

DOI: <https://dx.doi.org/10.18203/2319-2003.ijbcp20222756>

Review Article

## Antimicrobial stewardship program activities in India: an appraisal

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**Received:** 24 August 2022

**Revised:** 15 September 2022

**Accepted:** 16 September 2022

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### ABSTRACT

Human antimicrobial misuse/overuse/irrational use is one of the main drivers of antimicrobial resistance (AMR) and in the presence of a rapidly drying up antibiotic pipeline, it becomes imperative that we learn to use antibiotics judiciously and responsibly. In 2010, India was adjudicated to be the world's largest consumer of antibiotics and hence curbing injudicious use of antibiotics is a must. Antibiotic abuse happens due to common fallacies such as a belief that broad spectrum antibiotics are "safer" and failure to distinguish between bacterial infections and non-bacterial infections and non-infectious syndromes. In addition, antibiotics for durations longer than necessary, redundant cover (like double gram negative or double anaerobic cover) or treatment of colonizers or contaminants also constitute inappropriate antibiotic use. A stewardship program implementing rational antibiotic use is mandatory to curb irrational antibiotic use. Antimicrobial stewardship is defined as a set of coordinated interventions designed to measure and improve the appropriate use of antibiotics by promoting the selection of the optimal choice, dose, duration and route of the antibiotic which in turn lead to improved patient outcomes and decreased adverse effects.

**Keywords:** Antimicrobial, Rational antibiotic use, AMSP, IPC, AMRSN, India

### INTRODUCTION

Antimicrobial resistance (AMR) is one of the biggest global public health and development threat. It leads to longer hospital stays, higher medical costs and increased mortality.<sup>1</sup> It has the potential to affect people at any stage of life, as well as the healthcare, veterinary, and agriculture industries. This makes it one of the world's most urgent public health problems.<sup>2</sup>

Antimicrobial resistance threatens the very core of modern medicine and the sustainability of an effective, global public health response to the enduring threat from infectious diseases. Without harmonized and immediate action on a global scale, the world is heading towards a post-antibiotic era in which common infections could once again kill.<sup>3</sup>

India is the leading antibiotic consumer of world for humans (with  $12.9 \times 10^9$  units consumption every year).<sup>4</sup>

The economic burden in terms of health services costs and productivity loss has been reported to be \$55 billion in United States of America (USA) annually and the global economic loss has been projected to be \$100 trillion by 2050, if left unchecked. The O'Neill report on AMR has estimated that up to 90% of the 10 million projected deaths associated with AMR will occur in low- and middle-income countries (LMICs).<sup>5</sup>

The Indian Council of Medical Research (ICMR), New Delhi, India, has launched the anti-microbial resistance surveillance and research network (AMRSN) across the country in 2013 with an avowed purpose of rationalizing AMSP in India. This initiative was in line with the

recommendations of Chennai declaration which coincided with the global initiatives to combat antimicrobial resistance.<sup>6</sup>

In March 2017, the national health policy 2017 of Ministry of Health and Family Welfare (MoHFW), Government of India, prioritized AMR in India. From 2017 to 2021 the Government of India launched the national action plan on AMR in April 2017 to combat AMR and improve antibiotic use by doctors, consumers, and healthcare institutions.<sup>7</sup>

This review study aimed to use published data to assess the effectiveness of ASPs conducted in India in reducing the use of antibiotics, examine their impact on clinical outcomes and assess the findings within the framework of the recently published guidelines on proper implementation of ASPs.

AMR is a global threat to healthcare and one of the leading causes of morbidity and mortality as well as increased medical cost. AMR concern has also been raised by the WHO in its guidelines on core components of infection prevention and control programs. The main reason for resistance is unnecessary and irrational antimicrobial use at hospitals and at the community level.<sup>1,2</sup> To address the increasing burden of multidrug resistant infections antibiotic stewardship programs are promoted worldwide to rationalize prescription of antibiotics and preserve remaining antibiotics.

Antimicrobial stewardship (AMS) programs have been developed for optimizing the treatment of infections, to reduce infection-related morbidity and mortality, to limit the appearance of multidrug-resistant organisms (MDROs), and to reduce unnecessary antimicrobial use. This practice ensures the optimal selection, dose, and duration of antimicrobials and leads to the best clinical outcome for the treatment or prevention of infection.<sup>5</sup> A successful AMSP monitors not only prescribing patterns and practices but also contributes in minimizing the toxic effects of antibiotics. Moreover, AMSP also facilitates the selection of disease specific antibiotics and enforces rules and regulations to rationalize the use of antibiotics.

In the past decade, AMSP has been demonstrated by numerous studies to promote the adequate use of antimicrobials, to reduce AMR and its transmission, to improve patient outcomes, and to save medical expenditure. AMSP has subsequently been promoted by more and more countries and regions. Countries such as Australia, Chile, China, France, Scotland, South Africa, South Korea, Sweden, Taiwan, USA and Vietnam have successfully implemented antibiotic stewardship programs.<sup>7</sup> Stewardship programs are extensively used in the United States and compliance with the various recommendations is monitored annually by the national healthcare safety network annual hospital survey.<sup>3,4</sup> In Spain, different scientific societies promoted the development of a consensus document for optimizing the

use of antimicrobials in hospitals (PROA project). In tertiary hospitals of China, the development of an antimicrobial stewardship program assessed the potential challenges for the AMSP and provided references and benchmarks for strategic policymaking.<sup>6</sup> In India and globally, increasing levels of drug resistance seen in pathogens of public health importance have created a havoc situation of emergency. Hospitals in India are reporting high levels of resistance to fluoroquinolones and carbapenems and these trends of antibiotic resistance in India are alarming with increasing percentage of resistance to last resort antibiotics carbapenems and colistins.<sup>8</sup>

AMSP capacities in Indian healthcare institutions (HCIs) are rudimentary or rather non-existent and this has been well documented in one of the surveys carried out by ICMR in 2013 among 20 tertiary HCIs about AMSP components, implementation and outcome.<sup>12</sup> It showed that only 40 per cent of HCIs had AMSP written documents, 75 per cent of HCIs had HIC guidelines and 65 per cent had AMAs prescription guidelines. Process measures are easiest to evaluate as they utilize surrogate indicators to demonstrate whether an AMSP successfully changed processes (e.g. guidelines/clinical pathway adherence), prescriber behavior (e.g. accurate diagnosis; appropriate drug-indication pairing, correct antimicrobial dose, frequency, and duration; appropriate and timely therapeutic modifications) etc.<sup>13,14</sup> Although process measures are substantially easier to collect and provide useful data, however, to achieve goals like optimizing antimicrobial selection (i.e. drug, dose and duration); and reducing adverse drug events (i.e. morbidity and mortality, length of stay and healthcare expenditures, these cannot be evaluated through process measures alone.<sup>15-17</sup>

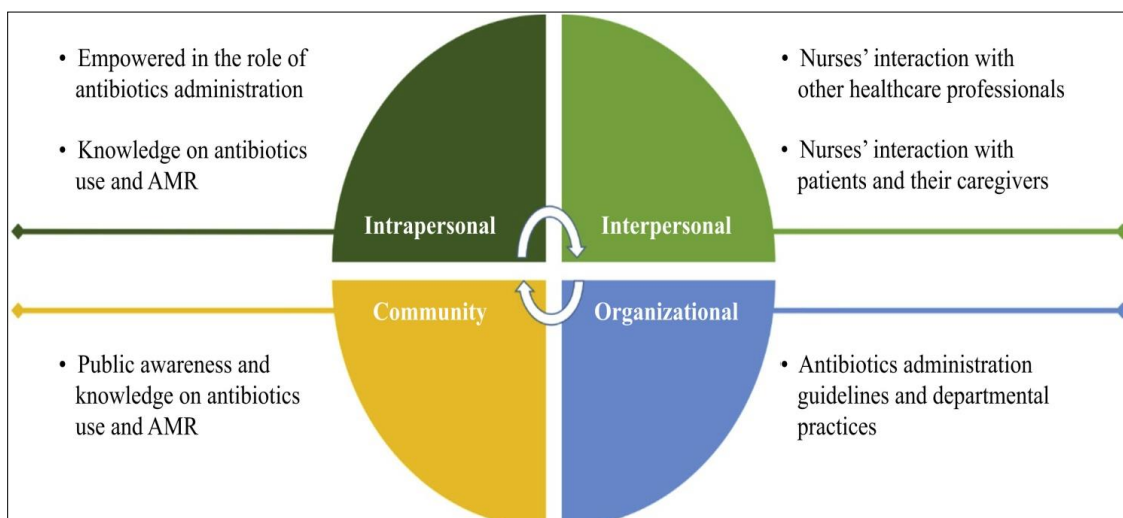
Both process and outcome measures are an integral part of any quality improvement program and should be incorporated into the hospital's antimicrobial stewardship plan. Interventions in terms of evaluating process and/or outcome measures for tracking and reporting antimicrobial use and outcomes data is critical to not only evaluating the success of the AMSP, but also in identifying areas for improvement.<sup>9,10</sup>

Thus, with a special focus on evaluating the process and outcome measures related to AMSPs in all 20 tertiary care hospitals part of ICMR AMR network, this study will ensure accurate and consistent data collection of antibiotics utilization, help in optimizing antimicrobial selection and reducing adverse drug events at our hospital. Moreover, only 30 per cent of HCIs had AMSP implementation strategies. Private HCIs showed better performance compared to government HCIs in AMSP that was attributed to the accreditation process (Figure 1).

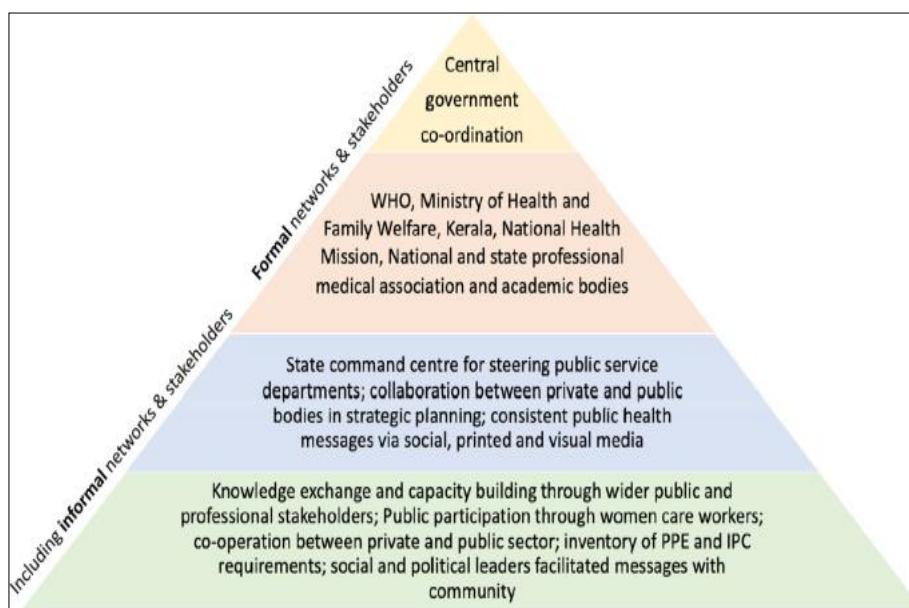
This shows a lacuna for AMSP in India and the dire need to implement AMSP as priority. Recognizing the need to create AMSP structures in HCIs in the country, the ICMR carried out four workshops on AMSP capacity building across the country in the second quarter of 2017 and

undertaken a series of capacity building initiatives and assigned funding for effective implementation and

sustainability of the AMSP program in tertiary care hospital since 2018 (Figure 2).<sup>19</sup>



**Figure 1: Empowerment of health care workers in antimicrobial stewardship program.**



**Figure 2: Addressing antimicrobial resistance in low- and middle-income countries (LMIC) like India.**

## CONCLUSION

Moreover, only 30 per cent of HCIs had AMSP implementation strategies. Private HCIs showed better performance compared to government HCIs in AMSP that was attributed to the accreditation process. This shows a lacuna for AMSP in India and the dire need to implement AMSP as priority. Recognizing the need to create AMSP structures in HCIs in the country, the ICMR carried out four workshops on AMSP capacity building across the country in the second quarter of 2017 and undertaken a series of capacity building initiatives and assigned funding for effective implementation and sustainability of the AMSP program in tertiary care hospital since 2018.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: Not required*

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**Cite this article as:** Chauhan J, Chakraverty R, Pathan S. Antimicrobial stewardship program activities in India: an appraisal. *Int J Basic Clin Pharmacol* 2022;11:676-9.