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A Systematic Review of Antimicrobial Resistance in Fish and Poultry – Health and Environmental Implications for Animal Source Food Production in Egypt, Nigeria, and South Africa

Authors : Ekemini M. Okon, Reuben C. Okocha, Babatunde T. Adesina, Judith O. Ehigie, Babatunde M. Falana, Boluwape T. Okikiola

Abstract : Antimicrobial resistance (AMR) has evolved to become a significant threat to global public health and food safety. The development of AMR in animals has been associated with antimicrobial overuse. In recent years, the number of antimicrobials used in food animals such as fish and poultry has escalated. It, therefore, becomes imperative to understand the patterns of AMR in fish and poultry and map out future directions for better surveillance efforts. This study used the Preferred Reporting Items for Systematic reviews and Meta-Analyses(PRISMA) to assess the trend, patterns, and spatial distribution for AMR research in Egypt, Nigeria, and South Africa. A literature search was conducted through the Scopus and Web of Science databases in which published studies on AMR between 1989 and 2021 were assessed. A total of 172 articles were relevant for this study. The result showed progressive attention on AMR studies in fish and poultry from 2018 to 2021 across the selected countries. The period between 2018 (23 studies) and 2021 (25 studies) showed a significant increase in AMR publications with a peak in 2019 (28 studies). Egypt was the leading exponent of AMR research (43%, n=74) followed by Nigeria (40%, n=69), then South Africa (17%, n=29). AMR studies in fish received relatively little attention across countries. The majority of the AMR studies were on poultry in Egypt (82%, n=61), Nigeria (87%, n=60), and South Africa (83%, n=24). Further, most of the studies were on Escherichia and Salmonella species. Antimicrobials frequently researched were ampicillin, erythromycin, tetracycline, trimethoprim, chloramphenicol, and sulfamethoxazole groups. Multiple drug resistance was prevalent, as demonstrated by antimicrobial resistance patterns. In poultry, Escherichia coli isolates were resistant to cefotaxime, streptomycin, chloramphenicol, enrofloxacin, gentamycin, ciprofloxacin, oxytetracycline, kanamycin, nalidixic acid, tetracycline, trimethoprim/sulphamethoxazole, erythromycin, and ampicillin. Salmonella enterica serovars were resistant to tetracycline, trimethoprim/sulphamethoxazole, cefotaxime, and ampicillin. Staphylococcusaureus showed high-level resistance to streptomycin, kanamycin, erythromycin, cefoxitin, trimethoprim, vancomycin, ampicillin, and tetracycline. Campylobacter isolates were resistant to ceftriaxone, erythromycin, ciprofloxacin, tetracycline, and nalidixic acid at varying degrees. In fish, Enterococcus isolates showed resistance to penicillin, ampicillin, chloramphenicol, vancomycin, and tetracycline but sensitive to ciprofloxacin, erythromycin, and rifampicin. Isolated strains of Vibrio species showed sensitivity to florfenicol and ciprofloxacin, butresistance to trimethoprim/sulphamethoxazole and erythromycin. Isolates of Aeromonas and Pseudomonas species exhibited resistance to ampicillin and amoxicillin. Specifically, Aeromonashydrophila isolates showed sensitivity to cephradine, doxycycline, erythromycin, and florfenicol. However, resistance was also exhibited against augmentinandtetracycline. The findings constitute public and environmental health threats and suggest the need to promote and advance AMR research in other countries, particularly those on the global hotspot for antimicrobial use.

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