risk factors were collected from mothers through history and case documentation.

1. Prolonged membrane breakage for ≥ 18 hours.
2. Dai handling in unsanitary conditions
3. Foul-smelling alcohol.
4. Maternal urinary tract infection within 2 weeks before delivery.
5. perinatal fever.

For the purpose of the study, all newborns presenting 2 or more of the following clinical signs of sepsis were identified within 7 days of birth.

1. body temperature irregularity (hypothermia / hyperthermia).
2.breathing irregularity (rapid breathing / sluggish breathing / apnea).
3. lethargy, irritability, restlessness, crying weakly or piercingly.
4. Poor feeding or sucking.
5. vomiting, diarrhea, abdominal distension.
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 tremors.

Of these suspected early-onset neonatal sepsis, only those for whom clinical suspicion was confirmed by positive blood culture or at least 2 or more of the following laboratory parameters were included in the study.

1.peripheral white blood cell (WBC) count > 20,000 / mm3
b. <5000 / mm3
2. absolute neutrophil count <1000 / mm3
3.High percentage of immature neutrophils (> 25%)
4. Neutrophil factor in the band of 0.2 or higher
5.High ESR (> 15mm1 hour)
C-reactive protein (CRP)> 6 mg / dL
7. Examination and culture of the cerebrospinal fluid (only in the case of suspected central nervous system infection).
8. Chest X-ray showing signs of infection

Newborns who received antibiotics prior to admission to the ICU were excluded.

Blood samples were taken from all suspected early-onset neonatal sepsis for culture and other laboratory parameters mentioned above. In these cases, a chest X-ray was included in the routine examination. Socio-economic status was assessed using the modified Kappuswami method.

Data was analyzed using SPSS version 19. Results were described in terms of percentages, frequencies, coefficients and values of P.

RESULTS:

In the analyzed period, out of 2620 live births, 82 newborns were diagnosed with early neonatal sepsis, with the frequency of 31.3 / 1000 live births. The female to male ratio was 1: 1.5, the maximum number of cases was in the 0 to 3-day age group (54.8%); 45.2% were in the 4 to 7-day age group. 60.9% belonged to the low group, 36.8% to the medium group, and 2.3% to the high socio-economic group. A statistically significant association was found between the early onset of neonatal sepsis and low socioeconomic status.

The incidence of early-onset neonatal sepsis is significantly higher in premature and low-birth weight infants. The culture showed early neonatal sepsis, which occurred in 14 newborns, accounting for 17.1% of the total early-onset neonate sepsis.

Of a total of 206 newborns with a potential maternal risk factor for sepsis, 48 (23.3%) experienced early-onset neonatal sepsis, while those without these risk factors experienced early-onset neonatal sepsis in only 34 (1.4 %). It was also noted that among those who developed early-onset neonatal sepsis, 59 (71.9%) infants were considered at risk of sepsis, and this percentage was as high as 84% of those confirmed by culture.

In this study, respiratory failure and poor nutrition were the most common symptoms of early-onset neonatal sepsis, accounting for 48 (58.5%) and 20 (24.4%) cases, respectively. The most important comorbidities in infants with early-onset neonatal sepsis were hyperbilirubinemia (26.8%), metabolic acidosis (19.5%), and DIC (14.6%). Positive culture had no significant effect on the incidence of the various diseases except metabolic acidosis and DIC which were more likely to be positive and negative, respectively.

Six newborns with early-stage neonatal sepsis died with a 7.3% mortality, while 3 of the positive cultures died, the mortality rate was 21.4%, which was significantly higher than negative cultures. Among the positive early-onset neonatal sepsis cultures, the most common organisms were Klebsiella pneumonia (21.4%) and Pseudomonas (21.4%), the rest found in culture were Staphylococcus aureus (14.3%), E. B streptococci (14.3%). and Staphylococcus epidermidis (14.3%).

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

There was a considerable overlap between preterm and different categories of low birth weight babies. Out of 291 preterm babies 11 were extremely low birth weight, 58 were very low birth weight and 162 were in low birth weight category.

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

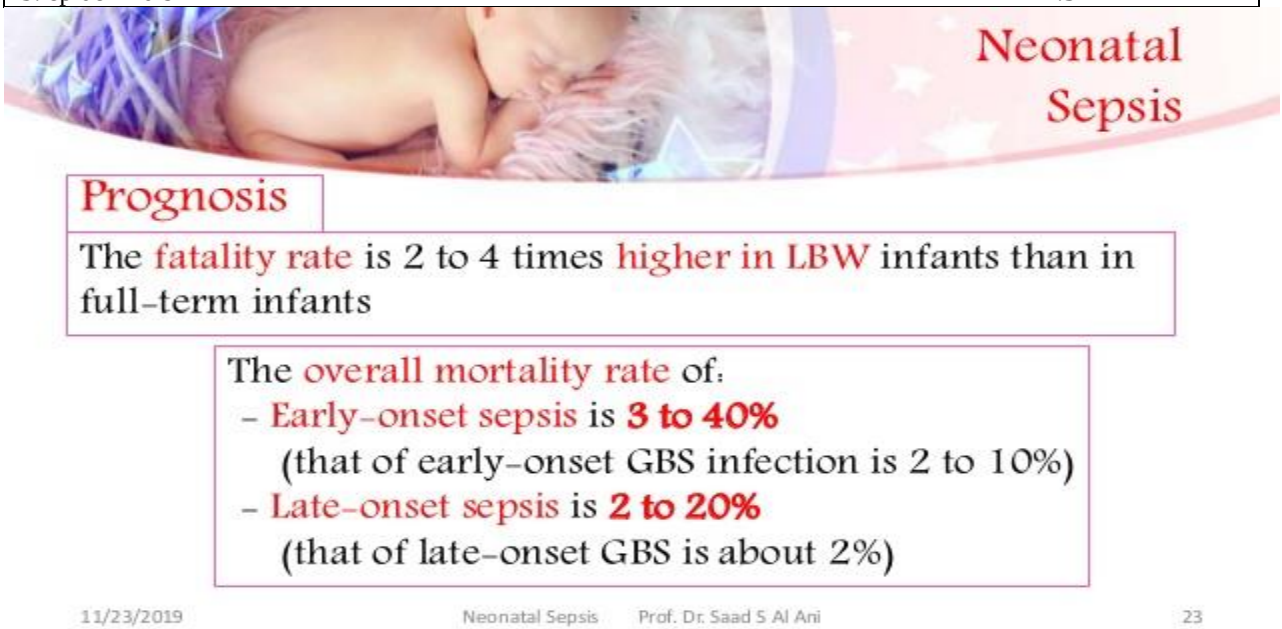
TABLE 3:- Morbidity and Mortality among infants with Early Onset Neonatal Sepsis

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)

Disseminated intravascular coagulation

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

Organism	No. of cases	%
Klebsiella Pneumoniae	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-onset neonatal sepsis at 31.3 / 1000 live births in this study is significantly higher than the 20.7 / 1000 live births and 20.15 / 1000 live births reported in India, but on the other hand, data from Pakistan fluctuates from 14 to 63/1000 live births. The incidence of early-onset neonatal sepsis confirmed by sepsis at 5.3 / 1,000 live births is similar

to the 5.6 / 1,000 live births reported in Karachi, but significantly less than 8.6 / 1,000 live births reported in the Indian Punjab and 9.8 / 1000 live births from South India. Studies from developed countries have shown a much lower incidence of neonatal sepsis (1-8 / 1000 live births), with early-onset neonatal sepsis accounting for 58% of cases. This significant fluctuation in the incidence of early-onset neonatal sepsis reflects a difference not only in predisposing factors, population characteristics and availability of health facilities, but also in the definitions used.

Neonatal sepsis is more likely to occur in male neonates than in women, especially in gram-negative organisms. This predominance of males in neonatal sepsis may be related to an X-linked immunoregulatory gene contributing to host susceptibility to infection in males. In this study, we also observed an increased incidence of neonatal sepsis in men. Betty Chacko and Somanet al observed that 83.3% and 83% of people with sepsis had low birth weight comparable to our observation, ie 63.4%. Culture-confirmed sepsis was reported in only 1.9% of VLBW infants by the Neonatal Research Network, 5.3% in the Indian study, compared to 3.6% in the present study. In the Indian study, preterm infants accounted for 80.6% of early neonatal sepsis compared to a slightly lower proportion (75.6%) in the present study.

Neonatal sepsis is generally considered to be the result of a variety of maternal and neonatal risk factors. Maternal and neonatal risk factors were observed in 71.9% of the cases in this study, as opposed to 77.8% in the Indian Punjab and 30% in southern India8. Prematurity and rupture of membranes greater than 18 hours before delivery were the most important risk factors described by Oddieet al., Which was also observed in this study.

There was an association between maternal urinary tract infection and early neonatal sepsis, similar to that reported by Bhutt and Yusaf.

In the absence of maternal risk factors, even when various neonatal high-risk factors such as low birth weight and prematurity are present, the incidence of early-onset neonatal sepsis is very low (i.e., 0.4 to 4.8%), similar to as in the Indian study. Punjab Study. Hence, neonatal factors alone are not worth considering when screening an asymptomatic infant.
According to the National Neonatal Perinatal Database 2000 report, respiratory failure and pneumonia are typical symptoms of early neonatal sepsis. The most common symptoms in this study were respiratory failure (58.5%) and poor nutrition (24.4%). The breeding positivity rate in the present study was 17.1%, which is much lower than in the Indian study 43.1% by Chackoet al. The most common organisms isolated were Klebsiella Pneumoniae and Pseudomonas (21.4% each), similar to those described by Talluret et al. And Chacko et al. Staphylococcus aureus accounted for only 14.3% in the present study, which is comparable to 13.3%. described in the Indian study. In the West, the most frequently isolated microorganism (26.2%) is Group B Streptococcus (GBS), followed by S. epidermidis, E. coli and S. aureus, in contrast to current studies where Group B Streptococcus, E. coli, S. aureus and S. epidermidis each accounted for 14.3%. The mortality rate in this study was 7.3%, which is close to the 7.6% mortality rates reported in the West and significantly lower than the 19.4% 3 and 16.7% 8 mortality rates reported in two different Indian studies.

CONCLUSION:

Early detection of cases and the immediate use of appropriate antibiotics and intensive care of newborns can contribute to low mortality.
The presence of maternal risk factors requires screening for early neonatal sepsis. It was also found that knowing the causative organisms and their sensitivity to antibiotics is very important for a more rational use of antimicrobials.

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