



Surveillance of infections in a pediatric oncologic unit and bone marrow transplantation unit in a tertiary public hospital in Jalisco, Mexico.



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Introduction

- Patient with cancer and those undergoing bone marrow transplantation (BMT) have higher morbidity and mortality rates in low to middle income countries .
- Since 2013, a program for the better care and prevention of infection was implemented in Hospital Civil de Guadalajara , Mexico. Prospective surveillance of infections and their outcomes in pediatric cancer patients have been documented as a part of this program.

Objective

- We aimed to compare the spectrum of infection, comorbidities, outcomes, and mortality of patients admitted to our pediatric oncology and BMT units due to present on admission (POA) or healthcare-associated infections (HAI).

Methods

- **Design:** This retrospective cohort study was conducted in the pediatric oncology and the BMT units from May 2014 to December 2015.
- **Settings:** The Hospital Civil de Guadalajara is the largest public hospital in Jalisco, Mexico. It has 501 beds with a bed occupancy rate >90%. The oncology department comprises a separate 34-bed oncology in ward and a 3-bed BMT unit. They have bed occupancy rates 59% and 30%; and day-patients of 20 and 1.4; respectively. A total of 43 nurses and 17 physicians provide care to pediatric cancer patients.
- **Data collection and Statistical Analysis:** We used the *Registry of Infections and Risk Factors* data collection tool developed by the St. Jude Children's Research Infectious Diseases Global Initiative. HAI events were classified on the basis of the CDC/NHSN standardized definitions. We compared demographic characteristics and clinical outcomes between groups using Fisher exact test, Pearson χ^2 test, or Independent t-test.
- **Human Subjects:** This study was approved by the local Institutional Review Board of the Hospital Civil de Guadalajara.

Results

- We identified 360 infections among 125 patients during 1,594 admissions in the oncologic unit, and 6 infections in 14 patients admitted in the BMT unit (Table 1).
- 55% of the infectious events were present on admission (Table 2). The HAI rate among pediatric patients with cancer was 22.6/100 admissions and 43/100 admissions among pediatric patients undergoing to BMT.
- In general, bloodstream infections (34%), pneumonia (30%) and urinary tract infection(15%) were the most common infection complications (Table 2). Catheter associated bloodstream infections were the most prevalent infection complication in the BMT unit (6 episodes, 43%).

- Gram-negative bacteria were the most common isolation for microbiologically-documented infectious episodes (Table 2). *Escherichia coli* was the most commonly isolated pathogen for the bloodstream infection events (Figure 1).
- We found a significantly greater frequency of neutropenia (94% vs. 8%, P=0.001) and profound neutropenia (92% vs. 8%) among POA episodes. Length of stay was greater (14 vs.23 days, P=0.001) among HAI episodes. The overall infection-associated mortality rate was 9.4% (34/360). The infection-associated mortality rate mortality was 33.3% (2/6) among BMT patients.

Table 1. Demographic of study population, stratified by present on admission (POA) versus healthcare-associated infection (HAI)

	All n=125	POA n=78	HAI n=47	P-value
Sex: Female	65 (52)	42 (54)	23 (49)	0.595
Age (year)	7.3 ±5.4 (0-20)	7.4 ±5.2 (0-20)	7.1 ±5.8 (0-18)	0.299
Oncological diagnosis				0.009
Leukemia	82 (66)	58 (75)	24 (51)	
Lymphomas	9 (7)	5 (6)	4 (8)	
Malignant Solid Tumor	15 (12)	6 (8)	6 (13)	
CNS Tumor	13 (10)	9 (11)	7 (15)	
HSCT	6 (5)	0 (0)	6 (13)	

NOTE: Values are presented as n (%) or mean ± SD (range)
 CNS: Central Nervous System; HSCT: Hematopoietic Stem Cell Transplantation
 *2-sided P-values calculated by t test (continuous variables), chi-square test or Fisher's exact test (binary variables)

Table 2. Distribution of infection-related variables, stratified by present on admission (POA) versus healthcare-associated infection (HAI)

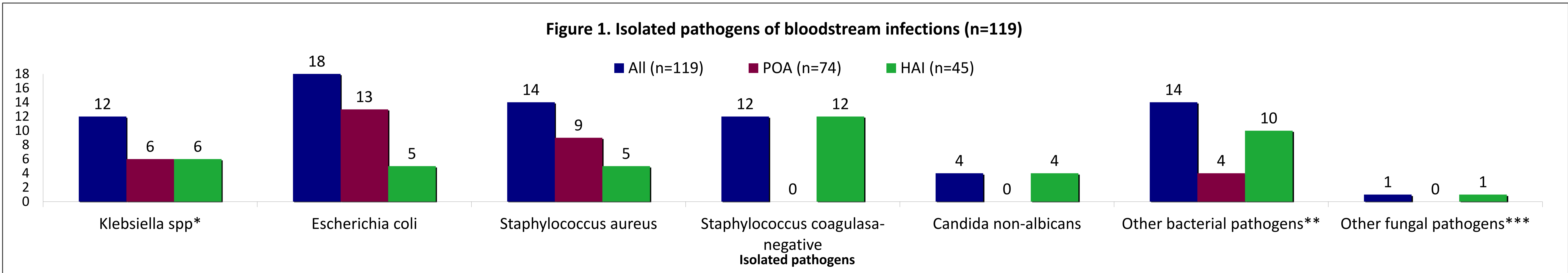
	All n=360	POA n=199	HAI n=161	P-value
<i>Infection category</i>				
Clinically suspected	177 (49)	86 (43)	91 (56)	0.012
Microbiologically confirmed	183 (51)	113 (57)	70 (44)	
<i>Site of infection</i>				
Fever of unknown origen	28 (8)	23 (12)	5 (3)	0.001
CNS infections	7 (2)	4 (2)	3 (2)	
Respiratory tract	16 (4)	10 (5)	6 (4)	
Bloodstream infeciions	119 (34)	74 (37)	45 (28)	
Gastrointestinal	18 (5)	8 (4)	10 (6)	
Skin and soft tissue	5 (1)	2 (1)	3 (2)	
Pneumonia	107 (30)	40 (20)	67 (42)	
Urinary tract	55 (15)	35 (17)	20 (12)	
Other	5 (1)	3 (2)	2 (1)	
<i>Neutropenia</i>				
Neutropenia (ANC ≤500 cells/mm ³)	205 (57)	188 (94)	17 (8)	0.001
Profund neutropenia (ANC ≤100 cells/mm ³)	124 (60)	114 (92)	10 (8)	0.001
<i>Microbial infection type</i>				
Gram negative bacterial	117 (59)	74 (62)	43 (53)	
Gram positive bacterial	49 (24)	29 (24)	20 (24)	
Fungal	13 (6)	4 (3)	9 (11)	
Virus	22 (11)	13 (11)	10 (12)	

NOTE: Values are presented as n (%)
 CNS: Central nervous system; FN: Febrile neutropenia (Fever 38.3°C plus ANC ≤500 cells/mm³); ANC: absolute neutrophil count
 *2-sided P-values calculated by t test (continuous variables), chi-square test or Fisher's exact test (binary variables)

Table 3. Clinical outcomes of study population, stratified by present on admission (POA) versus healthcare-associated infection (HAI)

	All n=360	POA n=199	HAI n=161	P-value
Admission to ICU due to infection	22 (6)	12 (6)	10 (6)	0.944
Length of stay	16 (5-145)	14 (1-139)	23 (0-145)	0.0001
Infection-associated mortality	34 (9.4)	15 (7.5)	19 (12)	0.169

NOTE: Values are presented as n (%) or mean (range)
 *2-sided P-values calculated by t test (continuous variables), chi-square test or Fisher's exact test (binary variables)



NOTE:
 **Klebsiella* spp. includes *Klebsiella pneumoniae* (n=9), *Klebsiella oxytoca* (n=3)
 **Other bacterial pathogens includes *Pseudomona aeruginosa* (n=4), *Enterobacter cloacae* (n=3), *Stenotrophomona maltophilia* (n=2), *Enterobacter gergoviae* (n=1), *Acinetobacter baumannii* (n=1), *Acinetobacter iwoffii* (n=1) and *Salmonella* spp. (n=1)
 ***Other fungal pathogens includes *Candida albicans* (n=1)

Conclusions

- Our findings suggest higher morbidity for HAI episodes among pediatric cancer patients. Further studies to identify risk factors might aid to improve infection care and prevention among children cancer in our hospital.

REFERENCES
 Centers for Disease Control and Prevention/National Healthcare Safety Network. *Identifying Healthcare-associated Infections*. 2015. <http://www.cdc.gov/nhsn/>



Acknowledgments
 Hospital Civil of Guadalajara, University of Guadalajara and CONACYT provided funding and support these Programs of Care and Prevention of Infections in children with cancer and undegoing to HSCT.