International Platform of Registered Systematic Review and Meta-analysis Protocols

INPLASY

Healthcare-associated infection causes and mitigation strategies: a systematic review

INPLASY202590070

doi: 10.37766/inplasy2025.9.0070

Received: 18 September 2025

Published: 18 September 2025

Irfan, M; Alquwez, N.

Corresponding author:
Mohammad Irfan

mquraish@su.edu.sa

Author Affiliation:
Shaqra University.

ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202590070

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 18 September 2025 and was last updated on 18 September 2025.

INTRODUCTION

Review question / Objective Primary Review Question: What is the prevalence, causes, and effectiveness of prevention strategies for healthcare-associated infections (HAIs) across healthcare settings worldwide?
Objectives: To estimate the incidence and prevalence of HAIs in healthcare facilities.
To identify the major causes, risk factors, and pathogens associated with HAIs.
To evaluate the effectiveness of interventions implemented to prevent or mitigate HAIs.
To assess antibiotic resistance trends in pathogens associated with HAIs.
To compare findings across subgroups (e.g., patient age, type of healthcare setting, type of infection, intervention type).
PICOS Framework:
Population (P):
Patients receiving care in healthcare settings (hospitals, ICUs, surgical units, long-term care facilities, outpatient clinics), of all ages and genders, with or without invasive devices.
Intervention (I):
Infection prevention and control strategies, including hand hygiene, PPE use, device sterilization, aseptic techniques, environmental measures (air/water quality, waste management), and antibiotic stewardship programs.
Comparator (C):
Standard care/usual infection control, alternative preventive strategies, or no intervention.
Outcomes (O):
Primary outcomes: HAI incidence/prevalence; effectiveness of interventions in reducing HAIs.
Secondary outcomes: Predominant pathogens, antibiotic resistance patterns, adverse events related to interventions.
Study Design (S):
Randomized controlled trials, non-randomized interventional studies, cohort studies, case-control studies, and cross-sectional studies providing primary clinical data on HAIs.

Rationale Healthcare-associated infections (HAIs) remain a significant global health challenge, causing morbidity, mortality, and substantial

financial burden on healthcare systems. Despite decades of research, HAIs continue to occur at alarming rates worldwide, with prevalence ranging from 3–6% in developed countries to as high as 40% in some developing regions.
HAIs are often associated with medical devices, invasive procedures, and lapses in hygiene or aseptic protocols, and are increasingly linked to multidrug-resistant pathogens. While many individual studies have examined HAI prevalence, causes, and prevention strategies, there is a lack of a comprehensive synthesis of worldwide evidence over the past two decades that integrates incidence trends, risk factors, pathogen profiles, and mitigation strategies.
This review aims to:
1. Identify the main causes and risk factors of HAIs across different healthcare settings.
2. Examine the pathogens most commonly responsible for HAIs and their resistance patterns.
3. Evaluate the effectiveness of prevention strategies adopted globally.

Condition being studied Healthcare-Associated Infections (HAIs), also known as nosocomial infections, including:
1. Urinary tract infections (UTIs)
2. Pneumonia (including ventilator-associated)
3. Bloodstream infections
4. Surgical site infections
5. Gastroenteritis
6. Meningitis
7. Device-associated infections.

METHODS

Search strategy ((((((((((Hospital-Acquired Infections[MeSH Terms]) OR (Nosocomial Infections[MeSH Terms])) OR (Healthcare-Associated Infections[Title/Abstract])) OR (Hospital-Acquired Infection[Title/Abstract])) OR (Nosocomial Infection[Title/Abstract])) AND (Prevention and Control[MeSH Terms])) OR (prevention[Title/Abstract])) OR (control[Title/Abstract])) OR (strategies[Title/Abstract])) OR (risk reduction[Title/Abstract])) OR (mitigation[Title/Abstract])) AND (("2000/01/01"[Date - Publication] : "2025/04/30"[Date - Publication])).

Participant or population Patients receiving care in healthcare settings who are at risk of, or have acquired, HAIs:
Settings: hospitals (wards, ICUs, surgical units), long-term care facilities, outpatient clinics (if HAIs reported)
All ages and genders
Patients with or without invasive devices.

Intervention
Strategies aimed at preventing or reducing HAIs:
Hand hygiene protocols, PPE use, isolation precautions
Sterilization and proper handling of devices and instruments
Aseptic techniques during procedures
Environmental/administrative measures (air/water quality control, waste management, audits)
Antibiotic stewardship programs.

Comparator
Standard care / routine infection control
Alternative prevention strategies (e.g., enhanced vs. standard hygiene)
No intervention / historical or concurrent controls.

Study designs to be included
Included:Observational: cohort, case-control, cross-sectionalInterventional: RCTs, non-randomized controlled, quasi-experimental
Excluded:Reviews, meta-analyses, case reports, editorials, commentaries, lettersLaboratory or animal studies.

Eligibility criteria
Inclusion Criteria:
1. Studies published between January 2000 and April 2025.
2. Articles published in English.
3. Full-text available.
4. Human studies only.
5. Clinical studies reporting incidence, prevalence, causes, pathogens, risk factors, or prevention strategies for HAIs.
Exclusion Criteria:
1. Non-clinical studies (e.g., laboratory-only, animal studies).
2. Publications without primary data (reviews, meta-analyses, editorials, commentaries, letters, case reports).
3. Studies lacking outcome data relevant to HAI prevalence, causes, or interventions.
4. Studies without citations or incomplete bibliographic details.
5. Duplicate publications.

Information sources Databases: PubMed/MEDLINE, Google Scholar.

Main outcome(s)
Primary Outcomes:
Incidence/prevalence of HAIs
Effectiveness of interventions
Secondary Outcomes:
Predominant pathogens (frequency, %)
Antibiotic resistance patterns (% resistant isolates)
Adverse events from interventions

Quality assessment / Risk of bias analysis Two reviewers independently assess.

Strategy of data synthesis Narrative and tabular summary. Trends over 20+ years, effectiveness of prevention, resistance patterns.

Subgroup analysis
By setting (ICU vs. general ward vs. long-term care)
By patient characteristics (age, device use)
By type of HAI (bloodstream, pneumonia, UTI, etc.)
By pathogen/resistance profile
By intervention type (hygiene vs. device vs. stewardship).

Sensitivity analysis
Excluding high-risk-of-bias studies
Comparing RCTs vs. observational studies
With/without grey literature.

Language restriction English.

Country(ies) involved Saudi Arabia - Shaqra University.

Keywords Healthcare-associated infections, nosocomial infections, infection control, medical device contamination, sterilization practices, multidrug-resistant pathogens, infection prevention strategies.

Contributions of each author
Author 1 - Mohammad Irfan - conception and design, data analysis writing, review.
Email: mquraish@su.edu.sa
Author 2 - Nahed Alquwez - writing, review, editing.
Email: nalquwez@su.edu.sa