

**Invited Editorial**

**Potential strategies to reduce inappropriate prescribing and dispensing of antimicrobials in Bangladesh building on the experiences in other developing countries**

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**Keywords:** Acute respiratory tract infections, Antimicrobial resistance, Bangladesh, Community pharmacies, COVID-19, Prescribing, self-purchasing antibiotics

*Bangladesh Journal of Medical Science Vol. 20 No. 04 October'21. Page : 700-706  
DOI: <https://doi.org/10.3329/bjms.v20i4.54123>*

In our previous editorial, we discussed that antimicrobial resistance (AMR) is a growing problem world-wide increasing morbidity, mortality and costs<sup>1-3</sup>. This needs to be urgently addressed with the World Bank recently documenting that the costs associated with AMR could exceed US\$1 trillion annually after 2030, and potentially up to US\$3.4 trillion annually, unless activities are instigated across countries to improve the prescribing and dispensing of antibiotics<sup>4</sup>. This is equivalent to 3.8% of annual Gross Domestic Product (GDP)<sup>4</sup>, with the costs associated with AMR typically greatly exceeding the costs of any antibiotic prescribed or dispensed<sup>5</sup>. We are aware that mortality rates from AMR are likely to be greatest among low- and middle-income countries (LMICs), including Asian countries such as Bangladesh by 2050, which is a concern going forward<sup>6,7</sup>. This builds on considerable resistance already to commonly prescribed antibiotics among LMICs including Bangladesh, with AMR rates continuing to rise<sup>2,8-15</sup> enhanced by appreciable usage in animal and food production alongside humans<sup>16-18</sup>. In their recent study, Ara *et al.* (2021) found high rates of resistance to colistin as well as amoxicillin/clavulanic acid and the cephalosporins in isolates of women attending out-patient clinics for urinary tract

infections<sup>9</sup>. This needs to be urgently addressed.

Rising AMR rates in Bangladesh and other LMICs have been enhanced by considerable over-prescribing and dispensing of antibiotics for essentially viral infections such as acute respiratory tract infections (ARIs)<sup>12,19-21</sup>. This is important with up to 80% or more of patients in LMICs receiving antibiotics unnecessarily for ARIs<sup>21-23</sup>. This over-use of antibiotics has been exacerbated by the COVID-19 pandemic<sup>24-26</sup>, with studies suggesting high rates of antibiotic utilisation, including broad spectrum antibiotics, even without proven bacterial infections<sup>27-29</sup>. Overall, less than 10% of COVID 19 patients appear to have concomitant fungal or bacterial infections necessitating antimicrobials<sup>30</sup>, which could be as low as 3.2% in some studies<sup>31,32</sup>. Despite this, an appreciable number of patients with actual or suspected COVID-19 are prescribed or dispensed antibiotics, increasing shortages, costs and AMR<sup>31,33-35</sup>.

High levels of inappropriate use of antibiotics in ambulatory care in Bangladesh and other LMICs mirrors concerns with their prescribing in hospitals including inappropriate timing of the first dose of antibiotics to prevent surgical site infections as well as extended use<sup>1,36</sup>.

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The concerns with inappropriate use of antimicrobials and the impact on AMR has resulted in many countries including Bangladesh launching their National Action Plans (NAPs) following guidance from the World Health Organisation<sup>1,14,37,38</sup>. Typically, the first steps in hospitals to reduce inappropriate prescribing of antibiotics include undertaking point prevalence studies to document current utilisation patterns and their rationale coupled with the instigation of antimicrobial stewardship groups<sup>1,39-42</sup>. Our previous editorial discusses such activities in more detail<sup>1</sup>. However, in this editorial we will just focus on ambulatory care especially among LMICs including Bangladesh.

Key stakeholders involved with improving antimicrobial usage in Bangladesh in ambulatory care include physicians, pharmacists/ drug store owners and patients<sup>14,19,43</sup>. Community pharmacies and drug stores are particularly important in countries such as Bangladesh with high patient co-payments, patients having difficulties with purchasing both medicines as well as paying for physician fees, stores open for longer hours than physician offices, and antimicrobials freely available over-the-counter despite legislation, similar to other LMICs including Pakistan<sup>14,44-47</sup>.

We have seen among LMICs including Kenya, Namibia, the Republic of Srpska and Sri Lanka (Figure 1) that trained pharmacists, coupled with guideline availability, can appreciably reduce inappropriate dispensing of antibiotics especially for ARIs including patients with COVID 19<sup>48-53</sup>. This has important ramifications for countries such as Bangladesh, and it is encouraging to see that community pharmacists in Bangladesh, especially in rural areas, are a preferred and trusted source of information and medicines for managing infections<sup>45</sup>. This mirrors the situation in other countries with the growing involvement of pharmacies in the management of diseases including infectious diseases<sup>54-56</sup>. The development of the Model Pharmacy Programme should help alongside greater education regarding antibiotics and infectious diseases among pharmacy students in Bangladesh during their training given current concerns, although we have seen greater knowledge regarding antimicrobials among biological versus non-biological students in Bangladesh<sup>43,44,57</sup>. Concerns with pharmacists' knowledge regarding antibiotics and AMR in Bangladesh mirror those in other LMICs, necessitating greater input during undergraduate training as well as post qualification<sup>44,53,58-60</sup>.

A key way forward could also be to restrict the range of antibiotics that can be dispensed within

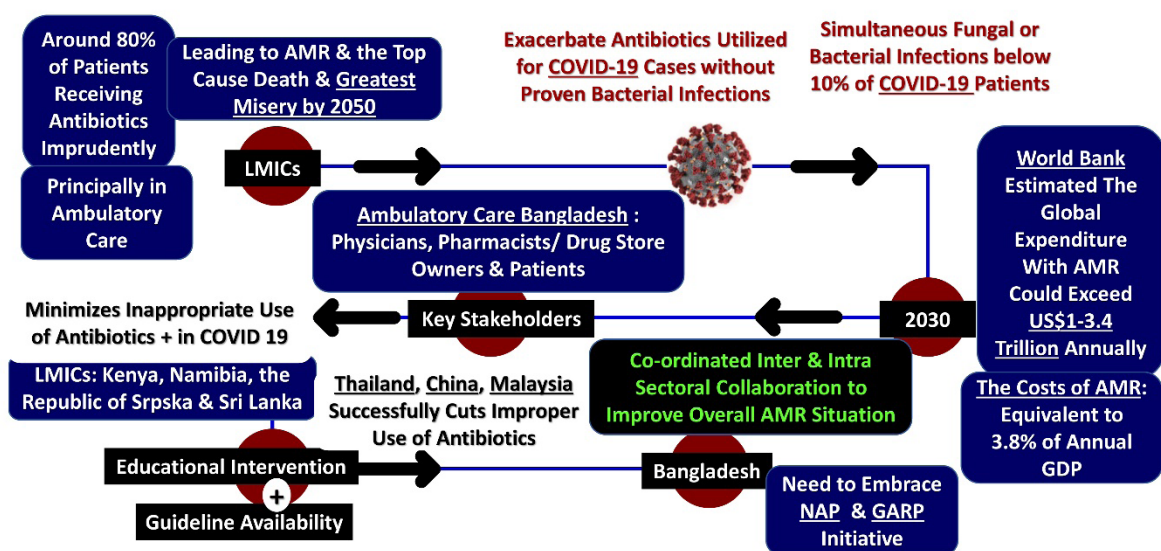


Figure 1 : Overview of activities to improve antibiotic utilisation in ambulatory care and the rationale

community pharmacies and drug stores based on the WHO AWaRe list of antibiotics, especially with concerns with rising resistance rates to critical antibiotics such as colistin<sup>9,18,61,62</sup>, alongside improving pharmacists' knowledge. We have seen regulations in other LMICs restricting antimicrobials that can be dispensed by grade of pharmacy, which provide guidance to the authorities in Bangladesh<sup>63</sup>. This may be preferable to fining pharmacists for dispensing antimicrobials without a prescription, which could be counter-productive especially in rural settings and slum areas where patients have limited incomes and cannot afford to take time off work to visit a physician<sup>19,64,65</sup>. This could be accompanied by the use of mobile and other technologies to track antimicrobial dispensing in pharmacies<sup>65</sup>, especially if there are concerns with the extent of antibiotics being dispensed for essentially viral infections exacerbated by commercial pressures, which include those from pharmaceutical companies<sup>44,66</sup>.

Concomitant with this, instigating targeted educational programmes among patients building on the experiences with COVID-19, which includes improving hygiene and the water supply as well as addressing the implications of misinformation<sup>14,34,67</sup>.

We have also seen a number of activities among physicians in LMICs to reduce inappropriate prescribing of antibiotics especially for patients with ARIs (Figure 1). Boonyasiri *et al.* (2014) in Thailand ascertained that the instigation of multiple educational initiatives limited the prescribing of antibiotics to just 13% of patients with ARIs<sup>68</sup>, and Wei *et al.* (2019)

in China also found that multiple interventions, especially surrounding education, resulted in a 49% reduction in the prescribing of antibiotics for ARIs after 6 months, with this reduction persisting<sup>69</sup>. More recently, Tay *et al.* (2019) in Malaysia also found that multiple interventions including toolkits appreciably reduced antibiotic prescribing for ARIs down from 29.1% of patients to 13.7%<sup>70</sup>. This follows similar activities and findings in higher-income countries<sup>19</sup>, with such activities helping to reduce adverse influences from pharmaceutical companies<sup>71</sup>.

In conclusion in Bangladesh, the first steps have been taken by the authorities to improve future antimicrobial use through the development and publication of their NAP as well as the Global Antibiotic Resistance Partnership (GARP) initiative. The next steps involve co-ordinated activities especially in ambulatory care to improve future prescribing and dispensing of antimicrobials along with similar activities in animal management and food production. Co-ordinated activities among physicians, pharmacists and patients have worked well in other countries to improve utilisation compared with countries with limited measures<sup>72-75</sup>. As a result, providing direction and guidance to key groups in Bangladesh. We will continue to monitor such developments and the need for additional activities given concerns with rising AMR rates in Bangladesh.

#### Conflicts of interest

The authors have no conflicts of interest to declare.

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