International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

Vasoactive Inotropic Score as a Predictor of Mortality in Neonatal Septic Shock: A Prospective Observational Study

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Abstract: ***Background**: Neonatal septic shock is associated with high mortality. The Vasoactive Inotropic Score (VIS) quantifies cardiovascular support and may serve as a prognostic marker. **Objective**: To evaluate VIS as a predictor of mortality in neonates with septic shock. **Methods**: A prospective observational study was conducted in the NICU of Shri M. P. Shah Government Medical College, Jamnagar, over 12 months. Neonates with septic shock receiving vasoactive drugs were enrolled. VIS was calculated at 0, 24, and 48 hours; VIS max was recorded. Primary outcome: in-hospital mortality. **Results**: 160 neonates were included. Mean gestational age was 35.2 weeks; 46% were term. Early-onset sepsis was seen in 75%. Culture positivity was 34%, predominantly Klebsiella pneumoniae. VIS max was significantly higher in non-survivors (60.2 vs 9.3; p<0.001). ROC analysis identified a VIS max ≥60 as the optimal mortality predictor (AUC 0.99). **Conclusion**: VIS is a simple, bedside tool strongly predictive of mortality in neonatal septic shock. A VIS max ≥60 identifies high-risk neonates warranting aggressive intervention.***

Keywords: Neonatal sepsis, septic shock, vasoactive inotropic score, mortality, prognostic marker

1. Introduction

Neonatal sepsis is a leading cause of morbidity and mortality worldwide, particularly in low- and middle-income countries. Septic shock represents the most severe form, with mortality rates approaching 40%. Accurate prognostic markers are essential to guide management. The Vasoactive Inotropic Score (VIS), originally developed in pediatric cardiac surgery, quantifies the intensity of vasoactive drug support and has shown promise in predicting outcomes. However, data in neonatal septic shock remain limited. This study aimed to evaluate VIS as a predictor of mortality in neonates with septic shock in a tertiary NICU in western India.

2. Materials and Methods

A prospective observational study was conducted over 12 months in the NICU of Shri M. P. Shah Government Medical College, Jamnagar. Neonates with septic shock requiring vasoactive drugs (dopamine, dobutamine, epinephrine, norepinephrine, milrinone, or vasopressin) were included. Exclusion criteria were major congenital anomalies, congenital heart disease, and prior referral after septic shock onset. VIS was calculated as:

*VIS = dopamine + dobutamine + 100 x epinephrine + 100 x norepinephrine + 10 x milrinone + 10, 000 x vasopressin (*all doses in μg /kg/min, vasopressin in U/kg/min).

VIS was recorded at 0, 24, and 48 hours. VIS max was defined as the highest value during NICU stay. The primary outcome was in-hospital mortality. Secondary outcomes were duration of ventilation, NICU stay, and multiorgan dysfunction. Statistical analysis used t-tests, chi-square tests, logistic regression, and ROC curve analysis (SPSS v20).

3. Results

Table 1: Baseline Characteristics

Characteristic	n (%)
Term neonates	74 (46.2%)
Preterm neonates	86 (53.8%)
Birth weight ≥2500g	69 (43.1%)
Low birth weight	56 (35.0%)
Very low/ELBW	35 (21.9%)
Early-onset sepsis	120 (75.0%)
Late-onset sepsis	40 (25.0%)

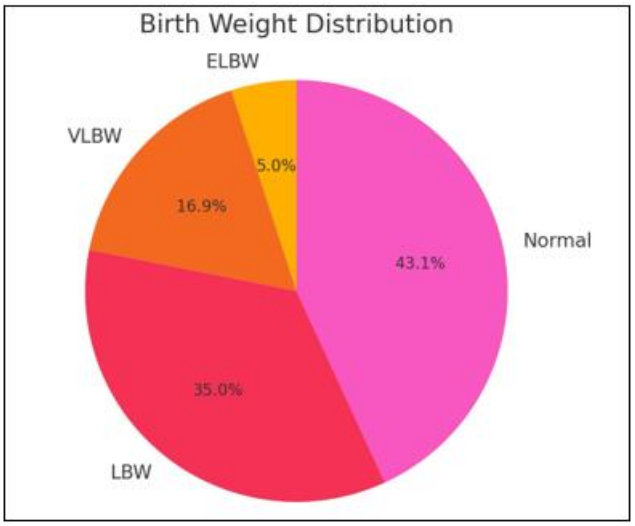

Figure 1: Birth Weight Distribution of Neonates

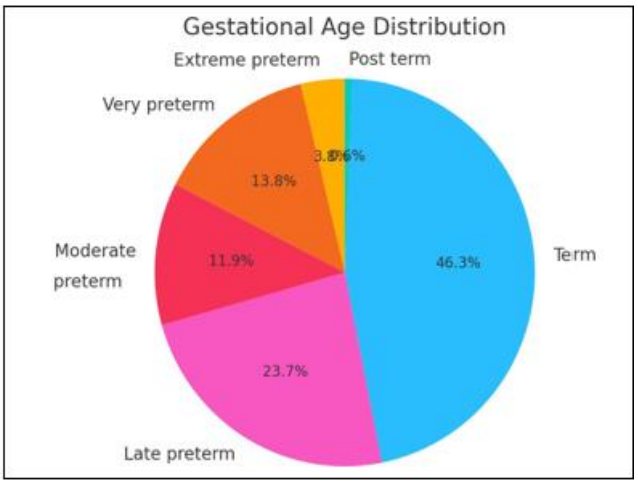

Figure 2: Gestational Age Distribution of Neonates

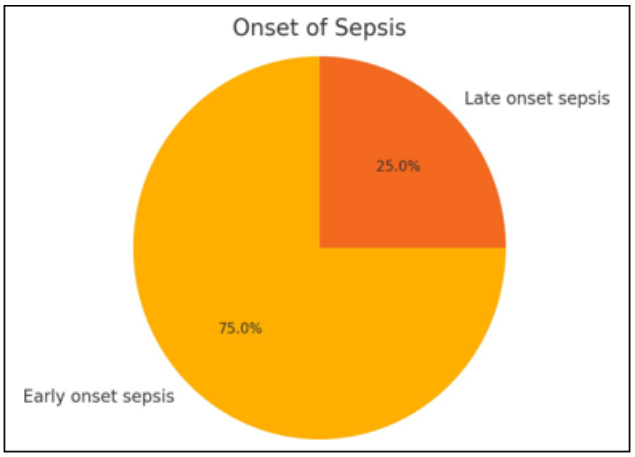

Figure 3: Onset of Sepsis

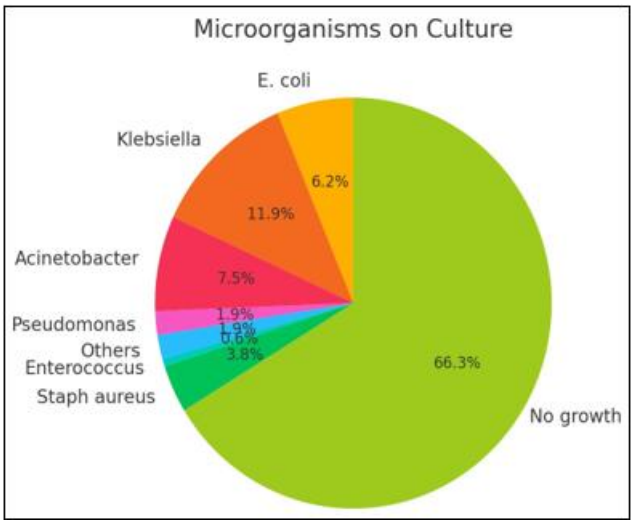

Figure 4: Microorganisms on Culture

Table 2: Clinical Outcomes

Outcome	n (%)
Intubation required	82 (51.3%)
Multiple inotropes	72 (45.0%)
Culture positive sepsis	54 (33.8%)
Predominant organism: Klebsiella pneumoniae	19 cases

Table 3: Vasoactive Inotropic Score (VIS) Parameters

VIS parameter	Median (IQR)
VIS 0h	5 (5–10)
VIS 24h	15 (10–30)
VIS 48h	20 (10–40)
VIS max	22.7 (5–70)

Table 4: Comparison of Survivors vs Non-survivors

Variable	Survivors (n=118)	Non-survivors (n=42)	p-value
VIS max (mean)	9.3	60.2	<0.001
Ventilator days (median)	3	9	0.01
NICU stay (median days)	10	7	0.05

4. Discussion

This study demonstrates that VIS is a strong, independent predictor of mortality in neonatal septic shock. Non-survivors had significantly higher VIS max values compared to survivors. ROC analysis confirmed excellent discriminative ability, with VIS max ≥60 predicting high mortality risk. Our findings align with Kumar et al. (2022) and Miletic et al. (2019), who also reported strong prognostic value of VIS. The higher threshold observed in our cohort may reflect regional differences in sepsis epidemiology and antimicrobial resistance. Strengths of our study include prospective design and standardized data collection. Limitations include single-center setting and lack of long-term follow-up.

5. Conclusion

The Vasoactive Inotropic Score (VIS) is a simple, bedside tool that strongly predicts mortality in neonatal septic shock. A VIS max ≥60 identifies neonates at high risk, supporting its role in guiding early aggressive management and family counseling.

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