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ARTICLE REVIEW

Antimicrobial resistance: a bioethical dilemma of global public health

Resistencia a los antimicrobianos: un dilema bioético de la salud pública mundial

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ABSTRACT

Introduction: worldwide, antimicrobial resistance is a health problem that has been progressively increasing in recent years. International organizations and states have committed themselves to establish strategies to reduce its prevalence until 2030.
Objective: to analyze the ethical and health aspects of antimicrobial resistance.
Methods: the present research work used the methodology of a systematic review, through the collection, critical appraisal, selection and summary of the scientific evidence present in scientific articles and other materials. The search for scientific articles was carried out in six databases: *SCOPUS, PUBMED, COCHRANE, SciELO, DIALNET and DIALNET*. To optimize the search in the databases, a series of keywords extracted from the DeCS thesaurus (Descriptors in Health Sciences) were used. Articles published during the period 2020 - 2024 were screened, considering articles from studies conducted in both English and Spanish.
Results: antimicrobial resistance is a global public health dilemma that requires the intervention of all stakeholders to prevent the abuse of these drugs by patients, as well as to generate trust with them so that they can have access to adequate health education that will favor the reduction of the prevalence of AMR in the long term.
Conclusions: the intervention of bioethics in the strategies for the resolution of this problem makes it possible to detect shortcomings in the application of professional ethics that affect the relationship and communication between the physician-patient.

Keywords: Antimicrobial Resistance; Human Rights; Public Health; Bioethics; Sustainable Development Goal.

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RESUMEN

Introducción: a nivel mundial, la resistencia a antimicrobianos es una problemática de salud que ha ido en aumento progresivamente. Los organismos internacionales y estados, se han comprometido a establecer estrategias para reducir su prevalencia hasta 2030.
Objetivo: analizar los aspectos ético-salubristas respecto a la resistencia a los antimicrobianos.
Métodos: el presente trabajo de investigación utilizó la metodología de una revisión sistemática, mediante la recolección, valoración crítica, selección y resumen de la evidencia científica presente en artículos científicos y otros materiales. La búsqueda de artículos científicos se realizó en seis bases de datos: *SCOPUS, PUBMED, COCHRANE, SciELO, DIALNET*. Para optimizar la búsqueda en las bases de datos se utilizaron una serie de palabras clave extraídas del tesauro DeCS (Descriptores en Ciencias de la Salud). Se realizó un escrutinio de los artículos publicados durante el periodo 2020 – 2024, se consideraron artículos de estudios realizados tanto en idioma inglés como español.
Resultados: la resistencia antimicrobiana es un dilema de salud pública mundial, que requiere de la intervención de todos los actores para prevenir el abuso por parte de pacientes de estos fármacos, así como, generar la confianza con los mismos para que accedan a una adecuada educación sanitaria que favorezca a largo plazo a la reducción de la prevalencia de las RAM.
Conclusiones: la intervención de la bioética en las estrategias para la resolución de esta problemática permite detectar las falencias en la aplicación de la ética profesional que afecta la relación y comunicación entre el médico-paciente.

Palabras clave: Resistencia a Antimicrobianos; Derechos Humanos; Salud Pública; Bioética; Objetivo de Desarrollo Sostenible.

INTRODUCTION

The first antimicrobial was discovered in 1928, and since then numerous families of this group of drugs have been discovered, which have been very useful to date in the treatment of infections caused by different strains of bacteria, viruses, fungi and parasites. The Centers for Disease Control and Prevention (CDC) defines antimicrobials as a group of drugs for treating infections by destroying or delaying the growth and multiplication of pathogens within the human or animal body.[1]

The use of these drugs for decades has represented a scientific advance for the benefit of human and animal health. The incorrect education regarding their use and administration has led to the invading bacteria, fungi, viruses and parasites becoming resistant and the infection continuing to proliferate within the host.[2]

From the public health perspective, the World Health Organization (WHO) has raised this antimicrobial resistance (AMR) as an emerging health problem worldwide, since it "calls into question the effectiveness of prevention and treatment measures relating to an increasingly wide range of infections."[2]

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In addition, drugs have become increasingly ineffective because pathogens have also changed or evolved over time, making it more difficult to treat these superbugs pharmacologically.[2] According to Del Arco,[3] in the case of bacteria, some can continue their growth despite the use of antibiotics, being a process that can occur by different mechanisms, either by genetic mutation or by acquisition by exchanging genetic material with another bacterial organism of the same or different strains.

These AMRs do not only affect the initial host, but also the community in which it develops, since they can be transmitted between members of the same or different species. When applying antimicrobial treatment, the result will not necessarily be 100 % effective in all cases, and it may be difficult or impossible to treat with the same drug or an alternative.[3]

The health problem caused by AMR has been caused in part by the indiscriminate use of antibiotics to treat infections that do not really require the drug. In the case of antibiotics, they should not be used to treat viruses such as influenza, sinus infections, or ear infections.[1] Such improper use generates undesirable side effects in the person, which could have been prevented by not administering antibiotics if the case did not require it.

From this perspective, the Pan American Health Organization (2023) mentions that the global health problem to solve AMR has become one of the fundamental health goals to be resolved within the 2030 Agenda of the Sustainable Development Goals (SDG).[4,5] Global statistical data report an exponential increase in the rate of AMR isolation cases from 2000 to 2020 in 22 countries around the world, reporting a total of 3.876.772 isolation cases until 2023.[6]

Epidemiological surveillance at a global level facilitates the early detection and investigation of new outbreaks to guide new therapeutic alternatives, modification or creation of public health policies, and evaluation of the impact of health interventions. In addition, there is a need to work more on direct health interventions with the population, such as health education and doctor-patient communication, since they are a fundamental key in reducing the rate of antimicrobial resistance worldwide.[7] The present bibliographic review focused on analyzing the ethical and health aspects regarding antimicrobial resistance.

METHODS

This research work used the methodology of a systematic review, through the collection, critical evaluation, selection and summary of the scientific evidence present in scientific articles and other materials.

Inclusion criteria

A review was conducted of articles published during the period 2020-2024, where bioethical dilemmas regarding antimicrobial resistance, health care for reducing antimicrobial resistance, and studies regarding the ethical analysis of problems regarding antimicrobial resistance are explicitly expressed. Articles from studies conducted in both English and Spanish will be considered.

Exclusion criteria

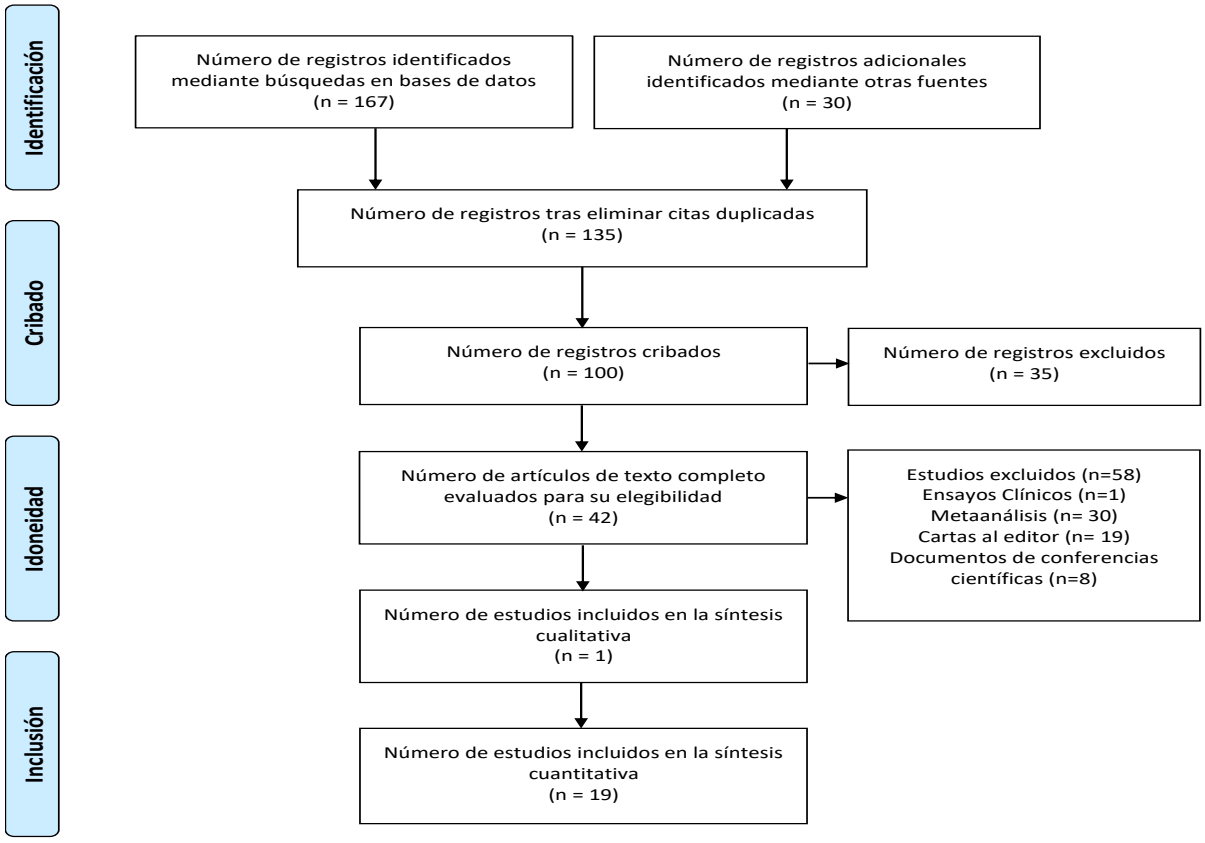
The review and analysis established exclusion parameters: bibliographic or systematic reviews not related to the topic, clinical trials in animals or non-randomized clinical trials, experimental studies on antimicrobial resistance in vulnerable populations.

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2024; 28(S2): e6560

Database

The search for scientific articles was carried out in six databases: SCOPUS, PUBMED, COCHRANE, SciELO, DIALNET. To optimize the search in the databases, a series of keywords extracted from the DeCS thesaurus (Health Sciences Descriptors) were used. The search was carried out using Boolean operators "AND" to relate the keywords, "OR" to introduce other synonymous or related terms, and the parenthesis was closed before starting the search.

167 studies were identified from the primary search databases and 30 scientific articles were added through manual search. The entire evaluation finally allowed us to define the definitive articles for carrying out the present bibliographic review (n=20). To determine the degree of confidence of the information collected, the CASPe methodology was used,[8] and the recommendations of the PRISMA Diagram (Preferred Reporting Items for Systematic Review and Meta-analyses) have been followed to carry out the evaluation of methodological quality.



Fountain: Moher D, et al. (2009).
Prepared by: Suaste, D. (2024)

Fig. 1 PRISMA flowchart for article selection and exclusion.

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RESULTS

Analysis from public health to antimicrobial resistance

Since the discovery of antimicrobials, this group of drugs has allowed timely and effective treatment of pathologies caused by different strains of viruses, bacteria, fungi and parasites, as well as improving the quality and safety of clinical care for patients.[9] However, the inappropriate use and/or abuse of this type of drugs has currently caused some strains of germs to be resistant to the positive effects normally expected from the use of antimicrobials against these microorganisms.[10]

De la Fuente et al,[11] mention that the decrease in the effect of antimicrobial treatments cannot be solely attributed to the genetic modification of pathogens, but also to the alterations in the human microbiota related to the change in lifestyle – environment – diet of human beings, which have increased the risk of contracting a pathogenic infection, causing the scale of AMR to grow uncontrollably.

Epidemiological surveillance systems worldwide reveal alarming rates regarding this problem. A study carried out in the Netherlands analyzing the reports of the national guide of the labor party on antibiotic policy and online searches by hospitals and health personnel, revealed that between 2020 - 2022, 75,9 % consulted information concerning antimicrobial therapy, mainly for the treatment of lower respiratory tract, kidney and urinary tract infections; since they are the most common pathogen infections in all regions.[12,13]

According to the 2022 report of the Pan American Health Organization (PAHO), the levels of resistance to this group of drugs are above 50 %, especially by hospital-level bacteria (Klebsiella pneumoniae, Acinetobacter spp) causing septicemia, 60 % of Neisseria gonorrhea strains are resistant to ciprofloxacin, and 20 % of Eschericha Coli strains are resistant to first-line antibiotics: ampicillin, cotrimoxazole, and second-line: fluoroquinolones.[14] In the analysis carried out by De la Fuente et al,[11] it is mentioned that some pathogenic organisms have developed an adaptive resistance to drugs in 65 %, of which 19,7 % of cases develop sepsis, being one of the main causes of death related to ADRs.

In Ecuador, the dissemination and evolution of AMR genes have been reported in epidemiological profiles since 2010, with the first isolation of carbapenemase-producing enterobacteria in a patient undergoing surgery (Klebsiella pneumoniae producing KPC type 2), and with repeated findings of the same bacteria during 2015.[15] Furthermore, during that same year the first case of Providencia rettgeri NDM-1 (New Delhi-metallo-β-lactamase) was detected, and in 2017-2018 Raoultella Ornitrhinolytica, producer of OXA-48 (β-lactamase Class D), was reported for the first time, which alarmed the health population due to the increasing dissemination of carbapenemases capable of completely inactivating carbapenem drugs.[16]

These high rates of antibiotic resistance have prompted the WHO, through the Global AMR and Use Surveillance System (GLASS), to report AMR rates in more than 87 countries in their territories, in addition to allowing the achievement of one of the sustainable development goals of the 2030 agenda, as part of the plan to guarantee the protection of the right to access to health for the world's population.[14,17]

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2024; 28(S2): e6560

Although there are epidemiological surveillance strategies to deal with this health problem worldwide, the situation is alarming, since the generation of antimicrobial resistance does not only occur in humans, but also in animals that receive treatment with this group of drugs or microorganisms are transmitted between the same/different species or to humans.[17,18] Furthermore, it can originate through two mechanisms: artificial selection due to inadequate antibiotic treatment or natural selection due to the transfer of resistance genes between microorganisms.[18]

The problem of inappropriate use of these drugs is due to several interrelated factors that have influenced the increase in the prevalence of ADRs. These include the low political and social participation of countries to solve this public health problem, inappropriate prescription by the health team, as well as the excessive demand by patients for outpatient medical consultations to result in the administration of these drugs when the clinical condition does not require it.[9,15]

These high AMR rates have prompted the WHO, through the Global AMR Surveillance System and its use of the National Surveillance Guide for Hospital Antimicrobial Monitoring Systems (GLASS) in more than 87 countries to report AMR rates in their territories, in addition to allowing the achievement of one of the sustainable development goals of the 2030 agenda, as part of the plan to guarantee the protection of the right to access to health for the world's population.[14,19]

Bioethical analysis of the problem of AMR

The United Nations (UN) has proposed, within the SDGs, an agenda of priorities for attention in the health axis, in accordance with the problems of greatest prevalence and incidence worldwide.[20] These include strategies to resolve ADRs, since, since the COVID-19 pandemic, healthcare management for the care of pathologies such as tuberculosis that require treatment with antimicrobials has decreased, which has caused an increase in the incidence and mortality from this type of disease.[20,21] It also highlighted how the influence of traditional and digital media can influence patients' healthcare choices, which in relation to ADRs has favoured the percentage increase in self-medication.[13]

From a bioethical perspective, a thorough analysis is required regarding the actions taken, the training of healthcare personnel and the bridges for effective connection with patients and family members, respect for the human rights and rights of each individual who accesses health care as a patient; as well as systems with an ethical approach to monitoring in response to emergency situations that require emergency intervention.[21]

The problem of indiscriminate and excessive administration of antimicrobial drugs is not a fact exclusive to second or third level medical care, it is also present in primary health care centers. It does not depend only on compliance with regulations and clinical care guidelines, but on the ethics of the health system and health professionals to commit to providing dignified and responsible care to people, in respect of the right to health care and well-being described in the Universal Declaration of Human Rights.[22,23]

Colliers A et al,[24] consider that primary health care (PHC) should implement interventions to modify the quality of health care, with respect to the prescription of antibiotics, which requires the participation of all the actors involved: state, health care system, hospitals and health centers, doctors and other health professionals, and of course, patients. Its application to practice can be difficult, but not impossible if participatory action methods based on experiences and multifactorial interventions are applied to identify the factors that influence access to information on the use and proper prescription of this group of drugs.[25,26]

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2024; 28(S2): e6560

On the other hand, Wushouer H et al,[27] evaluated the prescription of antibiotics in health professionals working in primary health care centers and the results of feedback for the modification of health policies. It was shown that for an adequate prescription of medications, professionals with sufficient knowledge regarding the procedures for an adequate organization and management of pharmacological prescriptions, detection of factors associated with the effectiveness of barriers and facilitators of administration of antimicrobial action in patients who have received antimicrobial therapy are required. Porras Povedano,[28] agrees with this since to ensure an optimization of the use of antimicrobials, surveillance and control are required in the application of prescription protocols, standard and specific precautions for pharmacological application with each patient, as well as measures with hospital furniture and waste management.

In addition, healthcare personnel are required to break the paternalistic paradigm in the relationship they maintain with their patients, and give way to a more participatory model with the patient, so that the latter can truly understand the information provided by the medical team.[21,29] Therefore, all members of the health team are required to have the skills to educate the population in the prevention of self-medication, as well as the motivation to work as a team and reduce the prevalence of antibiotic resistance in patients, including the creation of drug administration control programs.[15,27]

On the other hand, this educational and participatory process should not only focus on the patient and the health team. Currently, the technological revolution has influenced the means of access to health information, which represents a greater risk for maintaining adequate communication between health professionals and patients, since virtual media influence the population's predisposition to refuse health care and opt for self-medication.[21]

Although the patient's rights include decision-making autonomy over his or her health, this must be proportional to the protection of his or her life and dignity; and for his or her right to be correctly applied, medical personnel must play an informational role towards the patient, so that his or her decision really generates the expected potential benefit for his or her health.[10]

DISCUSSION

AMR is a public health problem worldwide, affecting respect for the human rights of individuals, especially the right to health, with respect to access to adequate health resources according to the needs of each patient in the health system. Since the necessary treatment for bacterial infections has been limited or is not available when an antimicrobial protocol is really needed in a patient, achieving a high prevalence of morbidity and mortality and high costs to the health system.[14,30]

The WHO, the Food and Agriculture Organization (FAO) and the World Organization for Animal Health (OIE) have established the necessary guidelines to try to reduce this problem, based on health research, awareness of the medical community, dissemination of biosecurity measures, hygiene of hospital spaces and modification of strategies for epidemiological surveillance in each country.[17,31] From this perspective, Pardo et al,[32] mention that this will allow the optimization of antimicrobial resources in health services, to exclusively administer this treatment when it is really required, and specifically for infectious pathologies for which this group of drugs have been created.

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2024; 28(S2): e6560

According to the analysis of the political influence in the application of strategies for the control of AMR, their effective application by States and their respective health systems will allow the proper application of the guidelines established within the clinical practice guidelines. This perspective allows for an effective and early diagnosis of pathologies caused by microorganisms, achieving the isolation of highly resistant bacteria to prevent the spread of community-based antimicrobial resistance, which is growing rapidly worldwide.[27]

From a political perspective, this is nothing new, since the WHO and the FAO Codex Alimentarius established guidelines 19 years ago for limiting the use of antimicrobial drugs and thus preventing the spread of AMR. However, the prevalence rate has not been reduced, since it depends not only on health policy but on the integration of all the axes involved for it to really work.[33]

From a bioethical perspective, the effective integration of the actors involved depends largely on the way these parties communicate. Health professionals are the key, since they interact directly with patients, and the way in which they communicate with them will depend on the degree of trust established and, therefore, the patient's response to medical recommendations.[34]

Carrillo de Albornoz,[34] mentions that the way to achieve trust with patients is to break paternalistic behaviors that direct the patient to obey orders and deny their beliefs and/or personal preferences in relation to their health, and give way to a relationship of equals between the doctor and his patient, to facilitate the patient's understanding and acceptance of health information, especially that referring to drugs.

Furthermore, to achieve the breaking of paternalism Pacheco Guevara and Ramos Hernández,[35] requires health professionals committed to fulfilling the professional ethical commitment, as well as health systems that monitor compliance with current regulations within the deontological codes of health professionals both national and international, especially: speaking the truth to the patient and responsibility with human life.

On the other hand, Sánchez González,[29] mentions that every doctor with professional ethics must carry out his activities with the main objective of achieving the maximum benefit and reducing as much as possible the possible risks to the health of patients; this includes pharmacological prescription, especially of antimicrobial drugs.

Therefore, to ensure proper prescription, administration and control of antimicrobial drugs, it is necessary to have a health team prepared in scientific knowledge, but also in bioethics, in order to promote the reduction of the prevalence of AMR, since it does not depend solely on health policy but on taking into account all the actors involved, their perspectives and opinions. In addition, health systems and states are required to commit to taking actions that limit "free" access to antimicrobial drugs and to preventive health education on the use of this group of drugs, to raise awareness in the population.[26,36]

ISSN: 1561-3194 **RNPS:** 1877
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CONCLUSIONS

Antimicrobial drug resistance is a public health problem that requires the intervention of the different health specialties, politics, economics and bioethics, to ensure that states can effectively reduce the prevalence of these in their territories. Bioethics is essential to encourage health professionals to improve the quality of care and communication with patients, which will allow for a better doctor-patient relationship, and thus, sufficient trust to prevent patients from requesting pharmacological treatments that they do not really require for their condition or the abuse of this group of drugs in countries where there is no adequate control over sales to the public.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authorship Contribution

DISP: Conceptualization, Formal analysis, Research, Methodology, Project management, Resources, Supervision, Visualization, Writing - original draft, Writing - review and editing
KVSP: Conceptualization, Data Curation, Project Management, Software, Validation, Writing - original draft, Writing - review and editing
KMTM: Conceptualization, Project Management, Writing - original draft, Writing - review and editing

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