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Short Communication

# India's National Action Plan on Antimicrobial Resistance: a critical perspective

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ABSTRACT

Antimicrobial resistance (AMR) is widely recognised as a global health threat, which is projected to account for more deaths than cancer by 2050. The Government of India has formulated a National Action Plan to tackle AMR (NAP-AMR), largely modelled on the World Health Organization's Global Action Plan on AMR. While the NAP-AMR successfully mirrors the Global Action Plan and lays out ambitious goals, we find that the lack of financial allocation across states, poor enforcement and inadequate multisectoral co-ordination have hampered progress. A broader focus on improving infrastructure for water and sanitation, linking the issue of AMR to existing vertical health programmes for human immunodeficiency virus (HIV) and tuberculosis (TB), prioritising infection prevention and control, strengthening the frontline healthcare workforce in rural and peri-urban settings to reduce reliance on antibiotics, leveraging point-of-care testing and mobile app-based health interventions for diagnosis and surveillance, and adopting a socioecological approach to health and development would help to create an enabling environment for concrete action on AMR in India.



## Introduction

Antimicrobial resistance (AMR) has been recognised as a major global health threat by the World Health Organization (WHO), but the challenges are particularly stark in India [1]. There is widespread resistance to commonly used broad-spectrum fluoroquinolone antibiotics as well as to third-generation cephalosporins; studies have shown that >70% of *Acinetobacter baumannii, Escherichia coli* and *Klebsiella pneumoniae* isolates and >50% of *Pseudomonas aeruginosa* isolates are resistant to third-generation cephalosporins and fluoroquinolones [2]. The emergence of new mechanisms of AMR, such as New Delhi metallo-$\beta$-lactamase (NDM-1) in 2008 and its rapid global spread to more than 70 countries, requires urgent action: the $bla_{\text{NDM-1}}$ gene encodes a carbapenemase that can counteract the most powerful and effective carbapenem antibiotics [3].

Limited standardised surveillance data make it even more challenging to monitor the extent and scope of AMR, and most of the data come from published studies of healthcare-associated infections in inpatient settings, scoping reports, prospective studies, and point prevalence surveys at select, large hospitals [4]. However, antibiotics are routinely prescribed for respiratory infections in primary care and outpatient settings both in the public and private sector [5–7]. A study in New Delhi, India, by Kotwani and Holloway found that 39% of all patients attending private retail pharmacies and public facilities and 43% of patients visiting private clinics were prescribed at least one antibiotic [6].

In this context, in September 2016 the Ministry of Health and Family Welfare of India established three technical bodies, namely the Intersectoral Coordination Committee, Technical Advisory Group and Core Working Group on AMR, to develop a National Action Plan on AMR (NAP-AMR) [8]. The NAP-AMR is largely modelled on the WHO's Global Action Plan on AMR, which was adopted by the World Health Assembly in 2015 [9]. In this paper, we examine the implementation, scope and progress of the NAP-AMR in India with respect to the human sector.

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## Scope and coverage of the National Action Plan on Antimicrobial Resistance (NAP-AMR): what is covered well and what is missing from the plan?

Political commitment for AMR containment in India has been building since 2011, when the health ministers of the South-East Asia Region's Member States articulated their commitment to tackle AMR through the Jaipur Declaration and to prioritise it in national policy-making. The NAP-AMR successfully integrates feedback from multiple stakeholders, including the Ministry of Health and Family Welfare, Ministry of Agriculture and Farmers Welfare, Department of Animal Husbandry Dairying and Fisheries, Ministry of Environment, and also clinicians and microbiologists as well as international experts and policy-makers from neighbouring countries [8]. It successfully models the WHO's Global Action Plan and follows a One Health approach, encompassing AMR in the context of human health, animal health, agriculture and the environment. The six strategic priorities of the NAP-AMR include:

1 improving awareness and understanding of AMR through effective communication, education and training;
2 strengthening knowledge and evidence through surveillance;
3 reducing the incidence of infection through effective infection prevention and control;
4 optimising the use of antimicrobial agents in health, animals and food;
5 promoting investments for AMR activities, research and innovations; and
6 strengthening India's international, national and state-level collaboration and leadership on AMR.

Each strategic priority has several different key outputs and activities, with distinct short-, medium- and long-term timelines [8]. While the plan is comprehensive in scope, it does not adequately take into account the nuances of pluralistic, multisectoral healthcare provision in India and fails to take into account the latest research on behaviour change interventions and structural disparities in healthcare access.

First, the plan relies heavily on individual knowledge, attitudes and practices (KAP) surveys across the general population and on behavioural studies without establishing a clear repository for tracking these data. A standardised approach, led jointly by the central and state governments, would help in streamlining, collecting and analysing these data to better monitor trends over time. As noted by Swaminathan et al., standardised surveillance by government health agencies is more likely than individual surveys to bring about policy and practice changes in India [4].

Second, the indicators in the plan rely heavily on training, guidelines and behaviour change interventions with prescribers (doctors, nurses, pharmacists, among others) that have seen limited success in India and other lower-middle-income country (LMIC) settings [10]. There is widespread variation in terms of compliance with standard treatment guidelines, and educational efforts have not been consistently implemented across states; even where attempts have been made, frequent changes in governance of institutions, lack of time and enthusiasm, and a perceived encroachment on professional autonomy have presented major barriers to successful behaviour change [7,11].

In the NAP-AMR, there is an adequate focus on revising the curricula of professionals in human, animal, agricultural and environmental health, but the overarching emphasis is on behaviour change through campaigns rather than social compliance through nudge interventions or structural changes to the socioecological environment. For example, there is a strong emphasis on social mobilisation campaigns and enhancing awareness of hand hygiene, but there is no mention of ensuring functional water and sanitation facilities in primary care institutions [8]. Existing initiatives should be closely linked to other sanitation programmes such as *Swachh Bharat Abhiyan* (Clean India Mission). While the plan does explicitly mention promoting 'measures for overall health improvement and service delivery' in maternal health and immunisation, a similar effort should be made to recognise the structural and socioecological impacts on behavioural changes and antibiotic prescriptions as a whole.

Additionally, while the plan does mention the need for antimicrobial stewardship at different levels, it does not recognise the diversity of outpatient care provision in India, nor does it provide clear mechanisms to co-ordinate activities between the public and private sectors. The private sector is named as an entity for collaboration in microbiological surveillance and communication campaigns, but the system linkages to promote antimicrobial stewardship or to track antibiotic use have not been detailed between the government sector and the traditional, informal or private sectors. Given the diagnostic challenges in outpatient settings, scaling-up use and access of point-of-care tests, such as C-reactive protein and procalcitonin, may reduce unnecessary antibiotic use. Electronic patient management algorithms utilising similar interventions have documented clinically significant reductions in severe adverse events as well as unnecessary antibiotic use in other LMICs [12].

With respect to data monitoring and evaluation and surveillance measures, the NAP-AMR relies on a national network of laboratory-based surveillance at a few designated reference laboratories in tertiary care medical institutions. While this Antimicrobial Resistance Surveillance & Research Network (AMRSN) has been a crucial step forward towards national surveillance, it is a reflection of tertiary care settings rather than community-based settings [13]. The patterns of antibiotic use and resistance differ widely between primary and tertiary care settings, with the understanding of drivers of antibiotic use at the community level extremely limited. As such, there is a clear need to scale up these surveillance networks to capture data from community-based settings [13]. Tracking and monitoring surveillance data from app-based platforms could be a crucial step forward in this regard. During the COVID-19 (coronavirus disease 2019) pandemic, India and China successfully launched and utilised mobile apps such as Aarogya Setu for contact tracing via Bluetooth [14]. Mobile, app-based platforms can be similarly leveraged as critical tools to disseminate information to private and public providers related to AMR patterns and antibiotic misuse, aiding the process of making a diagnosis and improving surveillance and data collection efforts from community-based settings.

Finally, while the plan does briefly reference the crucial need to align AMR containment measures with existing vertical health programmes (i.e. National Vector Borne Disease Control Program or National AIDS Control Organization), there are no supplementary, publicly available documents outlining the mechanisms for implementing these linkages. AMR containment is outlined as a cross-cutting, horizontal programme that cuts across several sectors and government ministries, but it must be integrated at all levels in existing programmes for dengue and malaria control, leishmaniasis, and tuberculosis (TB) and human immunodeficiency virus (HIV) care, among others.

## Implementation gaps in the National Action Plan on Antimicrobial Resistance (NAP-AMR)

The 5-year NAP-AMR (2017–2021) was intended as a pivotal blueprint for states to develop their own state action plans to tackle AMR, since health is a state subject in India. However, only three states/union territories have established state action plans, namely Kerala, Madhya Pradesh and Delhi; financial constraints have also impeded further implementation efforts [15].

While there have been significant legislative efforts to curb antibiotic misuse since 2017, including a ban on several fixed-dose combinations, a ban on colistin as a growth promoter in animals, and establishing antibiotic residue standards for pharmaceutical effluents, implementation and enforcement of measures has been a challenge [15].

Several efforts have been made to restrict access to over-the-counter (OTC) antibiotics, including the revamped and restrictive Schedule H1 policy that was enacted prior to the introduction of the NAP-AMR [16,17]. Schedule H1: (i) restricts the dispensing of certain drugs, including several third- and fourth-generation cephalosporins, carbapenems, newer fluoroquinolones, and first- and second-line anti-TB drugs, to prescription-only; (ii) mandates adequate labelling of these drugs; and (iii) requires the maintenance of a separate register for these prescription-based sales. The NAP-AMR identifies the need to add regulatory interventions to further support Schedule H1 and review the categorisation of newer antimicrobials under Schedule H1 [8].

A study by Farooqui et al. noted a significant decline in the quantity of antimicrobial use after Schedule H1 restrictions were imposed in 2014 based on retail sales data from 30 different regions in India [18]. However, implementation varied widely across states, and Kerala has been one of the few states to successfully limit OTC antibiotic sales and self-medication [18]. In other regions, implementation and enforcement of Schedule H1 has lagged far behind and has not resulted in reductions of non-prescription, OTC antibiotic use owing to poor regulatory enforcement by drug inspectors as well as limited capacity [17].

Funding challenges and lack of multisectoral co-ordination at the central and state government levels have also been challenging. Given the conflicting priorities for state governments, there is a lack of separate financial allocations for AMR initiatives across different states in India, which creates a major impediment to progress at the national level [9]. The advent of the COVID-19 pandemic has made AMR even less visible and has further impeded progress; AMR is rarely, if ever, documented specifically as a cause of mortality or morbidity [19]. Without clear templates and governance structures to co-ordinate action between states, India is unlikely to make significant progress on AMR. Kerala offers a unique model for other states in this regard because it has been able to co-ordinate public–private partnerships, to initiate and scale good antibiotic prescription practices across primary, secondary and tertiary institutions, and to co-ordinate activities via a state-wide task force and a core committee at the state level. Similar efforts should be encouraged by different state governments and financially supported by the central government.

## Conclusions

While the NAP-AMR successfully mirrors the WHO's Global Action Plan and lays out ambitious goals, the lack of financial allocation across states, poor enforcement and inadequate multisectoral co-ordination have hampered progress. The central government should emulate the successes of the Kerala State Action Plan in promoting a One Health approach and effectively co-ordinating between public and private sector actors to implement antibiotic stewardship initiatives. A broader focus on improving infrastructure for water and sanitation, linking the issue of AMR to existing vertical health programmes for HIV and TB, prioritising infection prevention and control, strengthening the frontline healthcare workforce in rural and peri-urban settings to reduce reliance on antibiotics, leveraging point-of-care testing and mobile app-based health interventions for diagnosis and surveillance, and adopting a socioecological approach to health and development would help create an enabling environment for concrete action on AMR in India.

## Declaration of Competing Interests

None declared.

## Funding

None.

## Ethical approval

Not required; the study did not interview any respondents and was exempt from ethical review.

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