

## Health Outcomes from Multidrug-Resistant Salmonella in High-Income Countries: A Systematic Review and Meta-Analysis

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**Abstract :** Objectives: Salmonella is a leading cause of foodborne enterocolitis worldwide. Nontyphoidal Salmonella (NTS) infections that are Multi-Drug Resistant (MDR) (non-susceptible to  $\geq 1$  agent in  $\geq 3$  antimicrobial categories) may result in more severe outcomes, although these effects have not been systematically examined. We conducted a systematic review and meta-analysis to examine impacts of MDR NTS on health in high-income settings. Methods: We systematically reviewed the literature from scientific databases, including PubMed, Scopus and grey literature sources, using PRISMA guidelines. We searched for data from case-control studies, cohorts, outbreaks, reports and theses, imposing no language restriction. We included only publications from January 1990 to September 2016 from high income countries as classified by World Bank. We extracted data from papers on duration of illness, hospitalisation rates, morbidity and mortality for MDR and non-MDR NTS strains. Results: After removing duplicates, the initial search revealed 4258 articles. After further screening, we identified 16 eligible studies for the systematic review, and 9 of these were included in meta-analysis. NTS serotypes differed among the reported studies but serotype Typhimurium, Enteritidis, Newport and Heidelberg were among the most often reported as MDR pathogens. Salmonella infections that were MDR were associated with excess bloodstream infections (OR 1.63; 95%CI 1.18-2.26), excess hospitalisations (OR 2.77; 95%CI 1.47-5.21) and higher mortality (OR 3.54; 95%CI 1.10-11.40). Conclusions: MDR NTS infections are a serious public health concern. With the emergence of MDR Salmonella strains in the high-income countries, it is crucial to restrict the use of antimicrobials both in animals and humans, and intervene to prevent foodborne infections.

**Keywords :** Antimicrobial Resistance, Bloodstream Infection, Health Outcomes, Hospitalisation, Invasive Disease, Multi-Drug Resistance (MDR), Mortality, Nontyphoidal Salmonella

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