History of Medicine: Vol. 10 No. 2 (2024):1909-1919
DOI: https://doi.org/10.48047/HM.10.2.2024.1909-1919

Antibiotics Overuse and its Consequences: Raising Awareness and Promoting Responsible Use

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Abstract

Antibiotic misuse in District Rawalpindi has emerged as a critical public health challenge, driven by factors such as self-medication, over prescription, and inadequate awareness of antimicrobial resistance (AMR). In this study of 200 respondents, 95% were familiar with antibiotics, yet 50% reported self-medication, and 35% admitted to not completing prescribed courses, underscoring significant gaps in responsible use. While 90% recognized the link between antibiotic overuse and resistance, only 30% had participated in public health initiatives addressing the issue. Key drivers of misuse include cultural misconceptions, economic constraints, and the unregulated availability of antibiotics. Healthcare providers, often seen as primary sources of antibiotic information, also contribute to cover prescription due to patient demands and systemic pressures. These behaviors have led to adverse health outcomes, as reported by 40% of respondents. Addressing these challenges requires multifaceted interventions, including stricter prescription policies, public education campaigns, improved healthcare access, and training for providers in antimicrobial stewardship. These strategies are essential to mitigating AMR and preserving the efficacy of antibiotics in Rawalpindi and beyond.

Keywords: Antibiotic misuse, Anti-microbial resistance, public health, Self-medication.

Introduction

Antimicrobial resistance (AMR) is a global health threat driven by antibiotic misuse, including self-medication for minor illnesses. A survey of 11,192 Chinese university students revealed widespread misuse: 29.6% self-medicated, 23.0% used antibiotics preventively, 63.1% stored antibiotics, and 56.0% purchased them, often without prescriptions. Students with lower antibiotic knowledge were more likely to misuse them. This highlights the urgent need for campaigns to promote responsible antibiotic use and enforce stricter regulations on sales [1]. Antibiotic misuse is a critical issue contributing to resistance [18]. A survey of 200 university students revealed frequent infections, infrequent antibiotic use, and high rates of non-hospital purchases. While 83% completed their courses, 41% were unaware of the harms of misuse, and 65% believed antibiotics were losing effectiveness. The study highlights a lack of awareness as the main driver of misuse and resistance [2,17].

Antibiotics, which help control bacterial infections, have greatly increased life expectancy, but their misuse has led to growing resistance. Our study in Karachi, Pakistan, surveyed 100 children and 200 adults to assess irrational antibiotic use. We found that 76% of children were prescribed antibiotics unnecessarily, while 23% of adults bought them without prescriptions. Many adults (41%) didn't understand the risks of misuse, and 39% reused old prescriptions. These results suggest that lack of awareness and improper prescriptions are key factors in antibiotic misuse and resistance [3,19]. Antibiotic misuse, especially in low- and middle-income countries, contributes significantly to antimicrobial resistance. This study assessed the antibiotic knowledge and usage among medical students in Mali and examined how their knowledge affects their health-seeking behavior related to antibiotic use [4]. Antibiotics have revolutionized infection treatment, but their overuse has led to antibiotic residues accumulating in the environment [16]. This paper discusses the main factors contributing to antibiotic presence in the environment, the behavior of these residues, and the importance of detecting them. It also covers the risks to both the environment and human health, along with current scientific and regulatory perspectives on antibiotic discharge [5].

Antibiotics have greatly advanced the treatment of infections, but their increased use has led to antibiotic residues accumulating in the environment. This paper explores the main factors behind antibiotic presence in the environment, their behavior, and the need for monitoring. It also covers recent scientific findings and regulations related to environmental antibiotic discharge and the risks they pose to human health and ecosystems. [6]. Antibiotics are crucial for treating infections, but overuse leads to antibiotic resistance, causing infections that are harder to treat. This resistance spreads in healthcare settings and the community, worsened by poor infection control. Understanding the effects of antibiotic misuse on resistance and the environment is vital. This chapter explores the causes, consequences, and potential solutions to antibiotic resistance, which is rapidly increasing and poses a serious threat to public health. [7]

Antibiotics are vital for treating infections, but overuse, particularly in developing countries, has led to resistance, threatening public health. This study examines the types of antibiotics, their effects, and the need for better regulation. Efforts like the One Health approach and global policies focus on reducing misuse and promoting alternatives. Responsible antibiotic use and alternative treatments are key to combating resistance and protecting public health [8]. Antibiotic resistance is increasing due to the irrational use of antibiotics, with self-medication being a key factor. This study aims to assess the prevalence of parental self-medication with antibiotics and their knowledge, attitudes, and practices regarding antibiotic use [9]. This study aims to examine the public's knowledge, attitudes, and practices regarding antibiotic use in Pakistan, focusing on the prevalence of self-medication and the extent of non-adherence to prescribed antibiotic regimens [10].

Antibiotic resistance is a major public health threat, worsened by the misuse and overuse of antibiotics. This paper explores how antibiotics induce genetic changes in bacteria, leading to resistance through mechanisms like mutation, recombination, and gene transfer. The rise of multi-drug-resistant bacteria, which are resistant to many antibiotics, poses a serious challenge to treatment and public health [11,4]. Antibiotic resistance in common pathogens is rising globally,

linked to higher antibiotic use. Countries with high antibiotic consumption show the most resistance. For instance, the overuse of penicillin, macrolides, and cephalosporins contributes to resistance in *Streptococcus pneumoniae* and other bacteria. Pediatric patients, often treated more frequently with antibiotics, show higher resistance rates than adults. Reliable data on antibiotic use and resistance is essential for creating effective national policies to reduce microbial resistance [12,14]. New antimicrobial agents offer broader activity and better safety, but they are costly and may lead to drug resistance [20]. Most common infections can still be treated effectively with conventional antibiotics. By combining clinical evaluation with simple lab tests, doctors can often choose more affordable treatments, reserving new antibiotics for specific cases. This approach helps control healthcare costs and preserves antibiotic effectiveness [13,15].

Antibiotic resistance is growing worldwide, and this study aims to identify the socioeconomic and political factors contributing to its rise in both developing and developed countries. The discovery of antibiotics revolutionized medicine, but their overuse and misuse have led to the rise of antibiotic-resistant bacteria, creating a major global health threat. This paper reviews the origins, spread, and factors of antibiotic resistance, along with strategies and challenges for controlling it.

Methodology

This study is a comprehensive survey to investigate the misuse of antibiotics within the Arid university in Rawalpindi. Utilizing a cross-sectional design combined with random sampling techniques, data were systematically collected to ensure broad representation and reliability. The process was employed by questionnaire generation. The study employed a cross-sectional, anonymous survey to collect data, ensuring participant confidentiality while providing a snapshot of behaviors, attitudes, and awareness levels regarding antibiotic use within the target population. The overuse of antibiotics and the awareness of its resistance among people were conducted. The survey conducted involved asking a series of questions, primarily designed as close-ended types. Respondents were provided with a set of predefined options and were asked to select the answer that best matched their experience or opinion. This approach was chosen to facilitate clear, quantifiable responses, allowing for easier data analysis and comparison across different participants. We statistically analyzed results to evaluate antibiotic misuse in arid university and used SPSS 20.0.

Results

The survey results reveal critical insights into antibiotic awareness, usage behaviors, and perceptions among 200 respondents from PMAS Arid Agriculture University Rawalpindi. Respondent demographics highlight a balanced distribution in gender, with 45% male and 55% female participants, and a significant concentration in the age group of 21-25 years (40%), followed by 31-35 years (30%). Educational backgrounds were diverse, with 35% holding graduate education and 30% possessing postgraduate degrees. Antibiotic familiarity was notably high, as 95% of participants

reported having heard about antibiotics, and 85% had taken antibiotics prescribed by a healthcare professional. Despite this, 50% admitted to self-medicating with antibiotics without a prescription, reflecting a widespread issue of accessibility and misuse.

A deeper analysis revealed gaps in understanding. While 80% correctly identified antibiotics as effective against bacterial infections, 10% mistakenly believed they work against viral infections, and 7.5% associated them with fungal infections. Confidence in antibiotic knowledge varied, with 45% feeling confident but 15% reporting low confidence, underscoring the need for targeted education. Awareness of antibiotic resistance was moderate, with 40% rating their awareness as high and 20% as very high. Alarmingly, 35% admitted to discontinuing antibiotics before completing the prescribed course, a practice known to accelerate resistance development. Despite this, 90% acknowledged that antibiotic overuse could lead to resistance, indicating a theoretical understanding of the issue but inconsistent practical behavior.

When asked about sources of information, 40% cited doctors as their primary source, followed by pharmacists (25%) and family/friends (15%). Public health campaigns were recognized by 70% of respondents, though only 30% had actively participated in such initiatives, suggesting room for increasing engagement and outreach. The findings also highlight negative outcomes related to misuse, with 40% of respondents reporting personal or observed adverse effects, such as treatment failures or side effects. Such experiences underscore the pressing need for stricter regulations and enhanced public awareness in Rawalpindi.

While the data reveals a generally high level of awareness regarding antibiotics, significant gaps in practical understanding and responsible usage persist. Targeted education campaigns, stricter prescription policies, and better access to reliable healthcare information are critical steps to mitigate the risks associated with antibiotic misuse and resistance in PMAS Arid Agriculture University Rawalpindi.

COMPREHENSIVE QUESTIONNAIRE ANALYSIS TABLE (N=200)

Question	Response Options	Frequency	Percentage (%)	Cumulative Percentage (%)
1. Age	<20	25	12.5	12.5
	21-25	85	42.5	55.0
	26-30	60	30.0	85.0
	31-35	30	15.0	100.0
2. Gender	Male	90	45.0	45.0

	Female	110	55.0	100.0
3. Educational Background	Graduate	60	30.0	85.0
	Postgraduate	30	15.0	100.0
4. Do you work in the healthcare industry?	Yes	30	15.0	15.0
	No	170	85.0	100.0
5. Have you ever heard of antibiotics before taking this survey?	Yes	190	95.0	95.0
	No	10	5.0	100.0
6. How confidently do you understand what antibiotics are and how they work?	Very Confident	40	20.0	20.0
	Confident	90	45.0	65.0
	Neutral	30	15.0	80.0
	Unconfident	30	15.0	95.0
	Very Unconfident	10	5.0	100.0
7. Have you ever taken antibiotics prescribed by a healthcare professional?	Yes	170	85.0	85.0
	No	30	15.0	100.0
8. Have you ever self-medicated with antibiotics without a prescription?	Yes	100	50.0	50.0
	No	100	50.0	100.0
9. What do you think antibiotics are effective against?	Bacterial Infections	160	80.0	80.0
	Viral Infections	20	10.0	90.0
	Fungal Infections	15	7.5	97.5
	Other	5	2.5	100.0

10. How would you rate your awareness of antibiotic resistance?	Very High	40	20.0	20.0
	High	80	40.0	60.0
	Neutral	40	20.0	80.0
	Low	30	15.0	95.0
	Very Low	10	5.0	100.0
11. Do you believe that overuse of antibiotics can lead to antibiotic resistance?	Yes	180	90.0	90.0
	No	20	10.0	100.0
12. Have you or someone you know experienced negative consequences from antibiotic overuse or misuse?	Yes	80	40.0	40.0
	No	120	60.0	100.0
13. Have you ever stopped taking antibiotics before completing the full course, as prescribed by a healthcare professional?	Yes	70	35.0	35.0
	No	130	65.0	100.0
14. Where do you primarily get information about antibiotics and their use?	Doctors	80	40.0	40.0
	Pharmacists	50	25.0	65.0
	Internet	20	10.0	75.0
	Friends/Family	30	15.0	90.0
	Media	15	7.5	97.5
	Other	5	2.5	100.0
15. Are you aware of any public health campaigns or initiatives that promote responsible antibiotic use?	Yes	140	70.0	70.0
	No	60	30.0	100.0

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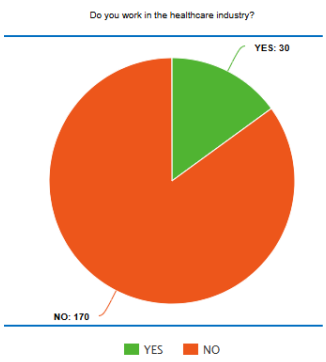
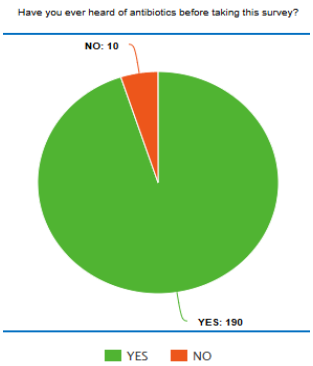
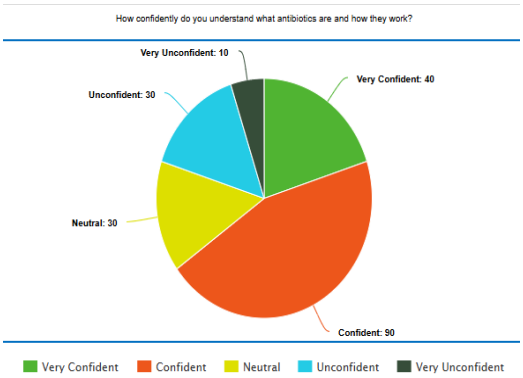
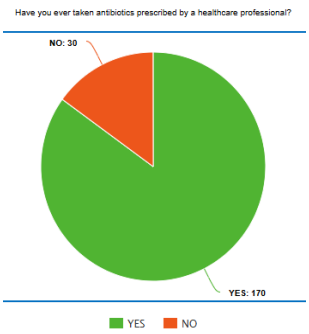
16. Have you ever participated in or supported any awareness campaigns related to responsible antibiotic use?	Yes	60	30.0	30.0
	No	140	70.0	100.0

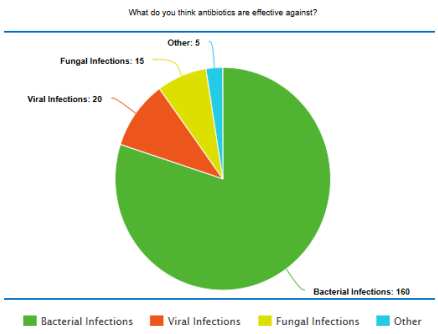
Table 1 Questionnaire Based Survey

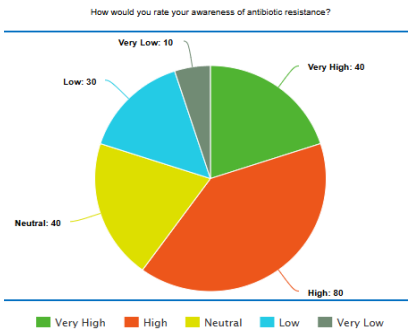












Discussion

The survey findings from PMAS Arid Agriculture University Rawalpindi shed light on critical patterns in antibiotic use and awareness, revealing significant gaps in both understanding and behavior despite high familiarity with antibiotics. While 95% of respondents had heard about antibiotics, indicating widespread recognition, behaviors such as self-medication (50%) and discontinuation of prescribed courses (35%) underscore the challenges in promoting responsible antibiotic use. These findings align with broader trends observed in developing countries, where easy accessibility, lack of enforcement of prescription policies, and socio-economic pressures exacerbate antibiotic misuse. A noteworthy observation is the disparity between theoretical awareness of antibiotic resistance and practical adherence to responsible usage practices. For instance, while 90% of respondents acknowledged that overuse leads to resistance, a substantial proportion still engaged in behaviors such as self-medication or early termination of antibiotic courses. This gap between knowledge and behavior suggests that awareness alone is insufficient to drive meaningful behavioral change. Similar studies emphasize that contextual factors such as cultural norms, economic constraints, and accessibility of healthcare heavily influence antibiotic misuse.

Healthcare providers play a dual role in addressing this issue. On one hand, doctors and pharmacists were identified as the primary sources of antibiotic information by 65% of respondents, highlighting their potential as key change agents. On the other hand, over-prescription remains a significant problem, particularly in private healthcare settings where patient satisfaction and financial incentives drive unnecessary antibiotic prescriptions. Addressing these systemic challenges requires equipping healthcare professionals with training on antimicrobial stewardship and enforcing stricter prescription policies. Another challenge lies in public health communication. Despite the presence of campaigns promoting responsible antibiotic use, only 30% of respondents reported participating in such initiatives. This reflects a gap in engagement and suggests that current campaigns may not be reaching or resonating effectively with the population. Tailored interventions that leverage trusted sources, such as community doctors, and employ culturally sensitive messaging are essential to enhance public participation.

The survey also highlights the role of education and socio-economic factors. Respondents with higher education levels demonstrated better awareness and confidence in their understanding of antibiotics. This suggests that interventions targeting less-educated demographics and emphasizing simplified, actionable information could be highly impactful. Economic factors, such as the affordability and accessibility of antibiotics, further complicate efforts to regulate their use. Policies addressing these structural issues, such as subsidized healthcare services and improved public healthcare infrastructure, are critical. The consequences of antibiotic misuse in PMAS Arid Agriculture University Rawalpindi are already apparent, with 40% of respondents reporting personal or observed negative outcomes, such as treatment failures or side effects. These findings underline the urgency of addressing this issue to prevent a broader health crisis, as multidrug-resistant infections become increasingly prevalent in the region.

Conclusion

The findings of this study underscore the urgent need to address antibiotic misuse in PMAS Arid Agriculture University Rawalpindi through a multifaceted approach involving education, regulation, and systemic reform. While awareness of antibiotics and their potential misuse is relatively high, significant gaps in responsible behaviors persist. Factors such as self-medication, over-the-counter availability, and incomplete antibiotic courses contribute to the growing threat of antimicrobial resistance, a phenomenon that poses severe health and economic challenges.

To combat these issues, targeted public health campaigns must be designed to bridge the gap between knowledge and behavior, emphasizing the importance of completing prescribed courses and avoiding self-medication. These campaigns should leverage trusted sources of information, such as healthcare providers, while employing culturally sensitive and engaging strategies to resonate with diverse demographics.

Additionally, regulatory measures must be strengthened to ensure antibiotics are dispensed only through valid prescriptions. Training healthcare professionals on antimicrobial stewardship can reduce over prescription, while investing in public healthcare infrastructure can make reliable treatment more accessible to economically disadvantaged populations.

Lastly, fostering community engagement and participation in awareness campaigns can amplify efforts to promote responsible antibiotic use. By addressing the root causes of misuse, such as socio-economic constraints and educational disparities, and implementing comprehensive policy changes, PMAS Arid Agriculture University Rawalpindi can serve as a model for other regions facing similar challenges. The battle against antimicrobial resistance is a collective responsibility, and proactive measures taken today will safeguard public health and preserve the efficacy of antibiotics for future generations

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