

Cross-sectional study of risk factors associated with neonatal sepsis in a tertiary care teaching hospital

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Abstract

Background: Neonatal sepsis is the term that has been used to describe the systemic response to infection in newborn infants during the first 28 days of life, which can be affected by multiple risk factors. **Objectives:** We planned this study is carried out to determine the various risk factors associated with neonatal sepsis in the neonatal intensive care unit (NICU) of this institution. **Materials and Methods:** This cross-sectional study was carried out in the NICU of Sri Siddhartha Medical College and Hospital, Tumkur, Karnataka, India. All neonates up to the age of 28 days with clinical signs and symptoms, and risk factors of suspected neonatal sepsis were included in the study. Various risk factors, clinical data and investigation findings were collected and recorded on a pretested proforma. **Results:** Out of 60 newborn babies, 35 were male and 25 were female, and 28 cases were culture positive. Pregnancy-induced hypertension, anemia during pregnancy, and premature rupture of membranes were the most common risk factors observed in our study. The most commonly associated risk factors seen in neonates with culture positive sepsis were low birth weight (89.3%) and prematurity (89.3%) ($p=0.0001$) followed by respiratory distress syndrome (42.8%). **Conclusion:** Neonatal sepsis is quiet common, especially when associated with neonatal and maternal risk factors. Prevention of risk factors, early detection of sepsis and accurate treatment go a long way in the good outcome of neonates with sepsis.

Key words: *Low birth weight, neonatal sepsis, risk factors*

Neonatal sepsis is the term that has been used to describe the systemic response to infection in newborn infants during the first 28 days of life [1]. The term “neonatal sepsis” used broadly in the clinical context encompasses diagnoses of septicemia, meningitis, pneumonia, arthritis, osteomyelitis, and urinary tract infection (UTI) in newborns [2]. Neonatal sepsis continues to be a major cause of neonatal mortality in India. As per the National Family Health Survey-3 report, current neonatal mortality rate in India is 39/1000 live births, neonatal deaths accounts for nearly 77% of all infant deaths (57/1000) and nearly half of under-five child deaths (74/1000) [3]. Some other population-based studies have reported clinical sepsis rates ranging from 49 to 170/1000 live births in rural India [4]. Incidence is not changed much over the past decade, and the fatality due to sepsis is between 30 and 65% [5].

The risk factors include lack of antenatal care, unsupervised or poorly supervised home deliveries, unhygienic and unsafe delivery practices and cord care, prematurity, low birth weight (LBW), lack of exclusive breastfeeding, low APGAR score, birth asphyxia, resuscitation during birth and delays in recognition of danger signs in both mother and baby [6-9]. It is important to know the etiology, various risk factors and

antimicrobial sensitivity patterns of organisms that cause neonatal infections in developing countries to develop effective treatment strategies and to reduce neonatal mortality [10,11]. Awareness of risk factors associated with neonatal sepsis prepares the clinician for early detection and effective treatment, thereby reducing mortality and morbidity. The present study is carried out to determine the various risk factors associated with neonatal sepsis of newborns admitted in special neonatal care unit of this institution.

MATERIALS AND METHODS

This cross-sectional clinical study was carried out for a period of 6-month on neonates, both inborn and outborn, admitted to the level-2 neonatal intensive care unit of Sri Siddhartha Medical College and Hospital, Tumkur, Karnataka, India. All neonates up to the age of 28 days with clinical signs and symptoms, and risk factors of neonatal sepsis were included in the study. Various risk factors, clinical data and investigation findings were recorded on a pretested proforma. This included the age, birth weight, gestational age, mode and place of delivery and risk factors of infection in mother like premature rupture of membrane (PROM), pregnancy-induced hypertension (PIH), perinatal fever, recent or

chronic maternal illnesses, and neonatal risk factors such as neonatal resuscitation and respiratory distress syndrome (RDS). The results were statistically analyzed using Epi Info version 3.5.3.

RESULTS

A total of 60 newborns were admitted with suspected neonatal sepsis during the study period; out of these, 35 were male and 25 were female. 13 babies were term babies and 47 babies were preterm babies. 19 babies (31.66%) were of normal birth weight (NBW), i.e. more than 2.5 kg and 30 (50%) were LBW between 2.5 and 1.5 kg, 7 (11.7%) were very LBW between 1 and 1.5 kg and one (1.7%) was extremely LBW weighing less than 1 kg.

Among 60 newborn babies, 12 babies were born to middle socio-economic status family and 48 babies were born to low socio-economic status family according to modified Kuppuswamy scale. An equal number of babies were delivered by normal vaginal delivery and by lower segment cesarean section (i.e. 30 each). The number of lower segment cesarean section was high because most of the pregnancies were high-risk pregnancy. In our study, 82.1% (23) of mothers of culture positive babies were multigravida while 17.9% (5) were primigravida. PIH, anemia during pregnancy and PROM were the most common maternal risk factors as shown in Table 1.

Out of 60 newborns, 36 (60%) were suspected to have early onset sepsis, and 24 babies (40%) were suspected to have late onset sepsis. In our study, 28 babies had culture positive sepsis. Among the 28 culture positive cases, 21 (75%) were males which are more and statistically highly significant ($p=0.01$) compared to 7 (25%) which were female babies. Out of 28 culture positive cases, 15 (53.6%) were outborn and 13 (46.4%) were inborn. The most commonly associated neonatal risk factors seen in culture positive sepsis newborns were LBW (89.3%), and prematurity (89.3%) which are statistically

Table 1: Maternal risk factors associated with neonatal sepsis

Risk factors among mothers	Culture positive	Culture negative	p value
PIH	12	10	0.35
Chorioamnionitis	1	1	0.92
Instrumentation	1	0	-
Intrapartum fever	1	1	0.92
Anemia during pregnancy	12	14	0.93
Polyhydramnios	1	0	-
Oligohydramnios	2	1	0.47
PROM	7	13	0.2

PIH: Pregnancy induced hypertension, PROM: Premature rupture of membrane

significant ($p=0.0001$) followed by RDS (42.8%) ($p=0.94$) as shown in Table 2.

DISCUSSION

Neonatal sepsis with its high mortality rate still remains a diagnostic and treatment challenge for neonatal health care providers. Developing countries have the highest incidence and mortality rates. Early diagnosis of neonatal septicemia helps the clinician in instituting antibiotics therapy at the earliest thereby reducing the mortality. Early identification of an infected neonate also helps in abandoning unnecessary treatment of a non-infected neonate.

In this study, among the culture positive cases, 53.6% neonates were outborn which was more compared to 46.4% of inborn neonates ($p=0.23$). Khinchi et al., [12] conducted a study which showed 59% having sepsis in outborn group as compared to 35% in the inborn group. In our study, 82.2% of septic neonates were born to mothers from low socio-economic status compared to 17.8% born to mothers from middle socio-economic status. In a study conducted by Bangi and Devi [13], 57.5% of the culture positive cases came from low socio-economic status while 25% came from middle socio-economic status and 17.5% from high socio-economic status.

Among the 28 culture positive cases in this study, 75% of them were male babies and 25% of them were female babies. Khinchi et al., got 65.1% of male babies with sepsis compared to 34.9% of female babies [12]. In our study, 89.3% cases were LBW among culture positive cases as compared to 10.7% NBW babies ($p=0.0001$). Khinchi et al., [12] reported that sepsis was seen in 65% of LBW group as compared to 35%

Table 2: Neonatal risk factors associated with sepsis

Risk factors among neonates	Culture positive	Culture negative	p value
LBW	25	13	0.0001
RDS	12	14	0.94
MAS	4	5	0.88
Prematurity	25	13	0.0001
Asphyxia	4	2	0.29

RDS: Respiratory distress syndrome, MAS: Meconium aspiration syndrome, LBW: Low birth weight

Table 3: Comparative study of LBW and sepsis

Studies	Sepsis in newborn (%)	
	Weight<2.5 kg	Weight>2.5 kg
Tallur <i>et al.</i> ¹⁴	54.55	45.55
Malik <i>et al.</i> ¹⁵	66	34
Khinchi <i>et al.</i> ¹²	65	35
Huggi and Navadagi ¹⁶	68.25	31.7
Present study	63.3	37.7

LBW: Low birth weight

in NBW group. Other studies also showed similar results as shown in Table 3.

In our study, the most commonly associated maternal risk factor for neonatal sepsis were PIH (42.8%), anemia during pregnancy (42.8%) followed by PROM (25%) and UTI (7%). The most common neonatal risk factors seen were LBW (89.3%), and prematurity (89.3%) followed by RDS (42.8%). Schuchat et al., [17] showed that one or more risk factors including preterm delivery, intrapartum fever and PROM was found in 79% of the sepsis positive cases. Bhutta et al., [18] showed a significant association between maternal UTI, maternal pyrexia and vaginal examination during labor and neonatal sepsis. Jiang and Ye [19] showed a significant association between neonatal sepsis and parity, PROM, amniotic fluid volume abnormalities, PIH, newborn gender, LBW, anemia, and prematurity while it showed no significant correlation between neonatal sepsis and abnormalities of the amniotic fluid.

The majority of morbidities and subsequently the mortalities due to neonatal sepsis can be prevented by improving antenatal care, maternal health, timely intervention, referring at appropriate time to tertiary care centers for high-risk cases, preventing preterm deliveries and care of neonates at centers with level three neonatal care facilities.

CONCLUSION

Neonatal sepsis is quiet common and is associated with many neonatal and maternal risk factors. It is important to have a high degree of suspicion so as to detect and treat neonatal sepsis early, so as to improve the outcome. Most deaths are seen in neonates with risk factors like LBW and prematurity. Prevention of risk factors, early detection of sepsis and accurate treatment go a long way in the good outcome of neonates with sepsis.

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