Microbiological Profile Evolution In Patients With Acute Lymphoblastic Leukemia At The Guatemalan Social Security Institute (2020–2025)

E.Hernández[1], D. Rosales [1], B. Sánchez [1], V. Guerra [1], S.Mateo[1], S. Mendoza [1], M. De La Cruz[1], P.Ruano [1], A. Peréz [1]

[1]. Instituto Guatemalteco de Seguridad Social (IGSS), Guatemala

Introduction

Infections are a leading cause of mortality during induction chemotherapy in patients with acute lymphoblastic leukemia (ALL), especially in countries with limited access to broad-spectrum antimicrobials and infection control strategies. Since 2020, the Hematology Unit at IGSS Guatemala has used a modified CALGB regimen for induction therapy. However, infection-related deaths remain a major concern. This study aims to describe the microbiological profile over time and identify patterns of emerging pathogens and resistance in this vulnerable population.

Aim

Describir el perfil microbiológico basado en hemocultivos en pacientes con leucemia linfoblástica aguda (LAL) que fallecieron por causas infecciosas durante la terapia de inducción con el esquema modificado CALGB en el IGSS entre 2020 y 2025.

Objectives

This study aimed to describe in detail the microorganisms isolated from blood cultures of patients with acute lymphoblastic leukemia (ALL) who died from infectious causes during induction therapy. Specifically, it sought to identify the most frequent bacterial species involved, determine their annual distribution between 2020 and 2025, and document their antimicrobial resistance patterns. These findings are intended to support the development of local empirical antibiotic strategies based on microbiological trends observed over time.

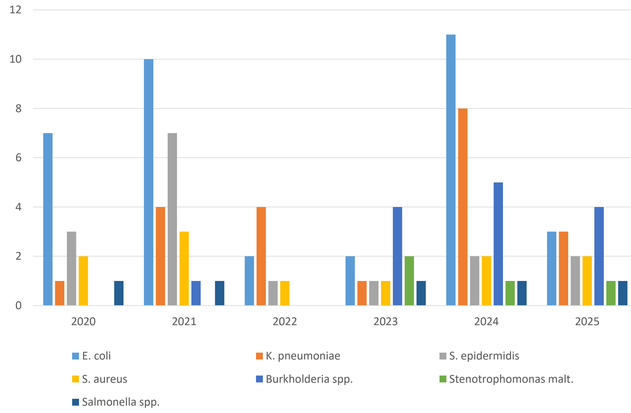
Methods

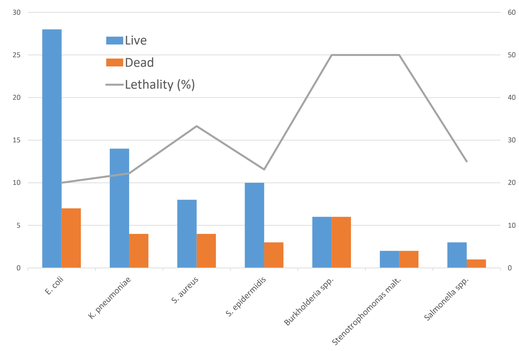
A retrospective descriptive study was carried out in the Hematology Unit of the Instituto Guatemalteco de Seguridad Social (IGSS), at the Hospital General de Enfermedades in Guatemala City. We included all patients diagnosed with acute lymphoblastic leukemia (ALL) who underwent induction therapy with the modified CALGB protocol between January 2020 and June 2025. All blood cultures collected during the induction period were reviewed, regardless of whether the patient survived or died. Microbiological records were analyzed to identify the isolated pathogens, their annual distribution, and their antimicrobial resistance profiles. Only the first isolate per infectious episode was included to avoid duplication. The data were obtained exclusively from microbiology laboratory reports and patient records; no patient contact or interventions were performed.

Results

Between January 2020 and June 2025, a total of 110 blood cultures were obtained from patients with acute lymphoblastic leukemia undergoing induction therapy with the modified CALGB protocol at IGSS. Among these, 110 cultures yielded positive results. The most frequently isolated microorganism was Escherichia coli, representing the leading cause of bloodstream infections across all years analyzed. Klebsiella pneumoniae ranked second in frequency, followed by species of the Burkholderia complex, including B. cepacia and B. contaminans. Notably, isolates of Burkholderia increased steadily from 2023 onward, raising concern for a potential nosocomial source.

A significant proportion of Gram-negative bacilli showed multidrug resistance, particularly to third-generation cephalosporins, fluoroquinolones, and carbapenems. The presence of Gram-positive cocci and fungal pathogens was infrequent, with no clear epidemiological trend. No seasonal variation was identified. Notably, Burkholderia species showed the highest lethality among all isolates, with a mortality rate of 50% in patients who had positive blood cultures for this pathogen.





Summary

This five-year study describes bloodstream infections during induction in ALL patients at IGSS. Escherichia coli was the most frequently isolated and most lethal microorganism, followed by Klebsiella pneumoniae and Burkholderia spp. A rise in Burkholderia after 2023 suggests possible nosocomial transmission. The predominance of multidrug-resistant Gram-negative bacilli underscores the need for updated antibiograms and empirical therapy based on local data.

Discussion

This study identified Escherichia coli as the most prevalent bloodstream pathogen during induction therapy in ALL patients, consistently isolated throughout the study period. However, Burkholderia species, although less frequent, showed the highest lethality, with a growing number of fatal infections after 2023. This pattern suggests possible nosocomial transmission and underscores the clinical relevance of emerging opportunistic and drug-resistant pathogens. The high burden of multidrug-resistant Gram-negative bacilli calls for stricter infection control, periodic institutional antibiograms, and empirical treatment protocols tailored to local microbial behavior and lethality trends.

References

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