



RESEARCH PAPER

Integrating Medical Teaching to Address Misuse of Antibiotic

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ABSTRACT

In highly vaccinated areas, resistance to antimicrobials has surged rapidly in low and middle-income countries (LMICs), especially within Pakistan, owing to the more extensive misuse and abuse of antibiotics. This study investigates the gap present in antibiotic stewardship and public health policies on AMR within the medical education system of Pakistan for this aim. This work investigates the insight and perspective of medical students, teachers, and professionals towards antibiotic misuse, antimicrobial resistance, and related policies. The findings suggest that there is an inadequate understanding and training concerning the extensive social and moral effects of AMR. Additionally, inadequate extracurricular activities. The findings point out the crucial requirement for adding antibiotic stewardship, bioethics, and public health issues into medical course materials to deal with the misuse of antibiotics and to check the rise of AMR. The results show that merging education, rigorous policy enforcement, and awareness into a single approach provides a practical solution to this challenge.

KEYWORDS Antibiotic Misuse, Pakistan, Public Health Problems

Introduction

Globally, overprescribing and the misuse of antibiotics have intensified to become an important health problem, especially for countries categorized as low- and middle-income countries (LMICs), such as Pakistan. Studies explore the high antibiotic prescribing patterns in LMICs, with a pooled incidence of 52% in primary care settings (Sulis et al., 2020). Across a variety of conditions, inappropriate use of antibiotics is common, with rates varying from 8% to 100% (Sulis et al., 2020). Due to the important role played by antibiotics in saving lives since their discovery, their extensive use is triggering a quick upsurge in antimicrobial resistance (AMR). The World Health Organization (WHO) warns that without immediate action, common infections and trivial injuries might again become deadly because of the diminishing effectiveness of antibiotics. Approximately 700000 people die annually around the world because of antimicrobial resistance, according to O'Neill (2014). Antibiotic misuse in clinical, community, and agricultural contexts calls attention to a clear problem facing Pakistan, one of the top antibiotic consumers in the developing world. An essential driver of this crisis is the inadequate unified and resilient antibiotic stewardship in the area of medical education in Pakistan. The situation has become worse because of the deficiency in extra-curricular programs, namely workshops and seminars that might raise awareness among students entering future healthcare fields about AMR. If healthcare providers prescribe antibiotics for viral infections for convenience or a shortage of knowledge, it leads to both mistaken beliefs and an unethical fall in medicine, which is adding to the rise of drug-resistant pathogens. The consequences of failing to address antibiotic misuse extend beyond the individual patient. The misuse of antibiotics undermines global public health, promotes the spread of resistant bacteria, and threatens the effectiveness of essential medical treatments for future generations. Despite the introduction of national action plans and global initiatives like antimicrobial stewardship programs, there remains a significant gap between policy and practice in Pakistan. These policies become less effective because of their inadequate implementation, combined with inadequate monitoring and regulation, which aggravates the crisis further.

This study aims to explore the existing gaps in the medical education system in Pakistan, specifically regarding the teaching and awareness of antibiotic use and resistance. The goal of this research is to reveal the urgent requirement for reforms by looking at the curriculum and the attitudes about antibiotic stewardship of both medical professionals and students. These crucial challenges need a prominent position in medical education; failing to do so may make the effort to combat antimicrobial resistance unsuccessful, leading potentially to an even graver public health crisis.

Literature Review

The global rise in antimicrobial resistance (AMR) has been recognized as one of the most pressing public health challenges of the 21st century. Antibiotics once heralded as miracle drugs following the discovery of penicillin by Alexander Fleming in 1928, are now losing their effectiveness due to their excessive use and growing resistance (Kalvaitis, 2008). AMR, characterized by the resistance of bacteria, viruses, and fungi to antimicrobial agents, threatens to render standard treatments ineffective, leading to prolonged illnesses and higher mortality rates (WHO, 2020). This issue is especially acute in LMICs, such as Pakistan, where antibiotic misuse is widespread and poorly regulated (Torumkuney et al., 2022).

Antibiotic Use and Misuse in LMICs

Antimicrobial resistance is growing as a significant issue in Pakistan, with high resistance rates observed across various pathogens (Atif et al., 2021). Studies indicate growing resistance to third-generation antibiotics i.e., cephalosporins, fluoroquinolones, and cotrimoxazole (Saeed et al., 2021). Similarly, acinetobacter species are highly resistant to carbapenems and aminoglycosides (Saeed et al., 2021; Iqbal et al., 2022). The most recent strains such as extensively drug-resistant (XDR) and multi-drug-resistant (MDR) organisms, such as XDR-Typhoid fever, are posing a major threat (Rasheed & Almas, 2023). The proportion of Methicillin-resistant *Staphylococcus aureus* has also risen up through the years (Saeed et al., 2021). To manage restricted healthcare accessibility, antibiotics are commonly used as the first-line treatment. In many cases, patients are given antibiotics for viral infections such as colds and flu, despite the ineffectiveness of these drugs against viruses (WHO, 2020). In Pakistan, a host of factors led to the rise of AMR, comprising widespread self-medication with antibiotics, the availability of quacks, a badly governed pharmaceutical sector, and its misuse in animal husbandry (Roien et al., 2022; Rasheed & Almas, 2023). In agriculture, antibiotics are important, with the major goal being to promote livestock and poultry growth and curtail infection dangers. This kind of practice is a danger to human health by eating meat rich in antibiotics while spreading drug-resistant bacteria (AMIS, 2020). According to Kalvaitis (2008), nearly 80% of antibacterial compounds enter our bodies from livestock, placing a major emphasis on agricultural techniques in the development of AMR. Addressing this crisis requires an immediate development of national policies on drugs, better regulation of antibiotic sales, and a rise in public awareness (Rasheed & Almas, 2023; Iqbal et al., 2022).

Gaps in Medical Education

The attitude and practices of future healthcare professionals in Pakistan critically depend on the education they will receive. The knowledge gap among both healthcare workers and the public is major contributing factor to antibiotic misuse and AMR. Medical students are aware of the importance of proper antibiotic use but express a need for greater knowledge of the proper selection process (Minen et al., 2010). Various research have revealed that the number of earlier works emphasizing on the dearth of antibiotic stewardship and antimicrobial resistance teachings across the medical curricula of Pakistan is not insignificant. This is articulated with Atif et al. (2021) who synthesized that the curricula of various medical institutions are dominantly preoccupied with technique-

centred and disease-specific provisions and marginally concerned with public health issues such as AMR and bioethics. (Minen et al., 2010; Che et al., Roos 2019). Knowledge gaps and misconceptions about antibiotics persist across various healthcare settings contributing to inappropriate use (Chalkidou et al., 2023). A critical requirement has arisen to embed antimicrobial stewardship into medical and allied health professional studies at the undergraduate level in order to address these issues. Also, the recommendation from the World Health Organization (2018) to policy makers was to develop strong national action plans to improve this issue's monitoring or surveillance. These sorts of policies and initiatives may increase rational antibiotic use, lower AMR, and improve patient outcomes by giving future prescribers the competencies they need (Majumder et al., 2020). The survey from the WHO (2020) noted that antimicrobial resistance occurs naturally, but misusing antibiotics greatly accelerates it. The understanding, however, is not mirrored in medical practice in Pakistan. Roien et al. (2022) indicate that broader attention on antibiotic stewardship, infection prevention, and responsible antimicrobial agent use in medical curricula is necessary. This action will ensure that medical graduates are better able to deal with the increasing hazards from AMR. The elimination of this educational gap is assisted by extracurricular, like workshops, seminars, and awareness campaigns (WHO, 2018b). These opportunities, though, are still limited in the vast majority of medical institutions across Pakistan.

The Role of Policy and Ethical Considerations

The lack of policy enforcement and inadequate oversight by regulations significantly increases the misuse of antibiotics in domains other than the classroom. This problem requires a cooperative education approach involving healthcare practitioners, patients, and community, based on the successful outcomes of the campaign specific to the right antibiotic usage (Steiner et al., 2004). To fight antimicrobial resistance, Pakistan has designed both national strategies and policies comprising the National Action Plan for Antimicrobial Resistance and the Antibiotic Stewardship Program (Atif et al., 2021). There exists an urgent demand to add antimicrobial stewardship to the curricula of medical and allied health professionals, as investigations show that students exhibit deficient confidence and skills in antibiotic prescribing (Majumder et al., 2020). The inappropriate use of antibiotics has far-reaching results that matter to more than human health, reshaping ecology among microbes and environmental elements. Extensive changes in policy are necessary to stop the growth of antibiotic resistance due to these developments (Kraemer et al., 2019). monitoring tools remain feeble, which creates a significant difference between policy implementation and practice (WHO, 2018b). Hunter (2016) reports that the irregular dialogue between healthcare workers and policy makers is a challenge, since political interests commonly eclipse public health concerns. Also, the moral implications of using antibiotics continue to be mostly disregarded. Prescribing antibiotics for non-bacterial infections or for financial gain violates basic medical ethics, which stress the importance of prioritizing patient welfare and safeguarding public health (Beauchamp & Childress, 2019). The dispersion of AMR is paced-up due to negligence of ethical issues by healthcare professionals. Bioethics and clinical ethics courses, critical as they are, generally are not given attention in medical curricula in Pakistan (Shirazi et al., 2024). This reveals the indispensable need for a revitalized approach to medical education that combines technical skill with an ethical attitude concerning the proper application of antibiotics.

Theoretical Framework

The multi-factorial causation theory of disease is a conceptual framework used to understand the complex interplay of multiple factors behind the cause and development of diseases. It was first proposed by Francis Galton in the late 19th century (Galton, 1897). It disagrees with the customary reductionist viewpoint that suggests a single causative agent, i.e., biological, results in illnesses. This work claims that the emergence of diseases

results from an interplay of various factors, including the biological, genetic, environmental, social, cultural, political, and economic. According to this theory, a significant lens is provided for creating disease prevention, control, and treatment strategies for a demographic by recognizing the fundamental causes of these diseases. The multifactorial disease model furnishes necessary comprehension to completely grasp the etiology of disease by supplementing biological or genetic insights. The abovementioned theory is especially important to analyze the multifaceted factors influencing the problem of antibiotic misuse and the related growth of antibiotic resistance in Pakistan. The list includes sociocultural approaches, biological vulnerabilities, economic circumstances, and political as well as power dynamics within healthcare.

Material and Methods

This section provides an overview of the research methodology of the research including participants, data collection, data analysis process, and ethical considerations. The data collection was conducted through in-depth interviews and informal conversations. The locales included medical educational institutes such as medical colleges and universities in the districts of Sindh, i.e., Karachi, Hyderabad, and Khairpur Mirs.

Participants

The research sample comprised 22 respondents, including medical and pharmacy teachers and students. The technique used for selection involved purposive sampling in combination with snowball sampling to present the larger population, and to select some respondents in accordance with the study's objectives, requirements, and purpose. The purposive sampling allowed us to address the research objectives. Similarly, the snowball sampling technique provided access to the respondents by referring relevant respondents for the research. The selection of the respected sample ensured the inclusion of key stakeholders. The diverse sample enables an in-depth understanding of multifaceted issues in medical curricula leading to excessive antibiotic use and AMR.

Data Collection

For the data collection, 22 in-depth interviews and informal conversations were conducted. A semi-structured interview guide addressing the research objectives was designed for the interviews. The interview guide included open-ended questions and avoided the leading questions that encouraged the respondents to share their perspectives and attitudes without any hesitation.

Prior to the actual data collection, a pilot study tested and improved the interview guide. This allowed us to identify any existing gaps in the guide and improve it for more comprehensive data collection. Furthermore, the unplanned and informal conversations with the respondents in natural settings added more details to the data collection beyond the interviews conducted. The data collected was later transcribed to avoid any loss of data and proceed to the data analysis process.

Result and Discussion

This chapter discusses the current condition and significance of medical curricula regarding the inclusion of knowledge of antibiotics and related policies into the syllabus. Initially, it discusses the integration of policies related to antibiotics in medical curricula. Moreover, the attitudes and knowledge of medical teachers and the perspectives of students concerning policies on antibiotics are elaborated. Lastly, the discussion includes bioethics and clinical ethics concerning the issue of antimicrobial resistance in medical curricula.

Antibiotics and Concerning Policies in the Medical Curricula

The over and misuse of antibiotics cause antimicrobial resistance, which is deemed a threat globally. World health organization has made many policies and introduced global and national strategies to cope with the growing rate of antimicrobial resistance and the justified use of antibiotics. Similarly, Pakistan has also launched some strategies and programs like antimicrobial stewardship, antibiotic stewardship program, and national action plan. These policy-based programs aim to select correct diagnoses, and appropriate usage of antibiotics, prevent infectious diseases, and localize the knowledge of those policies and implement them on a community level. Drug Regulatory Authority Pakistan introduced guidelines for healthcare professionals to reduce the burden of antimicrobial resistance and appropriate usage of antibiotics in light of antimicrobial resistance programs (DRAP, 2021). This policy aims to educate healthcare practitioners, medical teachers, and students. It emphasizes ensuring that antimicrobial stewardship is covered in all clinical specialty training programs (Atif et al., 2021). According to the views of the teaching staff, none of the courses added to the academic curricula addresses those policies or programs in most Pakistani medical colleges or universities. A respondent, a 41 years-old lecturer in a reputed medical university of Khairpur district, expressed his views concerning the curricula of the medical university and stated

Extra-Curriculum Activities Regarding Appropriateness of Antibiotics

The learning experience of student life does not rely on the curriculum or the books; it also includes extra-curriculum activities in their academic experience. Nevertheless, the current research observed that renowned medical colleges and universities in Khairpur, Sukkur, and Larkana lack interest in engaging students in current health-related issues, policies, and programs. The teaching staff has insufficient knowledge and is not updated about new health-related policies and programs. Little to no extra-curriculum activities are conducted in the educational institutes addressing the alarming issue of antibiotic resistance, prevention, and treatment. A Rajab Ali, a 24 years-old final year medical student, shared that most of his teachers, along with the teaching profession, practice in both private and government clinics and hospitals simultaneously. He added

How would a person who teaches in the morning and practices as a doctor in the evening find time to conduct activities beyond the provided outline? I have not witnessed any event or campaign arranged to address policy-level information on proper usage of antibiotics, control and prevention of antibiotic resistance, and policies or programs launched to curb this issue globally or nationally.

The study observed that one of the factors behind the lack of extra-curriculum activities at the academic level is the teachers' priorities. The academic faculty prioritize their career and money over the proper training of their students for their future professions. They prefer to practice as a doctor in their spare time from their teaching schedule to earn extra money. They practice part-time in private clinics or hospitals. Hence, they do not get time to train the students beyond the curriculum and course outlines. Besides extra-curriculum activities, no visual awareness via posters, guides, or pamphlets regarding antimicrobial resistance or concerning strategies for the proper use of antibiotics was made visible in the buildings of the medical universities and colleges. Some teachers mentioned that extra-curriculum activities concerning optimizing the use of drugs and ways of diagnosing had been conducted in the past but did not address the concerns related to antibiotics and their policies.

Attitudes of Medical Teachers Concerning Policies of Antibiotics

Teachers of medical institutions have different narratives according to the usage of antibiotics and their policies and programs introduced to reduce the burden of

antimicrobial resistance or fair use of antibiotics and their integration into the medical curriculum and activities. Teachers follow course outlines while teaching, usually designed by the authorities such as the Pakistan Medical Dental Council (PMDC), Higher Education Commission (HEC), and vice-chancellors of medical universities and colleges. Medical curricula do not address the issue of antimicrobial resistance. However, concerning medicines, only the usage and proper dosage are introduced, and the topics related to antibiotic resistance and its importance at the policy level are not addressed in the course outline. ASPs, AMSPs, and NAP are not included in the curricula by the Higher Education Commissioner (HEC) and Medical Dental Council (MDC). Professor Dr. Furkh, a 44 years Head of the Department of Community Medicine at a medical college in Khairpur mentioned that although the antibiotics stewardship program and national action plan for antibiotics are part of medical teaching institutions at every level. However, these programs are not implemented properly due to a lack of interest by policymakers and enforcement institutions. Even though teachers are aware of these policies, they are not part of their curriculum. Regarding policy, our findings indicate a need to enact legislation to introduce ASPs into Pakistan's medical and healthcare teaching setting. Furthermore, Pakistan's National Action Plan on antimicrobial resistance must be taught at every medical teaching institution. While in practice or professional career, there is a dire need for training and involvement of teachers and students in antibiotic stewardship programs to minimize the surge of antimicrobial resistance. Moreover, the biopsychosocial approach suggests that diagnosing patients through biological, psychological, and sociocultural contexts is more important than focusing only on biological or physical appearance. It is essential to teach students about these things along with the policy and strategies concerning antibiotics in Pakistan as the MBBS doctors treat every disease, including psychiatric issues of health, in which they are not specialized in. Globally healthcare settings imply all three of the approaches mentioned earlier. Furthermore, patients often misuse drugs as they do not get properly diagnosed by doctors and take the medications themselves as per their previous knowledge about the medicines.

Doctors have used antibiotics for almost 5 or 6 generations for many minor diseases, which is very harmful to present and upcoming generations.

Additionally, he mentioned that the monitoring, surveillance, and weekly or monthly reporting of antibiotic resistance cases are not being conducted. No one is taking any action against it, as most administrative positions are appointed through political involvement.

Medical Students' Perspective on Antibiotics and their policies

The use of antibiotics in hospitals or community settings will be led by medical and pharmacy students, who will be among the future healthcare practitioners in the field where antibiotics are practiced. That is why their information and knowledge are concerned regarding the usage of antibiotics, antimicrobial resistance, and new global and national policy-based problems. If they are trained and educated throughout the undergraduate degree, they could select a way of pattern appropriately. Contrarily selected local research observed that these types of education are not prioritized during undergraduate studies. Students can gain a better understanding of the likely results of antibiotic overuse and misuse, for the health of individuals and populations (El-sokkary et al., 2023). The course is capable of delivering an experiential education that serves to deepen student understanding by introducing case studies and actual examples of antibiotic resistance. El-sokkary et al. (2023) researched that participants gained greater awareness, better attitudes, and altered perceptions toward antibiotic prescribing when they took a optional course on the key teaching of antibiotic prescribing etiquette. Students get the opportunity in their elective classes to fully understand the gravity of the problem, advocate based on data, and manage the issue of antibiotic resistance (El-sokkary et al., 2023). The issues found in academic curriculum can encourage positive attitudes in

medical students towards using antibiotics. Inspiring students to treat the ethical and responsible use of antibiotics as a primary goal for their future practice is the objective of this course, achieved by raising its importance. Reviewing different treatments under favorable circumstances involves a look at the advantages and potential drawbacks of providing antibiotics, as well as being true to the recognized guidelines for their administration. Similarly, I conducted three Focused Group Discussions (FGDs) in medical educational institutes. The FGDs included total five (all MBBS students) from Khairpur Medical College in the first FGD, eight students (four MBBS and four pharmacology students from Khairpur Medical College) in the second FGD, and six students (two MBBS and four pharmacology students) in the third FGD from Gambat Institute of Medical College (GIMS), also known as Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences Gambat, Khairpur Mirs. During these focused group discussions, all the students were aware of antibiotics in general, and their sources of information were their academic degrees, books, and lectures. Most of them stated that they are only taught about antibiotics, their types, dosage, classifications, generations, merits and demerits, and the side effects of over and misuse. Most of the students learned these things in their pharmacology and physiology courses. Most of them also knew about antimicrobial and antibiotic resistance. However, some students were unaware of it. As per their discussions, most students were genuinely aware of these topics. However, few students did not know about antibiotic resistance despite their claim of being aware. For instance, one of the students called antibiotic resistance a disease, and another student called it a bacterium; both of them did not know its cause. Most students were unaware of the global policies to prevent or control antibiotic or antimicrobial resistance, and those who were aware had little information about them. While probing about the international policies or programs and national policies and clinical strategies, most students mentioned the general information about antibiotics and their dosage. Only three out of nineteen students mentioned policies such as tetanus vaccinations, FDA policies, TB resistance programs, and WHO programs. None of the students knew national policies to prevent or control antibiotic or antimicrobial resistance.

Bioethics

Bioethics focuses on the principles of proper and improper behaviors that guide medical research and practice among humans and animals. Bioethical principles are applied in academia, hospitals, health institutions, pharmaceutical companies, and private health sectors. Bioethics or medical ethics has been integrated into medical curricula worldwide since 1970, but only 4% of American medical institutions initially offered formal courses. By 1994 in America, Bioethics and medical ethics syllabi were integrated at every level of medical teaching institutions as compulsory subjects. Before the 21st century, medical education in Pakistan primarily focused on technical and scientific aspects of healthcare, with limited attention given to ethical and social issues. However, with the increasing globalization of medicine and the growing recognition of the importance of ethical considerations in healthcare, there has been a growing movement to incorporate bioethics into medical education and healthcare institutions in Pakistan. The members of the medical community who were trained in America imported contemporary bioethics into Pakistan in the mid-1980s (Gilbert, 2012). Similarly, in 2002, the Pakistan Medical and Dental Council's code of ethics mandated that medical ethics must be taught in medical teaching institutions at every level in Pakistan. The current issue of antimicrobial resistance can be addressed and prevented by problematizing such issues and regulating bioethics at medical professional and educational levels. Current research has observed that courses related to bioethics or medical ethics are not taught throughout the MBBS programs in most medical colleges and universities in selected locales.

Addressing the Issue of Antimicrobial Resistance in the Course of Clinical Ethics

Clinical ethics is a sub-discipline of bioethics that forces fairness in clinical practice and doctors' sincerity toward current and future patients. For instance, if doctors overprescribe for self-interest or do not conduct good practice for personal reasons, it would be considered malpractice and act against clinical ethics. The inclusion of courses related to clinical ethics in the medical curriculum throughout the MBBS degree is one of the ways to reduce antimicrobial resistance as it would define ethical rules of prescription and care of a patient's life in a clinical environment. Tom Beauchamp and James Childress created the four principles of healthcare ethics in 1985, which provide guidelines for medical professionals during practice and apply to any condition in every medical practice (Page, 2012). The four principles of ethics in health care include justice, beneficence, non-maleficence, and autonomy (Beauchamp & Childress, 2019). The correlation between the medicinal value and the adverse effects of prescription medications could be an example of beneficence. It is more relevant for the prescription of antimicrobials. The principle of non-maleficence refers to the obligation of not harming anyone or even avoiding the least harm possible to achieve a beneficial outcome (Jahn, 2011). It describes the choice between the immediate advantage of anti-infective treatment and the likely lack of future therapy for that patient. This term could also be used in principle for providing antibiotics with clinical prophylactic treatment, perhaps a right in the future. The principle of autonomy indicates an ethical concept that respects an individual's independence and capacity in decision-making. Doctors may recommend the best for a patient, explaining scientific judgments through clinical observation, expertise, and often psychosocial factors. However, they have to protect their privacy, respect the final decision of patients, obtain consent for their interventions, and ensure delivery of the truth about patients' conditions, treatments, or other necessary information (Jahn, 2011). Doctors' attempt to influence clinical autonomy, especially in the cases when they feel that some interventions in the decision of the choice of therapy or treatment for a specific patient or illness would benefit them monetarily, reflects that the doctor does not endorse restrictive legislation. Moreover, beneficence encourages the moral obligation to make decisions and act to provide benefits to others and balance the benefits and risks of others. For instance, it includes protecting others' rights, preventing harm to others, assisting individuals with disabilities, and rescuing people if needed. The principle of justice refers to the obligation of practitioners to equitably distribute benefits, risks, costs, and resources according to an equal share, need, effort, contribution, and merit (Jahn, 2011). For instance, Justice in decisions such as risk and benefit, appropriate allocation of limited resources and new therapies, and following the relevant laws and regulations before making decisions. This ethical element stresses doctors' justice, fair dealing, and honesty in prescriptions, which could be helpful in safeguarding the upcoming generations from infectious diseases, especially antibiotic resistance. Additionally, human dignity, confidentiality, privacy, and patient rights are some of the other ethical principles or guidelines established and followed in most professional organizations (Jahn, 2011).

The medical students, who have the country's future in their hands, are unaware of the important dilemmas of the medical or pharmaceutical profession.

Kazim Raza, 64 years old, former Medical Superintendent (MS) of Kot-Diji, mentioned that safety and care for future generations is a fundamental bioethical instrument. Our decisions in the present, policies, and actions are accountable for the future of the next generation. Antimicrobial resistance is not only a concern for the current generation but also a considerable risk for the future generation. Dr. Mujeeb Ur Rehman, a 42 years old lecturer at a renowned medical university, stated

Many people died due to infectious diseases in the pre-antibiotic era, and I think we will witness the disasters of the post-antibiotic period very soon.

Moreover, he said that inventing a drug takes years of research and effort. It is not developed in a short time but takes many years. One of the great examples is the time taken to find an appropriate treatment during the Covid-19 pandemic. Scientists and pharmacists had to go through a lot of research and trials to invent a vaccine to cure COVID-19. Meanwhile, the world lost millions of lives without treatment. Furthermore, he expressed concerns and stated that the present population must control the misuse of antibiotics and antibacterial drug production. The overuse and misuse of antibiotics could be addressed through academic bioethics courses by highlighting the proper usage of antibiotics and problematizing the issues of antimicrobial resistance to educate future doctors regarding this global public health dilemma. Amir, a 31-year-old teacher of community medicine, said that medical ethics courses were taught in first and second-year MBBS degrees as a minor course. The research observed that not only the students but also the teachers are not interested in teaching such subjects. The administration is also not interested in enforcing medical teaching institutions to put efforts into including the philosophical and social determinants of health courses in the medical curricula. This reflects the academic administration's lack of interest and responsibility in the quality assurance of education provided in the institutes, especially in theoretical courses like bioethics or clinical ethics. They also educate students on the principles of informed consent, patient autonomy, and the weighing of potential benefits and risks when prescribing antibiotics. Additionally, these courses may cover topics such as the global public health implications of antibiotic resistance and the need for stewardship of this precious resource. By having a solid understanding of these ethical and practical considerations, medical professionals can make informed decisions that prioritize patient safety while also reducing the spread of antibiotic-resistant infections.

Conclusion

In conclusion, the study observed that the medical curricula are designed by the collaboration of authorities such as the Pakistan Medical Dental Council (PMDC), Higher Education Commission (HEC), and vice-chancellors. Despite the significance of the proper knowledge of antibiotics, the teaching faculty denies it to be their responsibility to update and disperse the proper knowledge of antibiotics to their students. The teachers prefer not to put some extra effort into making students aware of antibiotic policies as they may have insufficient knowledge about new policies and strategies regarding the proper usage of antibiotics or the prevention of antibiotic resistance. Moreover, the priorities of teachers are different from the improving quality of academics or curricula, which is one of the factors behind the lack of extra-curricular activities at the academic level. The academic faculty prioritize their career and money over the proper training of their students for their future professions. The study also observed that most of the medical universities and colleges located in the study locale do not address the issue of antimicrobial resistance in the medical curricula. It even strongly suggested introducing lessons regarding antimicrobial resistance programs in primary and secondary education. Medical teaching in the selected locales focuses more on physiological or biomedicine approaches during medical-related degrees. Hence, very few universities in Pakistan concentrate on those biomedical approaches to teaching students throughout graduation and merely teach in the master programs of public health. Moreover, the biopsychosocial approach suggests that diagnosing patients through biological, psychological, and sociocultural contexts is more important than focusing only on biological or physical appearance. This lack of accountability creates an image of these important issues as unnecessary for a professional career and clinical practice among students. The inclusion of courses related to bioethics, medical ethics, or clinical ethics in the medical curriculum throughout the MBBS degree is one of the ways to reduce antimicrobial resistance as it would define ethical rules of prescription and care of a patient's life in a healthcare environment. The overuse and misuse of antibiotics could be addressed through academic bioethics courses by highlighting the proper usage of antibiotics and problematizing the issues of antimicrobial resistance to educate future doctors regarding this global public health

dilemma. Unfortunately, policies and strategies are not implemented adequately in Pakistan due to a weak assessment and monitoring system and a lack of interest among policymakers and administrative authorities. Moreover, the monitoring, surveillance, and weekly or monthly reporting of antibiotic resistance cases are also not being conducted. Despite that, no action has been taken against it by the authorities as most administrative positions are appointed through political involvement.

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