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Original Research Article

# A Comparative Assessment of the Outcome of Term and Preterm Neonates with Severe Sepsis Undergoes Exchange Transfusion

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**Abstract**

**Aim:** To compare the outcome of term and preterm neonates with severe sepsis undergoes exchange transfusion.

**Material and methods:** This is a hospital-based, time-bound, analytical observational study conducted in the NICU of DMCH, Darbhanga, Bihar, India for 1 year. The data was collected in pre-designed proforma, entered in Microsoft Excel and analysis was done using SSPS v 22.0.

**Result:** About 53 neonates were diagnosed with severe neonatal sepsis. Out of 30 of which 30 preterm neonates, 19 (63.3%) died and 11 (36.6%) were discharged after treatment and out of 23 term neonates 11 (47.8%) died and 12 (52.1%) were discharged after treatment. Maternal risk factor in study subjects, 22 (41.5%) had PROM, 8 (15.0%) had > 3 vaginal exam and 6 (11.3%) each had maternal fever.

**Conclusion:** Significant reduction of mortality in patients who underwent exchange transfusion, together with the no adverse effects observed, suggest that this procedure should be considered for the treatment of neonates with severe sepsis.

**Keywords:** neonatal sepsis, mortality, risk factors



## Introduction

Sepsis is still a major cause of morbidity and mortality in neonates, especially in preterm infants, causing approximately 36% of the estimated 4 million neonatal deaths annually [1, 2]. Mortality rate can reach 60% in very low birth weight infants (VLBWI, birth weight < 1500 g) [2]. Early diagnosis, timely administration of appropriate antibiotics, and a proper supportive therapy are crucial to improve survival and to reduce long-term sequelae [3, 4]. Unfortunately, neonatal sepsis can progress rapidly to septic shock, occurring in 1.3% of neonates hospitalized in neonatal intensive care unit (NICU), with an overall mortality of 40%, reaching 71%

in neonates weighing less than 1000 g at the onset of sepsis [5].

As per World Health Organization (WHO) sepsis/infection is one of the most common causes of neonatal mortality and morbidity [6]. It has been estimated that 7.6million children younger than five years of age died in 2010; of these deaths, 64% were attributed to infectious causes, and neonates contributed to a significant proportion (40.3%). [7]

Being aware of the persistently high mortality rate associated with sepsis and septic shock, despite an imposing and growing armamentarium of potent antibiotics, various adjunctive therapies like intravenous immunoglobulins and granulocyte-macrophage colony stimulating factors were evaluated in the treatment of sepsis and septic shock in the last decades. However, none of these strategies has been demonstrated to be able to reduce the mortality rate in sepsis and septic shock [8-10].

Owing to the immaturity of the immune system, newborn infants are highly susceptible to systemic infection [11-14].

Although most studies showed some beneficial effects to the use of ET, clear evidence for its clinical efficacy is lacking. The discrepancy observed across studies can be attributed largely to the use of different inclusion and exclusion criteria, diagnostic criteria, and study designs.

## Material and Methods

This study was conducted in the NICU of DMCH, Darbhanga, Bihar, India for 1 year. In this hospital-based time-bound analytical observational study, we enroll all neonates more than1000 grams admitted with severe sepsis undergoing exchange transfusion to fulfil all criteria.

**Inclusion criteria:**

Neonates weighing >1000 grams having sepsis with evidence of sclerema undergoing exchange transfusion.

**Exclusion criteria:**

1. All neonates having severe sepsis with multiple congenital anomalies
2. All neonates having severe sepsis without sclerema
3. All neonates having severe sepsis with RDS
4. All neonates having severe sepsis with MAS
5. All neonates having weight <1000 grams

**Methodology:**

Neonatal sepsis defined as any sign and symptoms of bacteremia with any two or more of the following septic screening (WBC count <5000/mm3, ANC <1800/mm3, Immature to total neutrophil ratio >0.2, micro ESR >15 mm in 1st hour, CRP > 10 mg/L.Signs and symptoms of bacteremia include hypothermia/hyperthermia, lethargy, poor cry, refusal to suck, poor perfusion prolonged capillary refill time, hypotonia, absent neonatal reflexes, bradycardia/tachycardia, respiratory distress, apnea, gasping respiration, hypoglycemia/hyperglycemia, and metabolic acidosis. Those neonates that satisfied the inclusion criteria with severe sepsis enrolled and after obtaining written and informed consent from their parents/legal guardian, all basic demographic and clinical details recorded in a pre-designed proforma. Proforma contained information of neonates, gender, age, weight, DOB, DOA, GA, maturity, risk factors, and vitals before and after exchange transfusion, investigation reports. Each neonate followed until the outcome (discharge from NICU or death).

**Results:**

Table 1 shows the maturity of study subjects. 32 (60.3%) were preterm, 39.7% were term neonates.

Table 2 shows the type of admission of study subjects. 38 (71.6%) were outborn and one third were inborn.

Table 3 shows maternal risk factor in study subjects, 22 (41.5%) had PROM, 8 (15.0%) had > 3 vaginal exam and 6 (11.3%) each had maternal Fever.

Table 4 shows the treatment outcome of study subjects, 30 (56.6%) have died and 23(43.3%) were discharged after treatment.

Table 5 shows the association b/w treatment outcome and maturity of study subjects, out of 30preterm neonates 19 (63.3%) died and 11 (36.6%) were discharged after treatment and out of 23 term neonates 11 (47.8%) died and 12 (52.1%) were discharged after treatment.

Table 6 shows the organ dysfunction status in study subjects, a maximum of 37 (69.8%) had cardiovascular dysfunction, 30 (56.6%) had respiratory system dysfunction and 9 (16.9%) had renal system dysfunction.

**Table-1: Maturity of study subjects**

| Maturity | Frequency | Percent |
|---|---|---|
| Preterm | 32 | 60.3 |
| Term | 21 | 39.7 |
| Total | 53 | 100 |

**Table-2: Type of admission of study subjects**

| Type of admission | Frequency | Percent |
|---|---|---|
| Inborn | 15 | 28.3 |
| Outborn | 38 | 71.6 |
| Total | 53 | 100 |

**Table-3: maternal risk factors in study subjects**

| Maternal Risk factors | Frequency | Percent |
|---|---|---|
| PROM | 22 | 41.5 |
| >3 vaginal exam | 8 | 15.0 |
| Maternal fever | 6 | 11.3 |
| Foul smelling discharge | 2 | 3.7 |
| Uterine tenderness | 2 | 3.7 |
| Hyper leukocytosis | 1 | 1.8 |
| No | 12 | 22.6 |
| Total | 53 | 100 |

**Table-4: Treatment outcome of study subjects**

| Outcome | Frequency | Percent |
|---|---|---|
| Death | 30 | 56.6 |
| Discharged | 23 | 43.3 |
| Total | 53 | 100 |
| **Outcome** | **Frequency** | **Percent** |
| Death | 30 | 56.6 |
| Discharged | 23 | 43.3 |
| Total | 53 | 100 |

**Table-5: Association b/w maturity and treatment outcome of study subjects**

| Maturity | Treatment outcome | | Total |
|---|---|---|---|
| | Death | Discharged | |
| Preterm | 19 | 11 | 30 |
| | 63.3% | 36.6% | 100.0% |
| Term | 11 | 12 | 23 |
| | 47.8% | 52.1% | 100.0% |
| Total | 30 | 23 | 53 |
| | 56.6% | 43.3% | 100.0% |

**Table-6: Organ dysfunction status in study subjects**

| Organ system | Frequency | Percent |
|---|---|---|
| Cardiovascular | **37** | 69.8 |
| Respiratory system | **30** | 56.6 |
| Renal system | **9** | 16.9 |

**Discussion:**

Sepsis and septic shock were defined according to Goldstein's or Wynn's criteria [15, 16] for term and preterm neonates, respectively. Term neonates were defined as those born at a gestational age (GA) of 37–42 weeks; preterm neonates were defined as those born at a GA less than 37 weeks.

GA was established on the basis of best obstetric estimates, including last menstrual period and first or second trimester ultrasonography. Small for gestational age (SGA) neonates were defined as those with a birth weight less than the 10th centile for age, according to Bettino's anthropometric charts [17].

In our study more than half of the study subjects were 32 (60.3%) were preterm and the rest were term neonates. In our study the mean gestational age was 32±2.5 weeks (range 30-38 weeks). Maximum 19 (45.24%) had GA of 38-40 weeks, 11 (26.19%) had GA of 32-34 weeks and 9 (2.43%) had GA of 34-36 weeks. Aradhya AS et al (2015) in Chandigarh reported the mean gestational age of neonates at exchange blood transfusion was 31±2.8weeks and 36% were small for their gestational age [18]. In a similar study Pugni, L et al. (2016) reported that the median gestational age was 28 weeks (range 26-31) weeks [19].

Our study showed maternal risk factor in study subjects, 22 (41.5%) had PROM, 8 (15.0%) had > 3 vaginal exam and 6

(11.3%) each had maternal Fever. In a similar study Aradhya AS et al (2015) in Chandigarh reported that 34% of mothers had pPROM (>24 h) and 27% of mothers had pregnancy-induced hypertension [18].

The overall survival was 77.4% and the survival rates for LBW and non-LBW infants were 73.6 and

68.2%, respectively, however, the difference was not statistically significant [20].Sadana S et al (1997) study the role of exchange transfusion in septic neonates with sclerema Mortality was 50% in the study group and 95% in controls [21].

There was a significant reduction in mortality in the intervention group (57% vs. 71% (p= .004). They concluded that in neonates with severe sepsis, DVET may be a useful adjunct therapy. It may reduce mortality and is a safe procedure in severely sick and septic neonates [22, 23].

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