

An analysis of the contributory factors to antimicrobial resistance in Sri Lanka

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International Journal of Biological and Pharmaceutical Sciences Archive, 2026, 12(01), 069–074

Publication history: Received on 20 June 2026; revised on 24 July 2026; accepted on 27 July 2026

Article DOI: <https://doi.org/10.53771/ijbpsa.2026.12.1.0073>

Abstract

Antimicrobial resistance (AMR) is a major public health challenge that threatens the effective treatment of infectious diseases and increases morbidity, mortality, and healthcare costs worldwide. Sri Lanka has also experienced increasing resistance among priority pathogens, highlighting the urgent need to strengthen antimicrobial stewardship (AMS) and promote the rational use of antimicrobials.

This case study aimed to identify the major contributing factors leading to antimicrobial resistance in Sri Lanka and to develop practical recommendations to strengthen antimicrobial stewardship. The analysis was based on key informant interviews with healthcare professionals and a review of national and international policies, guidelines, surveillance reports, and scientific literature. A fishbone diagram was used to identify the root causes of AMR.

The study identified several interconnected factors contributing to AMR, including inadequate knowledge of AMS among healthcare workers, inappropriate prescribing practices, poor adherence to national treatment guidelines, weak implementation of stewardship programmes, limited microbiology laboratory capacity, inadequate monitoring and audit mechanisms, easy access to antibiotics without prescriptions, and overcrowding in hospitals.

Based on these findings, the study recommends strengthening hospital-based AMS programmes, improving education and training of healthcare workers, establishing regular antibiotic prescription audits, expanding microbiology laboratory services, and strengthening regulation of community antibiotic use. Implementing these recommendations through coordinated action by policymakers, healthcare institutions, and healthcare professionals will help preserve the effectiveness of existing antimicrobials, improve patient outcomes, and reduce the burden of antimicrobial resistance in Sri Lanka.

Keywords: Antimicrobial Resistance; Antimicrobial Stewardship; Rational antibiotic use; Infection Prevention

1. Introduction

Antimicrobial resistance (AMR) is the ability of microorganisms such as bacteria, viruses, fungi and parasites to survive or grow despite exposure to antimicrobial medicines that were previously effective against them (Facts, 2015). AMR has emerged as one of the most serious public health threats of the 21st century because it compromises the effective treatment of infectious diseases, increases the risk of treatment failure and reduces the safety of medical procedures such as surgery, organ transplantation and cancer chemotherapy. In 2019, bacterial AMR was associated with approximately 4.95 million deaths globally, including 1.27 million deaths directly attributable to drug-resistant infections (Murray *et al.*, 2022).

Antimicrobial resistance has become a growing concern in Sri Lanka. According to the National Strategic Plan for Combating Antimicrobial Resistance (2023–2028), resistance among priority pathogens remains alarmingly high. In

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2020, methicillin-resistant *Staphylococcus aureus* (MRSA) accounted for 53.2% of *S. aureus* bloodstream infections, while third-generation cephalosporin resistance in *Escherichia coli* reached 61.9%. Furthermore, in 2021, ciprofloxacin resistance was reported as 57.7% in *E. coli* and 72.0% in *Klebsiella pneumoniae*, indicating a substantial burden of resistant infections in the country (Kinter and Sherman, no date).

The consequences of AMR extend beyond increased morbidity and mortality. It leads to prolonged hospital stay, increased healthcare expenditure, limited treatment options, reduced productivity and a greater economic burden on patients and the health system. If not effectively controlled, AMR will undermine decades of progress in infectious disease management and threaten universal health coverage. Therefore, identifying the contributory factors to AMR is essential to strengthen antimicrobial stewardship, infection prevention and control, surveillance, and policy implementation. This case study analyses the contributory factors to antimicrobial resistance in Sri Lanka with the aim of identifying practical strategies to prevent and contain this growing public health threat.

Objectives

- To identify the main contributing factors leading to antimicrobial resistance in Sri Lanka
- To develop practical recommendations to strengthen antimicrobial stewardship and reduce antimicrobial resistance in Sri Lanka.

2. Methodology

This case study was designed to analyze the factors leading to antimicrobial resistance comprehensively and to identify strategies to strengthen antimicrobial stewardship in Sri Lanka.

The following tools were used to analyze this case.

- Interviews
- Document Analysis

The assessment methods are described below.

2.1. Interviews

Key Informant Interviews (KIIs) were conducted with consultant microbiologists, infectious disease physicians, clinical pharmacologists, hospital administrators, selected General Practitioners (GPs), pharmacists and other healthcare professionals involved in antimicrobial stewardship. The interviews explored their perceptions regarding the major contributors to AMR, implementation challenges, and potential solutions.

2.2. Document Analysis

National and international documents on AMR and Antimicrobial Stewardship (AMS) were reviewed, including the National Strategic Plan for Combating Antimicrobial Resistance in Sri Lanka (2023–2028), National Antimicrobial Resistance Surveillance Reports, National Antimicrobial Stewardship Guidelines, World Health Organization (WHO) publications, scientific literature, and Ministry of Health circulars and guidelines. These documents were reviewed to identify the current status of AMR, existing policies, antimicrobial stewardship practices, and gaps contributing to antimicrobial resistance.

3. Problem Analysis

The causes of antimicrobial resistance in Sri Lanka were identified through a fishbone diagram.

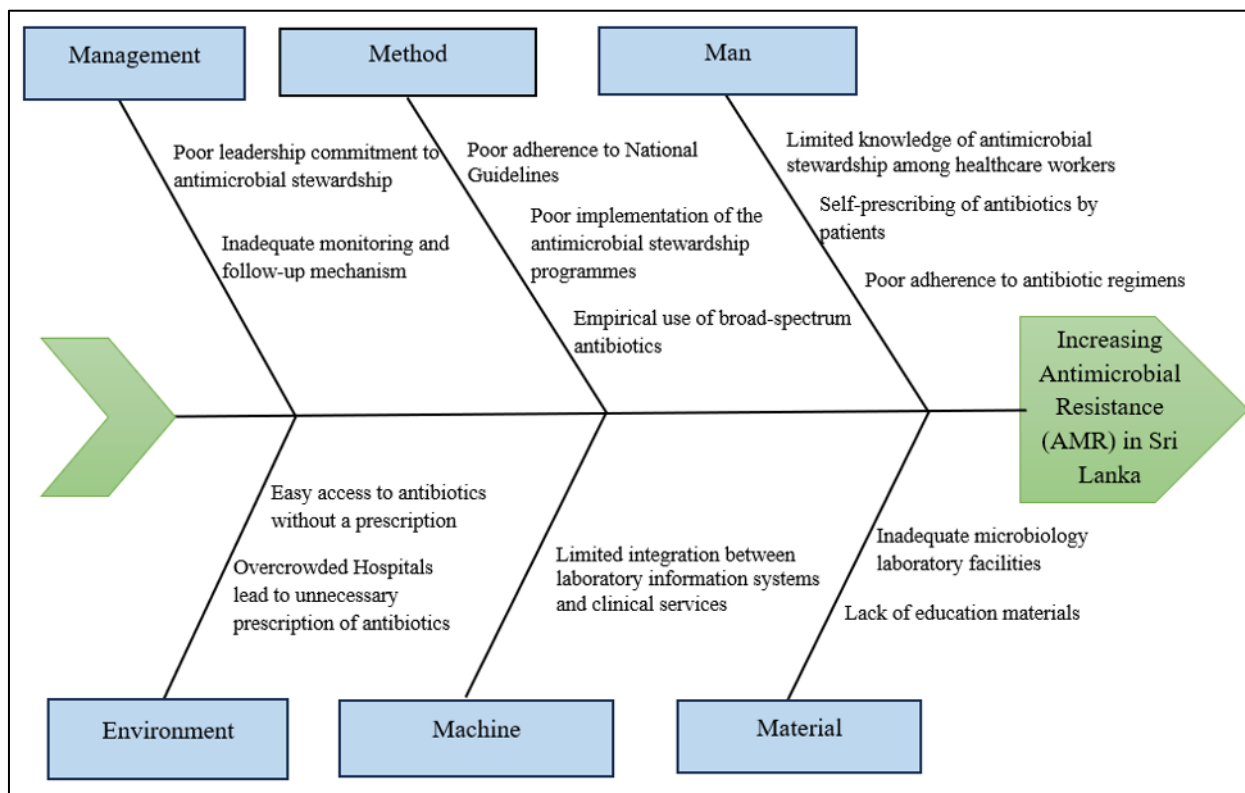


Figure 1 Fishbone Diagram

The root causes are further explained under the following main headings

3.1. Man (Human Resources)

3.1.1. Limited knowledge of antimicrobial stewardship among healthcare workers

Many healthcare professionals, including doctors, nurses, pharmacists, and other clinical staff, may have inadequate understanding of key AMS concepts such as appropriate antibiotic selection, local antimicrobial resistance patterns, review of antibiotic therapy, microbiological sampling before treatment, and the importance of avoiding unnecessary antibiotic use. This knowledge gap leads to inappropriate prescription practices.

3.1.2. Self-prescribing of antibiotics by patients.

Patients in Sri Lanka are used to taking antibiotics directly from a pharmacy without consulting a doctor. Sometimes they are using previously used prescriptions which might not be suitable in following episodes. This may result in unnecessary exposure to antimicrobials.

3.1.3. Poor adherence to antibiotic regimens

Most patients are not fully compliant with antibiotic regimens. They use fewer days than prescribed, which results developing resistant microorganisms. Improved clinical condition and the cost of antibiotics may lead to this.

3.2. Method (Policies/Process)

3.2.1. Poor adherence to national guidelines.

Ministry of Health, Sri Lanka has developed national guidelines through multidisciplinary stakeholder involvement. But most consultants or medical officers do not adhere to those guidelines.

3.2.2. Poor implementation of the antimicrobial stewardship programmes

The Directorate of Lab Services in the Ministry of Health has developed and funded multiple programmes in main hospitals across the country. Even with these programmes, the government hospitals and the private health sector are not implementing them. Many hospitals face challenges related to trained personnel, resources, and institutional commitments.

3.2.3. Empirical use of broad-spectrum antibiotics

With limited access to culture facilities, clinicians tend to start broad-spectrum antibiotics empirically. Unavailability of specific antibiotics due to supply issues may contribute to this.

3.3. Management (Leadership & Governance)

3.3.1. Poor leadership commitment to antimicrobial stewardship

The head of the institution of the hospitals should promote and facilitate antimicrobial stewardship within the hospitals. He should get the support from the senior staff, including consultants, to establish institutional AMS committee.

3.3.2. Inadequate monitoring and follow-up mechanism

Once the AMS guidelines are institutionalized, frequent audits and follow-up meetings should be done. The clinicians should be educated on the benefits of proper use of antibiotics.

3.4. Material (Resources & infrastructure)

3.4.1. Inadequate microbiology laboratory facilities

Only major hospitals across the country have microbiology laboratories to perform cultures. Other hospitals have to transport a limited number of samples to those laboratories. Considerable delays are happening due to this. Therefore, clinicians start broad-spectrum antibiotics blindly.

3.4.2. Lack of educational materials.

There are fewer educational materials and guidelines available in the ward setup to refer to. The management should arrange workshops, on-the-job training and digital resources to improve awareness among the staff.

3.5. Machine (Technology)

3.5.1. Limited integration between laboratory information systems and clinical services

There is no integration between laboratory information systems and clinicians. Real-time data and antibiotic susceptibility patterns are not available to convince clinicians of the importance of AMS.

3.6. Environment (External Factors)

3.6.1. Easy access to antibiotics without prescriptions

Even though there is a law prohibiting issuing antibiotics without prescriptions, most of the pharmacies issue them on their experience. But the patient does not receive the most appropriate antibiotic for the correct duration.

3.6.2. Overcrowded hospitals lead to unnecessary prescription of antibiotics.

All secondary and tertiary care hospitals in Sri Lanka are overcrowded. Hence, clinicians tend to start broad-spectrum, powerful antibiotics irrationally to reduce the length of stay of the patients and clear the crowd. However, this practice may contribute to inappropriate antibiotic consumption.

4. Proposals

This study proposes the following for the identified key issues.

Table 1 Proposals for identified key issues

Identified Key Issues	Proposals
Non-adherence to National antimicrobial guidelines.	Strengthen hospital-based antimicrobial stewardship programmes through AMS committee.
Unawareness of the basic principles of AMR and AMS	Training and awareness of health staff on AMS programmes
Unavailability of regular audits	Establish regular audits on antibiotic prescription and a feedback mechanism
Delayed laboratory investigations	Increase microbiology laboratory capacity
Self-prescribing of antibiotics by patients.	Regulation of community antibiotic use

5. Recommendations

5.1. Strengthen hospital-based antimicrobial stewardship programmes.

All secondary and tertiary care hospitals in Sri Lanka should establish functional Antimicrobial Stewardship Programmes under the guidance of the Ministry of Health. Although AMS initiatives have already been introduced, implementation remains inconsistent. Each hospital should establish an AMS committee comprising a consultant microbiologist, consultants, a pharmacist, an infection control nursing officer, a special grade nursing officer, and a hospital administrator.

The committee should monitor antimicrobial consumption patterns, conduct regular audits, provide feedback to clinicians and promote adherence to national antimicrobial guidelines.

5.2. Training and awareness of health staff on AMS programmes

Continuous education programmes should be developed to improve knowledge and prescribing practices among healthcare professionals. AMS training should be incorporated into undergraduate curricula, postgraduate training programmes, and continuing professional development activities. Hospital-based training can be conducted through workshops, clinical meetings, e-learning platforms, and bedside teaching sessions.

5.3. Establish regular audits on antibiotic prescription and a feedback mechanism.

A structured audit and feedback system should be introduced in hospitals to improve antibiotic prescribing behaviour. The audit should evaluate the indications of antibiotics, selection, dose and duration of antibiotics and availability of antibiotics within the institution.

5.4. Increase microbiology laboratory capacity

As timely laboratory investigations are essential for strengthening AMS programmes, the Ministry of Health should invest on increasing laboratory facilities across the country. The microbiology laboratory services should expand to selected base hospitals and a proper cluster system should be established.

5.5. Regulation of community antibiotic use

The misuse of antibiotics should be reduced through strong enforcement of regulations and public awareness programmes.

6. Conclusion

Antimicrobial resistance has become one of the most significant public health challenges facing Sri Lanka, threatening the effective management of infectious diseases and the sustainability of the healthcare system. This case study

identified that antimicrobial resistance is driven by multiple contributory factors, including inadequate knowledge of antimicrobial stewardship among healthcare workers, inappropriate prescribing practices, poor adherence to national treatment guidelines, weak implementation of antimicrobial stewardship programmes, limited microbiology laboratory capacity, insufficient monitoring mechanisms, easy access to antibiotics without prescriptions, and inadequate integration of laboratory information with clinical decision-making.

The findings highlight that antimicrobial resistance is not solely a clinical problem but also a health system challenge requiring coordinated action at national, institutional, and community levels. Effective leadership, continuous professional education, improved laboratory services, regular prescription audits, and strict enforcement of existing regulations are essential to promote the rational use of antimicrobials. Strengthening antimicrobial stewardship programmes across healthcare institutions should be considered a priority to preserve the effectiveness of existing antimicrobial agents and improve patient outcomes.

The practical recommendations proposed in this case study provide feasible strategies that can be implemented within the existing healthcare framework in Sri Lanka. Successful implementation will require strong commitment from policymakers, hospital administrators, healthcare professionals, and the public. Sustained investment in antimicrobial stewardship, surveillance, infection prevention and control, and public awareness will be essential to contain antimicrobial resistance and safeguard the effectiveness of life-saving antimicrobial medicines for future generations.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed

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