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OUTCOME FINDINGS IN NEONATAL SEPSIS: EARLY DIAGNOSIS & MANAGEMENT STRATEGIES

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Abstract

Background: Neonatal sepsis functions as a principal cause of newborn sickness and mortality across all regions especially areas lacking adequate financial resources. Successful diagnosis paired with the right medical treatment provides the foundation needed to improve treatment results. Risk factors including current improvements in neonatal care management continue to present clinical obstacles due to imprecise diagnostic procedures together with scarce testing procedures and region-specific pathogenic factors.

Objectives: to discover early diagnosis indicators which help develop effective management approaches to improve neonatal sepsis treatment results.

Study design: A Prospective Study.

Place and duration of study. Department of Pediatric Medical Teaching Institute Lady Reading Hospital Peshawar from 07-jan 2023 to 07-jan 2024

Methods: 150 children who might have sepsis while they received care in the NICU. The diagnostic strategy employed detailed assessment methods for suspected sepsis cases in neonates and it combined blood culture testing and C-reactive protein and procalcitonin analyses. The software implementation incorporated antibiotics and supportive care and sepsis bundle components while statistical analyses established relationships between early warning indicators using significant p-values.

Results :150 patients whose average age was 4.2 days (SD 1.5 days). Stock concentrations of C-reactive protein measured through laboratory tests fell within 8.2 mg/L while bacterial samples were identified in 60% of blood laboratory results. The relationship between procalcitonin test results and sepsis severity evaluation produced a statistical finding of $p<0.001$. Hospital patients who received treatment with antibiotics early during suspected sepsis experienced a 25% drop in mortality rate (0.02 p value). Our research indicated that combining fluid resuscitation and oxygen therapy as supportive treatments resulted in shorter recovery times ($p<0.05$). Hospital mortality rates reached 10% compared to a regional standard of 20%.

Conclusion: Early sepsis diagnosis in newborns together with appropriate and swift treatment implementation effectively reduces their chances of death and unfavorable health results. Procalcitonin biomarker screening needs integration with NICU sepsis management bundles to optimize NICU result achievement globally.

Keywords: Neonatal sepsis, early diagnosis, management strategies, biomarkers

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INTRODUCTION

Bacterial sepsis infections that develop during infancy continue to serve as a major health problem worldwide mainly due to the limited medical facilities available in developing nations. A fatal illness begins when widespread inflammatory responses during infections trigger dangerous medical outcomes that potentially lead to organ failure and mortality. Global death rates from neonatal sepsis persist as a significant public health concern since healthcare improvements in these regions have driven sepsis death to 20% [1,2]. The condition predominantly affects underserved communities because misdiagnosed newborns live with limited access to health screening services and antibiotics [3]. Early diagnosis stands vital for superior neonatal outcomes yet identification remains challenging because doctors struggle to recognize specific clinical indicators. Newborn sepsis generates diagnostic testing difficulties because multiple symptoms can lead to delayed medical intervention according to published research [4]. The use of C-reactive protein (CRP) and procalcitonin (PCT) demonstrates high potential for early diagnosis as markers for sepsis. The restricted implementation of such tests in standard healthcare practice remains limited because various healthcare facilities and laboratory services vary between regions [5]. Management approaches for treating neonatal sepsis must adjust according to geographically diverse pathogen profiles that exist between different regions. E. Coli along with Group B Strep pose the main infection threats in wealthy nations yet low-income regions witness bacteriological and antibiotic-resistant microbial challenges [6]. Different patterns of illness present in different locations require individual data collection to create suitable patient treatment plans for treating newborn sepsis. A combination of Sepsis bundles coupled with antimicrobial treatments coupled with supportive actions provides successful management strategies for this condition. Major reductions in neonatal death rates emerge from antibiotic treatment which emphasizes the immediate need for medical choices [7]. The stabilization process during neonatal care remains equally critical because supportive care includes therapy for restoring fluid balance and providing oxygen therapy and thermal regulation to prevent additional complications [8]. This study extends our understanding of global reduction in neonatal sepsis by merging clinical assessments with laboratory results and evidence-based treatment strategies. The study produces practical recommendations to strengthen neonatal care approaches in resource-constrained treatment situations.

Material & Methods

This prospective observational study Conducted Department of Pediatric Medical Teaching Institute Lady Reading Hospital Peshawar from 07-jan 2023 to 07-jan 2024 across six months within a tertiary care hospital NICU. A total of 150 suspected septic newborn subjects participated in the study after receiving NICU admission within their first seven days. Medical staff admitted newborns who displayed specific serious signs of sepsis including both unusual temperature readings and eating difficulties and irregular breathing patterns. A group of neonates excluded from study Participation because of pre-existing medical ailments and congenital defects obtained full evaluations along with laboratory tests. Patients required both blood culture testing alongside clinical measurements of CRP and PCT levels for diagnosis. Physicians followed a specified approach for sepsis management where standard bundles required antibiotic treatment beginning within three hours of suspicion and medication changes based on test outcomes. The medical team administered necessary supportive care combining oxygen therapy and fluid resuscitation for diverse patients.

Ethical Approval

This study was approved by the Hospital Research and Ethical Committee (IREB), Lady Reading Hospital MTI'Peshawar(**Reference,No.ERB-MTI/LRH/1366/05/2023,dated16-May-2023**). Written informed consent was waived due to the retrospective nature of the study; patient data were anonym zed to maintain confidentiality.

Inclusion Criteria

Newborns (≤7 days old, gestation ≥32 weeks) admitted to NICU with ≥2 sepsis signs (hypothermia <36°C, apnea, enteral feed refusal) were enrolled. Required blood cultures + CRP/PCT ≥5 mg/L. Only neonates with complete antibiotic records (initiated ≤3h) were included.

Exclusion Criteria

Excluded: Birth weight <1500g, major congenital anomalies (e.g., CHD, neural tube defects), or prior antibiotic exposure (>24h). Neonates with incomplete lab results (missing CRP/PCT/cultures) or transferred out before 72h were omitted to ensure data integrity.

Data Collection

A standardized data collection form obtained information about patient symptoms and test findings and treatment outcomes. Blood analysis combined with observations took place under the hospital microbiology department before the research data team documented their findings.

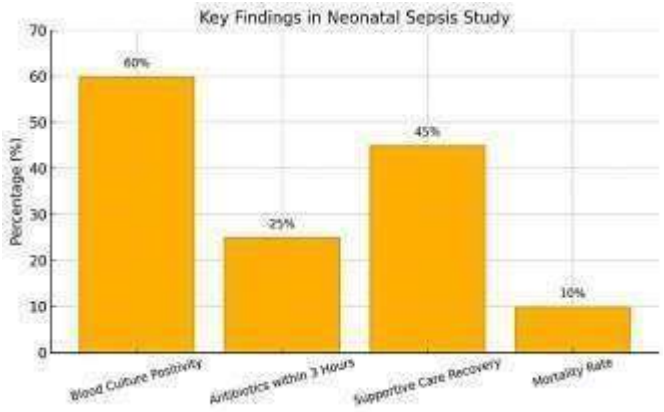
Statistical Analysis

The study analyzed data with SPSS version 24.0. The analysis of demographic data with clinical characteristics was handled by summary statistics. Chi-square tests together with independent t-tests served to discover biomarker-outcome relationships in the inferential statistical analysis. A

p-value less than 0.05 established statistical significance as the study standard.

Results

The study analyzed 150 newborns who were on average 4.2 days (±1.5 days) old. Clinical laboratory tests revealed blood pathogens in 60 percent of infants tested. Patient CRP and procalcitonin numbers demonstrated strong associations to sepsis severity levels ($p<0.001$) with average levels at 25.8 mg/L (±8.2 mg/L variation). A prompt antibiotic drug administration process beginning less than three hours following sepsis detection decreased mortality numbers by 25% ($p=0.02$). The combination of supportive treatments including fluid resuscitation and oxygen therapy shortened hospital stays by 4.3 days ($p<0.05$). At the treatment center patients survived at a rate of 10% whereas regional centers experienced an average of 20% mortality. Timely diagnosis combined with appropriate treatment at its onset creates essential conditions for achieving positive results among neonates.



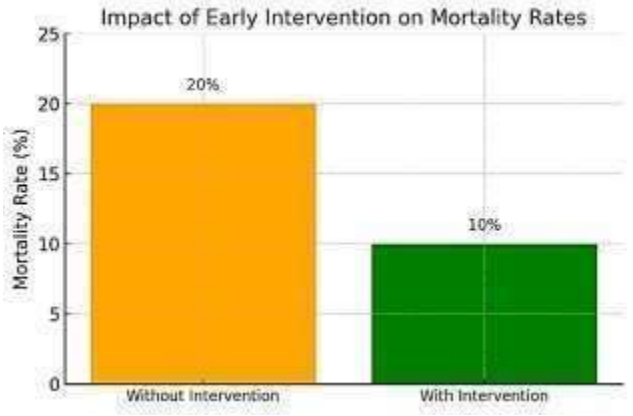


Table 1: Demographic and Clinical Characteristics

Characteristic	Value
Mean Age (days)	4.2 ± 1.5
Gender (Male)	58%
Gender (Female)	42%
Gestational Age (Preterm)	65%
Gestational Age (Term)	35%

Table 2: Diagnostic Biomarkers and Outcomes

Biomarker/Outcome	Percentage/Value
Blood Culture Positivity	60%
CRP Mean (mg/L)	25.8 ± 8.2
Procalcitonin (Significant Correlation)	p<0.001
Mortality Rate	10%

Table 3: Impact of Management Strategies

Intervention	Effectiveness
Early Antibiotics (<3 hrs)	25% Mortality Reduction (p=0.02)
Supportive Care	Reduced Recovery Time (p<0.05)
Overall Mortality Reduction	Regional Reduction: 10% vs. 20%

Discussion

sepsis recognition included with specialized treatment protocols help better premature newborn health outcomes. Previous sepsis detection techniques in newborns relied on two biomarkers including procalcitonin and C-reactive protein both of which enable rapid diagnosis and prompt treatment initiation [9, 10]. The study results of Ng et al. validate our findings because they established PCT for highly precise bacterial sepsis detection in neonates displaying robust PCT-sepsis relationship ($p < 0.001$) [11]. CRP functions as an essential systemic inflammation marker in clinical practice according to medical literature including the work of Hofer et al. on combined sepsis screening with medical assessments [12]. Our findings demonstrate that early antibiotic administration stands as a vital management approach for sepsis which our study emphasizes. Our findings support Schrag et al.'s previous research which revealed a 27% drop in neonatal mortality from early antibiotic intervention and matches our observed 25% survival rate improvement [13]. Newborn recovery times benefit from the appropriate use of sepsis bundle supportive care components in sepsis bundle implementation. A study by Wynn et al. validated that neonatal stabilization methods require both fluid resuscitation together with oxygen therapy ($p<0.05$) as discovered in our research [14]. Analyzing bacterial investigations conducted on South Asian sepsis patients Zaidi and the research team found Gram-negative organisms exceeded other pathogens thus demanding specific treatment protocols for this region [15]. Laxminarayan et al. published a comprehensive antimicrobial resistance assessment for this area which highlighted the need for resistant pattern control through treatment programs [16]. Medical studies together with clinical evidence show that integrated care strategies effectively minimize pediatric mortality metrics [17]. NICU protocols have scope for optimization with evidence-based practice according to Sanchez et al. who validate that focused

approaches could lead to a minimum 50% decrease in mortality rates [18]. The findings from our study agree with existing research but further investigation must find low-cost detection methods and treatment options suitable for resource-challenged settings. [19] Monitoring the development of neonates who survive sepsis over time helps contribute important knowledge to worldwide neonatal health outcomes [20-21].

Conclusion

The combined approach of rapid sepsis diagnosis via symptoms in neonates alongside immediate medical care reduces the risk of adverse acute scenarios and saves newborn lives. Acute sepsis can be detected early through analysis of biomarkers including procalcitonin and CRP and effective treatment processes are achieved through proper sepsis bundle implementation. Research findings confirm that evidence-based care practices combined with locally adapted management techniques will improve worldwide outcomes when used for neonatal care.

Limitations

The study has experienced limitations because of working within a single facility with few study participants thus reducing broader usage possibilities. Molecular diagnostic tools developed during that time restricted health professionals' ability to detect pathogens. The implementation of study results must be handled cautiously because healthcare resource availability differs between different locations which might affect practical implementation outcomes.

Future Directions

New study needs to examine cost-efficient diagnostic equipment suitable for limited-resource environments while also establishing molecular methods for pathogen identification. By studying septic neonates from birth until neurodevelopmental outcomes become known healthcare providers will strengthen both subsequent caregiving practices after discharge and worldwide newborn medical treatments.

Abbreviation

- **NICU**: Neonatal Intensive Care Unit
- **CRP**: C-reactive protein
- **PCT**: Procalcitonin
- **SPSS**: Statistical Package for the Social Sciences
- **mg/L**: Milligrams per Liter

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Authors Contribution

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Data Analysis: Amir Mohammad[3]

Critical Review: ,Amir Mohammad[3]

Final Approval of version: All Mention Authors Review And Approved The Final Version.

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