Combat against antibiotic resistance is a challenge in Bangladesh

ARTICLE INFO

ABSTRACT

To the Editor, Antibiotics are a class of drug used to treat or prevent infections caused by bacteria; they function by either eradicating the organism or stopping its growth. Penicillin, cephalosporins, macrolides, fluoroquinolones, and urinary anti-infectives are examples of common antibiotics. To effectively treat the illness, it's critical to take antibiotics as directed by a physician and to finish the entire course of treatment. Antibiotic resistance is a serious issue in Bangladesh as a result of subpar healthcare practices, antibiotic abuse, and overuse. Antibiotic resistance is the result of bacteria changing and becoming resistant to an antibiotic's effects. Moreover, one of Bangladesh's biggest challenges is the fight against antibiotic resistance. Therefore, the purpose of this letter is to raise awareness of the antibiotic resistance in Bangladesh.

Antibiotic usage is a major problem in Bangladesh because to things like self-medication, prescriptions written by incompetent doctors, and access to medicines without a prescription. The most often bought antibiotics for self-medication in Rajshahi City were metronidazole, azithromycin, ciprofloxacin, amoxicillin, and tetracycline, according to a study done there. The easy access to over-the-counter medications contributed significantly to the high rate of self-medication.[1] Furthermore, according to a study, unqualified healthcare professionals in Bangladesh prescribed 63% of antibiotics.[2] Additionally, the most prevalent class of antibiotics was cephalosporin, which was followed by penicillin and quinolone/fluoroquinolone.[3] The WHO Bangladesh and the Directorate General of Drug Administration (DGDA) have started programmes including red labelling drugs to reduce antibiotic resistance and raise public awareness of antibiotic use in order to address these problems (DGDA, 2023; WHO, 2023). The rising usage of antibiotics in Bangladesh has also been linked to uncontrolled drug stores.[4] These results underline the necessity of better oversight, education, and control over the nation's usage of antibiotics.

The most frequent cause of urinary tract infections (UTIs), *Escherichia coli*, has demonstrated a significant level of resistance to standard medications, including ampicillin (median resistance (MR) 94.6%), amoxiclav (MR 67.1%), ciprofloxacin (MR 65.2%), and co-trimoxazole (MR 72%). Comparable trends were noted for other UTI-causing pathogens. In Klebsiella spp., resistance to ampicillin, amoxiclav, ciprofloxacin, and co-trimoxazole was 100%. 87.5% of isolates of Enterococcus spp. were nonsusceptible to co-trimoxazole, whereas 86.6% of isolates of Pseudomonas spp. examined were not susceptible to it. 66% of isolates of Enterococcus spp. and 59.3% of isolates of Pseudomonas spp. showed signs of ciprofloxacin resistance. A markedly elevated resistance to beta-lactam antibiotics was indicative of the synthesis of extended-spectrum beta-lactamase (ESBL). The medications cefotaxime, ceftazidime, and ceftriaxone exhibited resistance rates of 55.4%, 65.3%, and 59% in E. Coli, and 97.8%, 82.5%, and 78% in Klebsiella spp. But most of the previously described microorganisms showed a high level of sensitivity to carbapenems. Imipenem resistance was found in just 2.3% of E. Coli strains,

0% in Klebsiella spp. strains, and 13.5% in Pseudomonas spp. strains; meropenem resistance was found in 13.3%, 7.7%, and 33.9% of the bacteria, respectively.[5]

Streptococcus pneumoniae isolates from pneumonia patients showed a high sensitivity to ampicillin (MR 0%) and penicillin (MR 4%). High levels of resistance to amoxicillin (MR 64.3%), co-trimoxazole (MR 43.2%), ampicillin (MR 89.7%), and penicillin (MR 83.8%) were shown by Staphylococcus aureus. Once more, 7.0% of the 144 S. aureus isolates were resistant to imipenem, while 6.8% of the 436 S. aureus isolates were resistant to vancomycin. Through testing for oxacillin susceptibility, methicillin-resistant S. aureus (MRSA) was identified in four investigations, accounting for 93 out of 199 isolates. High susceptibility to cefixime (MR 0%) and ceftriaxone (MR 3%) was seen in ABR of Salmonella spp. The percentage of isolates of Shigella spp. resistant to mecillinam was 6% and to ciprofloxacin was 8.9%. Acinetobacter species exhibited notable resistance (>55%) to every antibiotic examined, apart from imipenem.[5]

Bangladesh has a serious antibiotic resistance issue as a result of subpar medical care, medication abuse, and antibiotic overuse. According to a comprehensive analysis of antibiotic resistance in Bangladesh, there was significant resistance to co-trimoxazole, ampicillin, amoxiclav, and ciprofloxacin.[5] The review also pointed out areas where surveillance was lacking and suggested suitable actions to keep an eye on and regulate antibiotic use, as well as conducting statewide surveillance using standardised procedures. Antimicrobial resistance is exacerbated by the irrational use of antibiotics, non-compliance, and the existence of a "pluralistic" health system that involves unqualified providers in the informal sector, according to a scoping review of policy and practice in Bangladesh's human, animal, and environmental sectors.[6] According to a study conducted in Bangladesh, many patients were not taking prescribed antibiotics to the end of their recommended course, and a sizeable percentage of medicines were prescribed by unqualified healthcare professionals.[2]

A comprehensive analysis of antibiotic resistance in Bangladesh found that many commonly used first-line medications were largely

ineffective and that most examined pathogens had a significant incidence of resistance.[5] The study also pointed out areas where monitoring was lacking and suggested actions to keep an eye on and regulate the use of antibiotics, including national surveillance that adheres to established protocols (WHO, 2023). According to another study, antimicrobials were provided for 50% of outpatient prescriptions in three Bangladeshi cities, and 25% of those prescriptions included several antibiotics. The study also indicated that non-compliance was rather significant, at 69%.[6] Another important factor contributing to resistance is the extensive use of antibiotics in agriculture (WHO, 2023). Therefore, in order to reduce the prevalence of antibiotic resistance in Bangladesh, it is imperative to put policies and programmes in place to limit the use of antibiotics and raise awareness.

Bangladesh has a serious problem with antibiotic resistance (ABR), which adds to the worldwide problem with antibiotic resistance. In Bangladesh, the following are the primary reasons of antibiotic medication resistance:

1. **Poor healthcare standards**: Numerous issues plaguing the nation's healthcare system include low quality of care, undernourishment, recurrent and chronic infections, and insufficient surveillance, all of which fuel the rise in antibiotic resistance.[5]
2. **Misuse and overuse of antibiotics**: Antibiotic abuse and overuse, which can result in the creation of resistant bacteria, affects Bangladesh's human and animal populations equally. According to Hoque et al,[6] antimicrobials were prescribed in 50% of outpatient prescriptions in three Bangladeshi cities; of these, 25% involved the prescription of several antibiotics, and 83% did not include any laboratory testing.
3. **Non-human antibiotic use**: Antibiotic resistance in Bangladesh is also a result of the overuse of antibiotics in agricultural and animal husbandry.[5]
4. **Poor quality of drugs**: Antibiotic resistance may arise as a result of Bangladesh's frequently poor medicine quality.[5]
5. **Inadequate surveillance**: Antibiotic resistance may spread in Bangladesh because there are insufficient surveillance measures in place to keep an eye on and regulate antibiotic use.[5]
6. **Individual and national poverty**: Antibiotic resistance in Bangladesh may be made worse by elements linked to both personal and societal poverty, such as subpar medical care and recurrent infections.[5]
7. **Non-compliance**: Antibiotic non-compliance and the emergence of resistant germs result from patients stopping their medication regimens as soon as their symptoms begin to improve.[6]
8. **Inadequate knowledge and practices**: According to the World Health Organisation (WHO) Bangladesh and the Directorate General of Drug Administration (DGDA), 67.3% of the population showed inadequate knowledge of antibiotics, which led to the dispensing of antibiotics without prescriptions from licenced physicians (WHO, 2023).
9. **Widespread use of antibiotics in agriculture**: Antibiotic resistance in Bangladesh is mostly caused by the use of antibiotics in agriculture (WHO, 2023).

Bangladesh must address these root causes of antibiotic resistance by implementing appropriate measures to monitor and regulate antibiotic use, conducting nationwide surveillance using standardised protocols, and raising the bar for drug quality and healthcare standards.[5]

Based on the conclusions and suggestions from studies and health organisations, a number of actions can be implemented in Bangladesh to reduce the spread of antibacterial drug resistance. Several of the crucial tactics consist of:

1. **Surveillance and Monitoring**: Implementing national monitoring programmes that adhere to established protocols in order to track and manage the use of antibiotics (WHO, 2023).

2. **Regulation and Awareness**: Putting into practice laws like the "Red Label" system for antibiotics to control their usage and raise public awareness of the issue of antimicrobial resistance (WHO, 2023).
3. **Antibiotic Stewardship**: Encouraging initiatives aimed at stewarding antibiotics to guarantee their proper use in agricultural and human settings (WHO, 2023).
4. **Healthcare Practices**: Improving prescribing procedures, adherence, and patient education in order to address subpar healthcare standards, antibiotic overuse, and misuse.[6]
5. **Research and Policy**: Addressing antibiotic resistance in the human, animal, and environmental domains by carrying out additional research and regularly revising regulations.[6]

These steps can help effectively prevent antibacterial medication resistance in Bangladesh, coupled with continued research and cooperation with international organisations like the World Health Organisation. Bangladesh faces a great deal of challenges in the fight against antibiotic resistance, including low awareness, inadequate training for healthcare workers, and poor adherence to prescribing standards. Among the crucial elements of this difficulty are:

1. **Lack of awareness and training**: Antimicrobial stewardship (AMS) needs to be practiced by pharmacists in Bangladesh more frequently, and they should be adequately trained in diverse AMR contexts, including hospitals, communities, and retail pharmacies (https://commonwealthpharmacy.org/).
2. **Over the counter (OTC) sale of antimicrobials**: Antibiotic resistance is a result of both overuse and OTC drug sales, and the COVID-19 pandemic has made the issue worse.[7]
3. **Implementation of National Action Plan (NAP) on AMR**: Personalised awareness-building for both supply and demand sides as well as water, sanitation, and hygiene measures for infection prevention and control are among the issues facing Bangladesh's implementation of the NAP on AMR.[7]
4. **Regulatory challenges**: Antibiotic resistance is made worse by Bangladesh's mostly uncontrolled healthcare sector. Implementing the "prevent-detect-respond" strategy to health emergencies, like outbreaks of antibiotic-resistant illnesses, presents problems for the nation.[6]

In order to overcome these obstacles, it is essential to strengthen the regulatory framework to guarantee appropriate use of antimicrobials and stop the emergence of antibiotic resistance, as well as to better understand and apply antimicrobial stewardship. Healthcare professionals also need to be better informed and trained in this area.

Data availability

Not applicable.

CRediT authorship contribution statement

Miah Roney: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **AKM Moyeenul Huq:** Writing – review & editing, Validation, Formal analysis. **Mohd Fadhlizil Fasihi Mohd Aluwi:** Writing – review & editing, Validation, Supervision, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. Biswas M, Roy MN, Manik MIN, et al. Self medicated antibiotics in Bangladesh: a cross-sectional health survey conducted in the Rajshahi City. *BMC Publ Health*. 2014; 14:1–7.
2. Bonna AS, Pavel SR, Ferdous J, Khan SA, Ali M. Antibiotic resistance: an increasingly threatening but neglected public health challenge in Bangladesh. *International Journal of Surgery Open*. 2022;49:100581.
3. Orubu ESF, Samad MA, Rahman MT, Zaman MH, Wirtz VJ. Mapping the antimicrobial supply chain in Bangladesh: a scoping-review-based ecological assessment approach. *Glob Health Sci Pract*. 2021;9(3):532–547.
4. Rousham EK, Islam MA, Nahar P, et al. Pathways of antibiotic use in Bangladesh: qualitative protocol for the PAUSE study. *BMJ Open*. 2019;9(1):e028215.
5. Ahmed I, Rabbi MB, Sultana S. Antibiotic resistance in Bangladesh: a systematic review. *Int J Infect Dis*. 2019;80:54–61.
6. Hoque R, Ahmed SM, Naher N, et al. Tackling antimicrobial resistance in Bangladesh: a scoping review of policy and practice in human, animal and environment sectors. *PLoS One*. 2020;15(1):e0227947. https://commonwealthpharmacy.org/fighting-antimicrobial-resistance-in-bangladesh/. https://dgda.portal.gov.bd/sites/default/files/dgda.portal.gov.bd/files/a884dd82_db40_4cc9_bc72_e929b8553fd3/2023-12-29-19-23-951945f2793082187e830fed6fe11aed.pdf. https://www.who.int/bangladesh/news/detail/07-03-2023-establishing-red-label-of-antibiotics-for-curbing-antimicrobial-resistance-in-bangladesh.
7. Ahmed SM, Naher N, Tune SNBK, Islam BZ. The Implementation of National Action Plan (NAP) on Antimicrobial Resistance (AMR) in Bangladesh: challenges and lessons learned from a cross-sectional qualitative study. *Antibiotics*. 2022;11(5):690.

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