Comparison of Central Line Associated Blood Stream Infections In The Pediatric Intensive Care And Hemat-Oncology Unit In A Tertiary Care Hospital

Bhanuja Bhagwat, Rahul Jahagirdar, Bhakti Sarangi, Vibha Bafna

Department of Pediatrics

Bharati Vidyapeeth Medical College and Hospital, Pune, Maharashtra, India

Introduction

Central line associated bloodstream infections (CLABSIs) are a major hospital acquired infection (HAI) leading to an increase in morbidity and mortality in pediatric patients. The major usage of central venous catheters are observed in the pediatric intensive care unit (PICU) and the hemat-oncology (HO) unit, among children requiring prolonged IV medications and repeated sampling. The incidence, risk factors, microbiological profile and antimicrobial resistance in the PICU may differ from that of the HO unit, warranting the need for studies in our Indian pediatric population, as limited data exists.

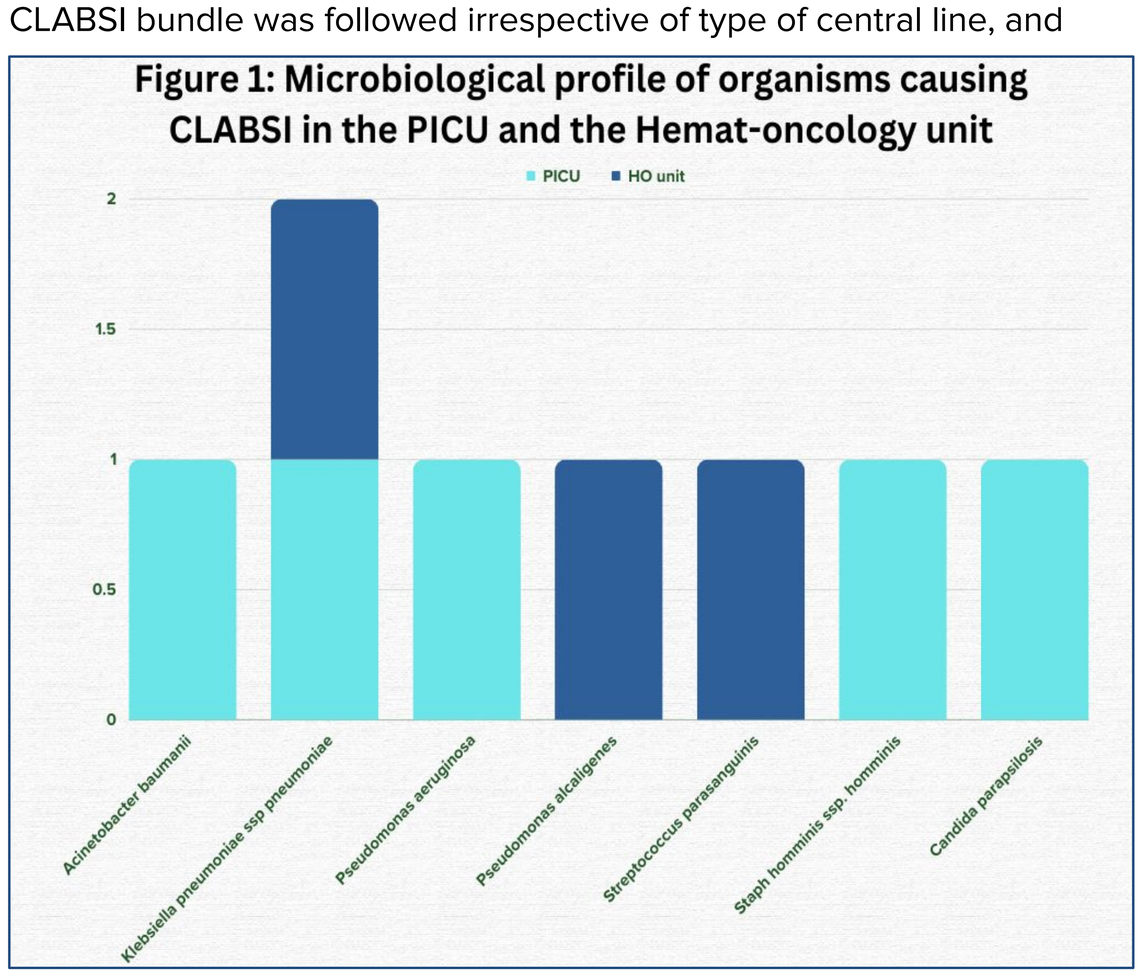
Aim

To compare CLABSIs in children admitted to the PICU with the HO unit, in terms of incidence, microbiological profile and antimicrobial sensitivity pattern.

Methodology

This is an ongoing prospective observational study in the PICU and HO unit of a tertiary care hospital, among children aged 1 to 18 years. CLABSI bundle was followed irrespective of type of central line, and

Figure 1: Microbiological profile of organisms causing CLABSI in the PICU and the Hemat-oncology unit



followed up till its removal. As per the standard care, in a patient suspected to have CLABSI evidenced by clinical signs of infection and no alternate source of blood stream infection, blood cultures were collected from both the central and peripheral lines, 48 hours after central line insertion, as per CDC guidelines [1].

Results

A total of 46 patients were analyzed, almost equally distributed in terms of gender (54.34% females, 45.65% males). It was observed that peripherally inserted central catheter (PICC) lines were preferred in the HO unit, as compared to central venous catheters (CVCs) in the PICU mainly via the jugular vein (63.04%). The overall CLABSI rate was 9.65 per 1000 central line days. The total device utilization rate was 0.82. The comparison of CLABSI rates are depicted in detail in table 1. The most common isolated organism belonged to the gram negative species (62.5%) while the rest were gram positive (25%) and fungal (12.5%). Microbiological profile of the organisms is depicted in figure 1. The gram negative organisms in both units were sensitive to colistin, with an additional sensitivity to ceftazidime-avibactam in the HO units. The gram positive organisms were sensitive to vancomycin and higher antibiotics like teicoplanin only. Fungal species were pan-sensitive. A favorable outcome was noted in 82.6% (discharged) while 17.39% resulted in death.

Table 1: PICU versus Hemat-Oncology unit - Comparison of demographics and CLABSI rates

	PICU	HO	Total
Total number of children	33	13	46
Males	13	08	21
Females	20	05	25
Total central line (CL) days	395	441	836
Total CLABSI	5	3	8
CLABSI rate	12.6/1000 CL days	6.8/1000 CL days	9.5/1000 CL days
Device utilization ratio	395/728 (0.54)	441/280 (1.57)	836/1008 (0.82)
Outcomes of children in PICU and HO unit with central lines			
Discharged	27	10	37
Death	5	3	8
Discharged against medical advice	1	0	1

Discussion

CLABSI is defined as an identified eligible blood stream organism (laboratory confirmed) that is not secondary to an infection at another body site in a patient with an eligible central line (placed for more than two consecutive calendar days) [1]. To be considered as a CLABSI, a single organism is to be identified in cultures from both central and peripheral line, as was done in our study [2]. Although CDC has no specific guidelines for the choice of site of CVC in the pediatric population, femoral lines are generally avoided due to the possibility of high risk of infection [3]. In our study, only 15% of CVCs were femoral lines. The Device utilization Ratio (DUR), which compares the number of device days to the number of patient days, was the least in the PICU. A lower ratio is desirable for infection control. However, CLABSI rate in the PICU was higher than the HO unit. This could be explained by the use of multiple ports, frequent handling and sampling in the PICU. The microbiological profile of our study was in accordance to similar Indian studies wherein gram negative organisms were the most prevalent (Klebsiella species), that were resistant to third generation cephalosporins and carbapenems, followed by gram positive and lastly, yeast species.[4].

Conclusion

CLABSIs prolong stay and cause economic burden. Frequent studies help in early recognition and understanding the trend of HAI. Analysis of CLABSI rates in the HO unit in the pediatric population are few. Considering the differences between both settings, and varied risk factors further studies are warranted, in turn helping in implementing targetted surveillances for each unit.

References

1. Bloodstream Infection Event (Central Line- Associated Bloodstream Infection and Non – central line associated bloodstream infections, National Healthcare Safety Network, January 2022, available on:https://www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf , accessed on May 1, 2022.

2. Mermel LA, Allon M, Bouza E, Craven DE, Flynn P, O'Grady NP, Raad II, Rijnders BJ, Sherertz RJ, Warren DK. Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 Update by the Infectious Diseases Society of America. Clin Infect Dis. 2009 Jul 1;49(1):1-45. doi: 10.1086/599376. Erratum in: Clin Infect Dis. 2010 Apr 1;50(7):1079. Dosage error in article text. Erratum in: Clin Infect Dis. 2010 Feb 1;50(3):457. PMID: 19489710; PMCID: PMC4039170.

3. CDC. Guidelines for the Prevention of Intravascular Catheter-Related Infections. 2011. Available from: *http://www.cdc.gov/hicpac/pdf/guidelines/bsi-guidelines-2011.pdf*. Accessed November 8, 2015

4. Singhal T, Shah S, Thakkar P, Naik R. The incidence, aetiology and antimicrobial susceptibility of central line-associated bloodstream infections in intensive care unit patients at a private tertiary care hospital in Mumbai, India. Indian journal of medical microbiology. 2019 Oct 1;37(4):521-6.