Original Research

ASSESSMENT OF INCIDENCE OF FUNGAL BLOODSTREAM INFECTIONS IN LATE-ONSET SEPSIS AMONG VLBW BABIES IN A TERTIARY CARE CENTRE

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ABSTRACT

Background: Late-onset sepsis is a major cause of morbidity and mortality in very low birth weight (VLBW) neonates, with fungal infections, particularly Candida species, emerging as an important etiological agent. The incidence and outcome of neonatal candidemia vary across neonatal intensive care units, especially in high-risk VLBW infants.

Methodology: This prospective observational study was conducted in the Department of Paediatrics, Sree Mookambika Institute of Medical Sciences, Kulasekharam, from March 2025 to February 2026. VLBW neonates (1.0–1.5 kg) with late-onset sepsis were included, while those with early-onset sepsis and birth weight <1.0 kg or >1.5 kg were excluded. Clinical features, laboratory data, and culture reports were analyzed to identify fungal sepsis. Statistical analysis was performed using Chi-square test and Fisher's exact test, with $p<0.05$ considered significant.

Results: Among VLBW neonates with late-onset sepsis, Candida sepsis was observed with male predominance (63.3%), though not statistically significant ($p=0.63$). A significant association was noted with birth weight ($p=0.046$). Common clinical features included hypothermia (70%), abdominal distension (90%), and feeding intolerance (90%). Mortality was high, with 36.7% deaths among culture-positive cases.

Conclusion: Candida sepsis is a significant cause of late-onset sepsis in VLBW neonates with high mortality. Early recognition of clinical signs and timely management are essential to improve outcomes.

Keywords: VLBW Neonates, Late-Onset Sepsis, Candida, Fungal Sepsis, Neonatal Mortality, NICU Infection.

INTRODUCTION

Neonatal sepsis remains one of the leading causes of morbidity and mortality among newborns worldwide, particularly in very low birth weight (VLBW) infants admitted to neonatal intensive care units (NICUs). Among the various etiological agents responsible for late-onset sepsis (LOS), fungal infections—especially those caused by Candida species—have emerged as an important and increasingly recognized cause in recent decades [2]. The immature immune system of preterm and VLBW neonates, along with prolonged hospital stay, invasive procedures, and broad-spectrum antibiotic exposure, significantly increases their susceptibility to invasive fungal infections.

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Data from the NICHD Neonatal Research Network published in 2002 reported that Candida species accounted for the third most common cause of late-onset sepsis, contributing to approximately 12.2% of cases. Importantly, outcomes associated with fungal sepsis were poor, with mortality rates reaching up to 32% in cases of candidemia and 36% in cases of Candida meningitis among infants with LOS [3]. These findings highlight the significant clinical burden and severity of fungal sepsis in this vulnerable population.

Recent literature suggests a changing epidemiology of neonatal fungal sepsis. Several studies have reported an increasing incidence of fungal bloodstream infections among newborns, particularly in VLBW infants, although some centers have demonstrated a declining trend, possibly due to the introduction of antifungal prophylaxis strategies in high-risk NICU populations [3]. Despite these variations, fungal sepsis continues to remain a major concern in neonatal intensive care settings globally.

The incidence of neonatal sepsis varies significantly with birth weight and gestational maturity. In term

neonates, the incidence of sepsis is relatively low, approximately 0.1%, whereas in VLBW infants the incidence increases dramatically to nearly 20% [4]. Furthermore, a strong inverse relationship exists between birth weight and risk of sepsis. Only about 10% of infants weighing between 1,000 and 1,500 grams develop sepsis, whereas this risk increases to nearly 35% in infants weighing ≤1,000 grams [4]. This clearly demonstrates the heightened vulnerability of extremely low birth weight neonates to infectious complications.

The incidence of Candida infection also varies widely across different neonatal populations and NICU settings. In developed countries, the cumulative incidence of candidiasis is reported to be less than 0.3% among infants weighing more than 2,500 grams admitted to NICUs. However, this incidence rises significantly to approximately 12% among infants weighing less than 750 grams [5]. Moreover, large multicenter data from the National Institutes of Health–sponsored Neonatal Research Network have shown a wide variation in the cumulative incidence of invasive candidiasis among infants weighing less than 1,000 grams, ranging from 2.4% to 20.4% across different NICUs [6]. This variability reflects differences in clinical practices, infection control measures, and antifungal prophylaxis protocols.

Given the high morbidity, mortality, and variability in incidence, early recognition of fungal sepsis in VLBW infants with late-onset sepsis is essential. Identifying its burden in individual NICUs is crucial for guiding preventive strategies and improving neonatal outcomes. Therefore, the present study was undertaken to estimate the incidence of fungal sepsis among cases of late-onset sepsis in VLBW neonates admitted to the Department of Paediatrics.

Aim and Objectives

Aim

To estimate the incidence of fungal sepsis among cases of late-onset sepsis in very low birth weight (VLBW) neonates admitted to the Department of Paediatrics.

Objectives

1. To determine the incidence of fungal sepsis in VLBW neonates with late-onset sepsis.
2. To identify the proportion of Candida species as a causative agent in late-onset neonatal sepsis.
3. To assess the clinical characteristics of VLBW neonates with fungal sepsis.

METHEDOLOGY:

The present study was conducted in the Department of Paediatrics, Sree Mookambika Institute of Medical Sciences, Kulasekharam, during the study period from March 2025 to February 2026. Very low birth weight (VLBW) neonates with late-onset sepsis admitted to the neonatal unit were included in the study. Neonates with a birth weight of less than 1.0 kg or more than 1.5 kg were excluded. In addition, neonates with early-onset sepsis occurring within the first 72 hours of life were also excluded from the study.

All eligible neonates were evaluated for clinical and microbiological evidence of late-onset sepsis, with special attention to fungal infections. Relevant demographic, clinical, and laboratory data were collected using a structured proforma. The diagnosis of sepsis was based on standard clinical criteria supported by laboratory and culture reports where applicable.

Statistical analysis was performed using appropriate methods. Categorical variables were expressed as frequency and percentages, while continuous variables were presented as mean ± standard deviation (SD). The incidence of fungal sepsis among VLBW neonates with late-onset sepsis was calculated as proportions. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test wherever applicable. A p-value of less than 0.05 was considered statistically significant for all analyses. Data analysis was carried out using standard statistical software.

RESULT:

Table No. 1: Incidence of Neonates Candida Sepsis According To Gender

S. No.	Sex	Total admission	Candida growth
1	Male	59	19
2	Female	41	11
		100	30

There was a male preponderance (63.3%) noted in neonates with candida sepsis, though the growth was more common in males but this was statistically not significant (p=0.63).

Table No. 2: Distribution of Cases According To Birth Weight

S. No.	Sex	Total admission	Candida growth
1	1-1.3kg	31	10
2	>1.3-1.5 kg	69	20
		100	30

Out of newborn, candida sepsis observed was 33.4% in newborns with birth weight 1-1.3kg & 66.6% in birth weight 1.3-1.5 kg, statistically significant (p=0.046).

Table No. 3: Clinical Presentation of Cases - Candida Sepsis

S. No.	Clinical Signs	CandidaSepsis Positive
1	Temperature Instability (Hypothermia)	21 (70%)
2	Apnea	11(36.7%)
3	Abdominal Distension	27 (90%)
4	Gastric Residual	27 (90%)

Among clinical features studied candida sepsis is more common with hypothermia (70%), abdominal distension (90%) & gastric residual (90%).

Table No. 4: Outcome of the Cases with Candida Sepsis

Outcome	Discharge	LAMA	Expired	Total
Candida positive	11 (36.7%)	8 (26.7%)	11 (36.7%)	30 (100%)

Out of 30 positive candida cases, 36.7% got discharged, 36.7%

DISCUSSION

The present study evaluated the incidence, clinical profile, and outcome of Candida sepsis among very low birth weight (VLBW) neonates with late-onset sepsis. In our study, a male predominance was observed among neonates with Candida sepsis, with 63.3% being males. Although fungal growth was more frequently observed in male neonates, this association was not statistically significant (p = 0.63). Similar gender trends have been reported in neonatal sepsis studies, although no consistent biological explanation has been established for sex-based susceptibility, and most authors suggest that this variation may be incidental rather than causative [7].

In relation to birth weight, Candida sepsis was more commonly observed in neonates weighing 1.3–1.5 kg (66.6%) compared to those weighing 1.0–1.3 kg (33.4%), and this difference was statistically significant (p = 0.046). This finding contrasts with several studies where lower birth weight is consistently associated with higher risk of invasive fungal infections. Stoll et al. reported that decreasing birth weight is strongly associated with increased risk of late-onset sepsis, particularly fungal infections, due to immaturity of immune defenses and increased exposure to invasive procedures [8]. The variation observed in the present study may be attributed to differences in sample size distribution, clinical practices, antibiotic exposure, or NICU-related factors.

Clinically, Candida sepsis in the present study most commonly presented with temperature instability in the form of hypothermia (70%), abdominal distension (90%), and increased gastric residuals (90%). Apnea was observed in 36.7% of cases. These findings are consistent with the non-specific and subtle presentation of neonatal fungal sepsis, which often mimics bacterial sepsis but may show predominant gastrointestinal intolerance and systemic instability. Kaufman et al. emphasized that feeding intolerance, abdominal distension, and respiratory instability are important early clinical clues in invasive candidiasis among VLBW infants [9]. Similarly, Benjamin et al. reported that gastrointestinal signs such as feeding intolerance are frequently associated with candidemia in extremely low birth weight infants [10].

Outcome analysis in the present study revealed that among 30 culture-positive Candida sepsis cases, 36.7% were discharged, 26.7% left against medical advice (LAMA), and 36.7% resulted in mortality. The mortality rate observed is comparable to earlier studies reporting high fatality rates associated with neonatal candidemia, particularly in VLBW infants. Benjamin et al. reported mortality rates ranging from 20% to 40% in neonatal invasive candidiasis, highlighting the severe prognosis associated with fungal sepsis [10]. The high mortality observed in the present study underscores the aggressive nature of fungal infections in this vulnerable population and the need for early diagnosis and prompt antifungal therapy.

Overall, the present study highlights that Candida sepsis remains a significant cause of morbidity and mortality in VLBW neonates with late-onset sepsis. Although male predominance was observed, it was not statistically significant. Birth weight showed a significant association, and clinical presentation was dominated by nonspecific gastrointestinal and systemic signs. High mortality rates further emphasize the importance of early recognition, strict infection control practices, and timely initiation of antifungal therapy in improving neonatal outcomes.

CONCLUSION

The present study demonstrates that Candida sepsis is an important cause of late-onset sepsis among very low birth weight (VLBW) neonates, with a considerable incidence and significant associated

mortality. Although a male predominance was observed, it was not statistically significant. Birth weight showed a significant association with the occurrence of fungal sepsis, indicating its role as an important risk factor in this vulnerable population.
Clinically, Candida sepsis presents with non-specific features such as temperature instability, abdominal distension, feeding intolerance, and increased gastric residuals, which necessitate a high index of suspicion for early diagnosis. The mortality rate observed in the present study was high, emphasizing the severity of invasive fungal infections in VLBW neonates.Early recognition, prompt initiation of antifungal therapy, and strict adherence to infection control practices are essential in improving outcomes. The study highlights the need for vigilant monitoring of high-risk neonates in NICU settings and supports the importance of preventive strategies to reduce the burden of fungal sepsis in VLBW infants.

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