

EXAMINING THE GAPS IN ANTIBIOTIC STEWARDSHIP AND PUBLIC HEALTH POLICIES RELATED TO ANTIMICROBIAL RESISTANCE

Sana Ahmad *

Faculty of Social Sciences, Jinnah University for Women, Pakistan.

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ABSTRACT

In regions with high vaccination rates, antimicrobial resistance has rapidly escalated in low- and middle-income countries (LMICs), particularly in Pakistan, largely due to the widespread misuse and abuse of antibiotics. This study examines the gaps in antibiotic stewardship and public health policies related to antimicrobial resistance (AMR) within Pakistan's medical education system. It explores the perspectives of medical students, educators, and professionals on antibiotic misuse, AMR, and associated policies. The findings reveal a significant lack of understanding and training regarding the social and ethical implications of AMR. The results underscore the urgent need to incorporate antibiotic stewardship, bioethics, and public health issues into medical practices to effectively address antibiotic misuse and combat the rise of AMR. The study suggests that a comprehensive approach combining education, stringent policy enforcement, and awareness-raising efforts offers a viable solution to this pressing challenge.

Keywords: Stewardship, Public health policies, Antimicrobial resistance.

*Corresponding Author. E-mail: sana_khan33@gmail.com

INTRODUCTION

The global issue of overprescribing and misuse of antibiotics has become a significant health concern, particularly in low- and middle-income countries (LMICs) like Pakistan. Research indicates that antibiotic prescribing patterns in LMICs are alarmingly high, with a pooled incidence of 52% in primary care settings. Inappropriate use of antibiotics is widespread across various conditions, with rates ranging from 8% to 100%. Since their discovery, antibiotics have played a vital role in saving lives; however, their excessive use is leading to a rapid rise in antimicrobial resistance (AMR). The World

Health Organization (WHO) warns that without immediate intervention, common infections and minor injuries may become fatal due to the declining effectiveness of antibiotics. It was estimated that approximately 700,000 people die each year worldwide due to antimicrobial resistance. In Pakistan, a leading consumer of antibiotics in the developing world, misuse occurs in clinical, community, and agricultural contexts, highlighting a critical public health issue [1]. A significant factor contributing to this crisis is the lack of a cohesive and robust antibiotic stewardship program within

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medical education. The situation is exacerbated by a shortage of extracurricular programs, such as workshops and seminars, that could increase awareness of AMR among future healthcare professionals. When healthcare providers prescribe antibiotics for viral infections due to convenience or lack of knowledge, it fosters misconceptions and compromises ethical medical practices, further promoting the emergence of drug-resistant pathogens [2-5]. The consequences of antibiotic misuse extend beyond individual patients, undermining global public health, facilitating the spread of resistant bacteria, and jeopardizing the effectiveness of essential medical treatments for future generations. Despite the establishment of national action plans and global initiatives like antimicrobial stewardship programs, a significant gap persists between policy and practice in Pakistan. This gap is compounded by inadequate implementation, monitoring, and regulation, intensifying the crisis [6]. This study aims to investigate the existing gaps in Pakistan's medical education system concerning the teaching and awareness of antibiotic use and resistance. The research seeks to highlight the urgent need for reforms by the attitudes of both medical professionals and students regarding antibiotic stewardship. Addressing these critical issues is essential; failure to prioritize them in medical education may hinder efforts to combat antimicrobial resistance, potentially leading to a more severe public health crisis [7].

MATERIALS AND METHODS

This section outlines the research methodology, including participant selection, data collection, data analysis, and ethical considerations. Data collection involved conducting in-depth interviews and informal conversations at medical educational institutions such as medical colleges and universities in Lahore, a city in Punjab, Pakistan [8].

The study sample consisted of 100 respondents, including medical and pharmacy teachers as well as students. Participants were selected using a combination of purposive sampling and snowball sampling. Purposive sampling was employed to ensure alignment with the study's objectives and requirements, while snowball sampling facilitated access to additional relevant respondents. This sampling strategy ensured the inclusion of key stakeholders and provided a diverse sample, excessive antibiotic use, and antimicrobial resistance (AMR).

Data collection involved 100 in-depth interviews and informal conversations. A semi-structured interview guide was developed, focusing on the research objectives. This guide featured open-ended questions designed to encourage respondents to share their perspectives and attitudes freely, avoiding leading questions [9].

Before the main data collection, a pilot study was conducted to test and refine the interview guide. This process helped identify and address any gaps, enhancing the comprehensiveness of the data collection. Additionally, unplanned informal conversations with respondents in natural settings enriched the data beyond what was gathered in the interviews. All collected data were transcribed to ensure accuracy and facilitate the subsequent data analysis process [10-13].

ANTIBIOTICS AND RELATED POLICIES IN MEDICAL PRACTICES

This study examines the current state and importance of medical practices in relation to the inclusion of knowledge about antibiotics and relevant policies. It begins by discussing how antibiotic-related policies are integrated into medical education. Additionally, it explores the attitudes and knowledge of medical educators, as well as the perspectives of students regarding these antibiotic policies. Finally, the discussion addresses

bioethics and clinical ethics related to antimicrobial resistance within medical practices.

The overuse and misuse of antibiotics have led to antimicrobial resistance, which is recognized as a global threat. The World Health Organization has developed numerous policies and initiated both global and national strategies to combat the rising rates of antimicrobial resistance and promote the responsible use of antibiotics. Similarly, Pakistan has implemented various strategies and programs, such as antimicrobial stewardship, antibiotic stewardship programs, and a national action plan. These policy-driven initiatives aim to ensure accurate diagnoses, appropriate antibiotic usage, prevention of infectious diseases, and the localization of this knowledge for community implementation. The Drug Regulatory Authority of Pakistan (DRAP) has issued guidelines for healthcare professionals to mitigate the impact of antimicrobial resistance and promote the appropriate use of antibiotics in accordance with these programs. This policy seeks to educate healthcare practitioners, medical educators, and students, stressing the importance of including antimicrobial stewardship in all clinical specialty training programs. However, many faculty members report that none of the courses in most Pakistani medical colleges or universities adequately address these policies or programs [14].

Extra-Curricular Activities on the Appropriateness of Antibiotics

The student experience extends beyond the classroom and textbooks; it encompasses extra-curricular activities that enrich academic life. However, recent research indicates that prominent medical colleges and universities in Lahore show a lack of engagement with current health-related issues, policies, and programs. The faculty often lack updated knowledge regarding new

health policies and initiatives. Consequently, few extra-curricular activities are organized to address the critical issue of antibiotic resistance, its prevention, and treatment [15]. The study identified faculty priorities as a key factor contributing to the scarcity of extra-curricular activities. Many educators prioritize their careers and financial gain over adequately training students for their future professions. They often choose to practice medicine part-time in private clinics or hospitals, leaving little time to provide training beyond the prescribed studies. Additionally, there is a noticeable absence of awareness materials—such as posters, guides, or pamphlets—regarding antimicrobial resistance and strategies for proper antibiotic use in the medical universities and colleges.

Some faculty members noted that while extra-curricular activities related to drug optimization and diagnostic methods have occurred in the past, they did not adequately address antibiotic-related concerns or relevant policies.

ANTIBIOTIC UTILIZATION POLICIES

Medical teachers in various institutions have diverse perspectives on antibiotic use and the associated policies and programs aimed at reducing the burden of antimicrobial resistance. These perspectives also extend to the fair use of antibiotics and their integration into medical practices. Teachers typically adhere to course outlines developed by authorities such as the Pakistan Medical Dental Council (PMDC), the Higher Education Commission (HEC), and the vice-chancellors of medical universities and colleges. Unfortunately, current medical practices often overlook the issue of antimicrobial resistance, focusing instead on the proper usage and dosage of antibiotics without addressing the importance of antibiotic resistance at the policy level. Antibiotic stewardship programs (ASPs),

antimicrobial stewardship programs (AMSPs), and the national action plan (NAP) are not included in the practices mandated by the HEC and PMDC.

It was noted that while ASPs and the national action plan for antibiotics are intended to be part of medical education at all levels, their implementation is inadequate due to a lack of interest from policymakers and enforcement agencies. Our findings suggest that there is an urgent need for legislative action to incorporate ASPs into Pakistan's medical and healthcare education framework. Additionally, the National Action Plan on antimicrobial resistance must be integrated into the practices of all medical teaching institutions [16-19].

In practical terms, there is a pressing need for training and involvement of both teachers and students in antibiotic stewardship programs to curb the rise of antimicrobial resistance. The biopsychosocial approach highlights the importance of diagnosing patients within biological, psychological, and sociocultural contexts, rather than focusing solely on biological or physical symptoms. It is crucial to educate students about these aspects, along with policies and strategies related to antibiotics in Pakistan, as MBBS doctors are responsible for treating a wide range of health issues, including psychiatric problems, in which they may not be specialized. Globally, healthcare systems emphasize the integration of these three approaches. Furthermore, patients often misuse medications due to inadequate diagnoses by doctors and rely on their prior knowledge of these medications.

Doctors have been using antibiotics for nearly five to six generations for minor ailments, which poses significant risks to both current and future generations. Additionally, It was mentioned that monitoring, surveillance, and regular reporting of antibiotic resistance cases are not being conducted. There is a lack of action on this issue, largely due to the appointment of

most administrative positions through political influence.

STUDENTS' PERSPECTIVE ON ANTIBIOTICS RESISTANCE

The future of antibiotic use in hospitals and community settings will be significantly influenced by medical and pharmacy students, as they will become the next generation of healthcare practitioners. Therefore, it is crucial that they are well-informed about antibiotic usage, antimicrobial resistance, and related global and national policy issues. Comprehensive training and education during their undergraduate studies can help them make informed decisions in this area. However, local research indicates that such education is often not prioritized in undergraduate curricula.

Students who receive proper training can better understand the consequences of antibiotic overuse and misuse on individual and population health. Courses designed to provide experiential learning, through case studies and real-world examples of antibiotic resistance, can enhance this understanding. Research shows that participants in an optional course focused on antibiotic prescribing etiquette developed greater awareness, improved attitudes, and revised perceptions regarding antibiotic prescribing practices. Elective classes offer students the chance to grasp the seriousness of antibiotic resistance, advocate based on data, and address this critical issue [20].

Enhancements in the academic practices can foster positive attitudes among medical students towards responsible antibiotic use. This course aims to inspire students to prioritize the ethical and responsible use of antibiotics in their future practice by emphasizing its significance. Evaluating different treatment options requires a careful consideration of the benefits and potential drawbacks of antibiotic administration, while adhering to established guidelines.

During these discussions, all students demonstrated a general awareness of antibiotics, with their knowledge stemming from academic courses, textbooks, and lectures. Most reported being taught about antibiotics, including their types, dosages, classifications, benefits, drawbacks, and side effects associated with misuse. This information was primarily covered in pharmacology and physiology courses. While most students had some knowledge of antimicrobial and antibiotic resistance, a few were unfamiliar with these concepts [21].

For example, one student mistakenly referred to antibiotic resistance as a disease, while another identified it as a bacterium, both lacking an understanding of its underlying causes. Furthermore, most students were unaware of global policies aimed at preventing or controlling antibiotic and antimicrobial resistance, and those who did have some awareness possessed limited information. When asked about international and national policies or clinical strategies, most students only provided general information about antibiotics and their dosages. Only three out of nineteen students mentioned specific policies, such as tetanus vaccinations, FDA regulations, TB resistance programs, and WHO initiatives. None of the students were aware of national policies designed to prevent or control antibiotic or antimicrobial resistance.

ADDRESSING AND PREVENTING ANTIMICROBIAL RESISTANCE

Prior to the 21st century, medical education in Pakistan primarily emphasized technical and scientific aspects of healthcare, often neglecting ethical and social issues. However, as medicine has become increasingly globalized and the importance of ethical considerations in healthcare has gained recognition, there has been a growing movement to incorporate bioethics into medical education and healthcare institutions in Pakistan. In the mid-1980s, members of

the medical community trained in the United States introduced contemporary bioethics to Pakistan. Additionally, in 2002, the Pakistan Medical and Dental Council mandated that medical ethics be taught at all levels in medical teaching institutions across the country [22].

Addressing and preventing the current issue of antimicrobial resistance requires a critical examination of these ethical issues and the regulation of bioethics within medical education and professional practice. Current research indicates that courses on bioethics or medical ethics are often not included in the MBBS programs at many medical colleges and universities in selected areas.

Clinical ethics, a sub-discipline of bioethics, emphasizes fairness in clinical practice and the integrity of physicians towards current and future patients. For example, if physicians overprescribe medications for personal gain or fail to adhere to best practices for selfish reasons, it constitutes malpractice and violates clinical ethics. Integrating clinical ethics can help mitigate antimicrobial resistance by establishing ethical guidelines for prescription practices and patient care.

In 1985, Tom Beauchamp and James Childress formulated four principles of healthcare ethics that serve as guidelines for medical professionals across various conditions. These principles—justice, beneficence, non-maleficence, and autonomy—are crucial for ethical practice.

Beneficence relates to the balance between the medicinal value and potential adverse effects of prescribed medications, which is particularly significant in the context of antimicrobials.

Non-maleficence underscores the obligation to avoid harm, advocating for the least harmful options that yield beneficial outcomes. This principle can be illustrated by the decision-making process surrounding anti-infective treatments,

weighing immediate benefits against potential long-term consequences.

The principle of autonomy respects individual independence and decision-making capacity. While doctors should advocate for the best treatments based on scientific evidence, clinical observation, and psychosocial factors, they must also safeguard patient privacy, honor their decisions, obtain informed consent, and provide truthful information regarding conditions and treatments. Attempts by physicians to influence patient autonomy for financial gain demonstrate a disregard for ethical standards.

Beneficence also carries a moral obligation to act in ways that benefit others, including protecting rights, preventing harm, assisting individuals with disabilities, and providing help when necessary. Justice, another core principle, mandates that practitioners fairly distribute benefits, risks, costs, and resources based on equity, need, effort, contribution, and merit. This principle emphasizes the importance of fairness in decision-making, particularly concerning the allocation of limited resources and new therapies, while adhering to relevant laws and regulations.

Overall, these ethical principles—justice, beneficence, non-maleficence, and autonomy—guide physicians in their responsibilities and can play a vital role in protecting future generations from infectious diseases, particularly antibiotic resistance. Additionally, principles such as human dignity, confidentiality, privacy, and patient rights are fundamental guidelines upheld by most professional organizations.

It was emphasized that safeguarding the well-being of future generations is a fundamental bioethical principle. Our present decisions, policies, and actions will significantly impact the future. Antimicrobial resistance is not only a pressing issue for today's population but also poses a substantial risk for generations to come.

It was further explained that developing a drug requires years of research and effort; it is not a quick process. The lengthy search for effective treatments during the COVID-19 pandemic serves as a prime example, as scientists and pharmacists endured extensive research and trials to create a vaccine. Tragically, millions lost their lives while waiting for effective treatments. Dr. Rehman voiced concerns about the current population's responsibility to curb the misuse of antibiotics and antibacterial drug production. He proposed that academic bioethics courses could address the overuse and misuse of antibiotics by educating future doctors on proper usage and the challenges posed by antimicrobial resistance.

It was noted that medical ethics courses are only offered as minor subjects in the first and second years of the MBBS program. Research indicates that both students and teachers show little interest in these topics. Furthermore, the administration does not prioritize enforcing the inclusion of philosophical and social determinants of health in the medical practice, reflecting a lack of commitment to ensuring the quality of education, particularly in theoretical subjects like bioethics and clinical ethics. These courses should teach students the principles of informed consent, patient autonomy, and the careful consideration of potential benefits and risks when prescribing antibiotics. They should also address the global public health implications of antibiotic resistance and the importance of stewardship in managing this vital resource. By gaining a solid understanding of these ethical and practical issues, medical professionals can make informed decisions that prioritize patient safety while mitigating the spread of antibiotic-resistant infections.

CONCLUSION

Despite the critical importance of antibiotic knowledge, teaching faculty often do not see it as their responsibility to update and

disseminate this information to students. Many educators avoid investing additional effort into educating students about antibiotic policies, potentially due to their own limited understanding of current guidelines and strategies for appropriate antibiotic use and the prevention of resistance. Furthermore, faculty priorities frequently diverge from enhancing academic quality, contributing to a lack of extracurricular activities at the academic level. Many educators prioritize career advancement and financial gain over adequately preparing students for their future professions.

The study also found that most medical universities and colleges in the examined region do not adequately address antimicrobial resistance within their practices. It strongly recommends the introduction of lessons on antimicrobial resistance in primary and secondary education. Medical teaching in these locales tends to focus primarily on physiological and biomedical approaches during medical degree programs, with few universities in Pakistan emphasizing these methods beyond the master's level in public health. Additionally, the biopsychosocial approach underscores the importance of diagnosing patients within biological, psychological, and sociocultural contexts, rather than solely focusing on biological or physical aspects. This lack of accountability fosters the perception that these critical issues are

irrelevant to professional careers and clinical practice among students. To combat antimicrobial resistance, incorporating courses on bioethics, medical ethics, or clinical could help establish ethical guidelines for prescribing and patient care. Academic bioethics courses could address the overuse and misuse of antibiotics by promoting proper usage and raising awareness of antimicrobial resistance as a pressing global health challenge.

Unfortunately, policies and strategies to tackle these issues are inadequately implemented in Pakistan, primarily due to a weak assessment and monitoring system and a lack of interest among policymakers and administrative authorities. Additionally, there is insufficient monitoring, surveillance, and regular reporting of antibiotic resistance cases. Despite these shortcomings, little action has been taken by the authorities, as many administrative positions are filled through political patronage.

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