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Frequency of Raised C-Reactive Protein in Blood Culture Positive Neonatal Sepsis in Rehman Medical Institute, Peshawar

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Abstract

Introduction: Neonatal sepsis remains a significant cause of neonatal mortality worldwide, and diagnostic obstacles continue to impede the timely administration of treatment. Although blood culture continues to be the gold standard, it is time-consuming. The rapid and cost-effective diagnostic instrument of C-reactive protein (CRP), an acute-phase reactant, is capable of facilitating clinical decision-making in environments with restricted diagnostic resources.

Objectives: To determine the prevalence of elevated CRP levels in neonates with blood culture-positive sepsis at Rehman Medical Institute, Peshawar.

Methodology: The Paediatric Department of Rehman Medical Institute conducted this cross-sectional investigation over a six-month period. Using sequential non-probability sampling, a total of 65 neonates aged 3–28 days with confirmed blood culture-positive sepsis were enrolled. Elevated serum CRP levels were defined as those exceeding 5 mg/dL. SPSS version 22.0 was employed to analyse the data, with a significance threshold of $p < 0.05$.

Results: Of the 65 neonates, 62 (95.4%) exhibited elevated CRP levels. 2.8 ± 0.4 kg was the mean birth weight, and the mean gestational age was 37.2 ± 2.1 weeks. Gender, gestational age, and socioeconomic status did not exhibit any statistically significant correlations with CRP levels.

Conclusion: In neonates with blood culture-positive sepsis, a high prevalence of elevated CRP was observed, indicating its potential as a rapid and cost-effective supplementary marker for early diagnosis in neonatal care.

Keywords: neonatal sepsis, C-reactive protein, CRP, blood culture, biomarker, newborn infection, early diagnosis.

Introduction: The neonatal period, which spans the first 28 days of life, is characterized by elevated susceptibility to infectious maladies due to an underdeveloped immune system, low levels of immunoglobulins, and limited exposure to pathogens. [1] Neonatal sepsis, which is the third most prevalent cause of neonate death worldwide, continues to make a substantial contribution to neonatal morbidity and mortality. [2] The burden is disproportionately high in underdeveloped nations, where the mortality rate for neonates with exceptionally low birth weight can reach 70% and culture-proven neonatal sepsis affects approximately 16 out of every 1,000 live births. [3]

Antibiotic therapy must be initiated immediately to effectively treat neonatal sepsis. [4] Nevertheless, the early detection of the condition is difficult due to the non-specific nature of clinical indications, including lethargy, poor appetite, fever or hypothermia, and aberrant reflexes. [5] The gold standard for diagnosis remains blood culture; however, the results are often delayed by 48 to 72 hours, which delays the commencement of effective treatment. [6]

The acute-phase reactant C-reactive protein (CRP) has shown potential as a rapid diagnostic for sepsis. Elevated CRP levels are linked to systemic inflammation and bacterial infection. According to prior research, including one conducted in the Congo, over 95% of neonates with culture-positive sepsis exhibited elevated CRP levels. [7] Nevertheless, there is a scarcity of local information regarding its diagnostic value in Pakistan, particularly in Peshawar. Concluding this lacuna was the objective of this investigation. [8]

Objective: To ascertain the prevalence of elevated C-reactive protein in newborns at Rehman Medical Institute in Peshawar who have blood culture-positive sepsis.

Operational Definitions:

- **Sepsis in neonates:** Infants between the ages of 1 and 28 days who exhibit one or more of the following symptoms for more than 12 hours, together with a positive blood culture: poor feeding, lethargy, slow reflexes, poor peripheral perfusion, or temperature instability.
- **Raised CRP**: We refer to serum CRP levels above 5 mg/dL as elevated CRP.

Materials and Methods:

- **Design of the Study:** Cross-sectional
- **Location:** Pediatric Department, Rehman Medical Institute, Peshawar
- **Duration:** six months after receiving ethical clearance
- **Method of Sampling:** Sequential non-probability sampling
- **Sample Size**: Using the WHO sample size calculator, the sample size was determined to be 65 neonates (expected CRP frequency 95.6%, confidence level 95%, precision 5%).

Inclusion Criteria

- Neonates aged 3 to 28 days
- Both genders
- Confirmed blood culture-positive sepsis

Exclusion Criteria

- Neonates born to HIV-positive mothers

Data Collection Procedure: Eligible neonates admitted to the neonatal unit were enrolled after obtaining informed parental consent. Place of domicile, socioeconomic background, symptom duration, birth weight, and gestational age were documented, in addition to clinical and demographic data. 2 cc of venous blood was extracted under aseptic conditions for the CRP study. The main investigator documented the findings in a structured pro-forma.

Data Analysis Procedure: The data was analysed using SPSS version 22.0. The normality of quantitative variables, including age, gestational age, birth weight, duration of symptoms, and CRP levels, was assessed using the Shapiro-Wilk test. The results were summarised as the mean ± SD or median (IQR), as required. Categorical variables, such as gender, socioeconomic status, and elevated CRP, were represented using frequencies and percentages. After stratification, the effect modifiers were assessed using either the chi-squared or Fisher's exact test. Statistical significance was determined by P-values that were less than
0.05.

Anticipated Impact: It is anticipated that this study will bolster the status of CRP as a rapid and cost-effective supplementary marker for the diagnosis of neonatal sepsis. Detecting elevated CRP levels in newborns with blood culture-confirmed illnesses can help physicians reduce sepsis-related

morbidity and mortality in locations with limited resources. This enables them to initiate antibiotic therapy at an early stage. The study also addresses a substantial information gap in the local healthcare system of Peshawar, which may have an impact on national neonatal care guidelines and will facilitate the development of early diagnostic procedures.

Results: The investigation enrolled a total of 65 neonates with blood culture-positive sepsis over a six-month period. Of these, 62 neonates (95.4%) exhibited elevated serum CRP levels (>5 mg/dL), while only three neonates (4.6%) had normal CRP levels.The neonates' mean gestational age was 37.2 ± 2.1 weeks, and their mean birth weight was 2.8 ± 0.4 kg. The median duration of symptoms prior to hospital admission was two days (interquartile range: one to three days). The study cohort was composed of
56.9% males (n=37) and 43.1% females (n=28). There was no statistically significant association between elevated CRP levels and stratification based on gestational age, gender, birth weight, and socioeconomic status ($p > 0.05$ for all comparisons). Nevertheless, neonates with a symptom duration of more than two days were more likely to have elevated CRP levels, although this finding was not statistically significant ($p = 0.08$).

Table 1: Summary of Neonatal Sepsis Data

VARIABLES	**COUNT**
Total neonates	65
Elevated CRP (> mg mg/dl)	62
Normal CRP (≤5mg/dl)	3
Males	37
Females	28

Graph: Birth Weight Distribution

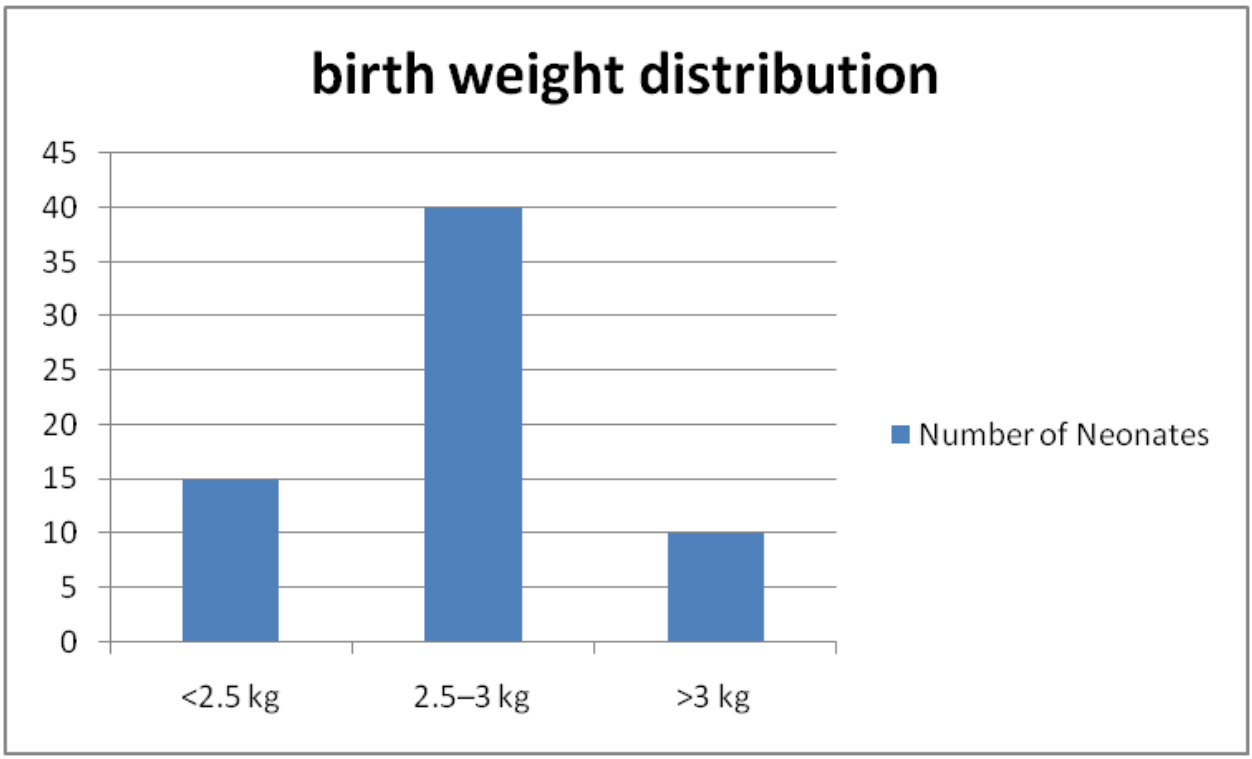

Table 2: Age Distribution of Neonates

Age (Days)	Number of Neonates
3	5
7	8
10	10

14	12
18	9
21	8
25	7
28	6

Table 3: CRP Levels in Neonates

CRP Level	Number of Neonates	Percentage (%)
Elevated (>5 mg/dL)	**62**	**95.40%**
Normal (≤5 mg/dL)	**3**	**4.60%**

Table 4: Descriptive Statistics of Neonates

Variable	Mean ± SD / Median (IQR)
Gestational Age (weeks)	37.2 ± 2.1
Birth Weight (kg)	2.8 ± 0.4
Symptom Duration (days)	2 (IQR: 1–3)

Table 5: Gender Distribution

Gender	Number of Neonates	Percentage (%)
Male	37	56.90%
Female	28	43.10%

Discussions: The objective of this investigation was to ascertain the incidence of elevated C-reactive protein (CRP) in neonates with blood culture-positive sepsis at Rehman Medical Institute, Peshawar. The results suggest that a high prevalence (95.4%) of elevated CRP levels among septic neonates is present, which is consistent with the prior literature, which reported CRP elevations in over 90% of confirmed neonatal sepsis cases.CRP, an acute-phase reactant, has been extensively acknowledged

for its effectiveness in the early detection of bacterial infections, such as sepsis. Its diagnostic value is derived from its cost-effectiveness in comparison to more sophisticated diagnostic methods and its rapid elevation in response to inflammatory stimuli. CRP is a valuable tool for the opportune initiation of antibiotic therapy in resource-constrained settings, such as ours, with the potential to reduce morbidity and mortality.Although our investigation did not identify statistically significant correlations between elevated CRP and a variety of clinical and demographic variables, this may be attributed to the relatively homogeneous characteristics of the study population or the small sample size. Larger investigations could offer a more comprehensive understanding of the predictive value of CRP in various neonate subgroups.

Conclusion: Rehman Medical Institute's neonates with blood culture-confirmed sepsis exhibit a high prevalence of elevated CRP levels, as indicated by the study. The utility of CRP as a swift, accessible, and cost-effective biomarker for the early detection of neonatal sepsis is substantiated by these findings. In resource-limited healthcare settings, the early diagnosis and treatment of neonatal sepsis may be improved by integrating CRP testing into standard protocols. It is advised that additional large-scale, multicenter studies be conducted to determine the role of CRP in the prediction of outcomes and the stratification of sepsis.

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