Abstract

Antimicrobial Resistant Bacteria in Health Care Facilities: Exploring Links With Water, Sanitation, and Hygiene in Gaza, Palestine

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Abstract

Background: Antimicrobial resistance (AMR) is a growing global phenomenon; however, its link to water, sanitation, and hygiene (WASH) remains underexplored, particularly in health care facilities where humanitarian crises prevail.

Objective: This study aimed to identify AMR bacteria in samples collected from WASH services in 2 hospitals in Gaza and to investigate the presence of AMR genes.

Methods: A hospital-based cross-sectional study to detect and identify antimicrobial resistance bacteria was conducted. Random samples from water, wastewater, soap, and surface swabs (n=345) were collected from Al-Shifa and European Gaza hospitals and screened for the presence of *Enterobacteriaceae*, *Pseudomonas*, *Enterococcus*, and *Staphylococcusaureus*. Antimicrobial susceptibility, extended spectrum beta-lactamase (ESBL) production, carbapenem resistance, and AMR genes were investigated.

Results: High levels of bacterial contamination were detected in water and surface swab samples with an overall percentage of 34.1%. Moreover, 22% of the identified *Enterobacteriaceae* was positive for ESBL, and 14% was positive for modified Hodge test. Over 2/3 of isolated *Enterobacteriaceae* in water and wastewater samples was found to be resistant to amikacin, ceftazidime, ceftriaxone, and imipenem. All *Enterobacteriaceae* isolates from swab samples were found to be resistant to piperacillin-tazobactam, amikacin, ceftazidime, and ceftriaxone; 13.8% of *S. aureus* in water samples was methicillin resistant. The prevalence of ESBL genes among *Enterobacteriaceae* isolates was 25% OXA, 19.4% SHV, 2.8% KPC, 66.7% TEM, 41.7% blaCTXM, and 5.6% blaCTXM-3. For carbapenem-resistant gene (MDM), the prevalence among *Enterobacteriaceae* was 11.1%, and among *Pseudomonas* was 12.5%. The antibiotic susceptibility profile was also presented for *Pseudomonas*, *Enterococcus*, and *S. aureus*.

Conclusions: The results underline the level of contamination with AMR bacteria in WASH samples and highlight the need to consider the safety of WASH service at health care facilities as an essential aspect in the fight against the spread of AMR and to interrupt nosocomial transmission.

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Multimedia Appendix 1

Potential transmission of antimicrobial resistant bacteria.

[PNG File , 138 KB-Multimedia Appendix 1]

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