World Journal of Biology Pharmacy and Health Sciences
eISSN: 2582-5542
Cross Ref DOI: 10.30574/wjbphs
Journal homepage: https://wjbphs.com/

(RESEARCH ARTICLE)

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Critical Analysis of Commensal Flora Isolation in Blood Cultures at Cheikh Khalifa International University Hospital: Focus on *Coagulase-Negative Staphylococci*

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World Journal of Biology Pharmacy and Health Sciences, 2026, 25(01), 262-265

Publication history: Received on 14 December 2025; revised on 20 January 2026; accepted on 22 January 2026

Article DOI: https://doi.org/10.30574/wjbphs.2026.25.1.0038

Abstract

This retrospective study assessed the prevalence of *Coagulase-Segative staphylococci (CoNS)* and other commensal flora in blood cultures at Cheikh Khalifa International University Hospital, Casablanca, over a 3-month period (April-June 2023). Of 844 blood cultures processed, 409 (48.4%) were positive. *CoNS* represented 21.7% of positive cultures (10.5% overall prevalence), predominantly isolated from intensive care units (52.8%) and pediatrics (22.5%). This prevalence significantly exceeds the 3% international quality threshold, highlighting the need for improved pre-analytical procedures and clinical-biological interpretation algorithms to distinguish true bacteremia from contamination.

Keywords: Blood culture; *Coagulase-Negative Staphylococci*; Commensal flora; Prevalence; Pre-analytical phase

1. Introduction

Blood culture remains the pivotal diagnostic test for identifying bacteremia. However, its performance is often compromised by the isolation of organisms from the cutaneous commensal flora, predominantly coagulase-negative staphylococci (CoNS). Although long considered contaminants, CoNS have become leading opportunistic pathogens, particularly in immunocompromised patients or those with invasive medical devices [1]. The objective of this study is to assess the prevalence of CoNS, *Corynebacterium spp*, and *Bacillus spp* at the laboratory of Cheikh Khalifa International University Hospital (CKIUH) and to analyze their distribution by department.

2. Materials and Methods

This is a retrospective descriptive study based on an analysis of the computerized database of the CKIUH microbiology laboratory in Casablanca over a 3-month period from April 1 to June 30, 2023. We included bacteria belonging to the commensal flora (*Coagulase-Negative Staphylococci*, *Corynebacterium species*, and *Bacillus species*) in our study. Blood culture bottles were incubated using the Bactec automated system. Identification of organisms from positive cultures was performed by automated method on Phoenix 1000, and antibiotic susceptibility testing was conducted according to EUCAST 2022 recommendations.

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3. Results

3.1. Overall Positivity Rate and Distribution of Isolates

Over a three-month period, the laboratory processed a total volume of 844 blood cultures. Among these, 409 bottles showed positive culture, representing a high overall positivity rate of 48.4%.

Microbiological analysis reveals that *Coagulase-Negative Staphylococci (CoNS)* constitute the predominant portion of commensal flora isolates. They were identified in 89 bottles, representing 21.7% of positive blood cultures. Relative to all requests from the institution (844 bottles), the prevalence rate of CoNS is 10.5%.

In comparison, other organisms usually considered potential contaminants show very low rates. The genus *Bacillus species* was isolated in only 1% of positive cultures (4 cases), while *Corynebacterium species* was detected in only 0.2% of cases (1 single isolate), representing 0.45% and 0.1% of total blood cultures processed, respectively *(Table 1)*.

Table 1 Distribution of Contaminating Bacterial Species

Contaminating Bacterial Species	N	%
CoNS	89	21.7
Bacillus species	4	1
Corynebacterium species	1	0.2

3.2. Analysis of Distribution by Clinical Department:

The distribution of the 89 *CoNS* isolates shows marked heterogeneity according to the criticality and specialty of departments *(Figure 1)*:

- Intensive Care: This department concentrates the absolute majority of isolations with 52.8% of cases (more than one isolate out of two).
- Pediatrics: It ranks second with 22.5% of isolates.
- Hematology-Oncology: This department represents 10.1% of identified *CoNS.*
- Internal Medicine: It totals 9% of cases.
- Surgery: This sector presents the lowest prevalence with 5.6%.

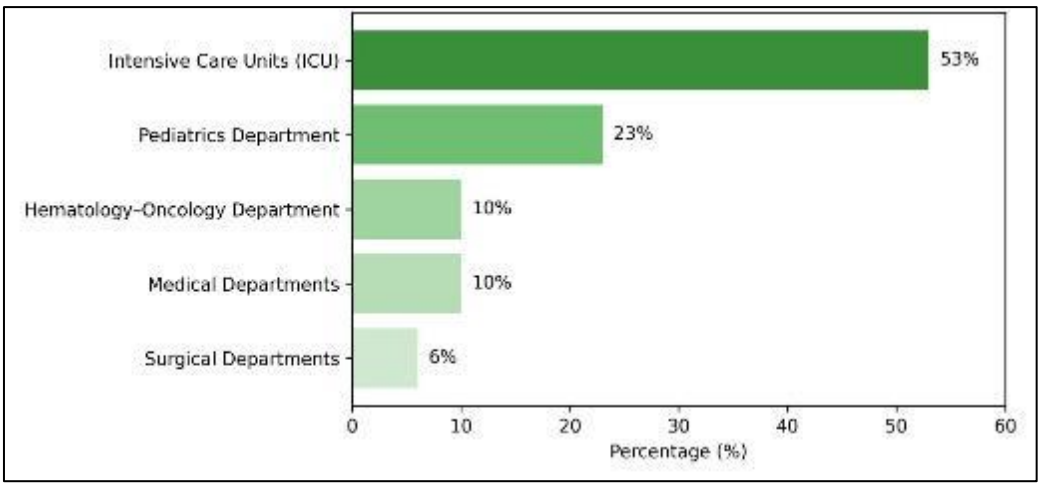

Figure 1 Distribution of *CoNS* Isolates by Clinical Department

4. Discussion

The prevalence of *CoNS* in our study is 10.5% of all blood cultures processed. This result is significantly higher than the 3% threshold generally accepted by international quality standards for blood culture contaminants [2, 3]. This situation is not isolated and reflects common challenges encountered in various regions.

4.1. Comparison with Moroccan and African Data

Our results corroborate observations made in other hospital structures in the Kingdom. In Casablanca, a study conducted at Ibn Rochd University Hospital also reported a predominance of *CoNS* among blood culture isolates, emphasizing that these organisms constitute the primary cause of positivity, often related to specimen collection quality issues [1]. At the continental level, studies conducted in sub-Saharan Africa show similar trends. For example, work conducted in Ethiopia and Nigeria reports *CoNS* rates ranging from 15% to 30% of positive isolates, often associated with insufficient skin asepsis and difficult collection conditions in intensive care settings [4, 5]. These data suggest that the problem of *CoNS* as major contaminants is a shared public health challenge at the regional level, requiring standardization of pre-analytical protocols.

4.2. Analysis in Light of International Literature

Internationally, the distinction between true bacteremia and contamination remains one of the most documented debates in clinical microbiology. In the United States, Edmond et al. demonstrated that *CoNS* are the most frequently isolated agents in nosocomial infections, but that a substantial portion (sometimes more than 80%) of these isolates do not represent actual clinical infection [2]. Recent international literature emphasizes the importance of "Time to Positivity": a *CoNS* detected after 24 to 48 hours of incubation is statistically more likely to be a contaminant than a strain detected early [6]. Furthermore, the use of modern techniques such as Initial Specimen Diversion has become a strong recommendation to bring the *CoNS* rate below the 3% threshold [7].

4.3. Pre-analytical Phase Issues in Intensive Care

The particularly high isolation rate in intensive care (52.8%) in our series is explained by the complexity of patient management. The literature shows that the urgency of care and the presence of multifocal invasive devices (central catheters, arterial lines) multiply the risks of translocation of cutaneous flora to the blood culture bottle [8]. Unlike conventional medicine departments (9%), intensive care requires increased vigilance during disinfection of insertion sites to avoid false positives.

4.4. Therapeutic Consequences and Bacterial Resistance

The major risk identified by our data, and confirmed by the work of Bates et al., is unjustified therapeutic escalation [3]. In the absence of a clear decision-making algorithm, *CoNS* isolation often leads to vancomycin administration. However, hospital-acquired *CoNS* are major reservoirs of resistance genes (notably the *mecA* gene), and their inappropriate treatment promotes the selection of multidrug-resistant strains within the hospital ecosystem [9]. Clinical-biological correlation, including the number of positive bottles and the patient's inflammatory status, remains the cornerstone for limiting the ecological and financial impact of these isolates.

5. Conclusion

CoNS remain the main contaminating agents of blood cultures at CKIUH, with a prevalence exceeding international standards. This situation requires increased awareness among healthcare personnel regarding good collection practices and the importance of skin asepsis. Close collaboration between clinicians and microbiologists for the adoption of a standardized clinical-biological decision-making algorithm is essential for interpreting results and optimizing antibiotic use and hospital resource management.

Compliance with ethical standards

Acknowledgments

The authors would like to thank the medical and nursing staff of the Cheikh Khalifa International University Hospital for their contribution to patient care.

Disclosure of conflict of interest

The authors declare that they have no conflicts of interest.

Statement of ethical approval

The study was conducted in accordance with ethical standards. Approval was obtained from the appropriate ethics committee.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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