THE 3rd INTERNATIONAL ELECTRONIC CONFERENCE ON ANTIBIOTICS

THE IMPACT OF COVID-19 PANDEMIC ON ESBL-PRODUCING ENTEROBACTERALES INFECTIONS: A SCOPING REVIEW

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INTRODUCTION

Extended-spectrum beta-lactamase-producing Enterobacterales (ESBL-PE) are a group of bacteria that have developed resistance to multiple antibiotics (especially Eco-ESBL and Kp-ESBL). [1]

The COVID-19 pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). [2]

Scoping review: summarize the available evidence on the impact of the COVID-19 pandemic on ESBL-PE infections by using specific search criteria on PubMed, MEDLINE, and EMBASE.

MATERIALS AND METHODS

The scoping review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) Statement.

Eligibility Criteria

Topic	Search Terms
Context	COVID-19 COVID-19 pandemic SARS-CoV2 Coronavirus pandemic
Bacteria	*Enterobacterales* AND (ESBL OR ESBL-positive OR ESBL-producing OR *Enterobacteriaceae* OR extended-spectrum beta-lactamase OR extended spectrum beta lactamase OR extended spectrum beta lactamases)
Outcomes	'COVID-19 ESBL' OR 'COVID-19 extended-spectrum beta-lactamase' OR 'pandemic associated esbl' OR 'pandemic associated ESBL' OR 'COVID-19 *Enterobacterales*' OR 'COVID-19 enterobacterales' OR 'COVID-19 enterobacteriaceae'

Study Selection and Extraction

The article search and study selection were completed by two independent reviewers

Each abstract underwent three rounds of evaluation by a separate reviewer. Any discrepancies during article screening were resolved through consensus between the two reviewers

Data extraction was performed independently by the two reviewers

Categorization and Analysis

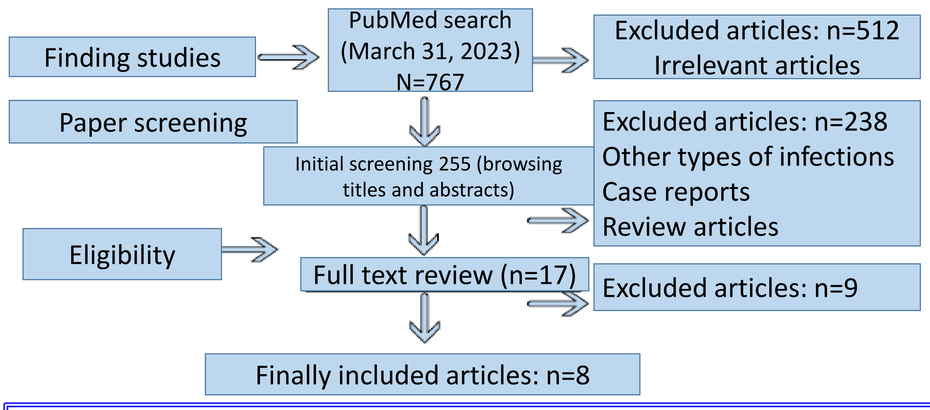


Figure 3. Outline of the literature search. Our search yielded a total of 767 articles, and 512 were rapidly excluded because they were considered irrelevant. The remaining 255 articles were further screened for titles and abstracts, and thereafter, 238 of them were excluded because some of them were case reports, some studies were review articles, and some reported other types of infections. Finally, 17 articles were subjected to a full text review, and 8 of them were found to fulfill the inclusion criteria and were therefore included in this scoping review.

Impact of Covid-19 on Multidrug-Resistant Infections

During the pandemic, there was an increase in the isolation of multidrug-resistant organisms (MDROs) because of the increased antimicrobial use appears to play a major role in the spread of these pathogens. [3]

Sulayyim et al. systematically reviewed a total of 23 articles that reported an increase in the incidence of MDRO during the COVID-19 pandemic. [4]

- Gram-negative bacteria: A. baumannii, K. pneumonia, E. coli and P. aeruginosa…
- Gram-positive bacteria: S. aureus, E. faecium…

The Epidemiology of ESBL-PE before Covid-19 Pandemic

The first ESBL-PE strains were reported in Germany in the 1980s. Notably, the spread of ESBL-PE was initially limited to healthcare settings.

By the 1990s, community-acquired infections caused by these bacteria were being reported. The most predominant ESBL enzymes detected globally were: temoneira (TEM) and sulfhydryl variable (SHV).

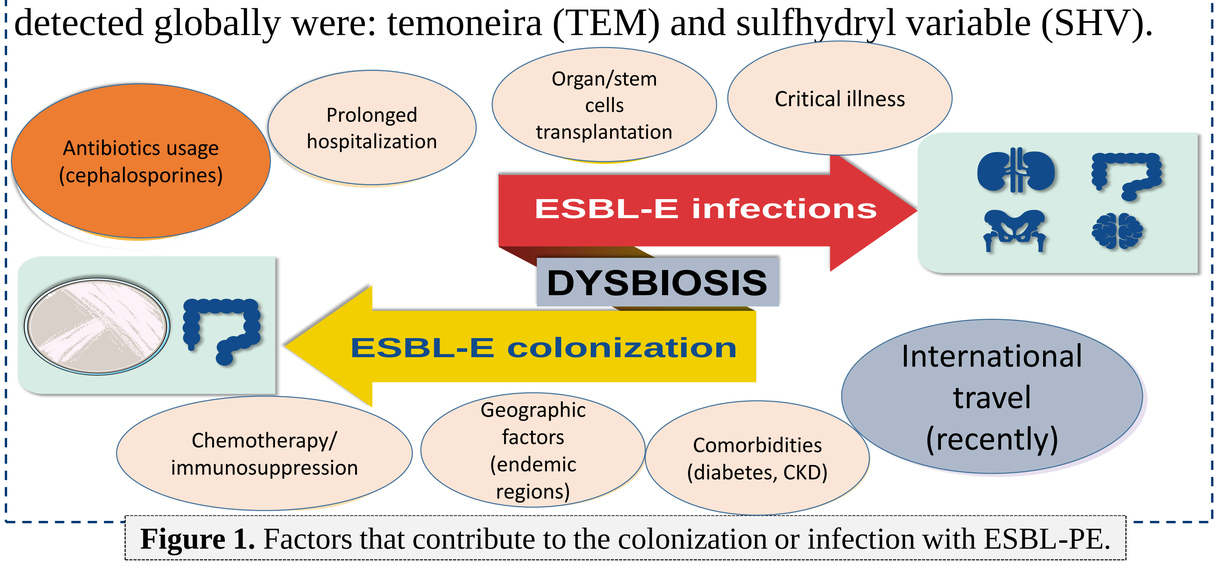


Figure 1. Factors that contribute to the colonization or infection with ESBL-PE.

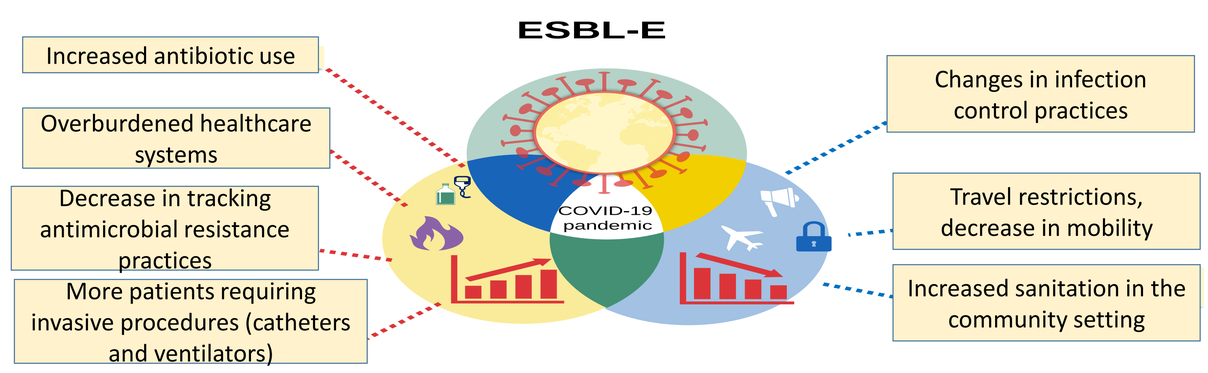
Did Covid-19 Affect the Epidemiology of ESBL-PE Associated Infections?

Table 2. Demographics and epidemiological characteristics of the reported studies.

Author/ country/ journal	Number of subjects/ specimens	Type of study (study design)	Bacterial strains	Main findings
M.R. Hasan, 2023, Canada, Microbiol Spectrum	8,652,381 urine cultures	Retrospective, observational study	Eco-ESBLi Kp-ESBL	The rate of ESBL isolation was higher during the pandemic than before it. However, decreasing trends of both Eco-ESBL and Kp-ESBL in the community setting were observed during the pandemic.
GL.Ngoula, 2023, French Guiana. Antibiotics	311 patients	Observational study	ESBL-PE	22.8% of ICU patients had ESBL-PE. Risk of ESBL-PE carriage among patients with severe COVID-19 was higher when they are exposed to cefotaxime.
A. Mena, 2022, the Dominican Republic. Antimicrob Steward Healthc Epidemiol	27,718 urine cultures with and 2,111 bodily fluid cultures	Retrospective study	E. coli and P. aeruginosa	Before and after the COVID-19 pandemic, the frequency of Eco-ESBL was 25.63% and 24.75%, respectively.
P. Santoso, 2022, Indonesia. Int J Gen Med	182 patients	Observational studies in two hospitals	35.7%	45.9% of COVID-19 isolates were MDRB, including 84.2% carbapenem-resistant A. baumannii and 61.1% Kp-ESBL.
M. Karataş, 2021, Turkey. Ann Clin Microbiol Antimicrob	4859 positive culture results from 3532 patients	Retrospective single center study	ESBL-PE	As compared to samples from the pre-pandemic period (20.76%) and samples from the pandemic era (20.74%), there was a substantial drop in the number of ESBL-PE (8.94%).
O. Lemenand, 2021, France. J Infection	793,954 E. coli isolates from 1022 clinical laboratories	Retrospective multicenter study	Eco-ESBL	A decrease was observed. In general practice, 3.1% of E. coli isolates were Eco-ESBL before March 2020 and 2.9% after May 2020. In nursing homes, Eco-ESBL rate decreased from 9.3% to 8.3% during the pandemic.
EH. Wardoyo 2021, Indonesia. Iran J Microbiol	210 E. coli isolates	Retrospective study	E.coli	Group A included 50% Eco-ESBL and group B 20.9%. Ofloxacin, aztreonam, and fosfomycin increased susceptibility to 10/16 antibiotics. Piperacillin, amoxicillin, cefadroxil, and ampicillin susceptibility decreased significantly.
E. Bentivegna, 2021, Italy, Int J Environ Res Public Health	1617 patients	Case-control study	S. aureus, K. pneumoniae, C. difficile, and A. baumannii.	Significantly higher incidence of MDRB infections in COVID-19 departments than in other medical departments (29% and 19%), with Kp-ESBL as the pathogen with the highest increase.

MDRB: multidrug resistant bacteria; ESBL: Extended Spectrum Beta-Lactamase; ESBL-E: ESBL-producing Enterobacteriaceae; K. pneumoniae: Klebsiella pneumoniae; Kp-ESBL: Extended Spectrum Beta-Lactamase Klebsiella pneumoniae; P. Aeruginosa: pseudomonas aeruginosa; Eco: Escherichia coli; Eco-ESBL: Extended Spectrum Beta-Lactamase-producing Escherichia coli; A. baumanii: Acinetobacter baumanii; C. Difficile: clostridoides difficile.

CONCLUDING REMARKS



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