

RESEARCH ARTICLE

# Antibiotic Resistance in Bangladesh: Current Scenario

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## Abstract

**Background:** Antibiotic overuse in Bangladesh has escalated to a concerning degree, endangering public health as a result of drug resistance. The government of Bangladesh is launching several initiatives and plans to manage this health issue. However, the situation is getting worse every day because of the ease of access to this medication and a lack of knowledge in the general public. To stop this growing menace, the government, medical professionals, local authorities, and the general public must work together.

**Methods:** Structured interviews with 30 people were conducted to find out whether individuals are aware of antibiotic resistance and the drug law of 2023. Information was also acquired from scholarships such as reports, journal articles, newspapers and websites.

**Results:** Bangladesh is reportedly experiencing a significant increase in antibiotic resistance. It is found that the majority of the participants possess (76%) misconceptions regarding antibiotic uses and resistance. Moreover, 94% have no idea about drug laws and government policies. A lack of funding and manpower prevented the government of Bangladesh from implementing its policies and legislation.

**Conclusions:** Antibiotic resistance can be controlled through rigorous government surveillance and a collaborative effort from all societal members.

**Keywords:** Antibiotic, Bangladesh, Health, Resistance.

## 1. Introduction

Antibiotics are potent medications that are primarily used to treat diseases brought on by microorganisms especially bacteria (1). These drugs have proven to be very beneficial in preventing infectious diseases and enhancing the quality of healthcare since they were initially introduced (2). However, when these medications are misused, pathogenic bacteria can proliferate out of control and become resistant to antibiotics designed to destroy them. Antimicrobial resistance (AMR) is the common term to describe the defiance of bacteria, viruses and fungi against drugs (3). A subgroup of AMR known as antibiotic resistance (ABR) refers specifically to bacteria that develop antibiotic resistance (3,4); another name for these bacteria is superbugs. Successful treatment of infectious diseases worldwide is at risk due to the

alarming growth of resistance to antibiotics among clinically significant and commensal bacteria. Antibiotic resistance has an impact on the economy, human health, and animal health since it raises the cost of healthcare for both humans and animals because antibiotic-resistant infections require more frequent testing, more time for recovery, and more expensive drugs (5).

It is reported that antibiotic resistance is directly responsible for 1.27 million deaths worldwide in 2019 and led to an additional 4.95 million fatalities (6). Globally, AMR infections claim the lives of some 0.7 million people annually (7). The World Health Organization (WHO) has projected that if things continue as they are then the number of such deaths may rise to 10 million by 2050 (8). The WHO has identified AMR as a serious hazard to public

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health in 2021. According to a study (9), the usage of antibiotics increased by 46% (of daily doses per 1,000 people) between 2000 and 2018. Moreover, bacterial AMR is the biggest hazard to human health in sub-Saharan Africa and Southeast Asia (6).

Antibiotics in Bangladesh are easily accessible to people over-the-counter. It is worth mentioning that Bangladesh is capable of producing antibiotics locally. Pharmacy density (7.2 per 10,000 population) is significantly higher in Bangladesh (3). Moreover, visiting a specialist in the private sector is expensive and public hospitals are over crowded. Therefore, people who prefer a quick recovery mostly purchase antibiotics from local pharmacies that do not ask for a prescription (10). Additionally, the COVID-19 pandemic has triggered the use of antibiotics as “big” medicine against this epidemic specifically in Bangladesh. Thus, it can be said that antibiotic resistance in Bangladesh has emerged mostly due to the easy availability of these drugs and the lack of training and adherence to the regulations among health practitioners (5). The alarmingly high rate of antibiotic use in Bangladesh today poses a major threat to public health. This paper aims to explore the current state of antibiotic resistance in Bangladesh against this backdrop. Additionally, it outlines the steps and tactics the Bangladesh government has taken to limit antibiotic resistance and offers some suggestions that might aid in reducing its severity.

## 2. Methods

This study makes use of both primary and secondary materials. Data about antibiotic resistance and antimicrobial resistance published between January 2010 and August 2024 was gathered from various sources. Google Scholar, local journals, reports, websites, and online news portals in Bangladesh were all searched extensively. Additionally, structured interviews were done with 30 participants between March - June of 2024 to collect information. Of these, 25 came to buy antibiotics, and five worked as salespeople at the pharmacies in Rajshahi. The participants were assured that the material gathered from the interviews would not be disclosed or used in any other context, and would only be utilized for the specific study’s academic goals. Before analysis, the obtained data was first specified following the study objectives. The primary data was cross-checked with the secondary data where analysis requires further in-depth study.

## 3. Antibiotic Resistance Scenario in Bangladesh

Bangladesh, a developing country, located in South Asia is struggling to deal with the increasing threat of antibiotic resistance. The irrational use of antibiotics, the easy availability of these drugs, and the growing contamination of the environment are aggravating this situation. Biswas et al. (11) in a study discovered 26.69% of participants self-medicated with antibiotics. Non-adherence to antibiotic protocols was aided by suggestions from others, lack of knowledge and previous experience. Saha and Hossain (12) found that 66.2% of people purchase antibiotics from neighbourhood pharmacies either by self-referral or without a prescription. The Department of Microbiology and Immunology at Bangabandhu Sheikh Mujibur Rahman University, Bangladesh in a study found 6.5% of patients resistant to superbugs in 2010 and that number rose to between 11% - 14% in 2018 due to the irrational application of antibiotics (13).

According to another study, one million people in Bangladesh take antibiotics every day on the advice of non-physicians or untrained people. About 36.5 million people buy antibiotics two to three times a year from different shops while only 50 million people take antibiotics on doctor’s advice (14). Another study by Nahar et al. (15) claims that in Bangladesh, 63% of prescriptions for antibiotics are given by untrained healthcare professionals. Moreover, 44% of primary health care consultations involve the prescription of antibiotics without the necessity of taking these drugs. Additionally, poor people and women mostly rely on quick remedies recommended by local unqualified healthcare providers where misuse and overuse of antibiotics are common.

The Institute of Epidemiology, Disease Control and Research (IEDCR) of Bangladesh indicated that a minimum of 10 types of bacteria exhibited increased resistance to 17 essential antibiotics used to treat diverse infectious diseases nationwide (4). The IEDCR reports that resistance to antibiotic drugs in Bangladesh rose by 11% between the 2017-2023 period. Moreover, the efficacy of some regularly used antibiotics was reduced by up to 82% as opposed to 71% in 2017. The IEDCR further claims that the nation is witnessing a startling increase in the number of antibiotic-resistant bacteria. The majority of popular first-line medications were found to be largely ineffective. In intensive care units, 70% of patients have a resistance to linezolid-type antibiotics while the rate reaches 82% outside the hospital. The

study also found that 90% of medications used to treat diarrhoea, urinary tract infection and lung infection are resistant to antibiotics like ampicillin, tetracycline, and ciprofloxacin (16). Additionally, livestock and water surfaces are also discovered to have a significant amount of antibiotic residue compounds (3) that ultimately harm human health.

#### 4. Initiatives Taken in Bangladesh to Prevent Antimicrobial Resistance

Antimicrobial Resistance has been recognized by the WHO as one of the top 10 worldwide hazards to humanity. The existing antibiotics are losing efficacy due to misuse of these medications. Additionally, there is a lack of new antibiotics. Thus, diseases become incurable and eventually cause death in countries like Bangladesh where there are few medical options. The WHO endorsed a Global Action Plan on antimicrobial resistance during the 68th World Health Assembly in May 2015 and mandated that every member state initiate a National Action Plan regarding antimicrobial resistance. Additionally, the Global Antimicrobial Resistance and Use Surveillance System (GLASS) was launched by WHO to keep track of the status and trajectory of antimicrobial resistance in humans globally (16).

Accordingly, a national strategy for antimicrobial resistance containment was introduced in Bangladesh under the Communicable Disease Control Unit, Directorate General of Health Services (DGHS), the Ministry of Health and Family Welfare (MOHFW) with a focus on multisectoral coordination, antimicrobial stewardship, standard treatment guidelines, effective surveillance, increased infection prevention and control, essential training, capacity building, monitoring and evaluation and advocacy, and communication and social mobilization. The IEDCR has been conducting countrywide antimicrobial resistance surveillance since 2017 beginning with five sentinel sites, now scaling up to 11. The national antimicrobial resistance surveillance strategy for 2020-2025 funded by the UK Fleming Fund country grant has been developed. Besides, a National Action Plan was formulated in 2017 highlights on prudent utilization of antibiotics across all fields by developing standard treatment guidelines, stewarding antibiotics, establishing reference laboratories, adhering to good manufacturing practice, good pharmacy practice, preventing and controlling infection, and creating a thorough surveillance system to be implemented between 2021-2026 to address antibiotic resistance in Bangladesh (16,17).

Following the revised National Drug Policy 2016, the government of Bangladesh (GOB) has formulated the Pharmacovigilance and Adverse Drug Reaction Policy 2017 to monitor the selling and dispensing of medicine without prescription. Moreover, a standard treatment guideline for the proper use of antimicrobials in hospitals is provided (17). The Directorate General of Drug Administration (DGDA), working under the MOHFW, Bangladesh is responsible for supervising and monitoring antimicrobial consumption in human and animal health. A report on antimicrobial consumption from 2015-2020 has already been submitted to GLASS. The WHO in partnership with DGDA initiated several programs to address antimicrobial resistance in Bangladesh. In July 2023 training sessions were launched to improve antimicrobial consumption (AMC) surveillance. Both the standard operating procedure for antimicrobial consumption surveillance in veterinary medicine and the national guideline on the dispensing, use, and disposal management of antimicrobial drugs in Bangladesh have been completed. A web-based GLASS-AMC monitoring platform is currently being developed (16). Surveillance activities have already been initiated in nine sites across Bangladesh in two phases; 1st Phase in 2017 covering five sites and 2nd Phase in 2018 covering four sites. The sentinel site physicians, nurses, microbiologists and technologists are given training. Technical support is also provided to the sentinel site laboratories (15).

Bangladesh commemorated the “World Antimicrobial Awareness Week” (18 to 24 November), a worldwide initiative that has been running since 2015 to raise public awareness towards antimicrobial resistance, promote best practices among healthcare professionals, and influence policymakers to slow the emergence and spread of drug-resistant infections. The DGDA arranges various programs in schools targeting developing children’s awareness towards antibiotics assisted by WHO Bangladesh (18). Moreover, a red labelling poster campaign was conducted in 2022 in the district of Chittagong to reduce self-medication and prevent antibiotic abuse. Pharmaceutical companies were required to mention that antibiotics are only allowed to be sold and dispensed when prescribed by registered veterinarians or registered physicians while packaging to make the public aware (19).

In addition, the Department of Livestock Services (DLS), under the Ministry of Fisheries and Livestock monitors the implementation of rules and regulations relating to livestock development including improvement, production, prevention

and surveillance of diseases across Bangladesh to prevent antimicrobial resistance of animal health(15). The government of Bangladesh promulgated the Drug and Cosmetics Act 2023 on 7 September 2023 with a provision of a fine of 20,000 BDT (167.36 USD as of 3 October 2024) for selling antibiotics without a prescription. The DGDA has been assigned to enforce the new law (20). Thus, it can be concluded that the government of Bangladesh has adopted several strategies to address the issue of antibiotic resistance in the country.

## 5. Findings and Recommendations

Several policies and initiatives have been implemented by the government of Bangladesh to prevent antimicrobial resistance. Nonetheless, putting the policies and initiatives into action continues to be difficult. These include the absence of a workable structure for coordination or implementation, the insufficiency of institutional and financial resources for the necessary capability and methods of infection prevention and control and the development of political commitment and awareness. The year 2017 saw the adoption of the National Action Plan (NAP), which aims to solve AMR-related challenges in Bangladesh. However, the DGHS/CDC is unable to monitor progress nationwide due to malfunctions in field-level NAP-related activities. They mostly worked on sectoral coordination and meeting arrangements. A framework for implementing sectoral activities as outlined in the National Action Plan has been created by the DGDA. The DGDA has the legislative jurisdiction to oversee the development, production, distribution, and oversight of medical products as an independent regulatory body. The DGDA claims that it has started to conduct prescription monitoring across the country. However, the reality is that the DGDA is unable to monitor the whole country due to a shortage of funding, logistics and personnel (21). It is essential to organize recruiting personnel and training the new staff as soon as feasible. Furthermore, the government must allocate a sufficient amount of funds for the organization to carry out its functions efficiently.

Bangladesh reportedly has five times more pharmacies both registered and unregistered than required which surpasses the capability of DGDA. The DGDA is mandated to audit pharmacies at least once a year while it visited only 63,971 pharmacies last year. Additionally, pharmacy registration needs to be renewed every two years following the current law. However, only 42,896 pharmacies renewed their registrations in 2023 while it is estimated that there

are around 216,791 listed pharmacies in the country. Of these, 173,693 (almost 80%) are functioning unlawfully even though their registration has expired. Besides, many have even never registered. The majority of the pharmacies have no pharmacists as required by the Drug and Cosmetics Law 2023. Consequently, the safety and standard of drugs prescribed to patients, particularly those from low-income families who depend more on neighbourhood pharmacies are jeopardized (22). Moreover, the DGDA instructed to sell antibiotics in red packages starting from 2022. But the law enforcement is hardly done. DGDA as the regulatory authority fails to supervise and monitor the implementation of the instruction due to lack of trained personnel.

The medical and other allied health curricula in Bangladesh did not incorporate any standards or protocols on the use of antibiotics and/or the containment of antimicrobial resistance. The Food and Agriculture Organization (FAO) has been implementing training programs for medical professionals, veterinarians, and public health specialists since 2016 to raise knowledge regarding antimicrobial usage and resistance based on their guidelines for the containment of antimicrobial resistance. They have trained only 231 medical professionals and 230 veterinary doctors. Additionally, the government started a few hospital-based awareness campaigns and surveillance programs. However, no monitoring and evaluation framework has been developed to track its execution. Implementation progress is sluggish due to a lack of funding and a skilled health care workforce. Moreover, feedback is essential to make any revisions to the programs which is absent in Bangladesh (21). Formulating a monitoring framework, strong feedback mechanisms and appropriate reporting systems on the National Action Plan implementation status is crucial. Additionally, hospitals need to be staffed with required health professionals and support systems.

Building awareness among mass people is very essential to prevent antibiotic resistance in Bangladesh. The DGDA has initiated some awareness programs. However, comparing the vast population they have reached a minor segment of the society. People are at large unaware of the usage and adverse effects of antibiotics. They are also mostly ignorant about policies and programs initiated by the government of Bangladesh. Likewise, Hasib reports that people widely take Metronidazole for loose motion without knowing that it is an antibiotic and discontinue when feel better without continuing the

course. The drug sellers are also unaware that this is an antibiotic and sell this drug as they are unaware of the new law (23). Additionally, the majority of people are unaware that antibiotics cannot fight against the common cold or flu. So, they randomly take antibiotics without visiting a physician (5).

Furthermore, a shocking image is recorded in the eastern region comprising three hill districts of Bangladesh. It is found that 60% of hill people are consuming antibiotics without a doctor's advice. People purchased drugs even for headaches from the pharmacies and shops and one in two hill people used antibiotics unnecessarily. The major reasons behind such arbitrary use are financial inability to meet medical expenses and purchasing on the advice of the nearest drug dealer or a close relative or using an old prescription. It is also reported that 60% of the hill people are unaware of the health risks caused by taking antibiotics (14).

Interviews and discussions with the participants give the same impression. It is found that 76% of them are unaware of the risks associated with using antibiotics at random. Furthermore, 94% of participants are unaware of the penalties for selling antibiotics without a prescription under the Drug and Cosmetics Law 2023. Besides, no antimicrobial awareness campaign has ever been conducted in their area. Most interestingly, people prefer to buy antibiotics from local pharmacies where they have informal relations with the seller. The seller also does not ask for a prescription as his client may switch to another local pharmacy. Even the model pharmacies are dispensing antibiotics without a prescription. Therefore, developing mass awareness through conducting community meetings involving national and local health service providers, local government representatives, political and religious leaders, social workers, teachers and neighbourhood people is a must. In addition, newspapers, electronic media, and social platforms can be used to develop mass awareness. Moreover, the government of Bangladesh may provide life-saving drugs free or at subsidized costs to disadvantaged and low-income people.

A significant number of physicians in Bangladesh prescribe antibiotics recklessly violating the recommended dosage, to provide patients with immediate comfort to become popular. Moreover, the aggressive marketing strategies of the pharmaceutical companies aiming at influencing physicians to prescribe their drugs have aggravated this situation (24). Strict rules and regulations like cancellation

of registration and suspension must be enforced to restrict doctors from prescribing unnecessary antibiotics. In addition, pharmacists working at the retail and community levels need to receive training on various facets of antibacterial resistance so that they can play a crucial role by informing people about the usage and harms of antibiotics. The provision of cancellation of registration of pharmacy practitioners must be followed strictly to restrain them from any ill practice.

Before prescribing antibiotics to a patient, it is crucial to conduct sensitivity testing (blood and urine cultures) to ensure that the bacteria can be treated with the appropriate antibiotic. However, only a handful of patients in Bangladesh receive this test as the test is mostly unavailable in hospitals as well and the examination is expensive (25). A well-equipped microbiology lab to conduct the test in every public hospital across the country needs to be set up. Moreover, the government needs to ensure that poor people are entitled to the test free or low-cost to get the right treatment. It might stop the random prescribing of antibiotics in public hospitals.

Furthermore, hospitals lack appropriate pharmacy practices and antibiotic waste control systems. There are no graduate pharmacists available either to counsel the patients or check prescriptions in hospitals. Until the quality of drugs is maintained and medicine waste is not disposed of properly, the issue of antibacterial resistance will continue (26) as the waste mixes with the soil and water and then ultimately enters the human body. So, guidance on systematic management of hospital waste disposal needs to be developed and monitored strictly for its full implementation. Besides, all hospitals must recruit pharmacists to prevent overdose and misuse of drugs.

Ground-breaking research to invent new antibiotics may be a good option to fight against bacteria. However, the research procedure is time-consuming and expensive. Actions like the allocation of sufficient budget to conduct research, inter-sectoral cooperation for the prevention and management of diseases and effective surveillance mechanisms to ensure the full execution of the new law of 2023 can reduce the challenge of antibacterial resistance in Bangladesh. The government of Bangladesh may also pursue international cooperation in research to create novel therapeutic medications.

## 6. Conclusion

Antibiotics are life-saving medications. However, unwarranted administration of antibiotics promotes the

development of antibiotic-resistant microorganisms and associated health issues. We need to be more aware and work together as prevention is preferable to treatment. The government of Bangladesh has initiated several programs to prevent antibacterial resistance. Promoting appropriate conduct, positive attitudes, and greater public awareness can help maintain antibiotic efficacy and manage antimicrobial resistance over the long term in Bangladesh. This study has discussed the status of antibacterial resistance in Bangladesh as well as focused on government initiatives to combat antibacterial resistance. However, to evaluate the long-term effects of these interventions more study is required to determine whether the law, policies and programs enforcement are closely watched over and controlled.

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