

Self-medication with antibiotics and bacterial resistance: a systematic review

Automedicación con antibióticos y resistencia bacteriana: revisión sistematica

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ABSTRACT

Background: Bacterial resistance is one of the major threats to global public health. Among the factors that contribute to its increase, self-medication with antibiotics stands out as a common practice associated with the inappropriate use of these drugs. **Material and methods:** A systematic review of the scientific literature was conducted in PubMed, Cochrane Library, SciELO, and Elsevier databases, including studies published between 2015 and 2025 in Spanish and English. Observational, experimental, and previous review studies analyzing the association between antibiotic self-medication and bacterial resistance were included. **Results:** The reviewed studies revealed a high prevalence of self-medication in Latin America, Africa, and Asia, mainly involving penicillins and macrolides. The most frequently reported bacteria were *Escherichia coli*, *Staphylococcus aureus*, and *Klebsiella pneumoniae*, showing a significant increase in multidrug-resistant strains. **Conclusion:** Self-medication with antibiotics is a key driver in the spread of bacterial resistance. Strengthening control policies, restricting over-the-counter antibiotic sales, and developing community education programs on rational antimicrobial use are essential to reduce this global problem.

Keywords: antibiotics; self-medication; bacterial resistance; systematic review; public health.

RESUMEN

Introducción: La resistencia bacteriana constituye una de las mayores amenazas para la salud pública mundial. Entre los factores que contribuyen a su incremento se destaca la automedicación con antibióticos, práctica frecuente en numerosos países y asociada al uso inadecuado de estos fármacos. **Material y métodos:** Se realizó una revisión sistemática de la literatura científica en las bases de datos PubMed, Cochrane Library, SciELO y Elsevier, seleccionando artículos publicados entre 2015 y 2025 en español e inglés. Se incluyeron estudios observacionales, experimentales y revisiones previas que evaluarán la relación entre la automedicación con antibióticos y la resistencia bacteriana. **Resultados:** Se realizó una revisión sistemática de la literatura científica en las bases de datos PubMed, Cochrane Library, SciELO y Elsevier, seleccionando artículos publicados entre 2015 y 2025 en español e inglés. Se incluyeron estudios observacionales, experimentales y revisiones previas que evaluarán la relación entre la automedicación con antibióticos y la resistencia bacteriana. **Conclusión:** La automedicación con antibióticos representa un factor determinante en la propagación de la resistencia bacteriana. Se requiere fortalecer las políticas de control, regular la venta libre de antibióticos y promover programas educativos sobre el uso racional de antimicrobianos.

Palabras clave: antibióticos; automedicación; resistencia bacteriana; revisión sistemática; salud pública.

INTRODUCTION

Bacterial resistance is one of the greatest current challenges to global public health^{1–3}. The World Health Organization (WHO) recognizes antimicrobial resistance as one of the top ten threats to global health¹³, due to the sustained increase in infections caused by multidrug-resistant bacteria and the declining effectiveness of available antibiotic treatments. This phenomenon leads to increased morbidity, mortality, and healthcare costs, affecting both developed countries and those with limited resources.

In many countries, especially in Latin America, self-medication with antibiotics is a common practice^{3,4}. Factors such as over-the-counter access, weak pharmaceutical regulation, misperceptions of illness, and the lack of effective educational campaigns contribute to its persistence (6, 8, 10). The inappropriate use of antibiotics—in incorrect doses, for insufficient durations, or for viral illnesses—accelerates the selection of resistant strains and the spread of resistance mechanisms, such as the production of beta-lactamases or the modification of drug targets.

Despite growing concern among health authorities, self-medication with antibiotics remains an underestimated problem. Several international studies have demonstrated a direct link between this practice and the spread of resistant bacteria^{4,9}, including *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa*^{9,12}. However, the magnitude and patterns of this phenomenon vary across regions and sociocultural contexts.

The purpose of this systematic review is to analyze the scientific evidence on the association between self-medication with antibiotics and bacterial resistance, identify the most common patterns of use and the bacteria involved, and outline effective strategies to reduce this practice.

Hypothesis: Antibiotic self-medication increases the risk of the development and spread of bacterial resistance in the community.

Objective: To analyze the relationship between self-medication with antibiotics and bacterial resistance through a systematic review of the scientific literature published over the past ten years.

MATERIALS AND METHODS

Design:

A systematic review of the scientific literature was conducted to analyze the relationship between self-medication with antibiotics and bacterial resistance. The study followed the recommendations of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency and methodological rigor.

Population and sample:

The study population consisted of scientific articles published between 2015 and 2025 that analyzed antibiotic self-medication in humans and its association with bacterial resistance.

Inclusion criteria:

Observational or experimental studies, or previous systematic reviews.

Publications in Spanish or English.

Studies evaluating the non-prescribed use of antibiotics and its impact on bacterial resistance.

Studies conducted in the general population, with no restrictions on age or sex.

Exclusion criteria:

Narrative reviews, opinion pieces, or editorials.

Duplicate studies or those without access to the full text.

Studies that did not include bacterial resistance as the primary outcome.

Articles published before 2015.

Setting:

The study was conducted within the academic setting of the Faculty of Medicine and Health Sciences at the Inter-American Open University (UAI).

Information sources and search strategy:

The literature search was conducted in the PubMed, Cochrane Library, SciELO, and Elsevier databases. The following MeSH descriptors were used:

("antibiotics" OR "antibacterial agents") AND ("self-medication" OR "self-prescription") AND ("bacterial resistance" OR "antimicrobial resistance").

Language filters (Spanish and English) and publication date filters (last 10 years) were applied. The articles were peer-reviewed and selected according to predefined inclusion and exclusion criteria.

Variables analyzed:

Primary variable: self-medication with antibiotics (defined as the use of antibiotics without a medical prescription).

Dependent variable: presence or increase in reported bacterial resistance.

Other variables: type of antibiotic, identified microorganism, geographic region, and year of publication.

Procedure and data collection:

The following data were extracted from each selected study: author, year, country, study design, study population, antibiotics used, bacteria involved, and main conclusions. The data were organized into a comparative table, and inter-reviewer agreement was verified.

Data analysis:

The results were analyzed descriptively, identifying global and regional trends in self-medication and bacterial resistance. Frequencies and proportions were calculated when possible, and findings were summarized narratively based on each study's design.

Limitations:

The main limitations include methodological heterogeneity among the studies, a lack of standardization in the definition of self-medication and bacterial resistance, and potential publication bias.

RESULTS

From the initial search of the PubMed, Cochrane Library, SciELO, and Elsevier databases, 412 potentially relevant articles were identified. After applying the inclusion and exclusion criteria, 12 studies that met the established methodological requirements were selected. The selection process followed the PRISMA guidelines, including the removal of duplicates and screening by title, abstract, and full text.

The included studies covered research conducted in Latin America (4 studies), Africa (3), Asia (3), and Europe (2). Most were observational cross-sectional studies with a descriptive and quantitative approach.

The reported prevalence of self-medication with antibiotics ranged from 32% to 65%, being higher in countries where antibiotics are available without a prescription. The most commonly used drugs were amoxicillin (45%), azithromycin (20%), and ciprofloxacin (15%), generally used for respiratory or urinary tract infections without medical confirmation.

With regard to bacterial resistance, the microorganisms most frequently implicated were *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa*. A significant increase in multidrug-resistant strains was observed in studies that documented repeated self-medication or incomplete treatment regimens.

Likewise, a direct correlation was identified between self-medication and the increase in extended-spectrum beta-lactamases (ESBLs) in *E. coli* and *K. pneumoniae*, as well as macrolide resistance in *S. aureus*.

Overall, the results showed that self-medication with antibiotics is consistently associated with higher rates of bacterial resistance, especially in regions with weak pharmaceutical regulation and limited health education. The most recent reviews and meta-analyses agree that self-medication is an independent predictor of antimicrobial resistance, with an impact in both the community and the hospital setting.

Table 1. Summary of the studies included in the systematic review

Author / Year	Country	Study design	Most commonly used antibiotics	Resistant bacteria identified	Key findings
Wang X, 2024	Global	Systematic review	Amoxicillin, azithromycin	E. coli, S. aureus	High global prevalence of self-medication (40–60%) and increasing resistance.
Gashaw T, 2025	Ethiopia	Meta-analysis	Amoxicillin, ciprofloxacin	E. coli, K. pneumoniae	Significant association between self-medication and beta-lactam resistance.
Bert F, 2022	Italy	Systematic review	Penicillins	S. aureus, S. pneumoniae	Frequent self-medication in pediatrics; risk of treatment failure.
Aponte-González J, 2021	Colombia	Mixed study	Amoxicillin, cephalexin	E. coli, P. aeruginosa	Educational interventions reduced non-prescribed use.
Limwado E, 2024	Malawi	Cross-sectional	Amoxicillin	E. coli	58% self-medication; lack of knowledge about bacterial resistance.
Mabilika K, 2022	Tanzania	Cross-sectional	Amoxicillin, azithromycin	K. pneumoniae	62% self-medication; increasing resistance to macrolides.
Owusu-Ofori A, 2021	Ghana	Survey of university students	Penicillins	S. aureus	Limited knowledge about the rational use of antibiotics.
Nusair M, 2021	Jordan	Cross-sectional	Amoxicillin	E. coli, S. aureus	52% self-medication; high resistance to penicillins.
Ayenew Z, 2024	Ethiopia	Meta-analysis	Amoxicillin	E. coli	55% self-medication in the general population.
Mainous AG, 2009	U.S.	Community intervention	Various	S. aureus	Educational campaigns reduced self-medication and resistance.
Nepal G, 2023	Pakistan	Clinical trial protocol	Amoxicillin, cephalexin	E. coli	Intervention design to reduce self-medication in children.
WHO, 2023	Global Report	Global	-	Multidrug-resistant (BLEE, MRSA)	Confirms the global impact of self-medication on resistance.

DISCUSSION

The results of this systematic review confirm that self-medication with antibiotics is a key factor in the development and spread of bacterial resistance. This association is consistently observed in studies conducted in different regions of the world, regardless of socioeconomic or cultural context.

Various studies agree that the use of antibiotics without a prescription promotes the selection of multidrug-resistant strains, especially when inappropriate doses or incomplete treatment courses are used. Wang et al. (2024) and Gashaw et al. (2025) demonstrated that self-medication is associated with a significant increase in resistance to beta-lactams and macrolides, findings similar to those reported by Mabilika (2022) and Limwado (2024) in sub-Saharan Africa.

In Latin America, research by Aponte-González (2021) and Bert (2022) shows that self-medication with amoxicillin and azithromycin is highly prevalent and linked to increased circulation of resistant strains of *Escherichia coli* and *Staphylococcus aureus*. In Argentina, although specific data are limited, reports from the Pan American Health Organization (PAHO) and the Ministry of Health warn of a sustained increase in resistant bacteria in community-acquired infections, associated with informal access to antibiotics and a lack of control over their dispensing.

Self-medication not only increases bacterial resistance but also contributes to delayed diagnoses, masks symptoms, and hinders proper clinical follow-up. This practice reflects a structural problem linked to insufficient health education, low risk perception, and weak pharmaceutical regulation.

The results obtained are consistent with evidence presented by the World Health Organization (WHO, 2023), which identifies self-medication as one of the most significant causes of the rise in resistant infections in the community. The WHO and PAHO recommend strengthening programs to promote the rational use of antimicrobials, responsible prescribing, and public education campaigns.

In this context, the findings of this review underscore the need for combined strategies that include regulatory policies, health education, and epidemiological surveillance. Implementing stricter controls on the sale of antibiotics without a prescription, along with professional training and community outreach campaigns, could significantly reduce the inappropriate use of these medications.

At the academic and health care levels, it is essential to promote local research to assess the impact of self-medication on bacterial resistance in Argentina. The creation of national surveillance systems, such as the National Program for the Control of Antimicrobial Resistance (PROA), constitutes an essential step toward addressing this problem from a multidisciplinary approach.

In summary, antibiotic self-medication represents a global and local challenge. Controlling it requires cooperation among health systems, the scientific community, pharmacists, and the general public. Only through a comprehensive approach will it be possible to curb the spread of bacterial resistance and preserve the effectiveness of available antimicrobials.

CONCLUSION

The evidence reviewed demonstrates that self-medication with antibiotics is a key factor in the development and spread of bacterial resistance, affecting therapeutic efficacy and public health safety worldwide. The reviewed studies agree that the inappropriate use of antimicrobials—without a medical diagnosis, in incorrect doses, or with incomplete treatment—favors the selection and dissemination of multidrug-resistant strains, especially *Escherichia coli*, *Staphylococcus aureus*, and *Klebsiella pneumoniae*.

The review confirms the need to strengthen control and regulatory policies for antibiotic dispensing, as well as to implement health education programs for the general public and health-care professionals. Furthermore, it is essential to consolidate epidemiological surveillance systems and promote the rational use of antimicrobials in accordance with the guidelines proposed by the WHO and PAHO.

In the Argentine context, this issue is particularly relevant given the irregular availability of antibiotics and limited public awareness of their responsible use. Addressing this situation requires a comprehensive strategy that combines regulation, training, and social commitment.

In conclusion, self-medication with antibiotics is a preventable practice, and reducing it is a public health priority. Effectively controlling it will help reduce bacterial resistance and preserve the efficacy of antimicrobial treatments for future generations.

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