



A CROSS-SECTIONAL STUDY OF BLOOD GLUCOSE LEVELS IN NEONATAL SEPSIS AND ITS OUTCOME IN A TERTIARY CARE HOSPITAL, TUMKUR, KARNATAKA.

Paediatrics

Dr. Milind Ram

Junior Resident, Sri Siddhartha Medical College And Hospital

Dr. K. B.**Rangaswamy**

Professor, Sri Siddhartha Medical College And Hospital

Dr. M Harika**Reddy***

Senior Resident, Osmania Medical College And Hospital *Corresponding Author

ABSTRACT

Background: Neonatal sepsis is a systemic condition resulting from bacterial, viral, or fungal infections, which leads to hemodynamic changes and clinical symptoms, often resulting in significant morbidity and mortality. In low- and middle-income countries, the estimated neonatal mortality rate is 20 per 1,000 live births. Annually, more than four million neonates worldwide die, and the majority of these deaths occur in LMICs. **Methods:** The current cross-sectional study was conducted in the Department of paediatrics at Sri Siddhartha Medical College, Tumkur. A total of 110 neonates were included in the study. Statistical analysis was performed to assess the relationship between EOS/LOS and glucose levels in the blood. **Results:** Among the study population, 48 neonates (53.3%) were aged between 1 to 3 days, followed by 22 (24.4%) aged between 4 to 7 days. Blood glucose levels, measured using GRBS (General Random Blood Sugar), were as follows: <40 mg/dL in 24 subjects, 41–100 mg/dL in 39 subjects, 101–200 mg/dL in 22 subjects, and >200 mg/dL in 5 subjects. There was a statistically significant association between age and GRBS scores. EOS was diagnosed in 51 neonates (56.7%), while 39 neonates (43.3%) had LOS. **Conclusions:** Early onset sepsis (EOS) was more commonly observed in male neonates, while late-onset sepsis (LOS) was more prevalent among females. Key risk factors significantly associated with neonatal sepsis included low birth weight, neonatal age, passage of meconium, indications for cesarean section, and extended duration of hospital stay following cesarean deliveries

KEYWORDS

Hyper glycemia, sepsis, neonates, hypo glycemia, EOS, LOS, neonatal morbidity and mortality

INTRODUCTION:

Sepsis remains to be a major cause of death and illness, particularly in the first five days of life, with a significant impact in low- and middle-income countries (LMICs).¹ In low- and middle-income countries, the estimated neonatal mortality rate is 20 per 1,000 live births, whereas in high-income countries it is only 3 per 1,000. Annually, more than four million neonates worldwide die, and the majority of these deaths occur in LMICs.¹

These deaths are primarily due to neonatal sepsis, and prematurity are often preventable or treatable.² Early diagnosis and appropriate therapy of septicemia is of utmost importance to prevent morbidity and mortality. Early-onset neonatal sepsis refers to cases where clinical signs appear within the first three days of life (<72 hours), although some researchers extend this period to the first seven days. Late-onset neonatal sepsis applies to cases diagnosed between the 4th and 30th days of life or after the first seven days

MATERIALS AND METHOD:

Source Of Data:

Patients admitted to Neonatal Intensive Care Unit (NICU) with neonatal sepsis in Sri Siddhartha Medical College & Hospital, Tumkur, Karnataka.

Method Of Collection Of Data (Including Sampling Procedure If Any):

All cases of culture-proven sepsis and lab reports suggested sepsis (probable sepsis) admitted to the NICU of the paediatric department, during an 18 months period are considered in the study.

Inclusion Criteria:

- All neonates with less than 28 days of life admitted during the study period.
- Neonates with suspected neonatal sepsis based on clinical profile (lab investigations).
- Informed consent from all the neonate parents have been taken before undergoing the study.

Exclusion Criteria:

- Infants have more than 28 days of life.
- Infant of diabetic mother and neonates with major congenital anomalies
- Those cases who receive I.V. Glucose before admission was excluded from the study.

- Those patient parents who refuse to be included in the study

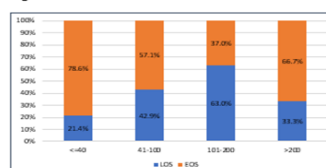
RESULTS:

Out of 110 (100%) subjects, 64 (58.2%) subjects were aged between 1 to 3 days, followed by 22 (20%) were aged between 4 to 7 days. GRBS scores were <40 for 28 subjects, between 41 to 100 for 49 subjects, 101 to 200 for 27 subjects and >200 for 6 subjects. Cross-tabulation of early onset sepsis, late onset sepsis and GRBS scores showed that 22 (78.6%) subjects who had EOS and 6 (21.4%) subjects had GRBS scores <40, 28 (57.1%) subjects had EOS and 21 (42.9%) subjects had GRBS between 41 to 100. The Chi-square test was applied to assess the association the sepsis with GRBS scores. The Chi-square test showed a statistically significant association between sepsis and GRBS scores ($p=0.05$). The results of the association of GRBS scores with sepsis are represented in Table 1 and plotted in Figure 1.

Table 1: Association of GRBS with EOS / LOS

EOS / LOS	GRBS				Total	Chi-square, P-value
	<40	41-100	101-200	>200		
LOS	6 (21.4%)	21 (42.9%)	17 (63.0%)	2 (33.3%)	46 (41.8%)	9.945a, 0.019
EOS	22 (78.6%)	28 (57.1%)	10 (37.0%)	4 (66.7%)	64 (58.2%)	
Total	28 (100%)	49 (100%)	27 (100%)	6 (100%)	110 (100%)	

Figure 1: Association of GRBS with EOS / LOS



DISCUSSION:

Abnormal plasma glucose levels at the time of admission were frequently observed in infants with neonatal sepsis, supporting the routine practice of checking glucose levels upon NICU admission. This cross-sectional study aimed to assess the glycemic status in neonates with sepsis and evaluate their clinical outcomes.

In the present study, the majority of neonates were between 1 and 3 days old. Among them, 24 had GRBS (General Random Blood Sugar) levels below 40 mg/dl, 39 had levels between 41 and 100 mg/dl, 22 had levels ranging from 101 to 200 mg/dl, and 5 neonates had glucose

levels exceeding 200 mg/dl. A significant number of infants in the 1–3 day age group showed GRBS levels below 40 mg/dl.

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These findings align with those reported by Ahmad and Khalid (2012), who found that 50 neonates (9.9%) had glucose levels below 40 mg/dl; 322 (64.1%) had levels between 40 and 100 mg/dl; 95 (18.9%) had glucose levels between 101 and 200 mg/dl; and 35 (6.9%) had levels above 200 mg/dl. Similarly, Begum et al. (2012) reported hyperglycemia in 4.62% of their neonatal sepsis cases.

Septic neonates often exhibit poor feeding behavior, which can contribute to hypoglycemia. Additionally, the increased metabolic demands and hypothermia associated with sepsis can further lower blood glucose levels.

Early-onset sepsis (EOS), which occurs within the first three days of life, represents a particularly severe form of neonatal sepsis, often associated with higher mortality rates compared to late-onset sepsis (LOS). In the current study, 57 (63.3%) of the subjects were male, and 16 (41%) were female, indicating a higher prevalence among males. Similar trends were reported by Gupta et al. (2019), where 157 (71.4%) of the subjects were male and 63 (47.3%) were female, findings consistent with the present study.

In terms of timing, EOS was observed in 51 (56.7%) of the neonates, while LOS was present in 39 (43.3%). Culture-proven sepsis was identified in 55 (61.1%) of the cases. Notably, most female neonates had LOS, while the majority of male neonates presented with EOS. Ellahony et al. (2020) reported EOS in 45 (25.8%) and LOS in 129 (74.1%) of their cases, with culture-proven sepsis found in 101 (58%) of their study subjects.

CONCLUSION:

Based on the findings of the present study, the following conclusions can be drawn:

- There was a higher prevalence of neonatal sepsis among male infants compared to females.
- Early-onset sepsis (EOS) was more commonly observed in male neonates, while late-onset sepsis (LOS) was more prevalent among females.
- Key risk factors significantly associated with neonatal sepsis included low birth weight, neonatal age, passage of meconium, indications for cesarean section, and extended duration of hospital stay following cesarean deliveries.
- The most frequent clinical symptoms in septic neonates were poor feeding, convulsions, rapid breathing, severe chest indrawing, abnormal temperature (either fever or hypothermia), and reduced activity at admission.
- A significant association was noted between glucose levels (GRBS) and clinical features such as convulsions, as well as between sepsis type (culture-proven/probable) and symptoms like fast breathing, chest indrawing, and temperature changes.
- Neonates with GRBS scores between 101–200 mg/dL had larger head circumferences, while those with glucose levels above 200 mg/dL exhibited higher heart and respiratory rates.
- Both neonatal hypoglycemia and hyperglycemia were associated with increased mortality in cases of neonatal sepsis.

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