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BLOODSTREAM INFECTIONS IN COVID-19 POSITIVE PATIENTS HOSPITALIZED IN THE UNIVERSITY HOSPITAL, LITHUANIA

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Background

Bacterial, viral and fungal co-infections in COVID-19 patients are associated with increased morbidity and mortality, requiring timely diagnosis and therapy. This study aimed to describe bloodstream infections (BSIs) and to evaluate risk factors for developing BSIs in hospitalized COVID-19 positive adult patients.

Methods

COVID-19 positive adults hospitalized in Vilnius University Hospital Santaros Klinikos, Lithuania, were included in this retrospective cohort study between March 2020 and May 2021. Depersonalized data were retrieved from electronic medical records.

BSI was defined as the growth of non-skin flora commensal on one or more blood cultures (BCs). Bacteria belonging to the commensal skin flora (coagulase-negative staphylococci, *Micrococcus* spp., *Propionibacterium* spp., *Corynebacterium* spp.) growing in BC sets were defined as contaminants. Only one BSI episode was counted when several BC sets were positive with the same microorganism for a patient.

To explore the risk factors associated with BSIs, multivariable logistic regression models were created. *p*-value < 0.05 was considered significant.

Results

- A total of **2844** patients were included in this study.
- Baseline characteristics of hospitalized COVID-19 patients and patients according to BSI group are provided in Table 1.
- Total 3031 BCs were obtained from 1905 patients.
- Overall, 1611 patients had BC collected at less than 48 hours from admission to hospital and 768 patients – ≥ 48 hours from admission.
- A total of 56 community-acquired BSIs were documented in 51 (1.8%) patient, 142 hospital-acquired infections were documented in 102 (3.6%) patients.
- Seven patients that were admitted with community-acquired infection got BSI caused by another pathogen during hospitalization.
- The most frequent pathogens of community-acquired BSIs were *Esherichia coli* (26.8%), *Staphylococcus spp.* (23.2%) and *Klebsiella pneumoniae* (14.3%) (Figure 1).
- The most frequent microorganisms causing hospital-acquired BSIs were *Acinetobacter baumanii* (23.2%), *Staphylococcus* spp. (14.8%), *Klebsiella pneumoniae* (13.4%) and *Enterococcus faecium* (10.6%) (Figure 1).
- The distribution of pathogens in BCs of hospitalized COVID-19 patients are shown in Figure 1.
- Age (OR 1.03; 95%CI 1.01–1.06, p=0.005) and having atrial fibrillation (OR 3.08; 95%CI 1.57–6.01, p=0.001) increased odds of having community-acquired BSI (Figure 2).
- Risk factors for hospital-acquired BSI were identified to be obesity (OR 2.43; 95%CI 1.15–5.11, p=0.020), previous stroke (OR 10.83; 95%CI 3.12–37.56, p=0.001), invasive ventilation (OR 13.63; 95%CI 7.03–25.43, p<0.001), and non-invasive ventilation/high-flow oxygen therapy (OR 1.99; 95%CI 1.06–3.76, p=0.033) (Figure 2).

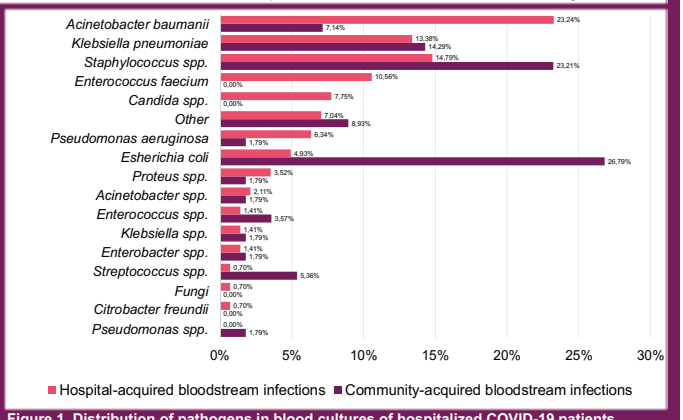

Figure 1. Distribution of pathogens in blood cultures of hospitalized COVID-19 patients.

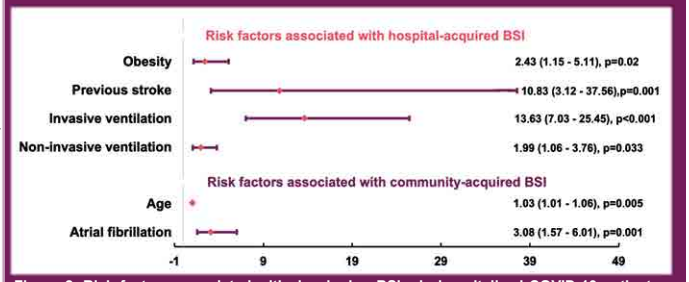

Figure 2. Risk factors associated with developing BSIs, in hospitalized COVID-19 patients, multivariable logistic regression, OR (95%CI, *p*–value).

Conclusions

Bloodstream infections' rate in hospitalized COVID-19 patients was quite low accounting 1.8% of community–acquired infections and 3.6% of hospital–acquired infections. Age and atrial fibrillation were identified as risk factors for community–acquired bloodstream infections, while obesity, previous stroke, the need of invasive and non–invasive ventilation/high flow oxygen therapy were associated with increased risk of hospital–acquired bloodstream infections in COVID-19 patients.

Table 1. Baseline characteristics of hospitalized COVID-19 patients and patients according to bloodstream infection group.

Characteristic	Total patients, n (%) N=2844	Patients with community–acquired bloodstream infection, n (%) N=51	Patients with hospital–acquired bloodstream infection, n (%) N=102
Age in years, median (IQR)	59 (48 – 70)	70 (58 – 78)	62 (55.75 – 70.25)
Female	1301 (45.7)	25 (49.0)	39 (38.2)
Any underlying condition	1335 (46.9)	40 (78.4)	74 (72.5)
Arterial hypertension	1037 (36.5)	30 (58.8)	54 (52.9)
Coronary artery disease	105 (3.7)	1 (2.0)	3 (2.9)
Congestive heart failure	221 (7.8)	6 (11.8)	18 (17.6)
Atrial fibrillation	286 (10.1)	18 (35.3)	24 (23.5)
Diabetes	385 (13.5)	11 (21.6)	25 (24.5)
Diabetes with no complications	111 (3.9)	1 (2.0)	2 (2.0)
Diabetes with complications	275 (9.7)	10 (19.6)	23 (22.5)
Obesity	129 (4.5)	6 (11.8)	21 (20.6)
Chronic obstructive pulmonary disease	45 (1.6)	1 (2.0)	3 (2.9)
Chronic kidney disease	216 (7.6)	8 (15.7)	18 (17.6)
Previous stroke	39 (1.4)	2 (3.9)	6 (5.9)
Invasive ventilation	227 (8.0)	10 (19.6)	61 (59.8)
Non-invasive ventilation / high flow oxygen therapy	273 (9.6)	9 (17.6)	42 (41.2)
In-hospital mortality	359 (12.62)	21 (41.2)	56 (54.9)
Length of hospitalization (in days)	11 (7 – 16)	14 (10 – 27)	32 (15.75 – 53)

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