Course and Complications of Early Onset Nonatal Sepsis : A Descriptive Study

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Background: Neonatal sepsis is an important cause of newborn morbidity and mortality. Despite increasing knowledge of pathophysiology and upcoming novel therapeutic approaches, the mortality associated with sepsis remains high.

Objectives: To describe the spectrum of presentation and complications of early onset sepsis (EOS), and case fatality due to its major causes and complications.

Study design: Descriptive study.

Setting: Neonatology unit at Department of Pediatrics, Mayo Hospital, Lahore.

Duration of study: 1st April 2005 t0 31st March 2006.

Patients and Method: Sixty culture proven cases of early onset neonatal sepsis. Data collected through history taking, analyzing the investigations and observing the outcome of cases with the help of a questionnaire.

Results: Sixty cases of early onset sepsis suspected on clinical grounds and positive blood culture, were included. Mean age at time of presentation was 2.73 days. Thirty – seven cases (61%) presented within 48 hours of birth, while twenty – three (39%) presented from 48 hours to 7 days. Male to female ratio was 2.33:1. Twenty-five (41%) babies were delivered at home while twenty-three (39%) were delivered at private clinics and twelve (20%) at public hospitals. Forty two (70%) babies were delivered by spontaneous vaginal delivery (SVD) and eighteen (30%) babies were delivered by lower segment caesarean section (LSCS). Out of 35 babies delivered at private clinic and public hospitals, eighteen (51%) were by C-section. Reluctance to feed (65%), lethargy (48%), respiratory distress (45%), fever (36%) and seizures (15%) were most common presenting complaints. Complications observed were disseminated intravascular coagulation (DIC) (73%), respiratory failure (48%), septic shock (1.7%), meningitis (1.7%) and symptomatic hypoglycemia (1.7%). Most common cause of death was DIC, followed by respiratory failure. Case fatality rate was 40%. **Conclusion:** Early onset sepsis is a life threatening condition with an ominous course and high subsequent fatality.

Keywords: Early onset sepsis, complications, case fatality.

Introduction

The term sepsis refers to bacteremia and constellation of symptoms and sings caused by microorganisms or their toxic products in blood. Neonatal sepsis refers to occurrence of this disease during first 28 days of life. Early onset sepsis occurs from 0 – 7 days, usually during first 72 hours.[1] Early onset sepsis is caused by Group A beta hemolytic Streptococci (GBS), Escherichia coli, Enterococcus, Listeria monocytogenes and non-typable Hemophilus influenzae.[2] The organism may vary from one place to other. Prolonged rupture of membranes (> 18 hrs), maternal fever (> 37.5°C), prolonged labor, chorioamnionitis, maternal urinary tract infection, dai handling, low apgar score at birth, prematurity and low birth weight (LBW) are risk factors for early onset sepsis.[3] Clinically it manifests as lethargy, hypothermia / fever, poor feeding, pallor, abnormal cry, skin rash, vomiting, diarrhea, hypotension, respiratory distress, shock, renal failure, meningitis, acute tubular necrosis, hepatomegaly, splenomegaly and disseminated intravascular coagulation. The gold standard for diagnosing early onset sepsis is the isolation of causative organism from blood. It can be false negative because of small amount of blood sample added to culture bottle or administration of antibiotics to the mother during labour.[4]

Neonatal sepsis is an important cause of neonatal morbidity and mortality. The incidence of neonatal sepsis varies from 1 to 4 per 1000 live births in developed countries.[1] In Pakistan neonatal mortality is reported as 47.3/1000 live births.[5] Seventy three percent of these deaths occur in 1st week of life. Infections contributed 37% to neonatal mortality in another study (268 deaths out of 3005 admissions; mortality= 9% of all admissions). Eighty eight percent of these deaths occurred in early neonatal period.[6] In one study from Pakistan, neonatal mortality was 22%,[6] while in another study from Basra, Iraq, neonatal mortality was 44%.[7] Early onset sepsis was a major risk factor for bad outcome in these studies.

Objectives

The objectives of our study were:

a) To describe the presenting features and complications of early onset sepsis (EOS), and
b) to determine the case fatality related to EOS and its complications.

Patients and Methods

This study was conducted in the neonatal unit (NNU) at the

Fig. 1: *Demographic and General parameters of study cases (n = 60).*

Department of Pediatrics, Mayo Hospital, Lahore over one-year period (1st April 2005 to 31 March 2006). It was a descriptive study. The data was collected by non-probability, purposive sampling. The cases of early onset sepsis were identified by means of clinical suspicion and proved by blood culture. Neonates with low birth weight, birth asphyxia and congenital anomalies like Down syndrome, meningomyelocele, sinus tract of urinary system were excluded. Systemic complications like meningitis, septic shock, acute tubular necrosis, necrotizing enterocolitis, disseminated intravascular coagulation, pneumonia and respiratory failure were observed during hospital stay. Data were collected on a predesigned questionnaire. Different variables like age, sex, place of delivery, mode of delivery, mode of presentation, causative organisms, complications and case fatality were computed using statistical programme SPSS 10.0. Data were presented in frequency tables.

Results

1276 newborn babies were admitted in the NNU of Mayo Hospital during the study period. Sixty cases of culture proven early onset sepsis were selected. The mean age of neonates at time of presentation was 2.73 days. Early onset (within 48 hours of birth), male sex and home delivery were major risk factors (Fig. 1).

Reluctance to feed, (65%) respiratory distress (45%), lethargy (48%), fever (36%) and seizures (15%) were common presenting complaints (Table 1).

Forty one (68%) Gram – positive and nineteen (32%) Gram – negative organisms were isolated. Staphylococcus aureus was the most common isolate in twenty-one cases (36%) (Table 2).

DIC was the most common complication observed. Other complications included respiratory failure, septic shock, meningitis and hypoglycemia (Table 3). Case fatality rate was twenty-four (40%). Most common causes of mortality were DIC (sixteen – 68%), followed by respiratory failure (two – 8%).

Table 1: *Distribution of cases by major presenting complaints (n = 60).*

Complaint	Number (%)
Reluctance to feed	39 (65)
Lethargy	29 (48)
Respiratory distress	27 (45)
Fever	21 (35)
Seizures	9 (15)

Table 2: *Distribution of bacterial isolates from blood cultures (n = 60).*

	Organism	Number (%)
Gram Positive: 41 (68%)	Staphylococcus aureus	21 (35)
	Streptococcus	20 (33)
Gram Negative: 19 (32%)	Escherichia coli	9 (15)
	Pseudomonas	9 (15)
	Kleibsella	1 (1.7)

Discussion

Neonatal sepsis is one of the most common reasons for admission in neonatal units in developing countries.[8] The

Table 3: *Frequency of complications among study cases (n = 60).*

Complication	Number (%)
DIC	43 (71.7)
Respiratory failure	28 (46.7)
Septic shock	1 (1.7)
Meningitis	1 (1.7)
Symptomatic Hypoglycemia	1 (1.7)

incidence of neonatal sepsis and its mortality are quite alarming all over the world.[9] A total of 60 culture proven cases of early onset sepsis were included in this study. The diagnosis was suspected clinically and confirmed by blood cultures. The mean age at the time of admission was 2.73 days. Majority of neonates (61%) presented within 48 hour of birth. Experts have termed early onset sepsis, as infections presenting within 7 days of birth.[9] However, a trend of focusing on 1st 72 hours of life is prevalent in current references. Some authorities limit this definition to 48 hours.[10] We subdivided our patients into 2 categories, i.e. birth to 48 hours and 48 hours to 7 days. The results in this study regarding age of onset are comparable with another study done by Linda,[11] which shows that 85% of neonates with early onset sepsis present within 24 hours of birth. Sex distribution revealed a definite male preponderance (70:30). Earlier studies confirm this gender predilection.[1] Parents in our country are more concerned for their male offsprings and may not bring many sick female babies to the hospital.

Forty – one percent neonates were delivered at home and 59% at private clinics or public hospitals. Seventy percent neonates were delivered by SVD and 30% by Caesarean section. Home delivery is a risk factor for development of neonatal sepsis because of suboptimal hygienic environment of delivery rooms.[12]

Clinical manifestations of neonatal sepsis are characterized by lack of specificity[13] and may be indistinguishable from non-infections conditions. Therefore, a high index of suspicion is necessary to make an early diagnosis. Major presenting complaints of the studied neonates with early onset sepsis were reluctance to feed (65%), lethargy (48%) respiratory distress (45%), temperature instability (36%) and seizures (15%). Karthikeyan and Prekumar[14] described that lethargy and refusal to feed was present in about 50% of the cases of both early and late onset sepsis. Kadir[15] observed that GBS infections most commonly present with respiratory symptoms within few hours of birth. A study by Metzger and Kunit[16] showed that fever was common in new borns, 1 – 4 days of age, delivered by C-section. Another study by Fok and Chan showed that about 50% of the babies with proven sepsis were febrile, 15% were hypothermic while remaining were normothermic.[17] The major presenting complaints in our study were similar to those in other studies as described above.

Staphylococcus aureus was the most common isolated organism (36%) followed by Streptococcus (34%), E. coli (14%), Pseudomonas (14%) and Klebsiella (2%). The most common isolated organisms causing early onset sepsis worldwide are group B Streptococcus followed by other streptococci and E-coli.[2] Streptococcus was second most common isolated organism in this study. We could not further subtype the organism due to technical difficulties. The most common isolated organism in our study was Staphylococcus aureus, which may be due to erroneous collection and processing of samples. In a study by Akram and Arif,[18] Staph aureus was the most common gram – positive organism isolated from cases of neonatal sepsis (both early and late onset).

DIC manifests clinically in 98% cases of severe neonatal sepsis. However, the combination of clinical and laboratory confirmation of DIC are noted in only 15 – 20% of neonates with severe sepsis.[19] Since there are no facilities to measure the fibrin split products or D-dimers in our hospital, we relied upon other indirect tests like platelet count, prothrombin time and activated partial thromboplastin time. In this study, DIC was observed clinically in 73% cases but proved only in 12% cases by lab parameters. Respiratory failure is considered as one of the top ten causes of neonatal mortality.[14] In this study, respiratory failure was noted in 48% cases. In septicemia, circulatory involvement may manifest as septic shock. Septic shock manifests as tachycardia, gallop rhythm, raised jugular venous pressure and hepatomegaly.[20] In this study, clinical features of septic shock were noted in only one (1.7%) neonate. The overall incidence of symptomatic hypoglycemia in newborns is 1–3 per 1000 live birth. This incidence is increased several folds in certain high risk neonatal groups e.g. sepsis. The cause of hypoglycemia in sepsis is increased metabolic demands.[20] In this study, symptomatic hypoglycemia was observed in one (1.7%) neonate. The incidence of meningitis in newborn infants is 0.2 – 0.4 per 1000 live births. Meningitis develops in less than 20% of neonates with early onset sepsis.[21] In this study, only 1(1.7%) newborn suffered from meningitis. No early complications of meningitis were observed in this case and he was discharged.

The case fatality rate in this study was 40%, which is consistent with other studies.[6,7]. The case fatality rate in developed countries is much less than reported in studies done in developed countries[9]. The high rate of mortality in our country is attributable to unhygienic conditions of birth places, excessive dai handling, and acquisition of infection from the environment and lack of facilities. In this study, most common cause of death in neonate with EOS was DIC followed by respiratory failure.

Conclusion

Early onset neonatal sepsis is a life threatening condition with an ominous course and high subsequent fatality. The morbidity and mortality are still on the rise, especially so in

developing countries like Pakistan. A lot has to be done to change this adverse situation regarding prevention (good antenatal and natal services) and prompt treatment of EOS cases.

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