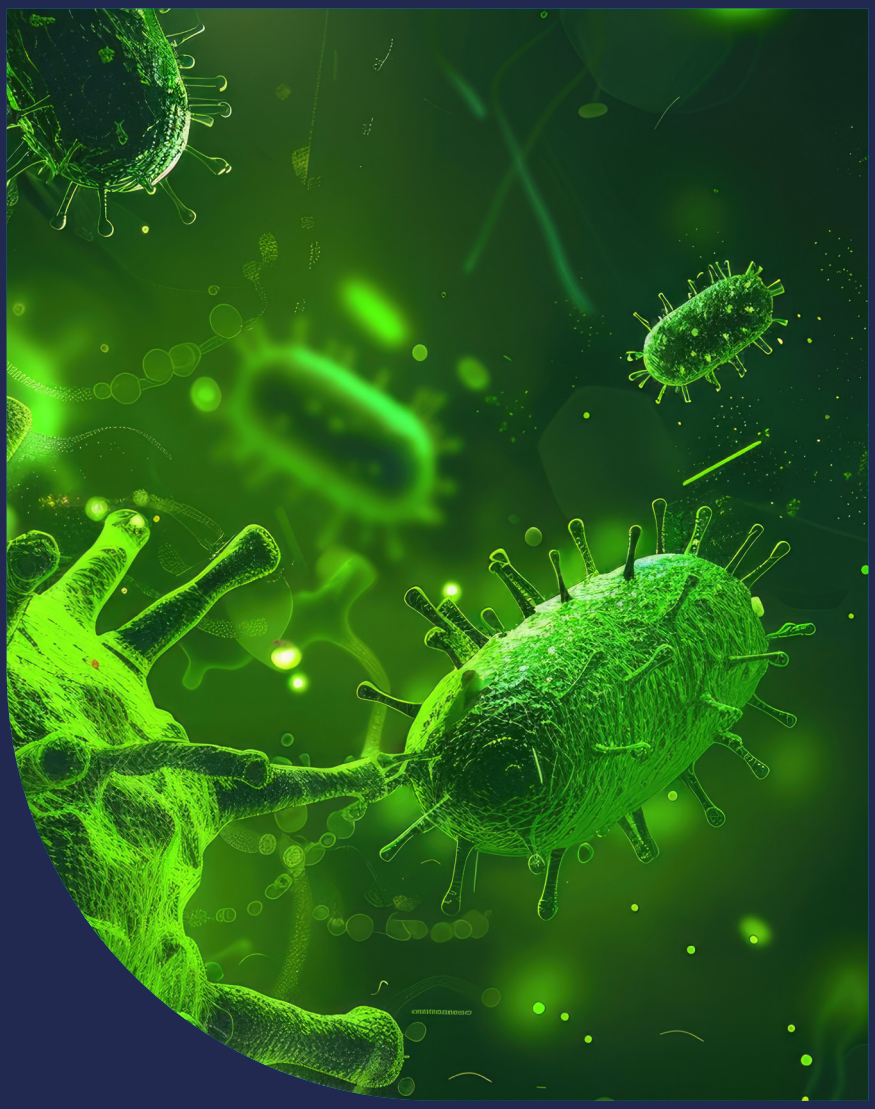
Toxics Link
for a toxics-free world

Understanding Antibiotics Use



About Toxics Link

Toxics Link is an Indian environmental research and advocacy organisation set up in 1996, engaged in disseminating information to help strengthen the campaign against toxics pollution, provide cleaner alternatives and bring together groups and people affected by these problems. Toxics Link has a unique expertise in areas of hazardous, plastic, medical and municipal wastes, international waste trade; and emerging issues of pesticides, Persistent Organic Pollutants (POPs), hazardous heavy metal contamination, etc. Apart from creating awareness among several stakeholder groups, we have successfully implemented various best practices and have contributed to policy changes in the aforementioned areas.

Toxics Link's Mission Statement - "Working together for environmental justice and freedom from toxics, we have taken it upon ourselves to collect and share both information about the sources and the dangers of poisons in our environment and bodies, and information about clean and sustainable alternatives."

Acknowledgement

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A Study Evaluating Policy Effectiveness and Implementation

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List of Abbreviations

AMR	Antimicrobial Resistance
ASP	Antimicrobial Stewardship Programme
AMC	Antimicrobial Consumption
GLASS	Global Antimicrobial Surveillance System
MoH&FW	Ministry of Health and Family Welfare
WHO	World Health Organization
NAP-AMR	National Action Plan on Antimicrobial Resistance
SAPCAR	State Action Plan to Combat Antimicrobial Resistance
KARSAP	Kerala Antimicrobial Resistance Strategic Action Plan
MP-SAPCAR	Madhya Pradesh State Action Plan for Containment of Antimicrobial Resistance
SAP-CARD	State Action Plan to Combat Antimicrobial Resistance in Delhi
OTC	Over-The-Counter

Executive **Summary**

Antimicrobial Resistance (AMR) is one of the biggest global health threats of the present time. The World Health Organization (WHO) estimates that AMR is directly responsible for 1.3 million deaths and contributes to 5 million deaths globally every year. Without any intervention, drug-resistant diseases could cause 10 million deaths each year by 2050, making the treatment of illnesses such as HIV, tuberculosis, malaria and pneumonia difficult. This would also impact the economy as additional healthcare costs would reach US$1 trillion by 2050, with a loss of US$1 trillion to US$3.4 trillion gross domestic product (GDP) per year by 2030.

This study by Toxics Link evaluates the knowledge, attitudes, and practices surrounding antibiotic use among consumers, pharmacists, and clinicians across five Indian states—three with State Action Plans (SAPs) (Delhi, Kerala, Madhya Pradesh) and two without SAPs (Andhra Pradesh, Haryana). Through 303 in-person surveys, it examines how well AMR policies have translated into behaviour change and responsible antibiotic usage in personal and clinical settings.

The findings of the study reveal serious gaps in awareness and practices. While general awareness of antibiotics is relatively high, misconceptions persist: Many believe antibiotics treat viral infections, function as painkillers, or can be shared with others. Self-medication and over-the-counter antibiotic sales remain common, even in states with SAPs. Pharmacists, despite familiarity with Schedule H1 and Red Line regulations, often yield to customer demands, citing lack of enforcement and pressure from consumers. Clinicians are more aware of AMR, but face barriers such as patient expectations, limited time for consultations, and poor diagnostic support.

The study also uncovers uneven implementation of stewardship programmes and IEC (information, education, communication) efforts across states. Kerala shows higher compliance and awareness, while states like Haryana and Andhra Pradesh lag in training, surveillance, and public engagement. Across all states, access to healthcare, affordability of antibiotics, and regulatory lapses are major barriers to rational use.

This report calls for:

- Strengthened enforcement of prescription regulations and OTC sales bans
- Scaled-up public awareness campaigns tailored to local contexts
- Investment in antimicrobial stewardship training for healthcare workers
- Greater accountability and intersectoral coordination under the One Health approach

The findings underscore the urgent need for India's upcoming NAP-AMR 2.0 to close existing policy-practice gaps and adopt a more robust, implementation-focused, and inclusive strategy

Without any intervention, drug-resistant diseases could cause 10 million deaths each year by 2050, making the treatment of illnesses such as HIV, tuberculosis, malaria and pneumonia difficult. This would also impact the economy as additional healthcare costs would reach US$1 trillion by 2050, with a loss of US$1 trillion to US$3.4 trillion gross domestic product (GDP) per year by 2030

Introduction

Antimicrobial resistance (AMR) is one of the biggest global public health threats in the 21st century. It alters the susceptibility of infectious pathogens to antimicrobials by rendering medical modalities ineffective. Although naturally progressing, in recent years, this phenomenon has accelerated due to increased usage of antimicrobials for various anthropogenic activities. Overuse and misuse in agriculture, healthcare settings and human consumption are a few factors contributing to the growing threats of AMR. It is estimated that deaths due to resistant (bacterial) infections will increase by almost 75% from 4.71 million to 8.22 million per year between 2022 and 2050.[1]

Recognising the urgency of the situation, the World Health Assembly, in 2015, announced the adoption of a global action plan on antimicrobial resistance. The plan underscored five primary objectives— improve awareness and understanding of antimicrobial resistance through effective communication, strengthen the knowledge and evidence base through surveillance and research, reduce the incidence of infection through effective sanitation, promote hygiene and infection prevention measures, optimise the use of antimicrobial medicines in human and animal health, develop the economic case for sustainable investment that takes into account the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions.[2] It also encouraged multisectoral participation by allowing various agencies (e.g. Food and Agriculture Organization of the United Nations (FAO), World Health Organization (WHO), and World Organisation for Animal Health, formerly OIE to participate in the development process.

A 2024 study predicted that in the absence of any substantial changes, global life expectancy would drop by 1.8 years, the healthcare cost of treating antibiotic-resistant infections would reach an annual US$412 billion, and productivity losses would reach $443 billion annually.[16] Such economic losses would only disproportionately impact lower- and middle-income countries.

Thence, WHO developed a harmonised Global Antimicrobial Surveillance System (GLASS) to encourage countries to report surveillance data to fill knowledge gaps and guide strategies at all levels. The objective of this system was to progressively integrate surveillance data on antimicrobials used in humans, track antimicrobial use, and understand the role of AMR in the food chain and the environment. It provided a standardised approach to collecting, analysing, interpreting, and sharing data by country, region, and area — allowing one to monitor the status of new or existing national surveillance systems, while emphasising the representativeness and quality of the data collected. If utilised correctly, the system can be used to study the correlation between AMR and antimicrobial use in different settings (animals, humans, and the environment) and to assess the effect of interventions within and between sectors.[3] As of 2020, 91 countries have enrolled in the GLASS AMR surveillance module and nine in the Antimicrobial Consumption (AMC) surveillance module.[4]

Despite the global acceptance of the need for antimicrobial surveillance mechanisms, their implementation varied across different countries. The disparities are a result of socio-economic instabilities, lack of infrastructure and financing, insufficient standards and a fragmented healthcare system[5] resulting in a higher burden of resistance falling on low and middle-income countries. The lack of ability to generate relevant data negatively impacts attempts at generating effective policy interventions.

India, a growing hub of resistant infections,[6] presents a unique set of challenges. The country is home to the third largest producer of antibiotics in terms of volumes, has one of the highest antimicrobial usages and has the highest rates of resistant infections in the world. While multidrug-resistant infections are creating newer challenges, India is still combatting infections such as tuberculosis, malaria, etc., which are also slowly developing resistance. Factors such as poverty, illiteracy, lack of access to healthcare and lack of awareness about infections have precluded much of the public from seeking sound medical advice. This has exacerbated reliance on either self-prescription or assistance from untrained healthcare professionals who lack sufficient diagnostic tools and end up prescribing broad-spectrum high-end antimicrobials. Compounded by the issues relating to the ease of availability of over-the-counter (OTC) drugs and a higher patient-to-doctor ratio in government-run facilities, the country faces many challenges.[7]

In 2017, India released its National Action Plan on AMR containment (NAP-AMR) in the footsteps of WHO's Global Action Plan. To curtail the rampant misuse of antimicrobials through over-the-counter sales, the Government of India notified Schedule H1 of the Drugs and Cosmetics Rules, 1945 in 2014. This stipulated that drugs coming under Schedule H should only be sold by pharmaceutical chemists on valid prescriptions.[8] Another key initiative from the government was the 'Red Line campaign' launched in 2016 to improve awareness among the public and healthcare professionals about the importance of the appropriate use of antibiotics. This initiative required antibiotics and certain other prescription-only medicines to have a bold red coloured line on the pack, to indicate that the drugs were to be consumed only on the advice of qualified prescribers.[9] As India prepares to welcome the second edition of the National Plan on AMR containment, it is important to look back and assess the effectiveness of the existing policy framework, the gaps in its implementation and the opportunities for improvement in the upcoming plan.

This study aims to highlight the current behaviour and practices of pharmacists, doctors and the general public towards antibiotic consumption, evaluating the effectiveness of activities proposed under priorities, "Awareness and understanding of AMR" and "Optimising use of antibiotics", in the State and National Action Plans. Furthermore, it aims to underscore the importance of community-based interventions and recommend ways in which states can overcome possible gaps in the implementation, eight years after the initiation of the NAP-AMR.

National and State Policy on AMR Containment

The NAP AMR of India was modelled after the WHO Global Action Plan and follows the One Health approach, incorporating human health, animal health, agriculture and the environment in addressing AMR. The six strategic priorities of the NAP-AMR include:

1. Improve awareness and understanding of AMR
2. Strengthen knowledge and evidence through surveillance
3. Effective Infection Prevention and Control
4. Optimise use of antimicrobials in health, environment and food
5. Increase investment for AMR research and innovations
6. Strengthen India's leadership

Each strategic priority has defined interventions, activities and outputs, and has helped pave the way for states to make their plan depending upon the state's specific needs.[10] However, in the first five years of its implementation, only three out of the 28 states formulated their own state policy, namely, Kerala, Delhi and Madhya Pradesh.

2.1 Policy and Governance

State Action Plans (SAPs) for the containment of AMR are derived from the NAP but are tailored according to the specific needs of each state. As a result, while they are structurally similar, their implementation strategies vary (**See Table 1**). For instance, Priority 1 (Improving awareness and understanding of AMR) and Priority 3 (Effective infection prevention) align closely with the NAP across all the states. However, the surveillance aspect (Priority 2) in the Delhi State Action Plan places a stronger emphasis on strengthening scientific capabilities for building an effective knowledge base. Similarly, while the Delhi plan encourages improving access to first-line antimicrobials and older antibiotics in its fourth strategic priority (optimise the use of antimicrobials), Madhya Pradesh and Kerala emphasise optimising uses in the veterinary and aquaculture sectors due to their prominent animal farming sectors.

These functional differences are also evident in financing and governance structure: Kerala aims to strengthen public-private partnership, Delhi focuses on building state-level partnerships for containment, and Madhya Pradesh emphasises the need for building an online repository for easier data sharing and promoting three focus areas – governance mechanism, inter-sectoral (state) collaboration and private sector engagement.

2.2 Implementation

2.2.1 Information and Communication

Both the National and State Action Plans on Antimicrobial Resistance place a significant emphasis on information, education, and communication strategies (**See Table 2**). These efforts include activities such as knowledge, attitude, and practice studies targeting diverse stakeholders; implementation of cross-sectoral communication campaigns in collaboration with private organisations and civil society; and utilising social and mass media to enhance public awareness.

The Kerala SAP prioritises initiatives such as observing World Antibiotic Awareness Week in healthcare and educational institutions, formulating risk communication strategies related to animal agriculture and food safety, and the launch of an online platform that adopts a one-health perspective. Delhi SAP focuses on promoting safe water and sanitation practices; educating veterinarians, farmers, pharmacists and food producers on the prudent use of antibiotics; and raising awareness among stakeholders, particularly in fast-food outlets that serve meat-based products. Similar to Delhi and Kerala, Madhya Pradesh SAP proposes the use of non-professional education tools such as role plays, social media, advertisements and FM radio to create awareness among schools and college students.

2.2.2 Education and Training

SAP's training programmes are meant to build the capacity of different stakeholders. Here, stakeholders include medical, nursing and pharmacy colleges; State Drug Controllers; and users of antibiotics like farmers, veterinarians, fisheries professionals (in the case of Kerala), etc. Capacity building among the Environment and Pollution Control Board and allied agencies for surveillance of antibiotic residue and AMR in the environment is also encouraged under Kerala's policy addressing education and training.

The Delhi Action Plan proposes education and training camps for chemists/pharmacists, such as in The Perfect Health Mela, by Chemist Associations for compliance with different provisions -- including rational and appropriate dispensing of antimicrobials. In Andhra Pradesh, pending its implementation, the SAP intends to promote the inclusion of study and research among undergraduate and postgraduate students and faculty to further improve outreach.

2.2.3 Optimising antimicrobial use

All SAPs recognise the need for Antimicrobial Stewardship Programmes (ASPs) for the success of optimal antimicrobial use. The main points of the three plans are:

- Improved access to high-quality antimicrobials
- Promoting and monitoring optimal use of antimicrobials across sectors
- Establishment of surveillance mechanism

SAPs also propose developing and implementing take-back mechanisms throughout the supply chain. The Kerala action plan uniquely incorporates APSs (Antimicrobial Stewardship Programmes) in human, animal and food sectors, while Madhya Pradesh and Delhi focus mainly on human and animal health. Enforcing restrictions on over-the-counter antibiotic sales is a common priority across all states. Notably, the Madhya Pradesh SAP introduces an innovative initiative expanding the FDA's H1 medication app to track antibiotic prescriptions, a unique initiative not found in other plans.

2.3 Monitoring

India's National Policy specifies a monitoring and evaluation framework with elements like activities, indicators, data collection specifics, and implementable targets. It proposes 10 indicators to track the progress, which include awareness levels, integration of AMR into educational modules, development of information material, etc. Consequently, the SAPs of Kerala, Madhya Pradesh and Delhi have incorporated a structured monitoring and evaluation framework in their state plans, emphasising five components: Input, Process (activities), Outputs (results at programme level) and Outcomes (results at population level). These components work under critical indicators aligned with strategic priorities, such as awareness and understanding, knowledge and evidence, infection prevention and control, optimising use of antibiotics, research and innovations, and collaboration. For instance, in all three policies, the input component includes the development of IEC materials for relevant groups. One of the activities proposed was AMR awareness campaigns organised at the state, district and sub-district levels. The number of print articles published would be considered as the output, while awareness levels among the target populations (percentage) would be an outcome. Such work would take place under the priority indicator 'Awareness and Understanding'.

Table 1: Objective and expected outcomes of state action plans [11–13]

NAPs/ SAPs	NAME OF DOCUMENT	YEAR	STRATEGIC PRIORITIES	MONITORING OUTCOMES	STAKEHOLDERS
Kerala	Kerala Antimicrobial Resistance Strategic Action Plan (KARSAP)	2018	• Improve awareness and understanding of AMR through effective communication, education and training • Strengthen knowledge and evidence for the containment of AMR through surveillance • Reduce the incidence of infection through effective infection prevention and control • Optimise the use of antibiotic agents in health, animals and food • Promote research and innovations for AMR containment • Partner with the private sector and civil society organisations for AMR containment	• Knowledge, attitudes and practices of health workers and vets on AMR and the implications for antimicrobial use and misuse • Reduced levels and trends of resistance in common pathogens • Effective prevention of infection – higher hand hygiene compliance, more hospitals under Kayakalp, more effluent treatment plants in pharmaceutical plants • Total consumption of antibiotics monitored • Proportion of KARSAP activities – with identified funds, adequately funded and implemented • Data/information from KARSAP to be reported to the State and Central Government	Departments of Animal Husbandry, Fisheries, Agriculture, Food Safety, Science and Technology and Drugs Control, AYUSH, Pollution Control Board, research institutes, and the private sector, among others
Madhya Pradesh	Madhya Pradesh State Action Plan for Containment of Antimicrobial Resistance (MP-SAPCAR)	2019	• Improve awareness and understanding of AMR through effective communication, education and training • Strengthen knowledge and evidence through surveillance • Reduce the incidence of infection through effective prevention and control • Optimise the use of antibiotic agents in health, animals and food • Promote investments for AMR activities, research and innovations for AMR containment • Strengthen the state's commitment and collaborations on AMR	• High AMR awareness in target populations • Reducing trends of multiple drug-resistant infections • Effective management and prevention of infections – compliance with hand hygiene, more Kayakalp certifications, more effluent treatment plants, and effective biomedical waste management • Effective monitoring of the Quality and Quantity of antibiotics and an effective ban on antibiotics in animal food • Adequate funding for service delivery, teaching, training and research • Higher percentage of meetings on AMR governance, points implementation, and successful submission of data from MP-SAPCAR reported to the State and Central Government every six months	Departments of Animal Husbandry (DAH); Farmer Welfare and Agriculture Development (FWAD), Fisheries, Health and Family Welfare, Labour, Medical Education, Public Work and Environment

NAPs/ SAPs	NAME OF DOCUMENT	YEAR	STRATEGIC PRIORITIES	MONITORING OUTCOMES	STAKEHOLDERS
Delhi	State Action Plan to Combat Antimicrobial Resistance in Delhi (SAP-CARD)	2020	• Improve awareness and understanding of AMR among all stakeholders through effective communication, education and training. • Strengthen knowledge and evidence through surveillance • Reduce the incidence of infection through effective infection prevention and control • Optimise the use of antimicrobial agents in health, animals and food • Promote investments for AMR activities, research and innovation • Strengthen collaboration to contain AMR	• Increased awareness and capacity building • Strengthened AMR surveillance and management of data • Strengthened regulations and restrictions of antimicrobials for non-therapeutic use • Better understanding of transmission dynamics and AMR mechanisms • Significant reduction of the AMR burden in Delhi in 5 years	Directorate of Health and Family Welfare (DHFW), Drug Control Department (DCD), Delhi State Health Mission (DSHM), Department of Animal Husbandry (DAH), Department of Food Safety (DFS), Delhi Pollution Control Committee (DPCC), Delhi Jal Board (DJB), Directorate of Agricultural Marketing (DAM), Department of Social Welfare (DSW), Women and Child Development Department (WCDD), Department of Education (DE), Directorate of AYUSH, Directorate of Information and Publicity (DIP), Integrated Disease Surveillance Programme (IDSP), Municipal Corporation of Delhi (MCD), New Delhi Municipal Corporation (NDMC), State Disease Control Programmes (SDCP), Delhi State Medical, Nursing, Dental and Pharmacy Councils, Delhi Society for Promotion of Rational Use of Drugs (DSPRUD), Food and Agriculture Organization of the United Nations (FAO), Food Safety and Standards Authority of India (FSSAI), Hospital Infection Society of India (HISI), Indian Association of Medical Microbiologists (IAMM), NCDC, WHO

Table 2: Strategic priorities and focus areas [11–13]

S. No.	STRATEGIC PRIORITIES	FOCUS AREA	KARSAP	MP-SAPCAR	SAP-CARD
1	Awareness and understanding	Focus: 1	Communication and IEC	Information and communication	Increase AMR awareness and understanding
		Focus: 2	Education and training	Education and training	Education and training
2	Knowledge and evidence	Focus: 1	Strengthen laboratories	Laboratory	Laboratory capacity
		Focus: 2	Surveillance of AMR – human, animal, environment	Surveillance	Surveillance of AMR
3	Infection, prevention and control	Focus: 1	IPC in human health	IPC in human health	IPC in healthcare
		Focus: 2	Animal feed & foodstuff	IPC in the animal sector/farms, community and environment	IPC in animal health and food
		Focus: 3	Environment	NA	IPC, hygiene, and sanitation in the community
4	Optimise the use of antibiotics	Focus: 1	Regulations	Regulations	Access to high-quality antimicrobials
		Focus: 2	Hospitals, in addition to healthcare institutions	Hospitals	Antimicrobial usage is being monitored
		Focus: 3	Veterinary (including Aquaculture)	Animals as well as food	In terms of human health, antimicrobial stewardship is important
		Focus: 4	Surveillance of antimicrobial use	NA	Animal husbandry and food antimicrobial stewardship and policy
5	Research Innovations	Focus: 1	Research on AMR	Research on AMR	Financing for AMR
		Focus: 2	Innovation	Innovation	Research and innovations
6	Collaborations	Focus: 1	Public-private partnership	Governance mechanisms	Strengthen state-level collaborations to contain AMR
		Focus: 2	State disease control programmes	State collaborations	NA
		Focus: 3		Inter-sectoral mechanisms and private sector engagement	NA

Research Study

3.1 Rationale of the study

Overuse and misuse of antimicrobials contribute to the emergence of antibiotic resistance.[14] These circumstances often stem from insufficient knowledge and improper practices of consumers, healthcare professionals and pharmacists.[15]

Some of the more common practices include dispensing antibiotics without a prescription or by untrained personnel, prescribing antibiotics for viral infections, self-medication and incorrect dosage.

Although national and state-level policies exist to address overprescription **(See Chapter 2)**, over-the-counter sales and public awareness, there is a lack of reliable monitoring data to assess the effectiveness of policy enforcement.

Recognising these gaps, Toxics Link through this study aims to evaluate the knowledge, attitudes and practices of physicians, pharmacists, the general public as well as the antibiotic supply chain regarding antibiotic prescription, dispersion and consumption in India. The study also assesses stewardship programmes in five Indian states by analysing the differences between states with and without state action plans, helping identify key areas for intervention to enhance knowledge, rational use and prescription practices.

3.2 Objectives of the study

Based on the rationale of the study, the following objectives were formed:

- Assessing the knowledge of antibiotic use and AMR in consumers, pharmacists and clinicians
- Understanding dispensing and prescription practices adopted by pharmacists and clinicians, respectively
- Analysing the implementation gaps identified through extensive surveys with consumers, pharmacists and clinicians

Furthermore, the findings of this study will be crucial in shaping strategies, policies and best practices to address and manage the challenges arising due to a lack of awareness of antibiotic consumption, prescription, and dispersal. We believe that this study will help reinforce the need for urgent action on AMR.

3.3 Sampling sites

We selected Delhi, Madhya Pradesh and Kerala for the study as each had a State Action Plan to Combat Antimicrobial Resistance (SAPCAR) in place for over five years. For comparison, Haryana and Andhra Pradesh were included as reference states to show the differences in implementation between states with and without such plans.

Acknowledging the significant impact of socio-economic factors on antimicrobial resistance, such as unequal access to healthcare, cities were strategically selected to underscore their influence on the implementation of AMR policies.

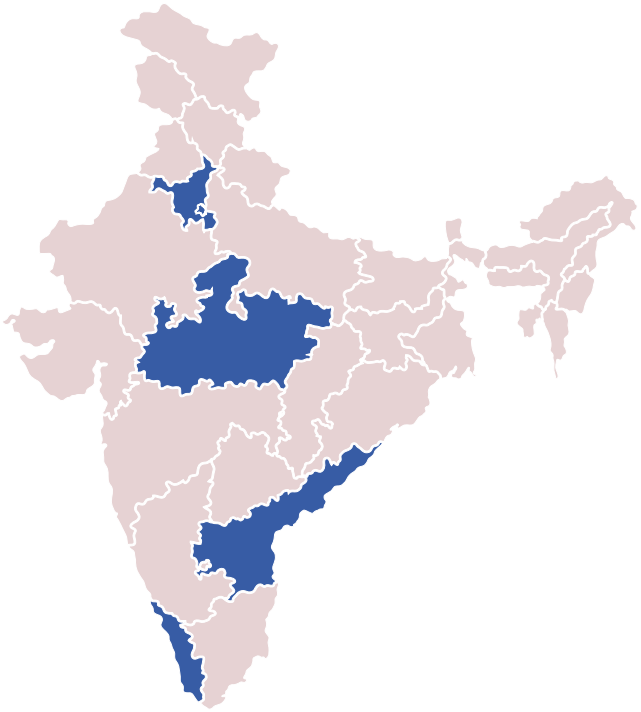


Figure 1: **Survey sites**

3.4 Methodology

- **Consumers**

  Across the five states, 50 consumers were randomly sampled. To ensure a balanced perspective, 25 respondents were chosen from primarily high-income localities and 25 from low-income localities. Educational level was not a criterion for selection.

  The survey contained a set of 49 questions covering topics such as their experiences with healthcare services, knowledge about antibiotics and antimicrobial resistance, susceptibility and experiences with self-medication, methods of disposal of medicines and challenges. Each participant was further asked for suggestions to improve public awareness on the subject of antibiotics and AMR. Factors such as education, occupation and annual income were also included.

- **Pharmacists**

  Ten pharmacists/chemists were surveyed in each state. Private pharmacies near government healthcare establishments like District Hospitals, Primary Health Centres, etc. were included. Some surveys were also conducted with private pharmacies in densely populated areas (e.g. Nangloi in Delhi).

  The questionnaire comprised 43 questions seeking information from the respondents/chemists about their experiences with consumers, awareness about AMR, over-the-counter supply of antibiotics, knowledge about regulations, possible challenges they face in remaining compliant with the regulations, and their suggestions for policymakers.

- **Clinicians**

  Five clinicians/physicians were surveyed in each state. These private physicians were chosen based on their clinic's proximity to densely populated areas, covering both high and low-income neighbourhoods. The questionnaire comprised 39 questions encompassing queries about their experiences with patients, knowledge about AMR, prescription patterns, their knowledge about regulations, the possible challenges they face in remaining compliant with the regulations, and suggestions for policymakers.

Result and **Observations**

A total of 303 respondents were interviewed from nine cities: 223 were general public, 52 pharmacists and 28 clinicians. Of the general public surveyed, 70% were males, with their average age between 31-45 years (48%). Similarly, among the pharmacists and clinicians surveyed, 82% were males and 18% females, with a median age between 31-45 years. While 45% of the general public had a bachelor's degree and 29% had passed secondary school. The majority of the pharmacists (49%) had a diploma in pharmacy, and 45% had a Bachelor's in Pharmacy. Both the clinicians and pharmacists who were a part of the survey had more than 10 years of experience.

4.1 Delhi

4.1.1. Consumers

Knowledge about antibiotics

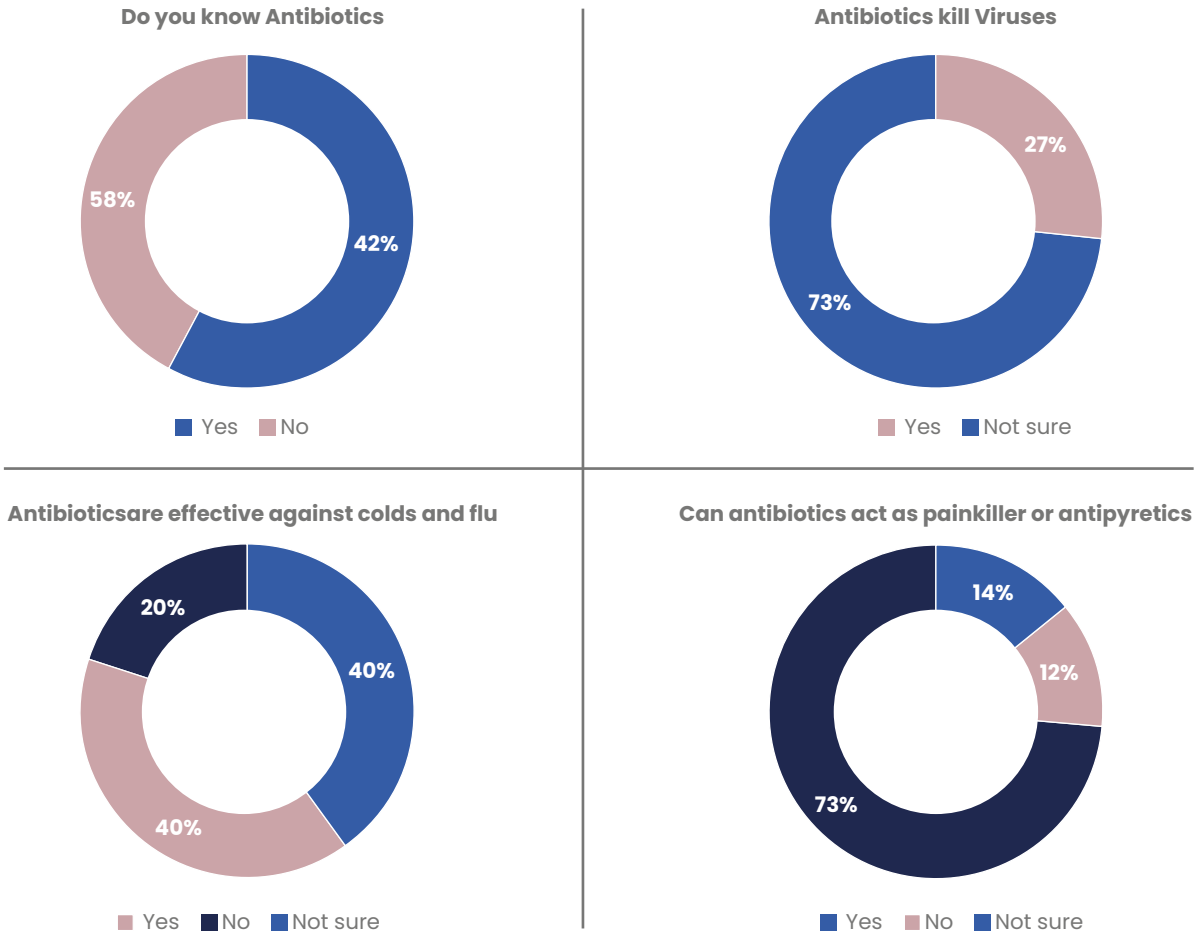


Figure 2: Awareness about antibiotics in the general public of Delhi

When the respondents were asked if they knew about antibiotics, 58% said they did not and also could not differentiate antibiotics from other medications. Out of the 42% respondents who knew about antibiotics, 70% believed that they worked against viruses, and a further 40% believed that antibiotics could be used to treat viral infections. Likewise, 73% believed that antibiotics were a form of painkillers or antipyretics (See Figure 2). Results from the survey show that consumers/the general public are overwhelmingly unaware of the use and impact of antibiotics.

Self-medication

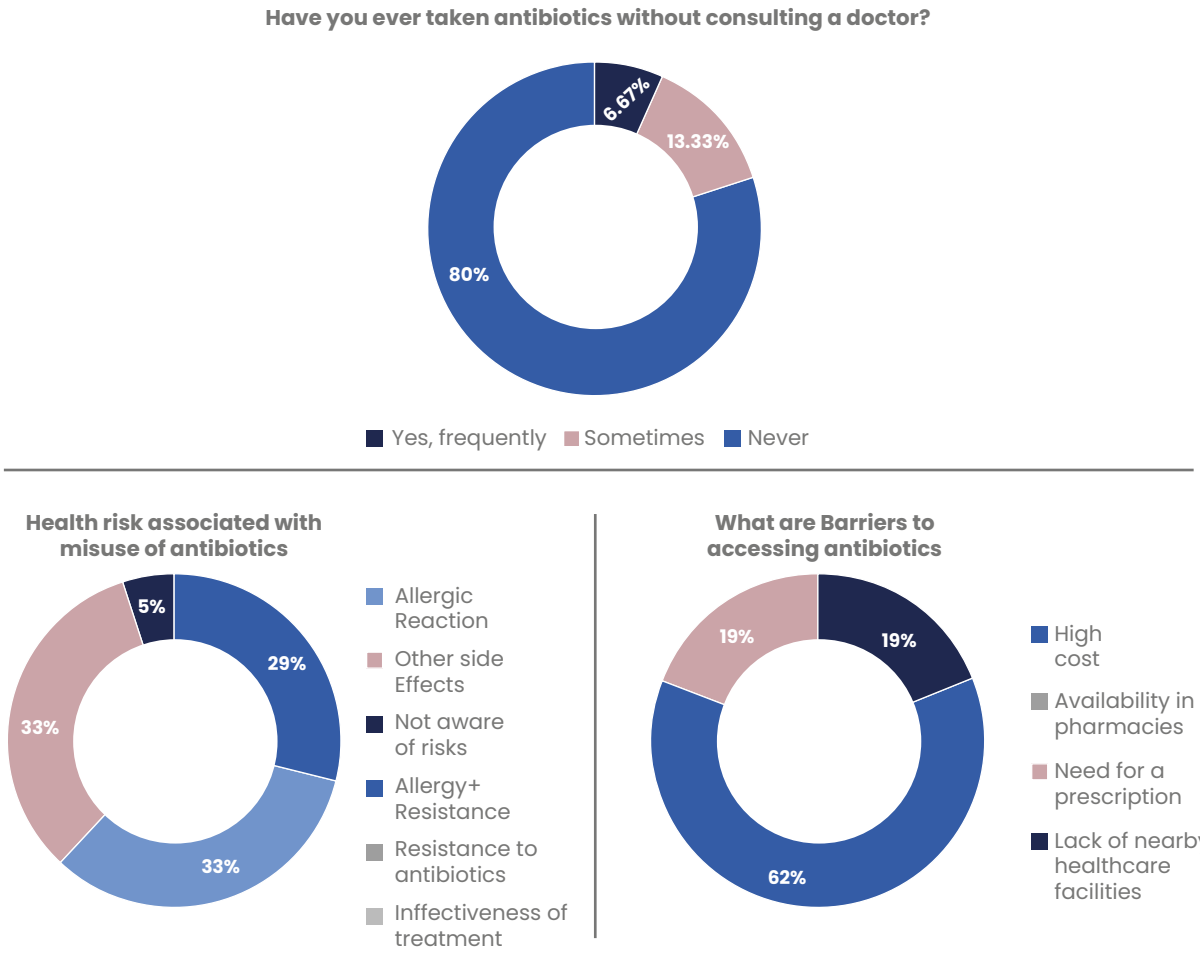


Figure 3: Misuse of antibiotics by the general public in Delhi

While 80% respondents said they do not purchase antibiotics or medicines, in general, without the prescription of a doctor, about 70% said they believed that antibiotics taken without the advice of a doctor could be harmful. Over-the-counter purchase of antibiotics was observed, as 12% respondents admitted to getting antibiotics from pharmacies without a prescription. When asked for the reason for purchasing an antibiotic without a prescription, a few pointed at previous experience of medication for the same illness and difficulty in getting a doctor's appointment. Since lack of access to antibiotics also influences AMR burden, the respondents were asked about barriers that make antibiotics inaccessible to them. It was observed that 62% agreed it was the cost of antibiotics and lack of proper nearby healthcare facilities as major factors (See Figure 3).

Knowledge of AMR

About 89% of the respondents were not aware of antimicrobial resistance (See Figure 4). Of the 11% that were aware of AMR, most of them heard about it either from their doctors or family members. This underscored the need for effective awareness programmes in schools, hospitals and at the community level as an effective tool in spreading information about AMR.

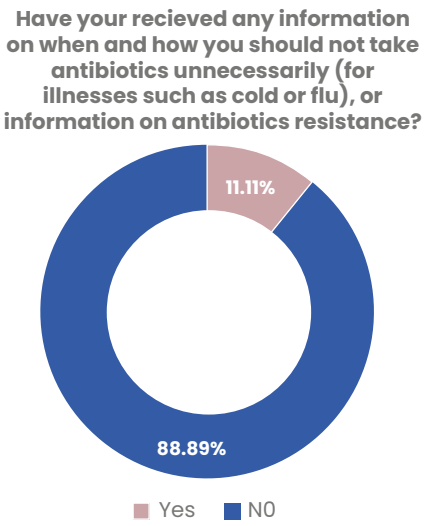


Figure 4: Knowledge of AMR shown by the general public in Delhi

Experiences with Healthcare Services

The study in Delhi was conducted in the month of January 2025, hence almost all the respondents had symptoms of cold and flu within the preceding 3-6 months. About 88% of the respondents had consulted a doctor, of whom about 60% believed they had been prescribed antibiotics. Of them, the majority (62%) said they did not receive any information about the potential side effects of antibiotics or AMR. It was observed that in most cases, doctors while prescribing medication had specifically told their patients to complete their dosage. When asked about the affordability of medication, a small majority (53%) expressed that the medicine was indeed expensive, but since it is a necessity similar to food and water, they had to spend money on it too.

Disposal of antibiotics

Over 98% of the respondents threw their antibiotics and pharmaceutical medicines directly into the garbage. The remaining 2% either donated those to hospitals or NGOs or gave it away to their family members.

Recommendations and Challenges

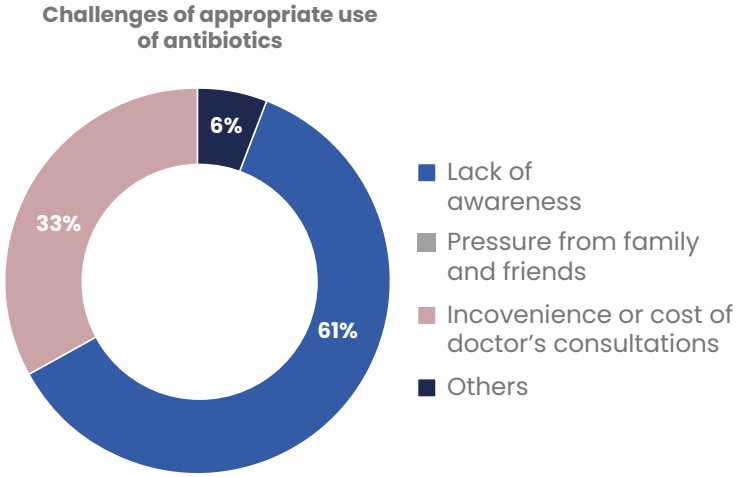


Figure 5: Challenges of the appropriate use of antibiotics in Delhi

Most of the respondents cite lack of awareness as a barrier to proper use of antibiotics, followed by the inconvenient costs of a doctor's consultation and medication (See Figure 5). The respondents, during the survey, also cited instances where they could not access affordable and better healthcare services at a nearby government facility due to a lack of doctors and had to settle for more expensive and lower-quality care. When asked for recommendations, the respondents emphasised improving access to better healthcare and the availability of affordable medicines.

4.1.2 Pharmacists

Behaviour analysis

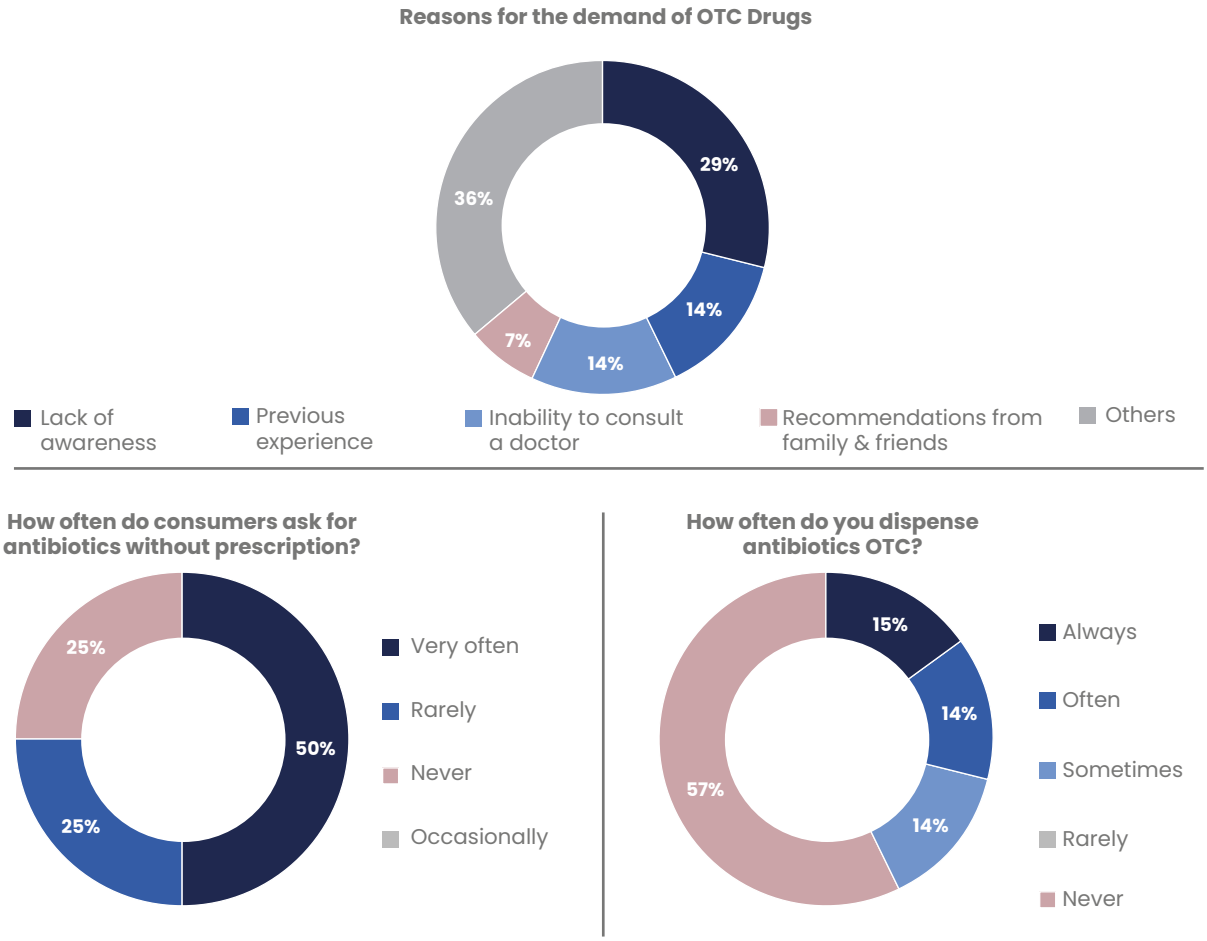


Figure 6: Experiences of pharmacists with customers in Delhi

The antibiotics most commonly sold in the survey areas (Jangpura and Nangloi in Delhi) were Amoxycillin and Augmentin.

About 50% of the pharmacists surveyed said they have very often been asked for antibiotics without a prescription. Of the pharmacists who admitted to selling antibiotics over-the-counter, half of them sold generic antibiotics and the other half sold branded antibiotics. They chose patient age, their own diagnosis of the condition, medical history and severity of symptoms as criteria for prescribing antibiotics. When asked how many doses they dispense, pharmacists said they dispensed a 'few tablets' (See Figure 6). The reasons behind dispensing the antibiotics over-the-counter as told by them were customer insistence and symptoms described by the customers. Of the pharmacists questioned, 62% believed that the patients were unaware of the risks related to self-medication with antibiotics. More than 87% respondents agree that pharmacists play a critical role in preventing antibiotic misuse and AMR.

Compliance

All pharmacists were very familiar with Schedule H medication and were able to list the categories of medicines under the list. However, only 37% were familiar with the red-line campaign. All the pharmacists kept a record of all Schedule H medicines sold, and had their records audited at least once by the Drug Inspector in the past 6 months.

AMR awareness

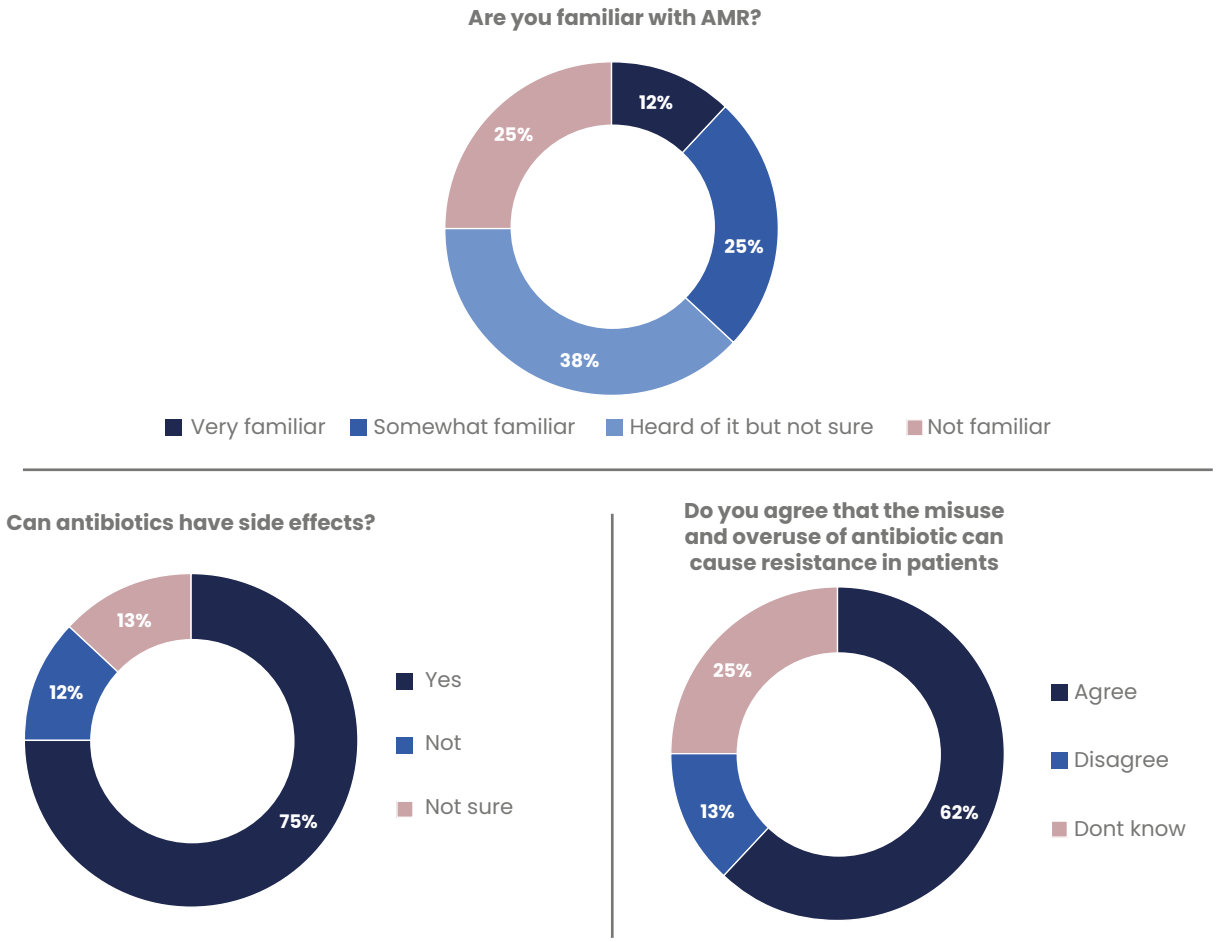


Figure 7: Awareness of AMR among Delhi pharmacists

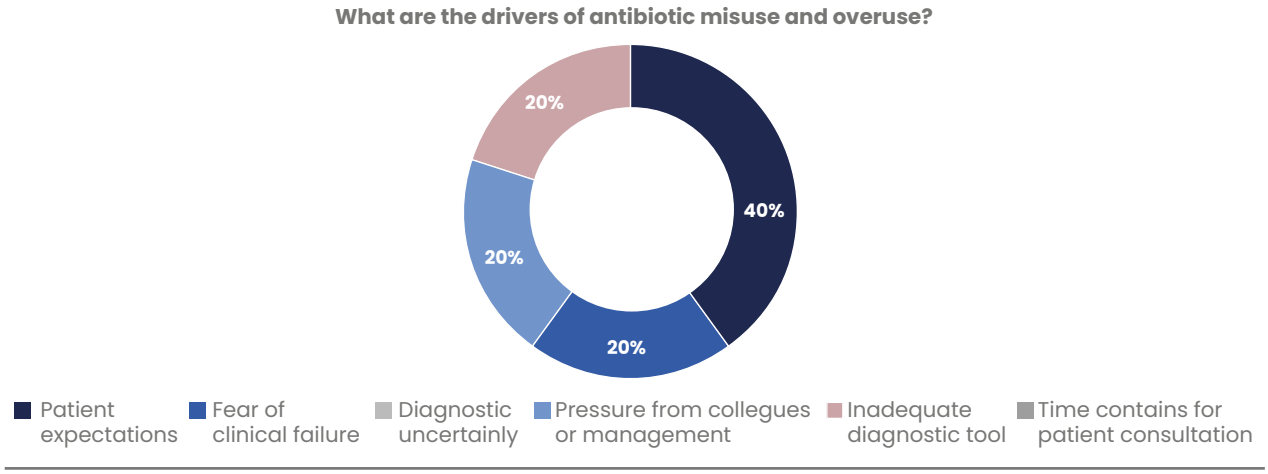
Sixty-three per cent pharmacists were not familiar with AMR. Of the 12% that were, 50% recognised it as a public threat. The majority of the pharmacists (62%) agreed that any misuse and overuse of antibiotics can cause resistance in patients, and 75% agreed that antibiotics can cause side effects. Despite this recognition, about 50% of the pharmacists never informed their customers of the potential side effects of antibiotics (See Figure 7).

Challenges and Recommendations

About 50% of the respondents had observed an increase in sales of antibiotics over the years. When asked if they faced any challenges in promoting rational use of antibiotics, the majority of the pharmacists said they did not face any challenge and believed that correct prescription and training from doctors could reduce the misuse and overuse of antibiotics.

4.1.3. Clinicians

Awareness and Prescription of Antibiotics



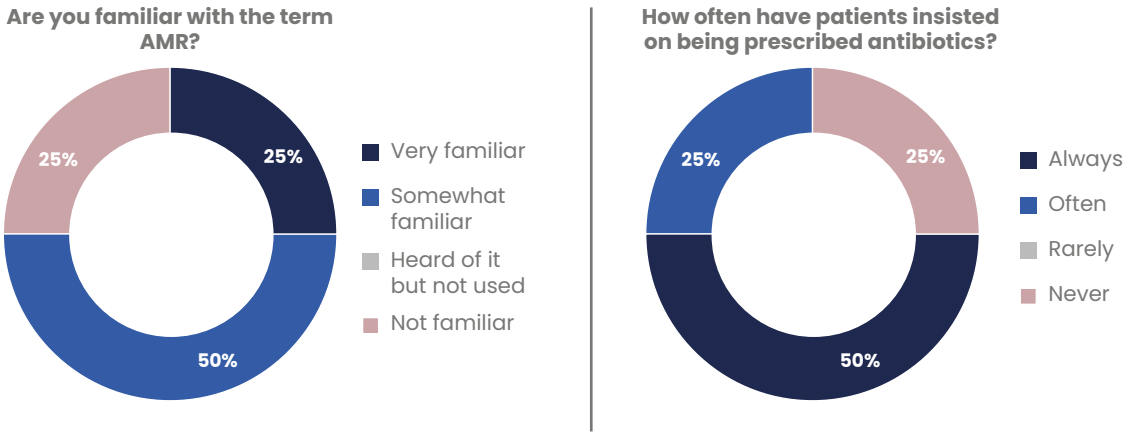


Figure 8: Knowledge and experiences of Delhi clinicians

At least 75% of the clinicians were somewhat or completely aware of AMR. The majority of the clinicians surveyed prescribed antibiotics to one in five patients and agreed that resistance was a result of over-prescribing and misuse. All the clinicians agreed that misuse of broad-spectrum antibiotics leads to the emergence of antibiotic resistance. The issue faced by up to 75% of the clinicians in Delhi, according to the survey, was the patient's expectation of being prescribed antibiotics (See Figure 8).

Antimicrobial stewardship

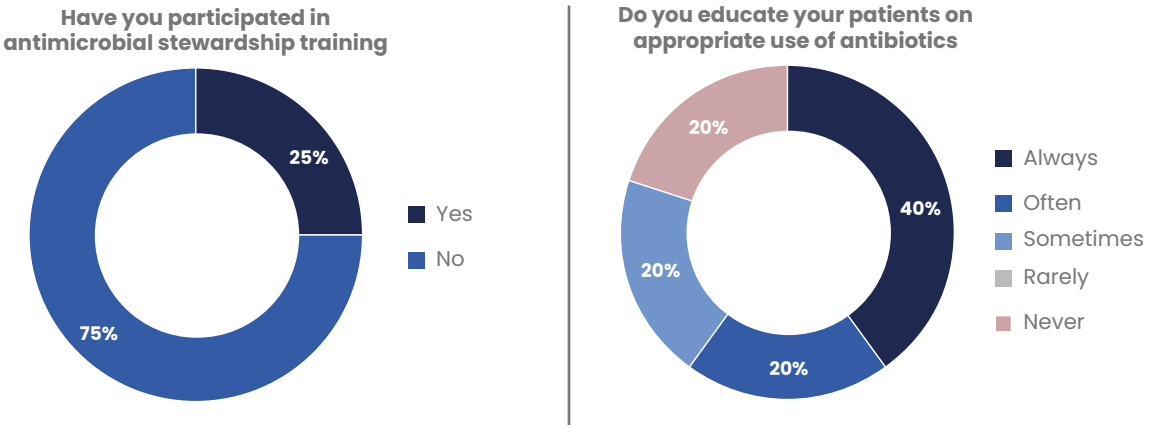


Figure 9: Antimicrobial stewardship in Delhi Clinics

Of the clinicians surveyed, 75% did not receive any antimicrobial stewardship training. However, about 80% of clinicians educated their patients on the appropriate use and disposal of antibiotics (See Figure 9). All the surveyed clinicians were familiar with the WHO AWaRe classification of antibiotics and referred to it for their clinical practice. All respondents believed that AwaRe classification was an essential tool for prescribing medicines.

Management and Research

All clinicians agreed that AMR is a major problem in India and that over-the-counter sales, overuse in hospitals and animals, and improper regulations were some of the biggest causes of AMR in India. All clinicians agreed that demand from patients contribute to the overuse of antibiotics in India and that over-the-counter sales of antibiotics should not be allowed.

AMR containment policy and clinical care

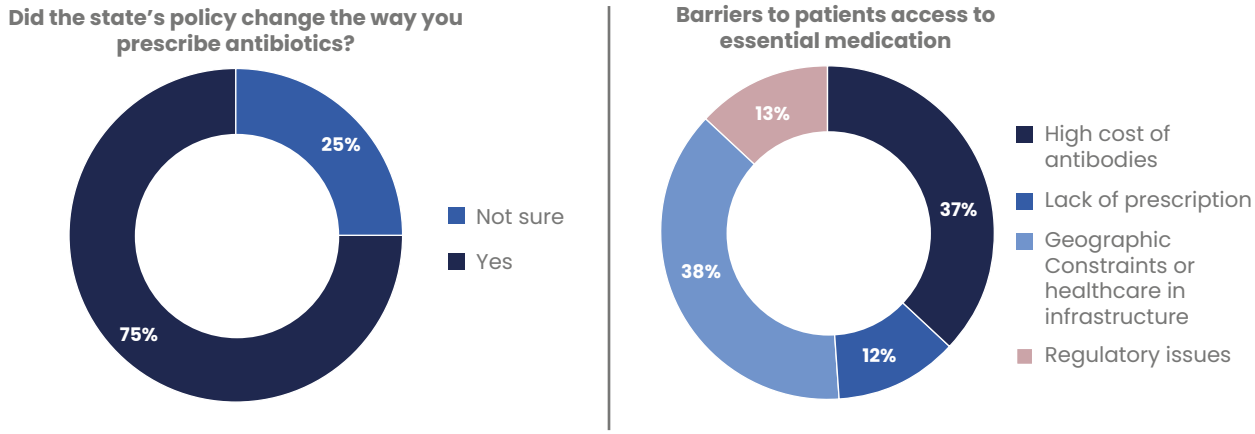


Figure 10: Enforcement of the Delhi policy and existing challenges

At least 75% of the clinicians agreed that the state and Centre's policy on antibiotic containment changed the way they prescribe antibiotics (See Figure 10). When enquired who should be mainly responsible for spreading information about the use and misuse of antibiotics, the respondents said doctors, the pharmaceutical industry, governmental bodies and civil society. Perceptions of pharmacists and the general public on the affordability of antibiotics as a key driver to inaccessibility to essential treatment, and eventually a driver of AMR, were further verified by the claims made by the clinicians.

Challenges and recommendations

All clinicians supported the establishment of stricter guidelines on antibiotic prescription and strong monitoring and feedback systems on antibiotic use to curtail the misuse of antibiotics in clinical settings. The two issues that they raised as pertinent challenges in containing overuse/misuse of antibiotics were: pressure from patients to prescribe antimicrobials, and decreasing quality consultation time spent per patient due to high patient load per doctor.

4.2 Madhya Pradesh

4.2.1. Consumers

Knowledge about antibiotics

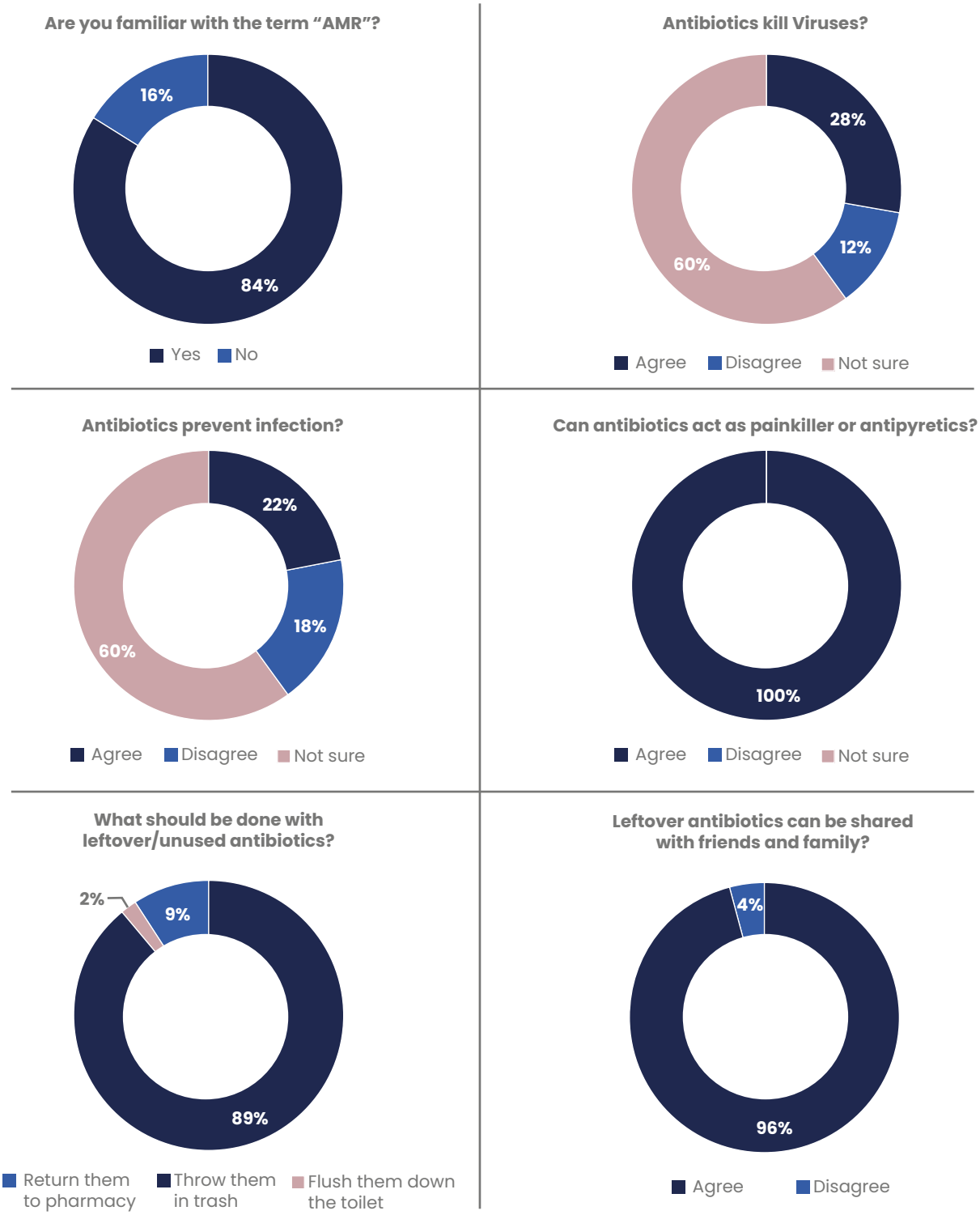


Figure 11: Awareness about antibiotics in the general public of Madhya Pradesh

The respondents were asked if they knew about antibiotics, and a majority (84%) answered in the affirmative. However, it was observed that a large majority of the respondents (70%) believed that antibiotics could cure any illness or infection, and all believed that they can also act as painkillers or antipyretics. Although 60% were unsure if antibiotics could kill viruses or be used as a preventative measure, all the respondents believed that they could be used to treat cold and flu. The majority of the respondents (84%) believed that a full course of antibiotics should be taken as prescribed by doctors

and that antibiotics are indeed harmful (99%), but they also agreed that leftover antibiotics could be shared with friends and family (See Figure 11). Similar to Delhi, over 80% in Madhya Pradesh believed that throwing antibiotics in the trash was the proper method for disposal.

Behaviour towards antibiotics

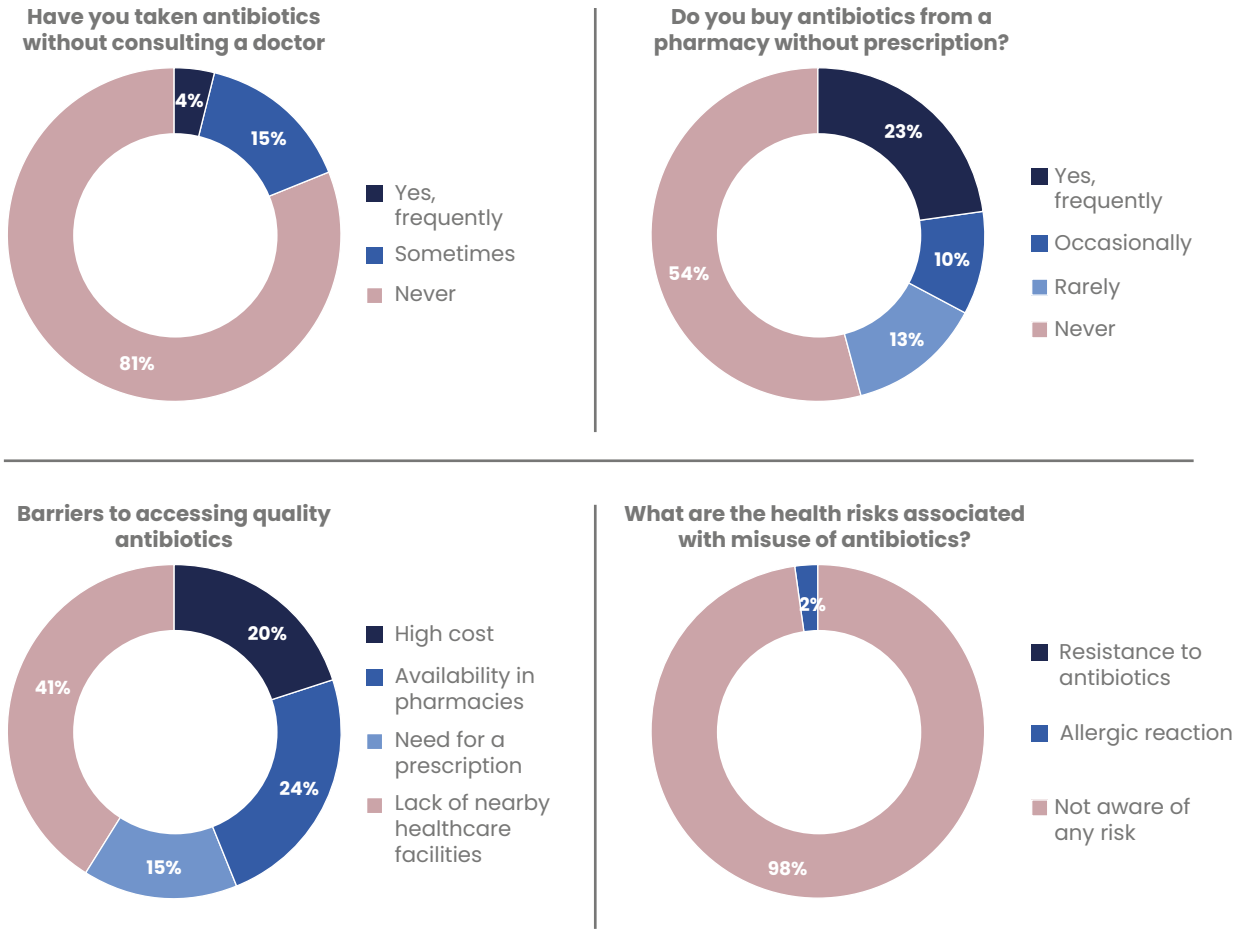


Figure 12: Behaviour and experiences of the general public in Madhya Pradesh towards antibiotics

Of the respondents, 81% said they have taken antibiotics only on the prescription of a doctor (See Figure 12). The high cost of doctors' consultations, recommendations from family and friends, and encounters with the same illness were major reasons for choosing to buy antibiotics without a prescription for the remaining 17% respondents. While a little over 91% of the respondents believed that having antibiotics without consulting a medical professional can be harmful, 98% did not know the health risks involved because of antibiotic misuse.

Over 85% of the respondents/population surveyed did not face any difficulty in accessing or affording antibiotics. However, 41% believed that a lack of healthcare facilities was a major barrier to accessing antibiotics, followed by unavailability of pharmacies, high cost and the need for a prescription.

Knowledge of AMR

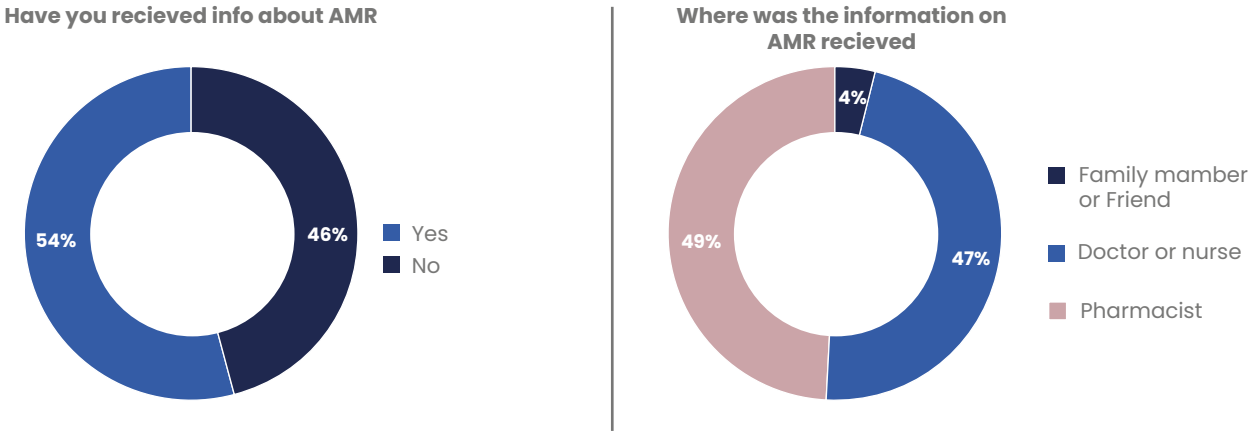


Figure 13: Knowledge of AMR shown by the general public in Madhya Pradesh

An average of 54% respondents received some sort of information on AMR. Out of the 54%, 49% received the information from their pharmacist, 47% from their doctor and the remaining 4% from their friends and family (See Figure 13).

Experiences with Healthcare Services

The majority of the respondents had suffered from a cold and flu in the past six months. Almost 80-90% visited the doctor; the ones who did not visit the doctor were believed to have taken antibiotics over the counter without a prescription. Of the majority who visited a doctor, almost 98% were prescribed antibiotics. 95% respondents never received any explanation from the doctor whenever antibiotics were demanded but were not prescribed. However, most respondents were told by their consulting doctor to complete the course, but weren't told about the side effects of the antibiotics prescribed.

Recommendations and Challenges

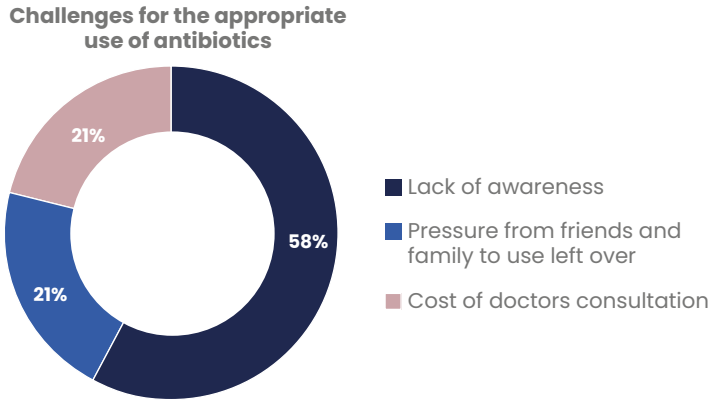


Figure 14: Challenges faced by the general public in Madhya Pradesh for the appropriate use of antibiotics

When asked if there should be stricter rules on the sale of antibiotics, 86% respondents were either apprehensive (40.6%) or unsure (46.8%). Lack of awareness, pressure from friends and family to use remaining medication and high cost of healthcare were a few reasons given as challenges for the appropriate use of antibiotics (See Figure 14). Consequently, the major recommendations from the surveyed population were the demand for clear information about antibiotics and continuous awareness campaigns.

4.2.2. Pharmacists

Behaviour analysis

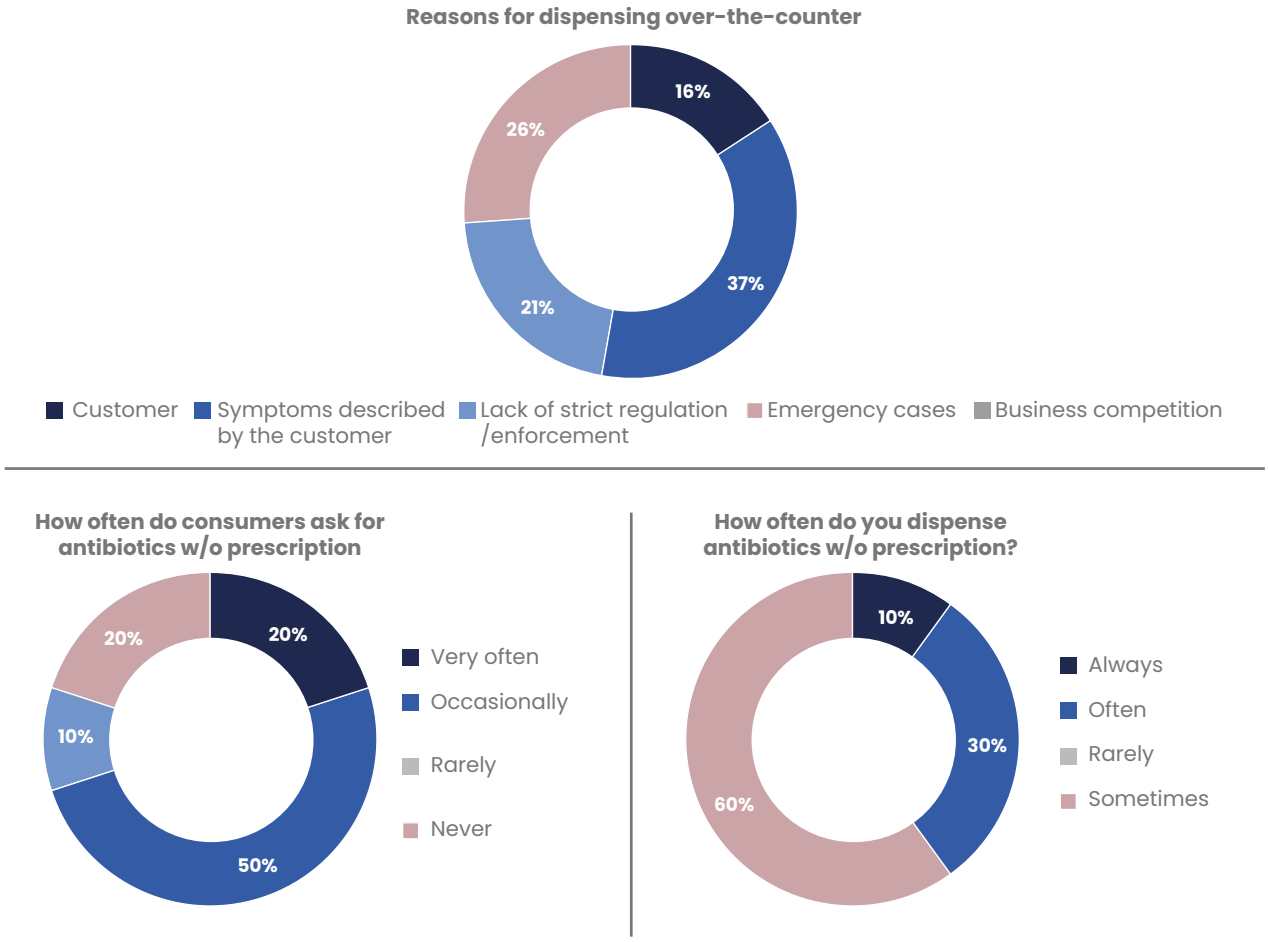


Figure 15: Experiences of pharmacists with customers in Madhya Pradesh

Of the total pharmacists surveyed, about 80% admitted to having encountered patients/consumers who demanded antibiotics without a prescription. The majority of the pharmacists (50%) said that such demands are occasional; however, none of the pharmacists surveyed denied dispensing antibiotics to consumers without a prescription (See Figure 15). This was despite all of them agreeing that over-the-counter sales of antibiotics are not beneficial for patients. Like in Delhi, pharmacists in Madhya Pradesh also do not take back expired antibiotics from the patients, but can give back expired unsold medicines to the wholesalers.

According to the respondents, parameters such as a patient's age, weight, allergies, medical history, duration of symptoms and guidelines from health authorities are all considered before prescribing antibiotics. Generic brands are more often prescribed than branded ones. Customer insistence, known symptoms, emergency and lack of enforcement were listed as reasons for pharmacists dispensing antibiotics over the counter. However, most respondents believed that the inability to consult a doctor is the primary reason for increasing demand for antibiotics without a prescription. Significantly, Amoxicillin and Penicillin were sold more frequently over the counter by the majority of pharmacists surveyed.

Compliance

Like in Delhi, respondents in MP also were unaware of the Red Line awareness campaign on AMR. Only 40% of the pharmacists were familiar with Schedule H1 medicines; the remaining 60% had heard of it but were not able to explain it. Despite the lack of awareness, all the pharmacists we surveyed kept a record of the medicines sold and had got it audited by the Drugs Inspectors at least once a year.

AMR awareness

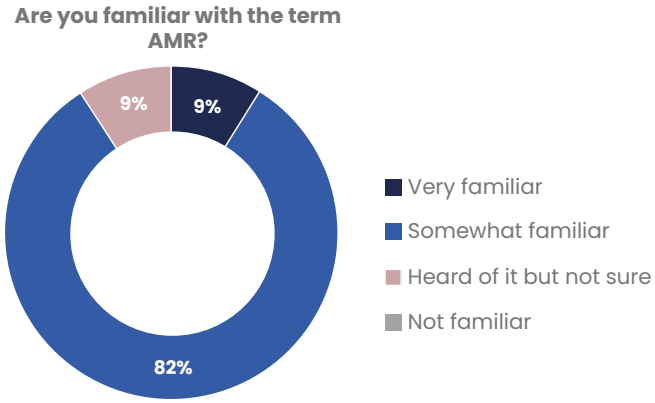


Figure 16: Pharmacists' familiarity with AMR

At least 82% of the respondents were somewhat familiar with the term "antimicrobial resistance" and 100% agreed that it is a public health threat (See Figure 16). However, 90% also believed that the indiscriminate use of antibiotics was not a significant cause of resistance in patients. All the respondents were unaware of the side effects of antibiotics and hence never advised or informed patients about the same.

Challenges and recommendations

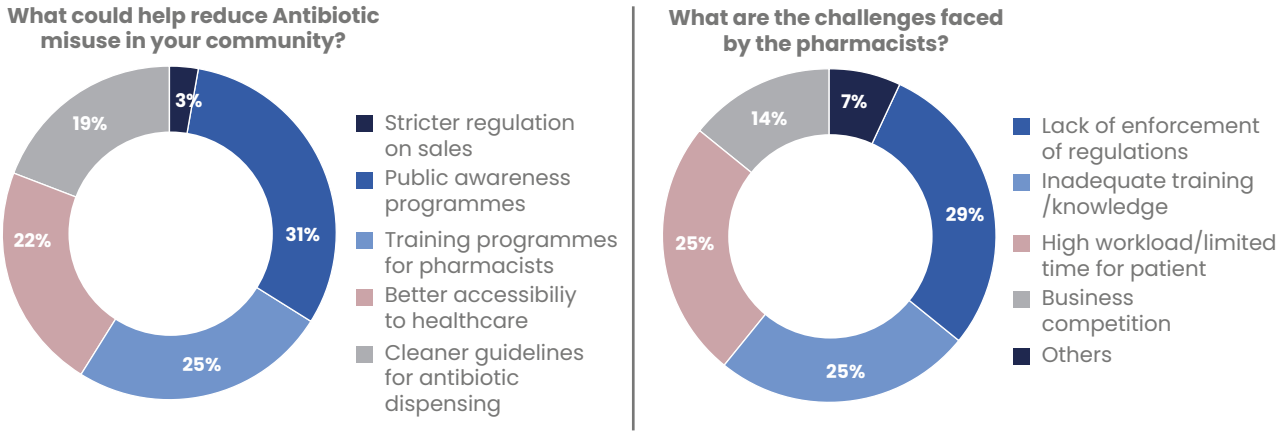


Figure 17: Challenges and recommendations according to pharmacists in Madhya Pradesh

In Betul and Bhopal, Amoxicillin and Penicillin are some of the most sold antibiotics. About 40% of the respondents observed an increase in sales of antibiotics over the years. When asked what could help reduce antimicrobial misuse in the community, respondents listed stricter regulations, public awareness programmes, training programmes for pharmacists, better access to healthcare facilities and clearer guidelines as some of the solutions to the problem. The pharmacists believe that lack of regulatory enforcement, inadequate training, high workload load and persistent business competition are challenges which prevent them from promoting the rational use of antibiotics (See Figure 17).

4.2.3. Clinicians

Awareness and Prescription of Antibiotics

All the clinicians surveyed were very familiar with antimicrobial resistance and admitted to prescribing antibiotics to one in five patients. Of them, 90% faced situations where patients insisted on being prescribed antibiotics even when not necessary. Despite that, 100% of respondents believed that the indiscriminate use of antibiotics in humans, plants and animals was not a primary reason for antimicrobial resistance. When asked for the probable reasons, 90% of the clinicians believed that time constraint for patient consultations were the main driver for antibiotic overuse/misuse in their clinical settings and that overprescribing was not one of these drivers. While 80% of the clinicians used antibiogram for prescribing antibiotics, all of them said they had observed cases of resistant infections in their professional capacity.

Antimicrobial stewardship

Ninety per cent of the clinicians surveyed had participated in antibiotic stewardship training. All of them were very aware of the AWaRe classification of antibiotics but did not use the classification in their clinical practice, as none of them believed that it would aid in rationalising prescription. Patients of the clinicians are given counselling on the proper use of antibiotics but not on disposal methods.

Research and Management

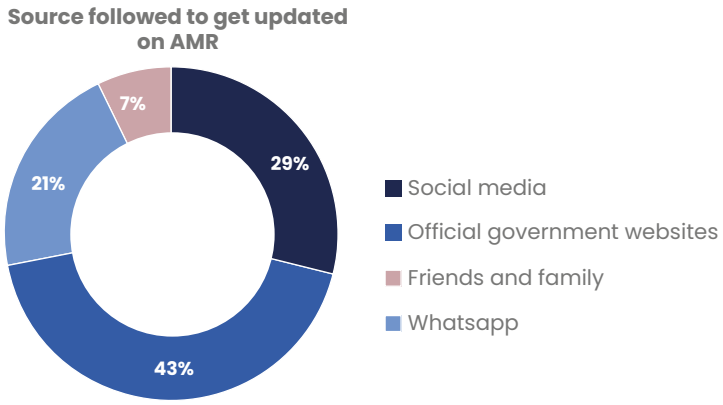


Figure 18: Sources utilised by clinicians in Madhya Pradesh to learn about AMR

All the clinicians surveyed were a part of a specialised doctors' association, e.g. paediatrics or physicians, etc. However, information on AMR was primarily received by the doctors through the Indian Medical Association (IMA). All the respondents followed and kept themselves updated on the State and Centre's policies on AMR containment and depended on government websites, social media, WhatsApp groups and friends and family for information (See Figure 18).

AMR containment policy and Clinical care

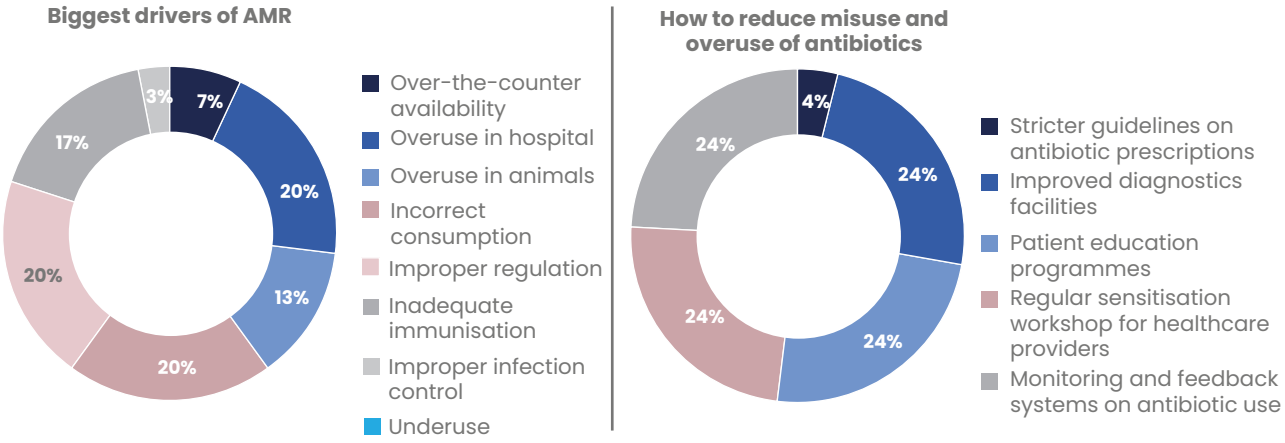


Figure 19: Challenges and recommendations according to clinicians in Madhya Pradesh

All clinicians believe that AMR is a major public health problem in India. Pressure from patients, inadequate diagnostic support, insufficient training on AMR, high patient volume/time and lack of institutional support were quoted as major drivers of this public health issue. According to the respondents, all including doctors, pharmacists, governmental bodies, civil society and the general public are equally responsible for spreading information on the use and misuse of antibiotics. The medical health professionals surveyed said high cost and limited availability of antibiotics, lack of insurance coverage, inadequate healthcare infrastructure and lack of regulatory enforcement were major barriers to patients' access to essential antibiotics. They also believed that stricter guidelines on antibiotics, improved diagnostic capabilities, patient education programmes, sensitisation workshops and monitoring and feedback systems could be a solution to the misuse and overuse of antibiotics in the community (See Figure 19).

4.3 Kerala

4.3.1 Consumers

Knowledge about antibiotics

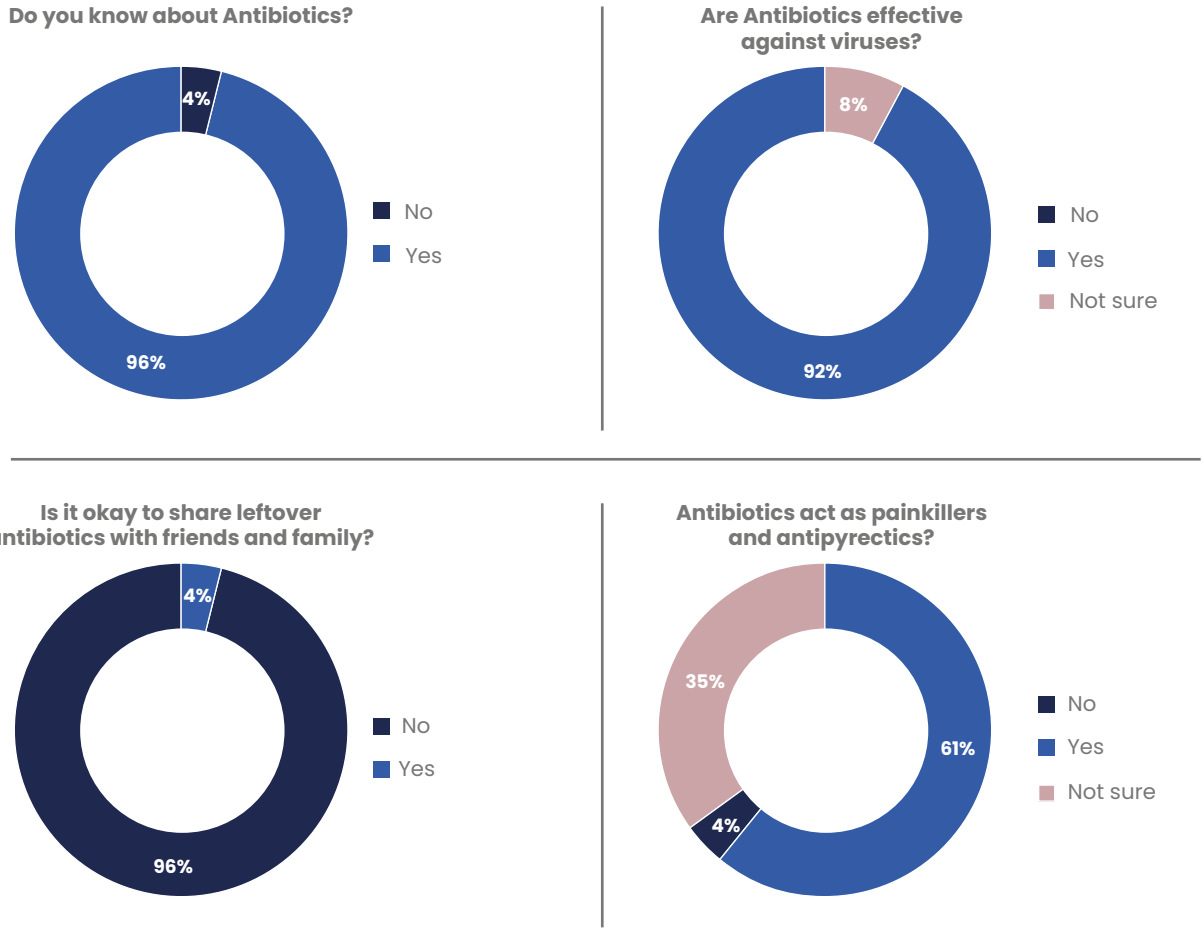


Figure 20: Awareness about antibiotics in the general public of Kerala

When the respondents were directly asked if they knew about antibiotics, a majority of 96% responded positively while 92% said they had been prescribed antibiotics in the past year. Of the respondents who had antibiotics in the past year, all of them sourced their medicines from a clinic or a pharmacy after being prescribed by a doctor, and nearly 88% completed their course as directed while 12% stopped medication after they felt better.

To assess the level of their understanding about antibiotics, when consumers were asked questions, 89% said they believed that antibiotics treat bacterial infection. However, 92% also believed that it can be used to treat viral infections, including 73% who thought it was effective against cold and cough. Although a large majority of respondents (70-90%) believed that antibiotics should be taken as per the instructions of the doctor and shouldn't be shared with pets, family and friends, misconceptions—such as the belief that antibiotics acted as painkillers and antipyretics (61%) —remained (See Figure 20).

Knowledge on AMR

Only 65% of the respondents had information on antibiotics and AMR, 4% did not receive any information, and 31% were unsure if they had been given information at all. Of the 65% informed respondents, the majority received this information from family and friends, healthcare professionals, pharmacists and some from newspapers and TV (See Figure 21).

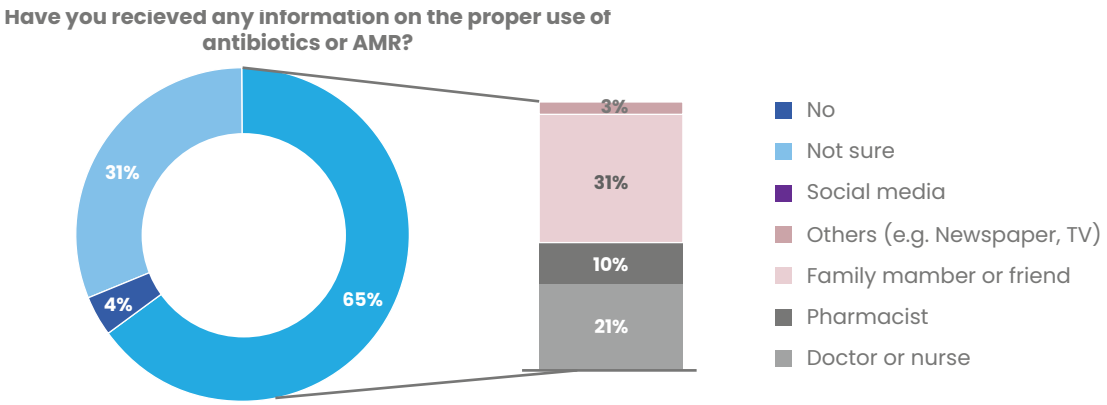


Figure 21: Consumers' knowledge on AMR in Kerala

Experiences with healthcare

All respondents reported having had symptoms of cold and flu in the year prior to the survey. However, only 42% sought treatment from a doctor, and among them, just 35% were prescribed antibiotics. Only 1% of those prescribed antibiotics were informed about their side effects, including the risk of AMR.

Of the 58% who did not seek medical care, most relied on home remedies, traditional medicine, homoeopathy, or over-the-counter medications. Notably, two respondents admitted to using leftover antibiotics.

4.3.2 Pharmacists

AMR awareness

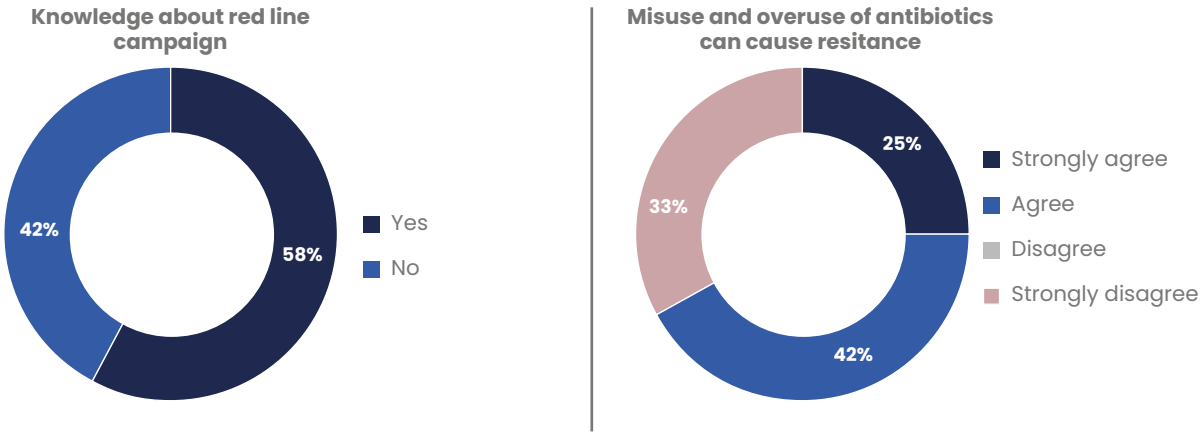


Figure 22: AMR awareness in pharmacists of Kerala

All pharmacists surveyed acknowledged that antibiotics are essential for treating infections. However, over 80% admitted that antibiotics can cause side effects. Among them, 75% agreed that antibiotics can disrupt normal gastric flora, and 66% recognised that misuse or indiscriminate use can lead to resistant infections.

Despite some level of awareness, 50% of pharmacists still believed that antibiotics are effective for treating common cold and cough. Additionally, 33% did not believe that misuse of antibiotics contributes to AMR, indicating persistent gaps in understanding (See Figure 22).

Over-the-counter sales

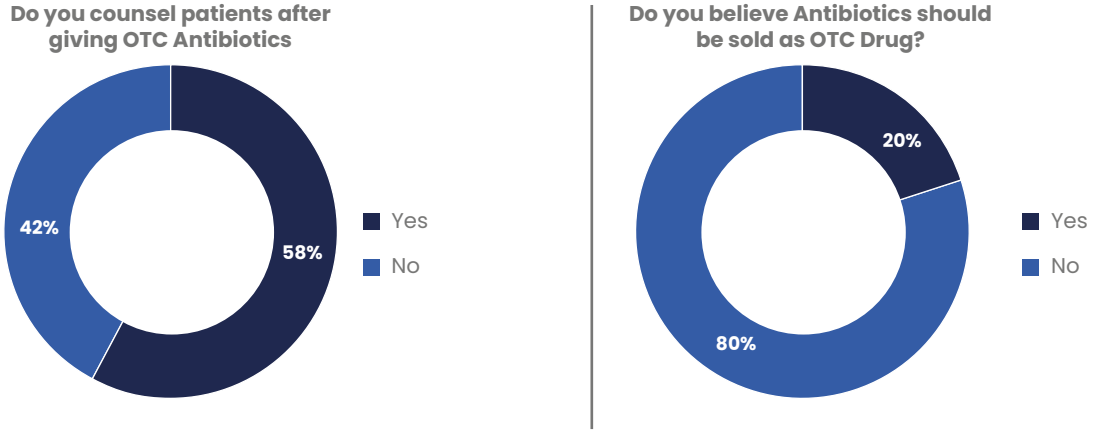


Figure 23: Over-the-counter sales of antibiotics in Kerala

When asked about their understanding of "over-the-counter (OTC)", 67% of pharmacists correctly identified that OTC drugs. Different from prescription medications, OTC medications can be dispensed without a prescription from a registered medical practitioner. 80% completely opposed the idea of selling antibiotics over the counter, and further 60% expressed apprehension in dispensing antibiotics based solely on patient demand, without a valid prescription (See Figure 23).

While 75% of respondents believed that high dosages of OTC medication could be dangerous, however, only 58% reported counselling customers on the potential side effects of antibiotics.

Compliance

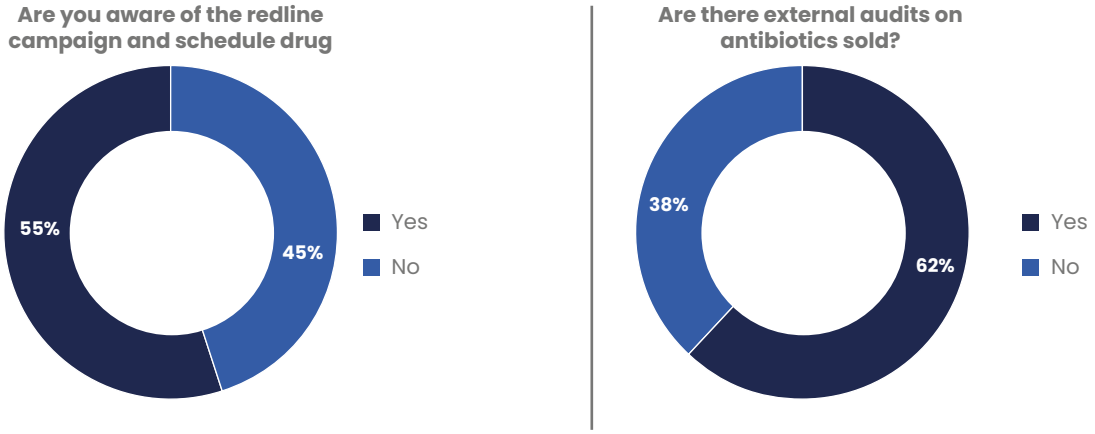


Figure 24: Pharmacists' compliance with regulations

Only 55% of pharmacists were aware of the Red Line campaign and Schedule H drug regulations, and maintained registries for Schedule H drugs sold. However, only 62% reported undergoing audits related to the sale of these drugs, indicating the need for strict monitoring and enforcement (See Figure 24).

Disposal

All pharmacists stated that expired or unsold antibiotics could be returned to wholesalers or distributors. However, there were no established systems for the return or disposal of leftover antibiotics by consumers. None of the pharmacists surveyed accepted expired or unused antibiotics from customers, highlighting a critical gap in safe antibiotic disposal practices.

4.3.3 Clinicians

Awareness and Prescription of Antibiotics

All clinicians agreed that indiscriminate use of antibiotics in humans, plants, and animals leads to antimicrobial resistance, followed by misuse of broad-spectrum antibiotics and a lack of rapid diagnostic tests. While 50% of the respondents showed confidence that antibiotics are inappropriately prescribed in India, almost all clinicians agreed that patients' demand for antibiotics was a major challenge in promoting judicious application of antimicrobials.

67% of clinicians who were surveyed agreed that AMR is a major public health crisis and listed OTC sales of antibiotics, overuse in hospitals, improper infection control, and underuse as the biggest causes of AMR in India (See Figure 25). All the respondents routinely counselled their patients on the proper use of antibiotics, but none had posters or IEC materials for patients.

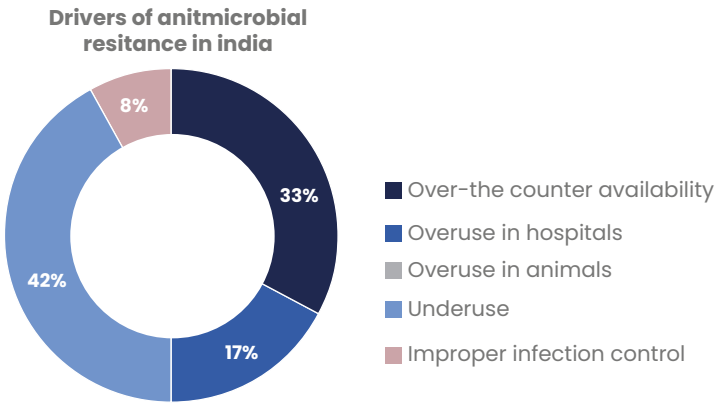


Figure 25: Drivers of AMR according to clinicians in Kerala

Antimicrobial stewardship

None of the clinicians were trained in antimicrobial stewardship. As a result, half of the respondents were unaware of AWaRe's classification of antibiotics and antibiogram programmes or other methods to prevent misuse of antibiotics in the clinical setting. Moreover, one-third of the respondents did not receive any training on PPE, BMW, or infection control.

4.4. Andhra Pradesh

4.4.1. Consumers

Knowledge about antibiotics

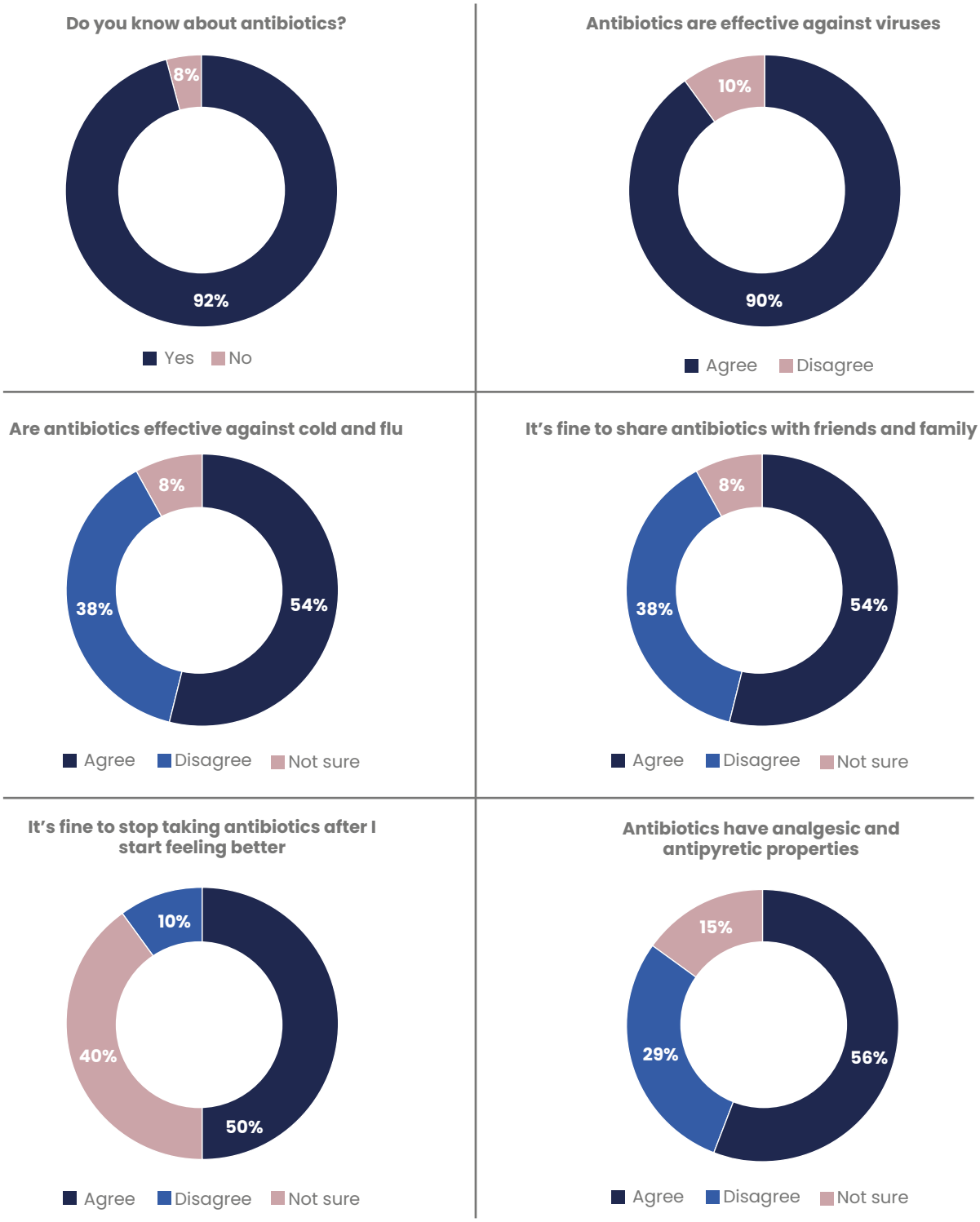


Figure 26: Awareness about antibiotics in the general public of Andhra Pradesh

Of the general public surveyed, 92% knew about antibiotics. Upon further questioning, it was observed that 93% of the respondents who knew about antibiotics believed that antibiotics could cure and prevent any illness or infection, including viral infections. A majority (56%) also assumed that antibiotics had analgesic and antipyretic properties. Consequently, 54% of the respondents believed it was a viable treatment for colds and infections. Respondents were

also divided when asked about the importance of completing the course or sharing antibiotics with friends and family (See Figure 26). Nearly 50% of people surveyed believed it was okay to stop taking antibiotics after they felt better, and a little more than half claimed it was okay to share antibiotics with friends and family. Similar to Delhi and Madhya Pradesh, a majority (50%) believed that throwing antibiotics in the trash was a proper method of disposal of antibiotics. Additionally, 30% proposed turning it into powder and dispersing it on plants as another solution.

Usage and behaviour towards antibiotics

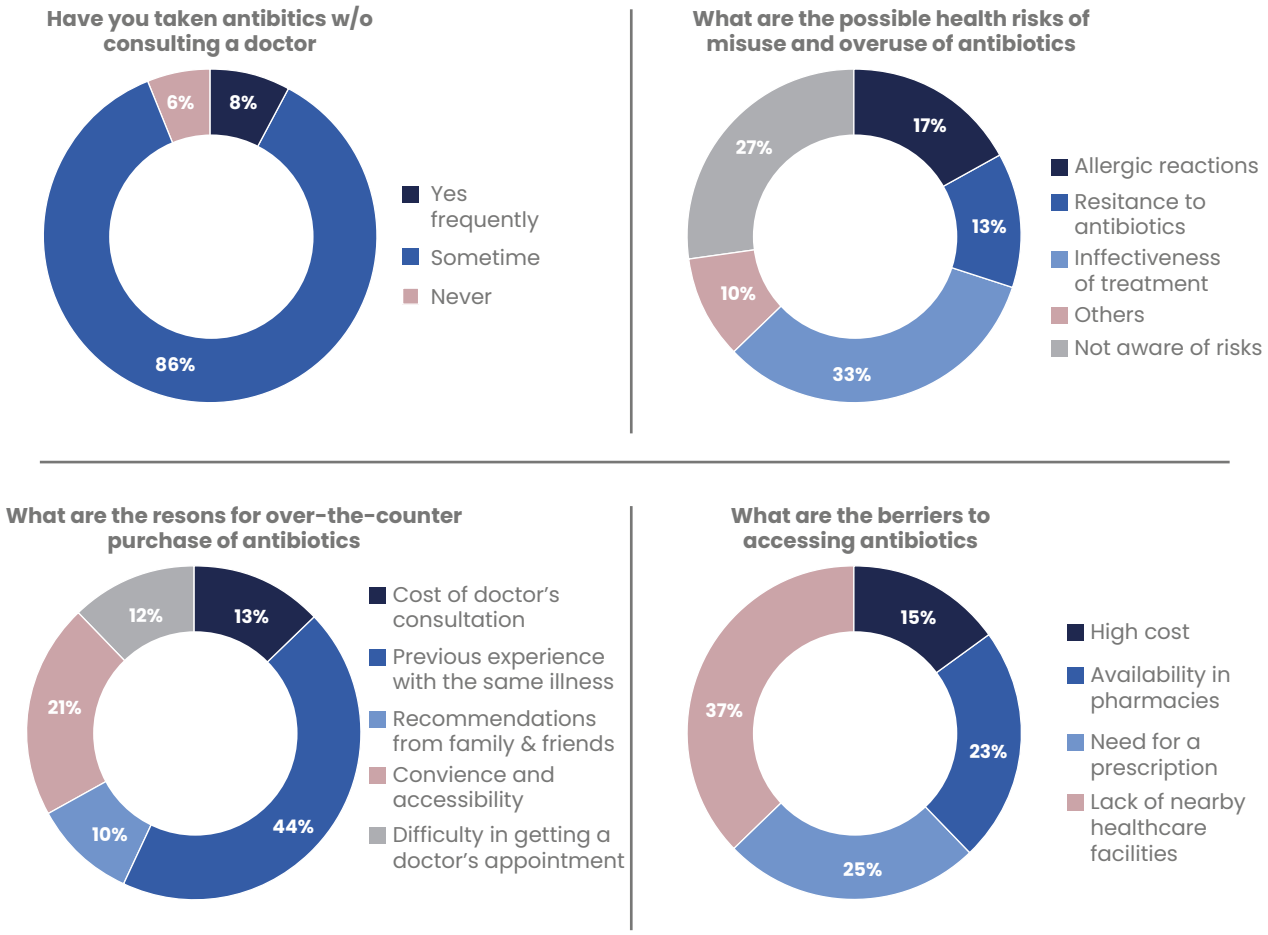


Figure 27: Behaviour and experiences of the general public with antibiotics in Andhra Pradesh

Eight-six per cent of respondents admitted to sometimes taking antibiotics without a doctor's prescription, though they were aware that having antibiotics without medical advice could be harmful. The respondents were well aware of the risks related to the misuse of antibiotics and listed allergic reactions, resistance to antibiotics and ineffectiveness of treatments as a few of them. Likewise, 76% of people admitted to buying antibiotics without prescriptions from pharmacies. They listed previous experience with the illness, convenience and accessibility as the primary reasons for acquiring antibiotics over the counter, followed by high consultation fee and inability of getting an appointment with a doctor. Accessibility and affordability of antibiotics are not a challenge for 78% of the respondents and their community, as they had either never faced issues or had only rarely faced them (See Figure 27). However, lack of a nearby healthcare facility, pharmacies, and a doctor's prescription are barriers to accessing antibiotics.

Knowledge of AMR

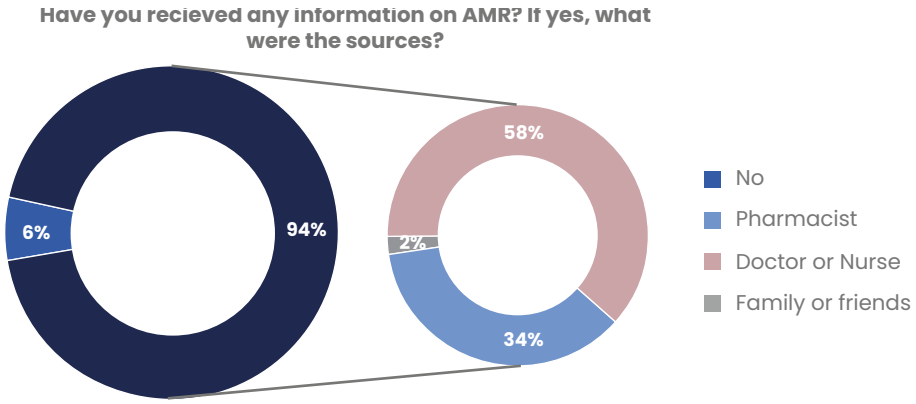


Figure 28: Knowledge of AMR shown by the general public in Andhra Pradesh

Of the respondents, 94% had received some information on antimicrobial resistance. Of these 94%, 58% received it from doctors and nurses, 34% through pharmacists and 2% from friends and family (See Figure 28).

Experiences with Healthcare Services

All the people surveyed had experienced symptoms of cold and flu 7-8 months before the survey, and 83% visited the doctor for treatment. The 17% who did not go to the doctor took traditional remedies or over-the-counter medicines. Of the people who visited the doctor, 91% were prescribed antibiotics and were mostly informed of antimicrobial resistance and other side effects of antibiotics (75%). However, 65% explained that they were not specifically told by the doctor to complete their antibiotic dosage. When asked if respondents had ever faced a situation where antibiotics were unaffordable or unavailable, 43% admitted to having experienced not being able to afford antibiotics.

Recommendations and Challenges

The general public participating in the survey unanimously agreed that there should be stricter rules about buying antibiotics without a prescription, that lack of awareness was a monumental challenge in the appropriate use of antibiotics and that more people should adhere to a doctor's consultation rather than relying on pharmacists or medical shops.

4.4.2. Pharmacists

Behaviour analysis

All pharmacists surveyed had customers who asked for antibiotics without a prescription. Most pharmacists faced this either occasionally or very often (See Figure 29). As a result, most pharmacists (46%) dispensed antibiotics over the counter every time the demand was made. Sixty-three per cent agreed that OTC sale was beneficial for the patients. Amoxicillin was the antibiotic sold most frequently over the counter. When asked which types of antibiotics they sold—branded, generic or cheaper alternatives—64% admitted to selling branded antibiotics. Criteria such as the consumer's age, weight, allergies, severity of symptoms and duration of symptoms are taken into consideration before antibiotics are dispensed. The symptoms described by the customers were named as the primary reason for over-the-counter sales made by the pharmacists, followed by customers' insistence and lack of strict regulations (See Figure 29). In the opinion of the pharmacists surveyed, lack of awareness and previous experience with similar symptoms were the primary reason for consumers asking for antibiotics OTC. They unanimously agreed that pharmacists don't play a critical role in preventing the misuse of antibiotics.

None of the pharmacists surveyed took back used antibiotics from patients, and only gave back their leftover antibiotics to the wholesalers.

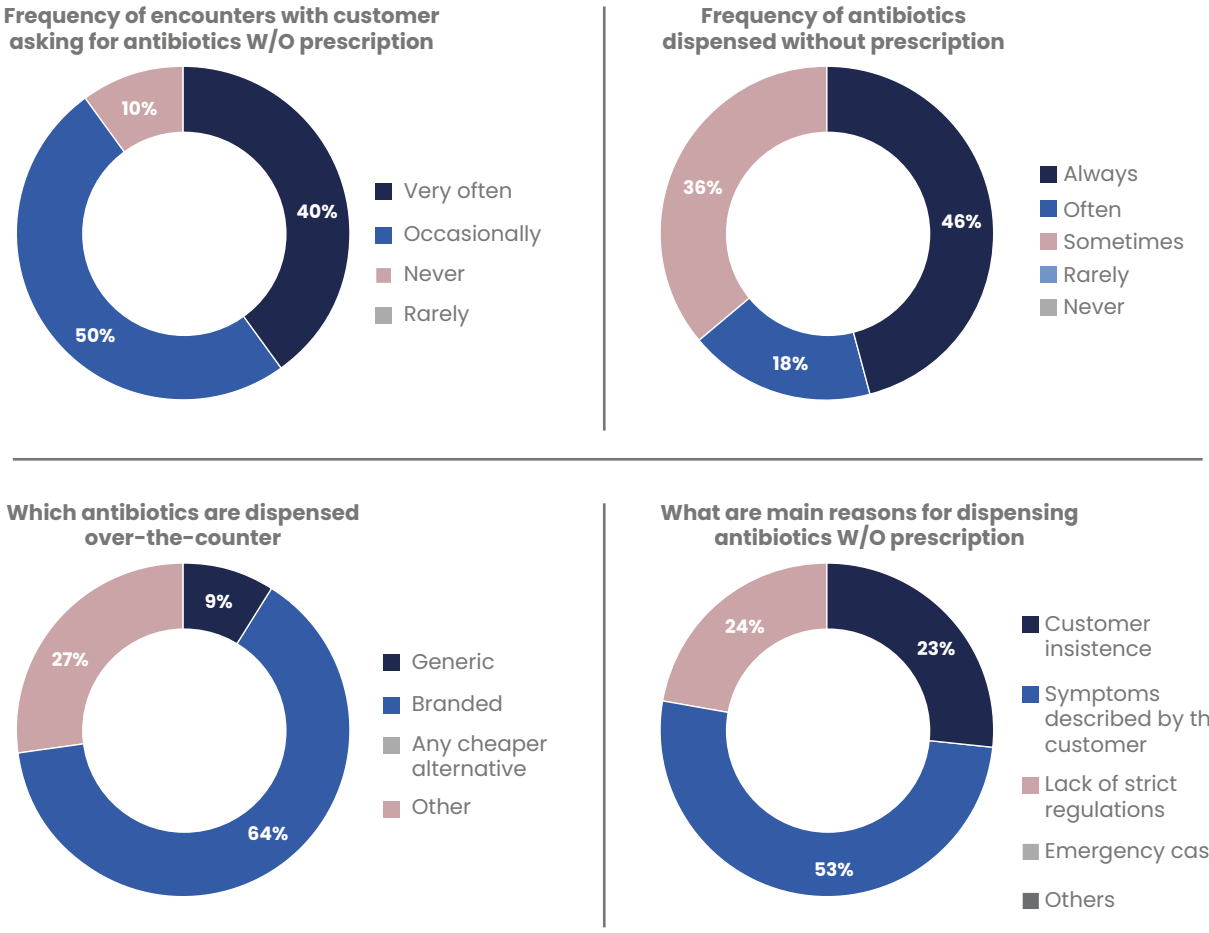


Figure 29: Behaviour and experience of pharmacists in Andhra Pradesh

Compliance

Close to 46% of the respondents were very familiar with the Schedule H1 medicines, and a small minority of 9% were completely unaware of what it meant. At least 63% of the pharmacists admitted to not having any record of Schedule H medicines being sold, and around 45% never got their records audited. Those who got their records audited had theirs done more than a year or six months ago.

AMR awareness

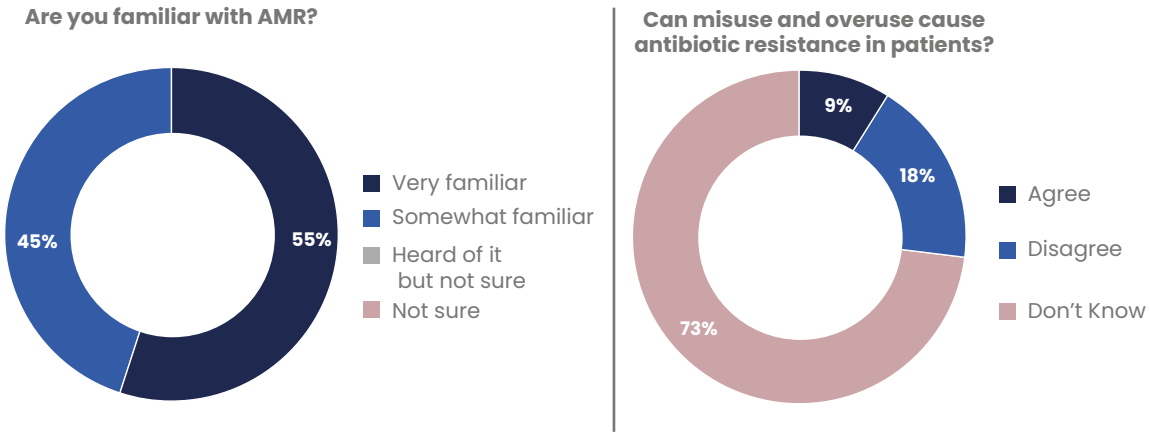


Figure 30: Pharmacists' knowledge on AMR

All the pharmacists had some knowledge about the term “Antimicrobial Resistance”. All of them believed that it is a public health threat, but were largely unaware whether misuse and overuse of antibiotics are a cause of AMR (See Figure 30). All the respondents knew the side effects of antibiotics and communicated the same to their customers.

Challenges and recommendations

About 20-30% of the total antibiotics were sold over the counter. Amoxicillin, Doxycycline, and Penicillin were the few antibiotics sold the most and none of the respondents (surveyed shops) observed an increase in antibiotic sales. According to the pharmacist surveyed, stricter regulations on antibiotics sales, public awareness programmes and training programmes for pharmacists could help reduce antibiotics misuse. At present, the main challenges for pharmacists are pressure from customers and a lack of regulatory enforcement.

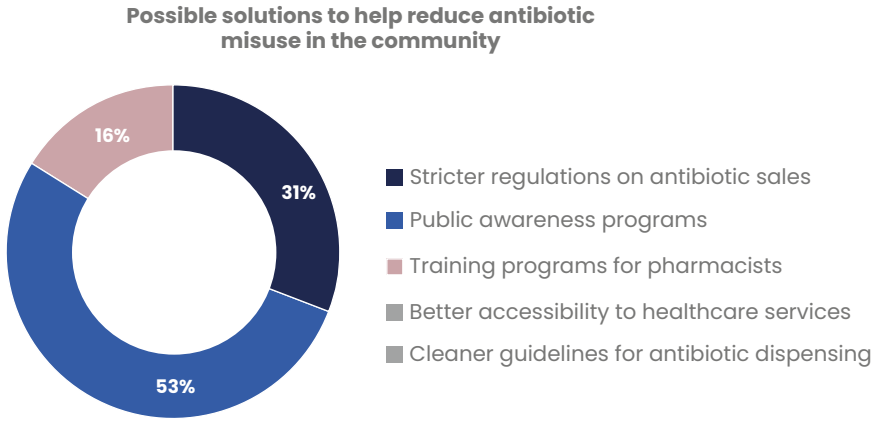


Figure 31: Recommendations to help reduce antibiotic misuse in Andhra Pradesh

4.4.3. Clinicians

Awareness and Prescription of antibiotics

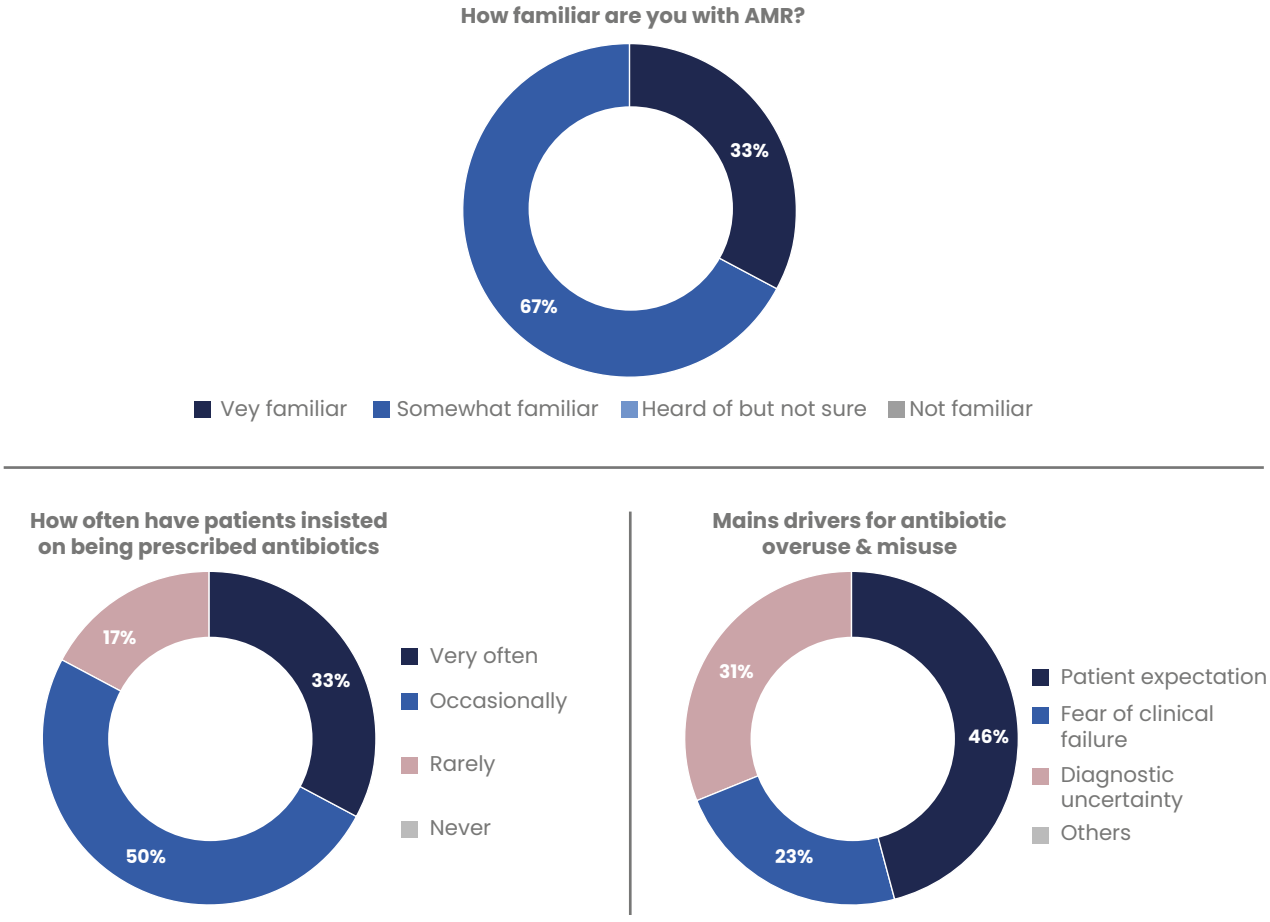


Figure 32: Knowledge and prescription practice of clinicians in Andhra Pradesh

All clinicians were familiar with the term “Antimicrobial Resistance”. Most of them prescribed antibiotics to one in five patients and have faced situations where patients themselves insisted on being prescribed antibiotics. All of them accepted that indiscriminate use of antibiotics in humans, plants and animals leads to antimicrobial resistance. The doctors listed patient expectations, fear of clinical failure and diagnostic failure as the main drivers for antibiotic overuse/misuse in clinical settings (See Figure 23). As a result, all respondents unanimously agreed that antibiotic resistance is a result of over-prescribing and misuse. Over 50% used antibiograms always for the prescription of antibiotics. Last resort antibiotics such as Colistin and Polymyxin B were prescribed regularly. All the clinicians surveyed had observed cases of resistant infections.

Antimicrobial stewardship

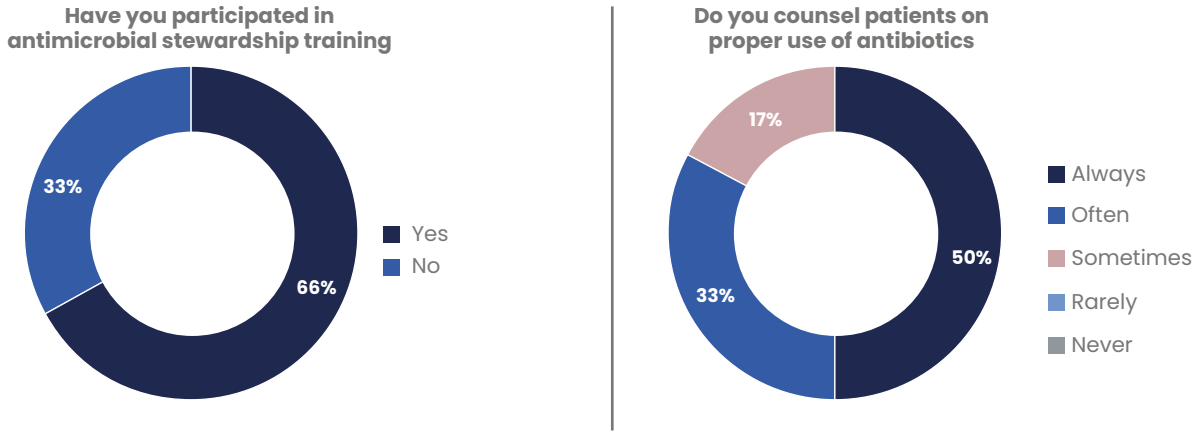


Figure 33: Antimicrobial stewardship in Andhra Pradesh’s clinical settings

Over 67% of the clinicians surveyed had attended antimicrobial stewardship training, but all were aware of the AWaRe classification of drugs and knowingly referred to it in their clinical practice. While 83% of the clinicians counselled their patients on proper disposal of antibiotics (See Figure 33), almost all clinicians admitted to educating their patients on the appropriate use of antibiotics.

Management and Research

Only 50% had been trained in PPE, BMW management and infection control. The trained clinicians had last received training 2-3 years ago. All the doctors surveyed were a part of a medical association; however, respondents were unsure if the association discussed AMR. A majority of the respondents received information regarding AMR via IMA and updated themselves on State and Central policies on AMR. For a large majority, the IMA website was the biggest source of information on the matter.

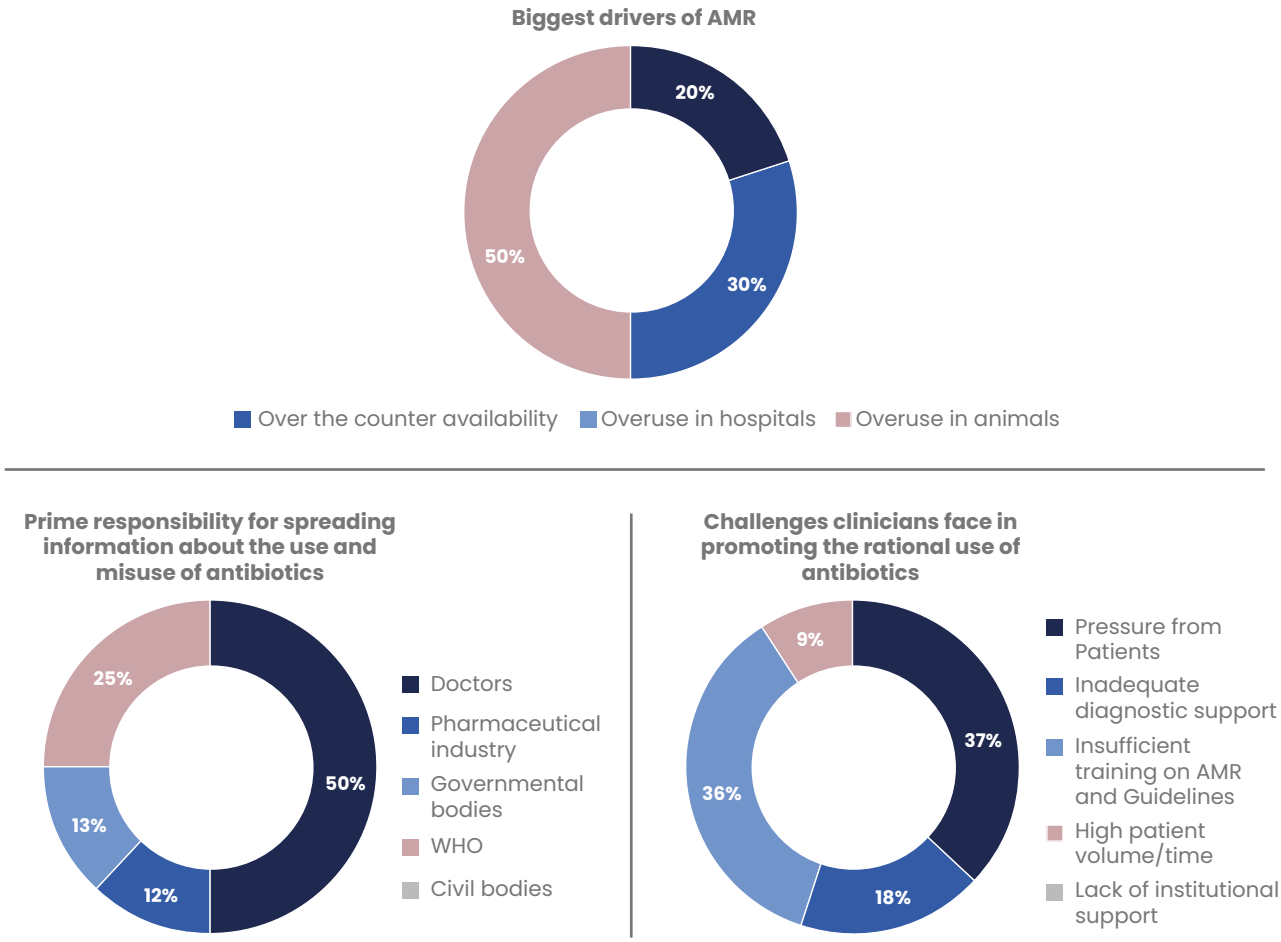


Figure 34: AMR in clinical settings in Andhra Pradesh

All clinicians agreed that AMR is a public health threat. The major drivers of AMR listed by them were overuse in animals and hospitals, and the sale of over-the-counter antibiotics. The respondents further admitted that resistance is observed in most of the infection cases. All clinicians believe that antibiotics are inappropriately prescribed in India and that patients' demand for antibiotics contributes to this. According to the respondents, doctors, WHO, and the pharmaceutical industries have the responsibility of sharing information about the misuse and overuse of antibiotics. In their opinion, the high cost of antibiotics, limited availability and lack of insurance coverage are major barriers to their patients' access to essential antibiotics. Respondents share that stricter guidelines on antibiotic prescription, improved diagnostic facilities, patient education programmes and sensitisation workshops for healthcare providers could be possible solutions to reduce the misuse of antibiotics in clinical settings.

4.5. Haryana

4.5.1. Consumers

Knowledge about antibiotics

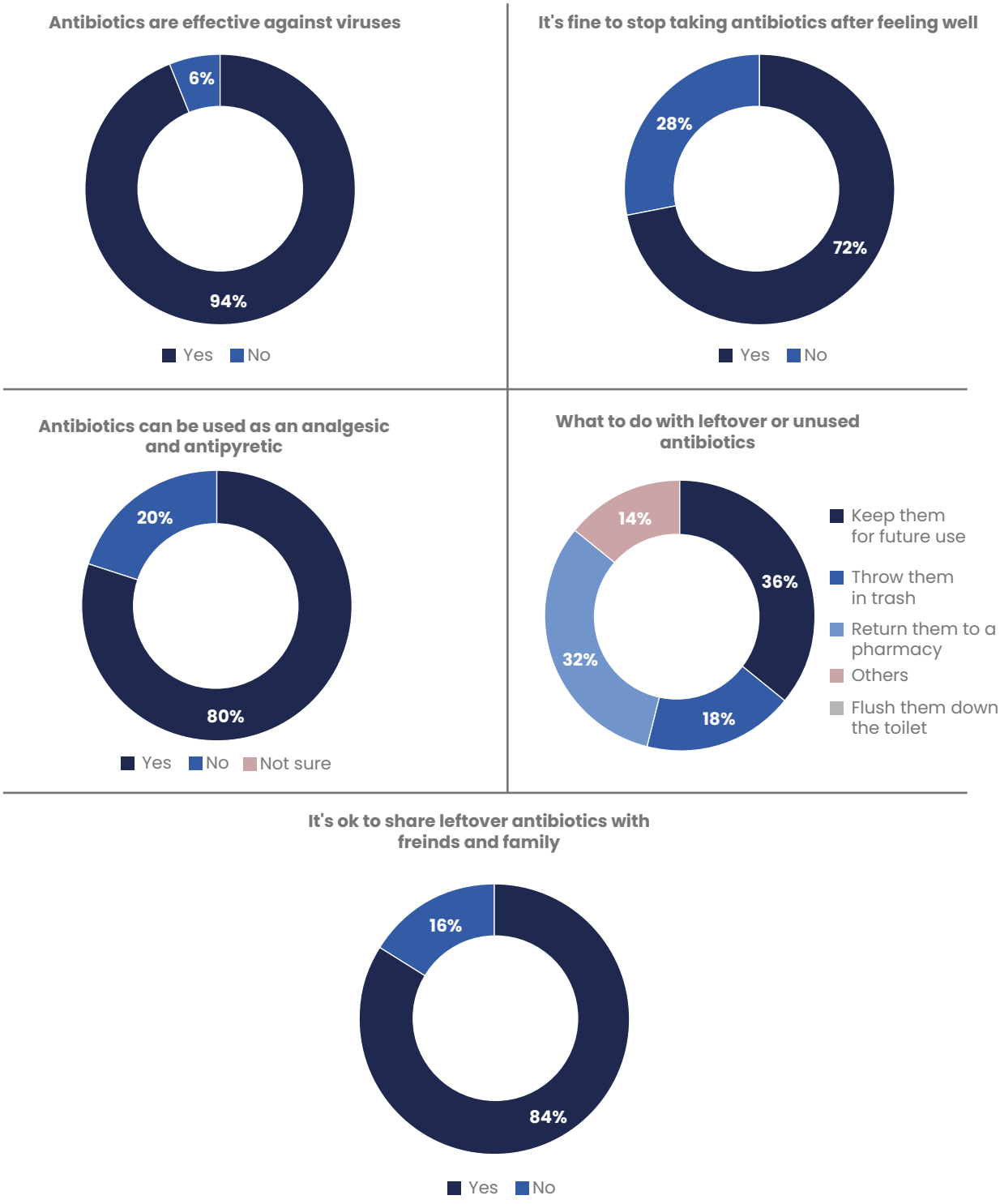


Figure 35: Awareness about antibiotics in the general public of Haryana

All of the respondents believed they had some knowledge of antibiotics. However, when asked how it works, all of them believed that antibiotics worked to prevent infections and should be used in case of all kinds of fevers. Some of them (72%) were also convinced that antibiotics acted as painkillers and antipyretics. When asked if they thought antibiotics were effective against viruses, 94% responded positively and added that it was also a pertinent method of treatment for cold and flu (98%). Close to 50% of respondents believed that antibiotics were harmless, 80% believed that it was okay to halt the antibiotic course when they felt better, and 84% thought that it was normal to share antibiotics with friends

and family. While 60% of respondents believed they knew how to dispose of antibiotics, the disposal methods they mentioned were – throwing them in the trash, flushing them down the toilet, returning them to the pharmacy, or storing them for future use (See Figure 35).

Usage and behaviour towards antibiotics

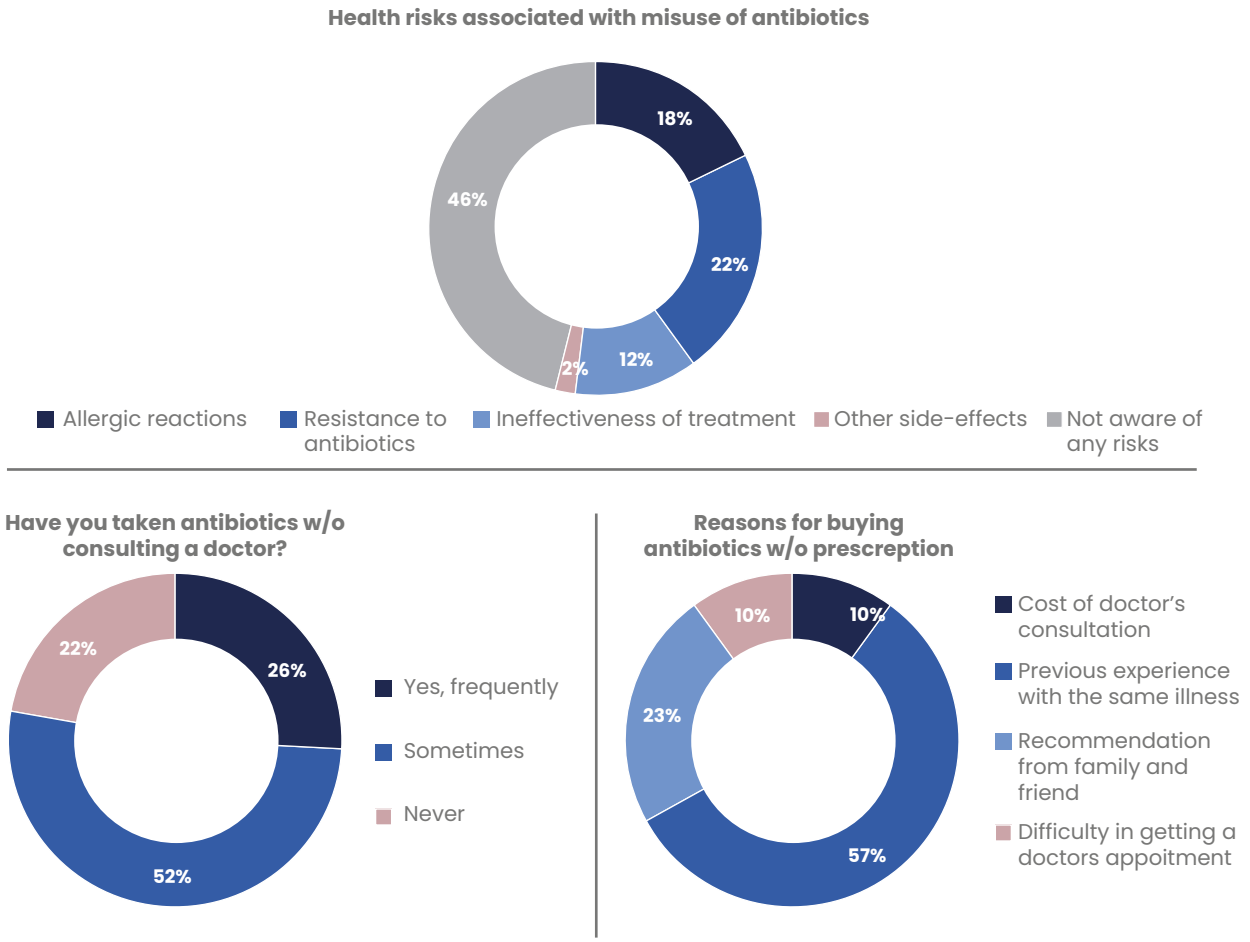


Figure 36: Consumer usage and behaviour towards antibiotics in Haryana

78% of the respondents surveyed admitted to having taken antibiotics without consulting a doctor, despite 60% agreeing that it was necessary to consult a doctor before taking antibiotics, and only 48% believing that taking antibiotics without medical advice can be harmful, without knowing the health risks associated with the misuse of antibiotics. When asked for reasons for purchasing antibiotics over the counter, respondents listed previous experiences with the same symptoms, recommendations from family and friends, high cost and unavailability of doctors as some primary drivers. Affordability did not have a huge impact on altering their or their community's accessibility to essential antibiotics, as 60% admitted these instances were rare. However, they also believed that affordability was a primary determining factor of their accessibility to antibiotics, along with a lack of healthcare facilities and the need for a prescription (See Figure 37).

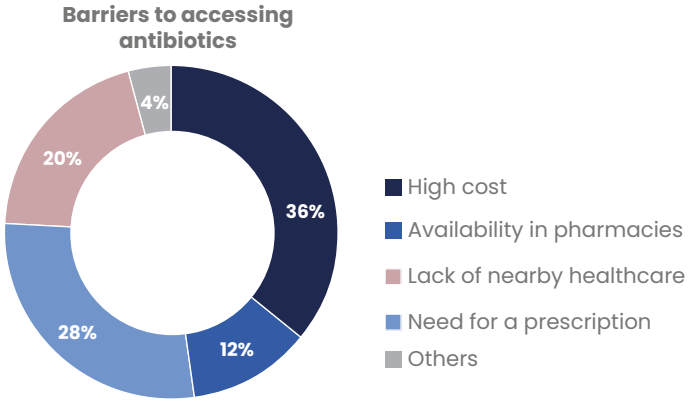


Figure 37: Barriers to accessing antibiotics in Haryana, according to respondents

Knowledge of AMR

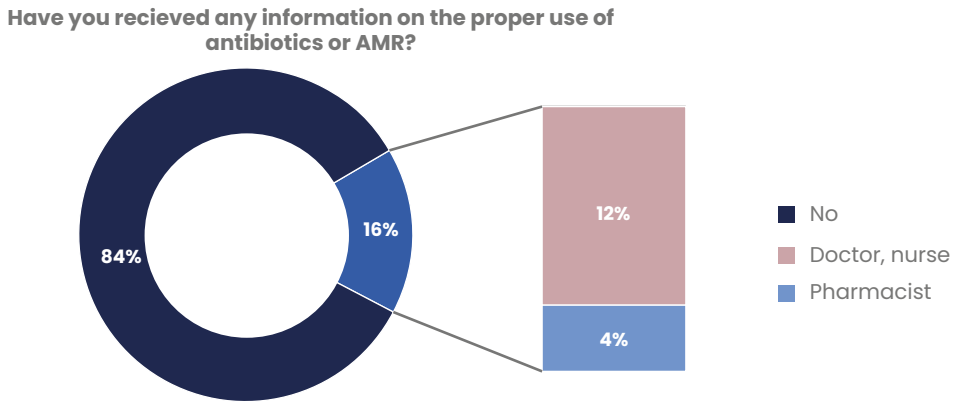


Figure 38: Knowledge of AMR and sources of information utilised by consumers in Haryana

A majority of the respondents (84%) never received any information on the proper use of antibiotics, and the remaiming 16% received information from doctors, nurses or pharmacists (See Figure 38).

Experiences with Healthcare Services

Most respondents had flu and cold-like symptoms last year before the survey. While 32% visited a doctor, 68% did not. Of the majority who did not see a doctor, 40% took leftover antibiotics, 32% took traditional medicines, and 14% took over-the-counter medicines. Of the people who visited the doctor, all of them were given antibiotics, and only half of them were given information on the side effects of antibiotics, but almost all were specifically told to complete their course.

Recommendations and Challenges

Unlike in the states mentioned above, 62% of the people surveyed in Haryana believe that there shouldn't be stricter rules about buying antibiotics without a prescription. A majority believed that the cost of doctors' consultations, pressures from family and friends and lack of awareness were challenges they faced in the appropriate use of antibiotics. The respondents suggested online campaigns, educational programmes in schools, and awareness efforts by doctors as measures to address AMR.

4.5.2 Pharmacists

Behaviour analysis

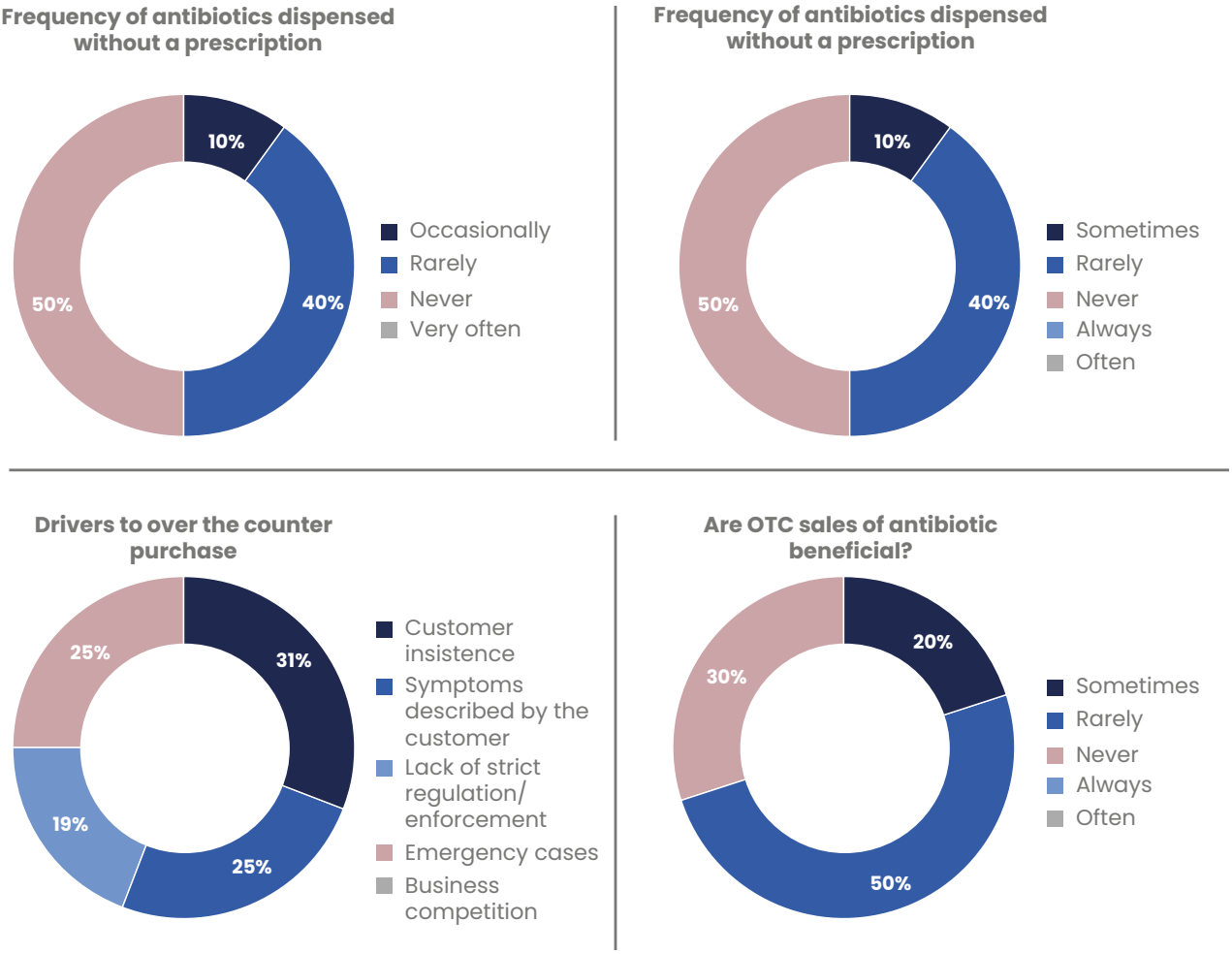


Figure 39: Antibiotics dispensing practices adopted by pharmacists in Haryana

Very few pharmacists reported encountering customers who asked for antibiotics without a prescription (See Figure 39). However, when such requests were made by the consumers, 50% admitted to dispensing antimicrobials without a prescription, despite having received training on over-the-counter medication guidelines. Among the antibiotics sold OTC, Amoxicillin and Penicillin were the most commonly dispensed.

All respondents agreed that OTC sales of antibiotics provided some benefit to patients. When asked about the common reasons behind such purchases, the most frequently cited factor was the customer's prior experience with the antibiotic (See Figure 39). This was followed by the inability to consult a doctor, lack of awareness, and occasional recommendations from family or friends.

Around 70% of pharmacists believed that their customers lacked sufficient knowledge about the risks associated with self-medication with antibiotics. Additionally, more than half of the respondents preferred selling branded antibiotics over generic or cheaper alternatives. Before dispensing antibiotics, pharmacists considered factors such as the consumer's age, weight, allergies, medical history, severity of symptoms, and duration of illness.

Customer insistence was identified as the primary reason for dispensing antibiotics without a prescription, followed by symptoms described by the customer, lack of strict regulatory enforcement, and emergencies. None of the surveyed establishments accepted expired medicines from customers, although most returned their own unsold, expired antibiotics to the manufacturers.

Compliance

More than 80% of the respondents were very familiar with the Red Line Campaign and Schedule H1 medicines. However, only 70% of the respondents kept full records of Schedule H medicines being sold and had their sales audited. For most of the pharmacists surveyed, these audits were conducted six months or not more than a year ago.

AMR awareness

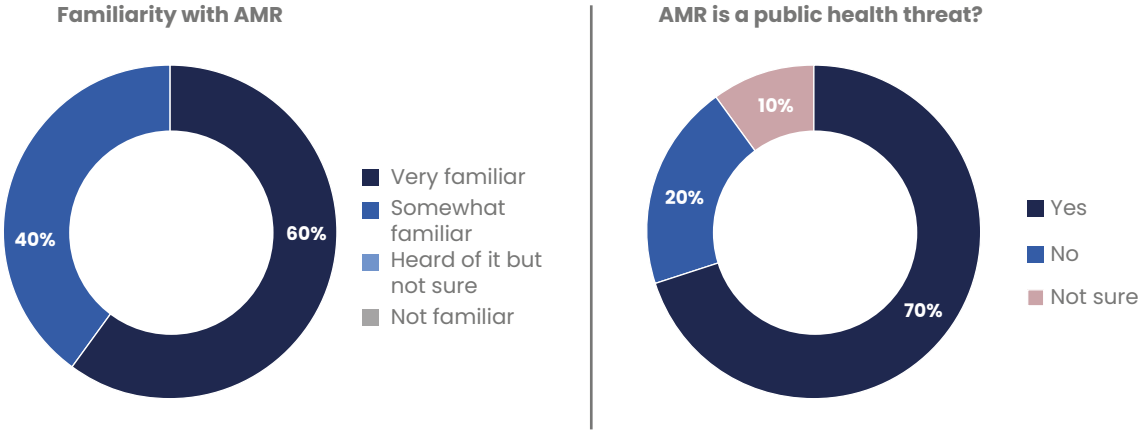


Figure 40: AMR awareness in pharmacists in Haryana

All respondents reported being at least somewhat familiar with the term AMR. While 70% believed that AMR poses a public health threat (See Figure 40), and all agreed that antibiotics can have side effects—including the development of resistant infections due to indiscriminate use—there were notable gaps in understanding and communication. For instance, 60% of participants mistakenly believed that antibiotics are an effective treatment for common cold and cough, which are typically viral in origin. Among the pharmacists surveyed, only half consistently communicated the potential side effects of antibiotics to patients, while the other half did so rarely or not at all.

Challenges and recommendations

Amoxicillin, Doxycycline, and Ciprofloxacin were identified as the most commonly sold antibiotics in the surveyed pharmacies. On average, 30-40% of the antibiotics sold were dispensed over the counter, without a prescription. All respondents reported having observed an increase in antibiotic sales over the years.

When asked for suggestions on how to reduce antibiotic misuse, pharmacists recommended implementing stricter regulations on antibiotic sales, increasing public awareness, conducting training programmes, improving access to healthcare services, and providing clearer guidelines for antibiotic use.

Despite these suggestions, several challenges were noted in promoting the rational use of antibiotics. These included pressure from customers, weak enforcement of existing regulations, inadequate training, high workload, and intense business competition among pharmacies.

4.5.3. Clinicians

Awareness and Prescription of Antibiotics

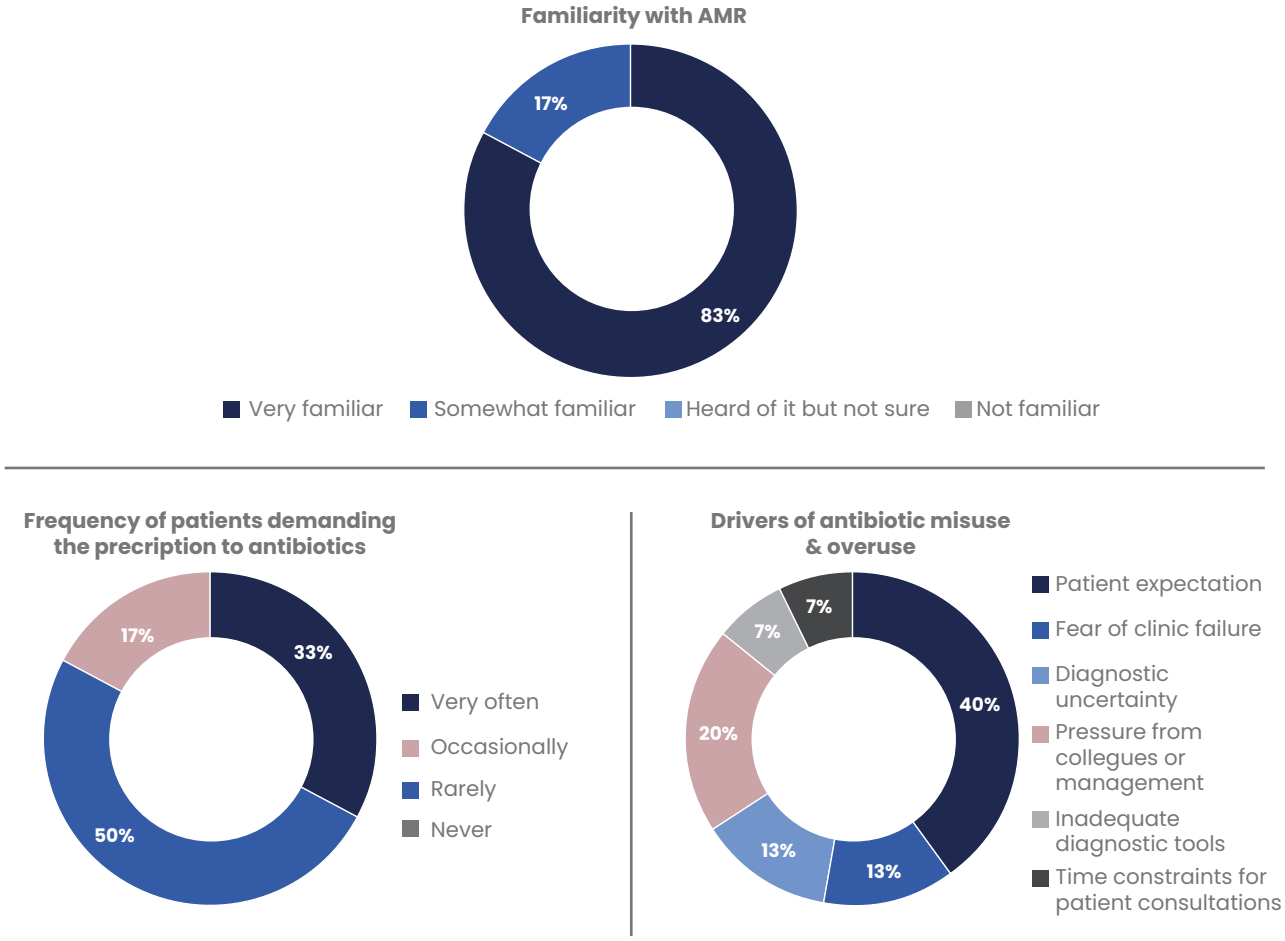


Figure 41: Prescription practices adopted by clinicians' in Haryana

All clinicians surveyed were familiar with the term "Antimicrobial Resistance", and most described it as a public health threat in which microorganisms gain immunity against necessary medication. All respondents agreed that antibiotic resistance was a result of indiscriminate use and over-prescription. In the clinical setting, patient expectation was listed as the main driver for antimicrobial overuse/misuse, followed by pressure from management, fear of clinical failure, diagnostic uncertainty, inadequate diagnostic tools and time constraints (See Figure 41). All the clinicians in the survey had encountered resistant infection in their professional capacity.

When enquired about their own prescribing practice, 84% admitted to prescribing antibiotics to one in 10 patients and 84% admitted to never using antibiograms for the prescription of antibiotics. While 67% of respondents never prescribed 'last resort' antibiotics, about 16% prescribed them sometimes.

Antimicrobial stewardship

None of the clinicians in the survey participated in any antibiotic stewardship training while 83% were either somewhat familiar or completely unsure about AWaRe's classification of antibiotics. As a result, 67% weren't sure if it could aid in rationalising antibiotic prescription and over 80% rarely used the classification to prescribe antibiotics. Although over 80% of the respondents routinely counselled their patients on the proper use of antibiotics while prescribing, none of them informed their patients on the proper disposal of medicines, especially antibiotics.

Research and Management

Only 50% of respondents reported receiving training on PPE, biomedical waste management, and infection control. Among those who received such training, all had undergone it within the past year, indicating recent efforts to improve awareness and practices in these areas.

A significant gap was observed in professional engagement, as 84% of the clinicians surveyed were not affiliated with any medical association. None had received information regarding AMR from the Indian Medical Association, nor had they updated themselves on relevant State or Central Government policies on AMR containment.

When it came to sourcing information on medicines and healthcare, most respondents relied primarily on social media platforms such as Facebook. Other common sources included friends and family, WhatsApp messages, and, to a lesser extent, the official government website.

AMR containment policy and Clinical care

All clinicians surveyed agreed that AMR is a significant public health concern in India. The primary driver identified was the over-the-counter sale of antibiotics, followed by overuse in healthcare settings and the animal production sector, incorrect consumption, inadequate regulation, and even underuse. All respondents admitted that antibiotics are often inappropriately prescribed, with demand from patients being a major contributing factor. Other contributing challenges include limited diagnostic support, insufficient training on AMR, and high patient loads that limit the time available for proper consultation (See figure 42).

Furthermore, the clinicians believed that the responsibility for spreading awareness about antibiotic misuse lies with multiple stakeholders, including doctors, pharmaceutical industries, governmental bodies, civil society, and the general public. When asked about the barriers faced by patients in accessing essential medications, they cited several issues: high costs of antibiotics, limited availability, lack of insurance coverage, inadequate healthcare infrastructure, and regulatory gaps that restrict access or lead to misuse (See figure 42).

To address these concerns, respondents recommended a combination of policy and practice reforms. These included the enforcement of stricter guidelines for antibiotic prescriptions, the expansion of diagnostic facilities, regular training workshops for healthcare professionals, and the creation of a monitoring mechanism to oversee antibiotic use and support rational prescribing practices.

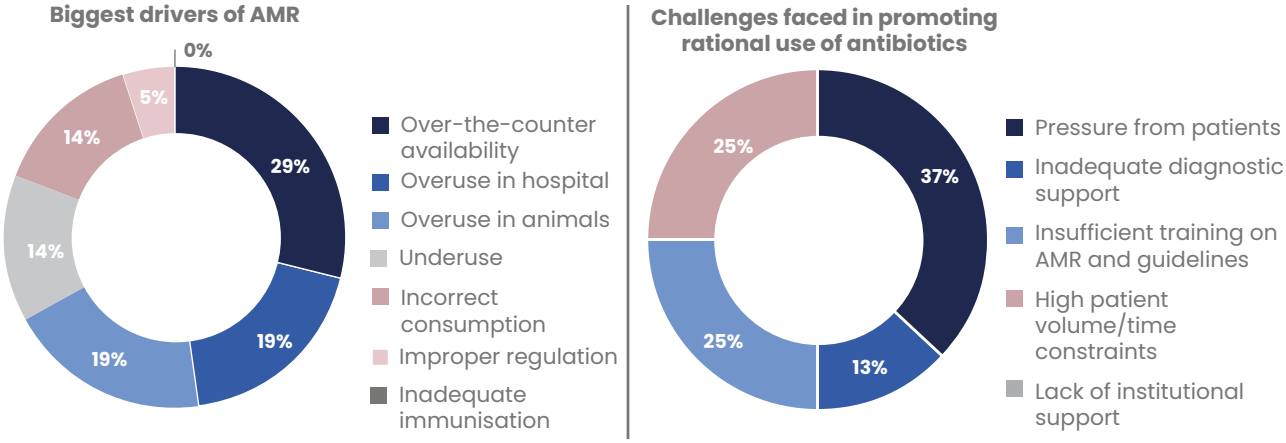


Figure 42: Challenges and drivers of antibiotics use and AMR, respectively

Discussion and Analysis

5.1. Consumers

Knowledge and awareness

Table 3: Antibiotic misconception in the surveyed states (in percentage)

Location	Antibiotics kill viruses (%)			Antibiotics are effective against colds and flu (%)			It's okay to share antibiotics with family and friends when they are sick with the same symptoms (%)		
	Agree	Disagree	Not sure	Agree	Disagree	Not sure	Agree	Disagree	Not sure
Overall	76.6	6	17.4	78.8	11.1	10.1	56.9	38.5	4.6
Delhi	72.5	0	27.5	50	12.5	37.5	48.75	24.16667	27.08333
Haryana	94	6	0	98	2	0	84	16	0
Andhra Pradesh	90.15	9.85	0	53.65	38.35	8	53.8	38.35	7.85
Kerala	92.15	0	7.85	74.55	0	25.45	3.9	96.1	0
Madhya Pradesh	30	10	60	100	0	0	96	4	0

Public awareness about antibiotics varies notably across states. In Andhra Pradesh, 92.31% of respondents are aware of antibiotics, closely followed by Kerala at 96.15%. Haryana reports full awareness at 100%, while Delhi shows a significant knowledge gap with only 42.11% awareness. These differences highlight uneven public health outreach and education across regions.

However, misunderstandings about antibiotics remain widespread. In Andhra Pradesh, 90% correctly understand that antibiotics do not kill viruses, while in Delhi, 72% mistakenly believe they do. Haryana and Kerala show better understanding, with 94% and 92% responding correctly (See Table 3). Regarding sharing of the antibiotics, 53.85% of respondents in Andhra Pradesh think it is acceptable, which poses risks of misuse. Similar concerns exist in Haryana, where 84% find it acceptable, compared to a moderate 33.33% in Delhi.

Socioeconomic factors

The study reveals that socioeconomic factors such as income, education and gender influence antibiotic knowledge and practices. Higher education levels tend to correlate with better awareness of antibiotics. In contrast, individuals from lower-income backgrounds may lack access to accurate information and essential medications, making them more prone to self-medication and misconceptions about the use of antimicrobials, resulting in disproportionate impact (See Table 4). However, the data further shows that regardless of socioeconomic disparities, respondents of all groups hold misconceptions about the use of antibiotics and do not yet possess accurate information on the purpose of antibiotics.

In Andhra Pradesh, 90% correctly understand that antibiotics do not kill viruses, while in Delhi, 72% mistakenly believe they do. Haryana and Kerala show better understanding, with 94% and 92% responding correctly (See Table 3).

Table 4: Knowledge of antibiotics and their consumption in different demographics

Character-istics	Categories	N	Do you know antibiotics? (%)		Did you get a prescription for the antibiotics? (%)		Antibiotics are effective against colds and flu (%)		
			Yes	No	Yes	No	Agree	Disagree	Not sure
Overall		223	88.7	11.3	56.5	42.1	78.8	11.1	10.1
Age	<18	1	100	0	0	100	0	0	100
	18-30	49	95.9	4.1	77.1	22.9	79.6	10.2	10.2
	31-45	108	90.7	9.3	74.3	25.7	79.6	13.9	5.6
	46-60	53	77.4	22.6	74.5	25.5	69.8	7.5	18.9
	Above 60	12	91.7	8.3	100	0	75	0	8.3
Gender	Male	157	89.8	10.2	72.5	27.5	79	9.6	10.2
	Female	66	86.4	13.6	84.4	15.6	71.2	13.6	9.1
Location	Urban	78	91	9	56.6	43.4	85.9	14.1	0
	Rural	54	94.4	5.6	100	0	70.4	0	24.1
	Semi-urban	91	83.5	16.5	78.9	21.1	72.5	14.3	9.9
Education Level	No formal education	10	60	40	66.7	33.3	60	30	10
	Primary school	18	44.4	55.6	47.1	52.9	66.7	5.6	11.1
	Secondary school	49	91.8	8.2	62.5	37.5	81.6	8.2	6.1
	Graduate	77	94.8	5.2	76.3	23.7	79.2	18.2	2.6
	Postgraduate and above	17	94.1	5.9	76.5	23.5	82.4	11.8	5.9

Self-Medication Practices

Awareness of the risks of self-medicating with antibiotics also differs. In Andhra Pradesh, 82.69% of respondents recognise the potential harm in taking antibiotics without medical advice. This drops to 53.33% in Delhi and 48% in Haryana, suggesting lower risk perception and possibly higher self-medication rates in those regions (See Figure 43). However, despite having more public awareness in states like Andhra Pradesh, it was observed that more people were likely to take OTC antibiotics than in states like Delhi and Madhya Pradesh. This indicated that awareness of AMR and antibiotics is not sufficient, and enforcement of OTC sales of antibiotics and clinical prescriptions is equally and extremely important for the success of state and national policies on AMR containment.

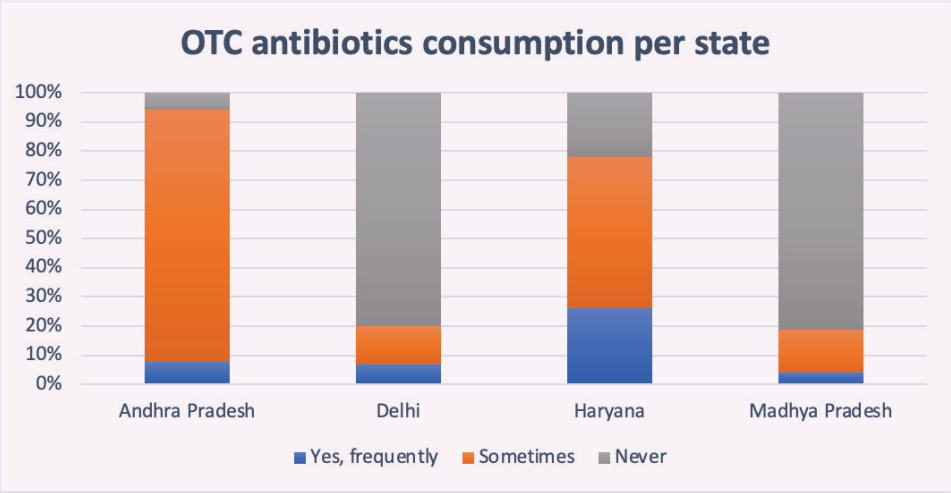


Figure 43: Over-the-counter antibiotic consumption (per state)

Pharmacists

Over-the-Counter Sales of Antibiotics

Over-the-counter sales of antibiotics are a common practice among many pharmacists, with a significant number admitting to dispensing antibiotics without a prescription. This practice is driven largely by customer demand and convenience. Frequently dispensed antibiotics, include Amoxicillin, Cefixime, and Doxycycline, which are readily sold without formal medical consultation. Pharmacists report that customers often request these drugs, citing financial constraints or displaying a lack of awareness about the risks of self-medication. In several responses, pharmacists noted an increase in antibiotic sales over the years, especially during certain seasons, indicating a consistent and growing trend. While the percentage of OTC antibiotic sales varies, the overall data suggests that a substantial portion of antibiotics are being sold without prescriptions. Moreover, pharmacists in Madhya Pradesh and Delhi were more likely to dispense antibiotics without prescriptions compared to their counterparts in Kerala, Haryana and Andhra Pradesh (See Table 5). This implies that regulations need to be supplemented with stricter compliance and monitoring mechanisms, and that their presence alone doesn't guarantee successful outputs.

Table 5: Frequency of OTC sales of antibiotics (in percentage)

Location	Frequency of OTC sales of antibiotics by pharmacists (%)				
	Always	Often	Sometimes	Rarely	Never
Madhya Pradesh	10	30	60	0	0
Andhra Pradesh	45.5	18.2	36.4	0	0
Haryana	0	0	0	40	60
Kerala	0	0	0	0	100
Delhi	14.3	14.3	14.3	0	57.1

Compliance

Despite a general awareness of regulatory frameworks in both states, with and without state policy, on Schedule H1 and red-line campaigns, compliance remains inconsistent across pharmacies. While some pharmacists adhere to rules requiring record-keeping and prescription-only dispensing, many others either do not maintain records or fail to audit their sales regularly. The handling of expired or leftover antibiotics also varies, with some pharmacies returning them to manufacturers and others using different, less regulated methods of disposal, such as throwing them with household waste. Although awareness campaigns have increased recognition of these regulations, they have not translated uniformly into compliant practices, revealing significant gaps in enforcement.

AMR Awareness

Awareness of AMR among pharmacists is mixed. While some respondents clearly understand AMR as a critical public health threat, others show limited knowledge of the issue. Most pharmacists do acknowledge the potential side effects of antibiotic use, including skin reactions, gastrointestinal disturbances, and allergic responses. There is also some emphasis on educating customers about the importance of completing the full course of antibiotics and the dangers of misuse. However, this awareness does not always influence dispensing behaviour, especially in the face of customer pressure or when regulations are poorly enforced. The data also indicates that a majority of respondents believe they have sufficient knowledge about the risks of self-medication with antibiotics, while a smaller number are unsure or believe they do not have sufficient knowledge. However, it appears that there are no respondents who believe pharmacists play a critical role in preventing antibiotic misuse and AMR.

Table 6: Awareness of AMR amongst pharmacists (in percentage)

Location	How familiar are you with the term "Antimicrobial Resistance (AMR)"?				Do you believe that AMR is a public health threat			Do you agree that the misuse/Indiscriminate use of antibiotics can cause resistance in patients?		
	Very familiar	Somewhat familiar	Heard of it, but not sure	Not familiar	Yes	No	Not sure	Yes	No	Not sure
Madhya Pradesh	10	80	10	0	90	10	0	0	90	10
Andhra Pradesh	54.5	45.5	0	0	100	0	0	10	20	70
Kerala	0	0	0	0	0	0	0	66.7	33.3	0
Haryana	40	60	0	0	40	40	20	100	0	0
Delhi	12.5	25	37.5	25	50	0	50	71.4	14.3	14.3

Challenges

The data reveal several challenges in regulating antibiotic sales. These challenges include weak regulatory enforcement, persistent customer demand for antibiotics without prescriptions, and a general lack of awareness, both among the public and pharmacy personnel. Although many pharmacists recommend consulting a doctor before taking antibiotics, in most cases, they often end up dispensing medications based on customer insistence. To address these issues, respondents recommend a combination of public awareness campaigns, targeted training programmes for pharmacists, and stricter policy enforcement to ensure responsible antibiotic use.

5.2 Clinicians

Prescription Practices

The analysis of the data reveals that clinicians generally report a moderate frequency of antibiotic prescription. Although outright overprescription may not be widespread, there is a clear indication that antibiotics are regularly used in clinical settings, likely as part of routine treatment. However, a critical finding is that a significant number of clinicians experience pressure from patients who insist on being prescribed antibiotics, even in cases where such treatment may not be necessary. Moreover, clinicians overwhelmingly agree that patient demand is a major contributor to the overuse of antibiotics in India, underscoring the need for public education and behaviour change communication strategies.

Antimicrobial Stewardship Awareness and Practice

Many clinicians recognise the dangers of misusing broad-spectrum antibiotics, which are known to accelerate resistance. Despite this awareness, the practical implementation of antimicrobial stewardship tools such as antibiograms is inconsistent. While some clinicians reported using antibiograms to guide their antibiotic prescriptions, a significant majority admitted to using them only occasionally or not at all. This inconsistency suggests a gap between knowledge and practice, potentially due to a lack of access to diagnostics, time constraints, or institutional support. In addition, responses regarding the influence of national or state-level policy on prescribing behaviour were mixed. While a few clinicians noted that such policies had influenced their practices, a majority felt that these policies had little to no impact, indicating weak policy enforcement and limited engagement with frontline clinicians.

Challenges to Rational Use of Antibiotics

One of the most commonly reported barriers is the pressure to prescribe antibiotics quickly, often without the support of diagnostic tests. This is especially true in high-volume clinical environments where time is limited and expectations from patients are high. Limited access to rapid diagnostic tools further exacerbates this issue, forcing clinicians to rely on empirical treatment. Additionally, clinicians cite lack of institutional support and ineffective policy enforcement as key obstacles.

Clinician Recommendations and Policy Suggestions

Clinicians offered a range of practical suggestions to reduce antibiotic misuse and combat AMR. Most advocated for improved and continuous training of healthcare professionals on antibiotic stewardship and resistance trends. Public awareness campaigns were also emphasised as a means to reduce patient-driven pressure for antibiotics. Importantly, clinicians highlighted the need for stricter enforcement of prescription-only regulations to curb OTC sales. Strengthening antimicrobial stewardship programmes, including the mandatory use of antibiograms and routine prescription audits, was also recommended. Clinicians expressed frustration at the lack of policy impact and called for better communication and implementation of national AMR guidelines. Their suggestions to policymakers included sealing antibiotic packs for sale only with valid prescriptions, enhancing policy transparency, and ensuring that patient education becomes a routine part of public health outreach. Collectively, these recommendations indicate a strong willingness among clinicians to improve prescribing practices, provided they receive adequate institutional support and regulatory backing.

Recommendations

India faces a critical situation regarding AMR. Recognised as the AMR capital of the world, it is one of the largest producers of antimicrobials and also has the highest rates of antimicrobial usage. The country faces multiple challenges, namely, over-the-counter sales of antibiotics, overprescription in hospitals and overconsumption in the animal food sector. Furthermore, lack of awareness among the general public and healthcare professionals exacerbates the problem, with many patients demanding antibiotics even for viral infections. This scenario is compounded by socio-economic factors such as poverty and limited access to quality healthcare, which often lead individuals to self-prescribe or seek medications from untrained providers.

Given these challenges, the following recommendations could be considered to mitigate risks associated with AMR:

1. **Implementation of a State Action Plan on the containment of AMR:** State action plans serve as essential policy frameworks that demarcate key priorities, actionable outcomes, outputs, and proposed activities aimed at combating antimicrobial resistance. While these plans align with the overarching goals of the National Action Plan, they are tailored to address the specific health needs and contexts of individual states, as health is a state subject. For e.g., initiatives focused on reducing antibiotic use in aquaculture are particularly relevant in states like Odisha and Andhra Pradesh, where such practices are prevalent, as opposed to states like Delhi that are not centres for aquaculture.

   The implementation of these state action plans provides a structured roadmap for initiating activities across various sectors and developing a shorter but comprehensive institutional action plan to combat AMR. Given that resistant infections and pathogens transcend state borders, these plans must be executed consistently across the country and different sectors. This coordinated approach will significantly contribute to improving the overall public health landscape and effectively addressing the challenges posed by AMR on a national scale.

2. **Adopting the One Health approach to the policy framework:** The existing national and state policies include provisions addressing antibiotic use and surveillance in animal husbandry and the environmental sector. However, they are often overlooked or ignored. There needs to be stricter enforcement of the action plan addressing AMR across sectors, which includes an inventory of antibiotics consumed, AMR surveillance, a reporting mechanism, awareness campaigns and evaluation of implemented policy.

3. **Addressing Socioeconomic Barriers:** Policies aimed at improving access to affordable healthcare and medications, particularly in low-income areas, need to be implemented. It was observed in the study that people of a weaker socioeconomic background experience limited access to proper healthcare facilities. Therefore, enhancing the availability of essential antibiotics and ensuring that healthcare facilities are adequately equipped would proportionately reduce incidents of resistant infections.

4. **Integration of AMR in other health-related policies:** Another method to effectively combat AMR is to develop integrated strategies that address AMR as part of broader public health and climate resilience efforts. This would enhance the overall effectiveness of public health initiatives by ensuring that AMR awareness and strategies are embedded within broader health frameworks, such as infectious disease control, maternal and child health, and climate change, instead of being addressed in a silo. Stakeholders can promote a more comprehensive approach to health management that addresses the multifaceted nature of AMR. Collaborative efforts among various sectors, including agriculture and environmental management, will further strengthen the response to AMR, ensuring that all relevant stakeholders are engaged in the fight against this pressing public health threat. For e.g. Tamil Nadu's new One Health and Climate Change Hub.

5. **Establishing a proper disposal channel for antibiotic wastes from households:** The management of antimicrobial-containing wastes at healthcare facilities is highlighted in the Biomedical Waste Management Rules 2022. However, as the study reveals, consumers do not have sufficient knowledge on how to dispose of expired and unused medication at the household level. This gap in understanding significantly increases the likelihood that such medications will be discarded in landfills or sewage systems, contaminating the environment and propagating resistant pathogens. Therefore, there needs to be clear guidelines on disposal methods along with community awareness programmes to reduce the risk of antimicrobial resistance.

6. **Enhance Public Awareness Campaigns:** Observations made from the survey highlight the significant need to develop and implement awareness campaigns targeted at educating the general public on the misuse and overuse of antimicrobials. It is essential to design targeted educational programmes to improve public understanding of appropriate antibiotic use and AMR, including states that lack a formal containment plan. Given that most respondents reported that they rely on online sources for such information, utilising platforms such as social media, schools, and community health programmes could be an effective strategy for widespread and impactful dissemination.

7. **Improve Training for Healthcare Professionals:** Routine workshops should be conducted to train clinicians in antimicrobial stewardship, appropriate prescribing practices, and AMR awareness. Such initiatives are essential to bridge the knowledge gaps identified in the study. While states like Delhi, Kerala, and Madhya Pradesh have proposed these trainings in their respective action plans, it is important to ensure the inclusion of private practitioners and practising pharmacists.

   To encourage participation, incentives, such as linking the training to licensing or renewal requirements, could be introduced.

8. **Develop Monitoring and Evaluation Mechanisms:** India reports its AMR surveillance annually in the healthcare sector; however, information about the effective enforcement of current regulations on annual antibiotic usage and sector-wide consumption is unavailable in the public forum. Robust systems to monitor antibiotic use and resistance patterns need to be implemented. This could include the establishment of surveillance systems to collect data on antibiotic prescriptions, usage, and AMR trends across different regions. E.g., increasing audits and building surveillance data on drug usage in the healthcare and animal husbandry sectors.

9. **Encourage Research and Innovation:** An increase in funding for research focused on AMR, including studies on the effectiveness of current policies and the development of new antibiotics and alternative therapies, is required. This will help address the gaps in knowledge and inform future strategies.

Limitations

- **Number of states surveyed:** While the study depicts a microcosm of AMR-related practices and behaviours, it does not completely reflect the complexities and variation across the states. However, it can be extrapolated to a possible situation occurring in each state. Budgetary constraints limited the possibility of a more comprehensive, state-wide analysis.
- **Assessment of private and government hospitals:** Gaining access to private and government healthcare facilities required formal approvals and coordination with multiple stakeholders, which exceeded the logistical and operational capacity of the research team.
- **Sample Size and Representation:** The sample size in each location may not have been large enough to generalise findings across all socio-economic groups or healthcare providers. Selection bias may also exist due to voluntary participation.
- **Limited Timeframe:** The study was conducted within a limited period, which may not reflect seasonal or long-term trends in antibiotic use, healthcare-seeking behaviour, or AMR awareness.
- **Cultural and Regional Diversity:** India's vast cultural and linguistic diversity means attitudes towards healthcare and medicine can vary significantly. These cultural dimensions may not have been fully captured by the study's scope and tools.

Appendices

Survey questions (for clinicians)

PERSONAL INFORMATION	
A1. Age	
A2. Gender (Male/Female/Others)	
A3. Educational Qualification	
A4. Specialisation:	1. General Practitioner 2. Internal Medicine 3. Paediatrics 4. Surgery 5. Obstetrics & Gyanecology 6. Others (Please specify)
A5. Years of Experience	1. Less than 5 years 2. 5-10 years 3. 11-20 years 4. More than 20 years
A6. Type of work setting (Government/Private)	1. Public Hospital 2. Private Hospital 3. Primary Health Centre 4. Clinic/Private Practice 5. Others (Please specify)
A7. Geographical setting (Rural/Urban)	
A8. Average no. of patients seen in a week	
AWARENESS AND USAGE OF ANTIBIOTICS	
B1. How familiar are you with the term "Antimicrobial Resistance (AMR)"?	1. Very familiar 2. Somewhat familiar 3. Heard of it but not sure 4. Not familiar
B2. According to you, what is Antimicrobial Resistance (AMR)?	_____
B3. How often do you prescribe antibiotics (try to grade it)?	1. One in 10 2. One in 5 3. To every patient
B4. Have you ever faced situations where patients insisted on being prescribed antibiotics even when not necessary?	1. Very often 2. Occasionally 3. Rarely 4. Never
B5. Indiscriminate use of antibiotics in humans, plants and animals leads to antimicrobial resistance	1. True 2. False

B6. What are the main drivers for antibiotic overuse/ misuse in your clinical setting? (Select all that apply)	1. Patient expectations 2. Fear of clinical failure 3. Diagnostic uncertainty 4. Pressure from colleagues or management 5. Inadequate diagnostic tools 6. Time constraints for patient consultations 7. Others (Please specify)
B7. Do you believe antibiotic resistance is a result of over-prescribing and misuse?	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree
B8. Broad-spectrum antibiotics, when misused, lead to the emergence of antibiotic resistance.	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree
B9. Do you use Antibiograms for the prescription of antibiotics?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
B10. How often have you prescribed 'last-resort' antibiotics like colistin, minocycline, polymyxin B, etc.?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
B11. Have you observed cases of resistant infection in your professional capacity?	_____
C. ANTIMICROBIAL STEWARDSHIP	
C1. Have you ever participated in antibiotic stewardship training? **If yes, when was your last training?**	1. Yes 2. No _____
C2. Are you aware of the WHO AWaRe classification of antibiotics (Access, Watch, Reserve)?	1. Very familiar 2. Somewhat familiar 3. Heard of it but not sure 4. Not familiar
C3. How often do you refer to the AWaRe classification in your clinical practice?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
C4. Do you think the AWaRe classification aids in rationalising antibiotic prescriptions?	1. Yes 2. No 3. Not sure

C5. Do you counsel patients on the proper use of antibiotics while prescribing?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
C6. Do you counsel patients on ways to properly dispose of antibiotics?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
C7. If yes in C6, what are the methods you suggest?	
C8. Do you routinely educate your patients on the appropriate use of antibiotics?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
C9. According to you, what are the conditions when antibiotics are not indicated?	_____
RESEARCH AND MANAGEMENT	
D1. Have you been trained in PPE, BMW management and infection control? **If yes, when did you last receive the training?**	1. Yes 2. No _____
D2. How do you dispose of your biomedical waste?	_____
D3. Are you part of any doctor's association? **If yes, is AMR discussed often?**	1. Yes 2. No _____
D4. Do you receive information regarding AMR from the IMA?	1. Yes 2. No 3. Not sure
D5. How often do you update yourself with the state and centre's policies on AMR containment?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
D6. If yes on D5, what sources do you follow?	1. Social Media (Facebook, Twitter) 2. Official government website 3. WhatsApp 4. Friends and Family 5. IMA website 6. Others _____
D7. Are you involved in any research or community awareness initiatives related to AMR?	1. Yes 2. No
AMR CONTAINMENT POLICY AND CLINICAL CARE	
E1. Do you think AMR is a major problem in India?	1. Yes 2. No 3. Not sure

E2. What do you think is the biggest cause of AMR in India?	1. Over-the-counter availability 2. Overuse in hospitals 3. Overuse in animals 4. Underuse 5. Incorrect consumption 6. Improper regulation 7. Inadequate immunisation 8. Improper infection control 9. Others
E3. Have you personally observed cases of resistant infections?	_____
E4. Do you think antibiotics are inappropriately prescribed in India?	1. Yes 2. No 3. Not sure
E5. Do you think patients' demand for antibiotics contributes to the overuse?	1. Yes 2. No 3. Not sure
E6. What is your view on the over-the-counter sale of antibiotics?	_____
E7. Do you think the State/Centre's policy on antibiotic containment guidelines has changed the way you prescribe antibiotics?	1. Yes 2. No 3. Not sure
E8. Who do you think holds prime responsibility for spreading information about the use and misuse of antibiotics?	1. Doctors 2. Pharmaceutical industry/Pharmacists 3. Governmental bodies 4. Civil society 5. Public 6. Others: _____
E9. In your opinion, what are the major barriers to patients' access to essential antibiotics? (Select all that apply)	1. High cost of antibiotics 2. Limited availability or stock issues 3. Lack of prescription/insurance coverage 4. Geographic constraints or inadequate healthcare infrastructure 5. Regulatory issues 6. Others (Please specify)
E10. What measures do you believe could reduce the misuse of antibiotics in clinical settings? (Select all that apply)	1. Stricter guidelines on antibiotic prescriptions 2. Improved diagnostic facilities 3. Patient education programs 4. Regular sensitisation workshops for healthcare providers 5. Monitoring and feedback systems on antibiotic use 6. Others (Please specify)

E11. What challenges do you face as a clinician in promoting the rational use of antibiotics?	1. Pressure from patients 2. Inadequate diagnostic support 3. Insufficient training on AMR and guidelines 4. High patient volume/time constraints 5. Lack of institutional support 6. Others (Please specify)
E12. Do you have any suggestions for policymakers to improve antibiotic use and reduce AMR?	

Survey questions (for pharmacists)

PERSONAL INFORMATION	
A1. Age	
A2. Gender (Male/Female/Others)	
A3. Qualification	1. Diploma in Pharmacy 2. Bachelor of Pharmacy (B.Pharm) 3. Master of Pharmacy (M.Pharm) 4. Others (Please specify)
A4. Years of Experience	1. Less than 1 year 2. 1-5 years 3. 6-10 years 4. More than 10 years
A5. Type of Pharmacy:	1. Standalone Pharmacy 2. Chain Pharmacy 3. Hospital-based Pharmacy 4. Others (Please specify)
BEHAVIOURAL ANALYSIS	
B1. Do you often encounter customers asking for antibiotics without a prescription?	1. Very often 2. Occasionally 3. Rarely 4. Never
B2. Prescription-only drugs are meant to be given only with a prescription of RMP (Registered Medical Practitioner).	YES 2. NO
B3. How often do you dispense antibiotics without a prescription?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
B4. Name the antibiotics that are dispensed over the counter.	_____
B5. If yes B3, when giving the OTC antibiotics which antibiotics do you generally prescribe?	1. Generic antibiotic 2. Branded antibiotic 3. Any cheaper alternative 4. Others: _____

B6. If yes in B3, what criteria do you use to prescribe antibiotics? (Choose all that apply)	1. Diagnosis of the condition 2. Patient age 3. Weight of the patient 4. Allergies and sensitivities 5. Medical history 6. Severity of symptoms 7. Duration of symptoms 8. Local resistance patterns 9. Guidelines from health authorities 10. Patient adherence and understanding 11. Other (please specify): _____
B7. How many doses do you dispense?	1. full course 2. half course 3. a few tablets. 4. Other (please specify): _____
B8. If you dispense antibiotics without a prescription, what are the main reasons? (Select all that apply)	1. Customer insistence 2. Symptoms described by the customer 3. Lack of strict regulations/enforcement 4. Emergency cases 5. Business competition 6. Others (Please specify)
B9. In your opinion, what is the most common reason customers request antibiotics without a prescription?	1. Lack of awareness 2. Previous experience of using antibiotics 3. Inability to consult a doctor 4. Recommendations from family/friends 5. Others (Please specify)
B10. Do you think customers have sufficient knowledge about the risks of self-medication with antibiotics?	1. Yes 2. No 3. Not sure
B11. Do you believe pharmacists play a critical role in preventing antibiotic misuse and AMR?	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree
REGULATION AND COMPLIANCE	
C1. Are you aware of the red-line campaign?	1. Very familiar 2. Somewhat familiar 3. Heard of it but not sure 4. Not familiar
C2. Which medicines have this red line?	_____
C3. Are you aware of Schedule H1 medicines?	1. Very familiar 2. Somewhat familiar 3. Heard of it but not sure 4. Not familiar
C4. What are your criteria for deciding which antibiotics need to be stocked?	_____

C5. Do you keep records of Schedule H1 sold?	YES 2. NO
C6. If yes in C5, when was the last time the records were audited?	1. <6 months 2. 1 year ago 3. 2 years ago 4. Other: _____
C7. Are antibiotics effective in treating common cold and cough	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree 5. Don't know
C8. Do antibiotics destroy the normal gastric flora?	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree 5. Don't know
AMR AWARENESS	
D1. How familiar are you with the term "Antimicrobial Resistance (AMR)"?	1. Very familiar 2. Somewhat familiar 3. Heard of it but not sure 4. Not familiar
D2. What does AMR mean to you?	_____
D3. Do you believe that AMR is a public health threat?	1. Yes 2. No 3. Not sure
D4. Do you agree that the misuse/Indiscriminate use of antibiotics can cause resistance in patients?	1. Agree 2. Disagree 3. Don't know
D5. Are you aware that antibiotics could cause side effects?	1. Yes 2. No 3. Not sure
D6. Can you list some of these side effects?	_____
D7. Do you advise or inform patients about the potential side effects of antibiotics at the time of purchase?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
D8. Do you advise patients to complete their course?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
D9. Are antibiotics prescribed differently for children and adults? **If yes, how?**	YES 2. NO
D10. Is there any age restriction for obtaining over-the-counter medication?	YES 2. NO

OVER THE COUNTER SALES	
E1. Do you dispense medications over the counter for other major ailments? (B.P., diabetes)	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
E3. Do you think OTC sales of antibiotics are beneficial for the patients?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
E4. If antibiotics were sold over the counter, which antibiotic could be sold without harm?	_____
E5. If you deliver medicines at home, how do you check the prescriptions?	_____
E6. Do you update your knowledge regarding OTC drugs/attend any modules/or participate in government-initiated training programs	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never
E7. What do you do with expired/unsold antibiotics at the shop?	_____
E8. Do you take back expired/leftover antibiotics from consumers?	
CONSUMER BEHAVIOUR	
F1. Which antibiotic is sold the most?	_____
F2. What % of the total medicines sold are over-the-counter compared to prescription medicines (approximately)?	_____
F3. Have your antibiotic sales increased over the years? **When were the sales highest?**	1. YES 2. NO _____
F4. What do you think could help reduce antibiotic misuse in your community? (Select all that apply)	1. Stricter regulations on antibiotic sales 2. Public awareness programs 3. Training programmes for pharmacists 4. Better accessibility to healthcare services 5. Clearer guidelines for antibiotic dispensing 6. Others (Please specify)
F5. What challenges do you face as a pharmacist in promoting the rational use of antibiotics?	1. Pressure from customers 2. Lack of enforcement of regulations 3. Inadequate training/knowledge 4. High workload/limited time for patient counselling 5. Business competition 6. Others (Please specify)
F6. Do you have any suggestions for policymakers to improve antibiotic use and reduce AMR?	

3. Survey questions (for public)

A. PERSONAL INFORMATION	
A1. Age	1. Below 18 2. 18-30 3. 31-45 4. 46-60 5. Above 60
A2. Gender (Male/Female/Others)	
A3. Annual Income/Occupation	
A4. Education Level:	1. No formal education 2. Primary school 3. Secondary school 4. Graduate 5. Postgraduate and above
A4. Location:	1. Rural 2. Semi-Urban 3. Urban
B. AWARENESS AND USAGE OF ANTIBIOTICS	
B1. Do you know about antibiotics?	1. YES 2. NO
B2. Have you taken any antibiotics?	1. YES 2. NO
If yes, when and why did you take antibiotics last time?	_____
B3. Did you get a prescription for the antibiotics?	1. YES 2. NO
B4. If yes on B2, who gave you the prescription?	1. Medical Doctor 2. Homeopathic doctor 3. Pharmacist 4. Others (specify_____) 5. Do not remember
B5. Where did you buy the antibiotics?	1. Clinic 2. Medical store or pharmacy 3. Stall or hawker 4. Friend or family member 5. I had them saved up from a previous time 6. Somewhere/someone else
B6. How do you decide how much antibiotics to buy?	_____
B7. In your opinion, why do people stop taking antibiotics before completing the full course? (Select all that apply)	1. Feeling better 2. Side effects 3. Cost of the medication 4. Lack of awareness 5. Others (Please specify)

B8. Do you have extra (leftover) antibiotics at home?	1. YES 2. NO
B9. What do you do with leftover antibiotics?	1. Give it back to the pharmacist/druggist 2. Use it in the future for personal use 3. Give to friends and family in need 4. Throw it in the garbage 5. Other (_____)
B10. How do you dispose of unused medicines?	1. Flush down the toilet 2. Turn into powder and disperse on plants 3. Give it to pharmacists 4. Give it back to the hospital 5. Throw it in the dustbin 6. Other (_____)
C. KNOWLEDGE ABOUT ANTIBIOTICS	
C1. Do you believe that antibiotics can cure any illness or infection?	1. Yes 2. No 3. Not sure
C2. Antibiotics should be used in case of all fevers?	1. Agree 2. Disagree 3. Not sure
C3. Antibiotics kill viruses?	1. Agree 2. Disagree 3. Not sure
C4. Do antibiotics work in the prevention of infections?	1. Agree 2. Disagree 3. Not sure
C5. Antibiotics are effective against colds and flu?	1. Agree 2. Disagree 3. Not sure
C6. It's okay to stop taking antibiotics after I start feeling better?	1. Agree 2. Disagree 3. Not sure
C7. It's okay to share antibiotics with family and friends when they are sick with the same symptoms?	1. Agree 2. Disagree 3. Not sure
C8. It's okay to share my leftover antibiotics with my pets when they are sick?	1. Agree 2. Disagree 3. Not sure
C9. It's okay to take another antibiotic if the one prescribed by the doctor is not available in the market?	1. Agree 2. Disagree 3. Not sure
C10. Antibiotics are harmless?	1. Agree 2. Disagree 3. Not sure
C11. Antibiotics act as painkillers or antipyretics (anti - fever)?	1. Agree 2. Disagree 3. Not sure
D. KNOWLEDGE ABOUT ANTIBIOTIC RESISTANCE	
D1. Have you ever received any information on when and how you should not take antibiotics unnecessarily (for illnesses such as cold or flu), or information on antibiotic resistance?	1. YES 2. NO

D2. If yes in D1, how did you receive the information?	1. Doctor or nurse 2. Pharmacist 3. Family member or friend 4. Social media (WhatsApp, Facebook) 5. Others (e.g. Newspaper, TV) 6. _____
E. EXPERIENCES IN USING HEALTH CARE SERVICES	
E1. When was the last time you had symptoms of cold and flu?	_____ months ago,
E2. Did you visit a doctor?	1. YES 2. NO
E3. If no, what did you do to relieve the symptoms?	1. Took extra rest 2. Took left-over antibiotics 3. Took traditional medicine 4. Took over-the-counter medicine 5. Others: _____
E4. If yes, did your doctor prescribe you antibiotics?	1. YES 2. NO
E5. Did your doctor talk to you about antibiotic resistance and other side effects of antibiotics?	1. YES 2. NO
E6. Has your doctor explained to you why you do not need antibiotics?	1. YES 2. NO
E7. Has the doctor ever specifically told you to complete the antibiotic dosage?	1. YES 2. NO
E8. Has there ever been an instance where the antibiotic prescribed was unaffordable or unavailable	1. YES 2. NO
F. SELF-MEDICATION	
F1. Have you ever taken antibiotics without consulting a doctor?	1. Yes, frequently 2. Sometimes 3. Never
F2. Do you think taking antibiotics without medical advice can be harmful?	1. Yes 2. No 3. Not sure
F3. Are you aware of any health risks associated with the misuse of antibiotics? (Select all that apply)	1. Allergic reactions 2. Resistance to antibiotics 3. Ineffectiveness of treatment 4. Other side effects (Please specify) 5. Not aware of any risks
F4. Do you usually buy antibiotics from a pharmacy without a prescription?	1. Yes, often 2. Occasionally 3. Rarely 4. Never

F5. If yes, what are the main reasons for buying antibiotics without a prescription? (Select all that apply)	1. Cost of doctor's consultation 2. Previous experience with the same illness 3. Recommendations from family/friends 4. Convenience and accessibility 5. Difficulty in getting a doctor's appointment 6. Others (Please specify)
F6. Do you think it is necessary to consult a doctor before taking antibiotics?	1. Yes 2. No 3. Not sure
F7. Have you ever faced difficulties in accessing or affording antibiotics?	1. Yes, often 2. Occasionally 3. Rarely 4. Never
F8. Do you feel that antibiotics are generally affordable for most people in your community?	1. Yes 2. No 3. Not sure
F9. In your opinion, what are the main barriers to accessing antibiotics? (Select all that apply)	1. High cost 2. Availability in pharmacies 3. Need for a prescription 4. Lack of nearby healthcare facilities 5. Others (Please specify)
G. DISPOSAL OF ANTIBIOTICS	
G1. What do you usually do with leftover or unused antibiotics?	1. Keep them for future use 2. Throw them in the trash 3. Flush them down the toilet 4. Return them to a pharmacy 5. Others (Please specify)
G2. Do you know the correct way to dispose of unused or expired antibiotics?	1. Yes 2. No 3. Not sure
H. RECOMMENDATIONS AND CHALLENGES	
H1. Do you think there should be stricter rules about buying antibiotics without a prescription?	1. Yes 2. No 3. Not sure
H2. What challenges do you face in following the appropriate use of antibiotics?	1. Lack of awareness 2. Pressure from family/friends to use leftover antibiotics 3. Inconvenience or cost of doctor's consultations 4. Others (Please specify)
H3. Do you have any suggestions for improving public awareness and use of antibiotics?	

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